

Impacts of Risk Perceptions of Secondhand Exposure to Drugs on Intent to Leave Among Transit Operators

Transit Operators' Perceived Risk of Drug Exposure

Pranav Srikanth, PhD, Isaac C. Rhew, PhD, Edmund Seto, PhD,
Christopher Zuidema, PhD, and Marissa G. Baker, PhD

Objective: This study investigates whether transit operators' risk perceptions of workplace exposure to drug use incidents, occupational stress, and job satisfaction were associated with intent to leave their job. **Methods:** A cross-sectional survey of operators from union locals (WA, OR) assessed perceived risk of drug exposures, occupational stress, job satisfaction, and intent to leave (N = 273). Ordinal logistic regression models were developed for intent to leave. **Results:** Most operators were bus drivers. Higher perceived risk was significantly positively associated with greater intent to leave; stress and job satisfaction attenuated this relationship. Higher stress and lower job satisfaction were significantly associated with greater intent to leave across models. **Conclusions:** Operator turnover can potentially be reduced by increasing supports targeting risk perceptions of drugs, such as training, or by providing supports (eg, mental health resources) that reduce stress and improve job satisfaction.

Keywords: occupational health, perceived risk, job satisfaction, occupational stress, public transit

With drug misuse of synthetic opioids and methamphetamines increasing in the USA,¹⁻⁵ research has shown potential transit operator exposure to drug residue in air and on surfaces resulting from drugs being smoked by riders.⁶ Transit systems are a vital component of a city's infrastructure, playing a crucial role in moving people throughout communities. In 2023, transit systems in Washington (WA) and Oregon (OR) states served over 280 million passenger

LEARNING OUTCOMES

- Upon reading this article, professionals should be able to describe occupational factors associated with experiencing workplace exposure to drug use
- Readers should be able to explain how workplace exposure to drug use can impact intent to leave among workers
- Professionals designing policies should be able to identify methods to reduce turnover of transit operators, as it pertains to workplace exposure to drug use

trips.⁷ As transit ridership increases and recovers to prepandemic rates,⁸ ensuring transit workers' safety and health is crucial to maintain safe and effective service to communities.

Despite transit systems employing nearly 150,000 operators and drivers across the USA,⁹ the industry continues to experience workforce shortages due to challenges in worker retention,¹⁰ particularly among newer workers.¹¹ New operators are typically provided with brief trainings focusing on driving practices, company policies, and customer service¹²; however, it is unclear whether these trainings adequately prepare operators for other challenges such as drug misuse aboard their vehicle.

Transit systems in WA and OR employ an estimated combined 9830 transit operators as of May 2024,^{13,14} and research finding on fentanyl and methamphetamine residue on transit vehicles suggests that misuse of these drugs occurs on transit vehicles,⁶ consistent with these illicit drugs being the most commonly misused nationally and in the Pacific Northwest specifically.¹⁴ Additionally, states and cities have different local policies regarding drug use. For example, in OR, the introduction of Measure 110 in 2020 decriminalized drug use and was subsequently repealed in 2024; however, it is unclear whether this impacted rates of drug use on transit vehicles.¹⁵ Both WA and OR have also decriminalized and legalized recreational and medical cannabis sale and consumption; however, public use remains illegal in both states.^{16,17}

Risk perception of secondhand drug exposure, particularly fentanyl, remains high,¹⁸⁻²² despite research indicating low risk of toxicity associated with secondhand exposures.²³ Perceived risk refers to an individual's beliefs about their vulnerability to a potential hazard and is typically characterized by perceived risk severity (the believed magnitude of risk to health) and perceived risk susceptibility (the believed likelihood of exposure) to the hazard.²⁴ Front-line workers who respond to opioid overdose incidents remain concerned about fentanyl exposure despite low risks of toxicity.²³ This leads to a phenomenon where risk perceptions and expectations of negative health effects result in real health symptoms^{21,25}; however, in the case of fentanyl exposure, it is unclear if these symptoms are due to fentanyl toxicity.²⁶ Research of first responders indicated that there are misconceptions about the hazards associated with brief contact with fentanyl; in one study, nearly 80% believed that touching fentanyl could be fatal.²⁷ Another study of first responders found that, despite low frequency of exposure to fentanyl, first responders remained concerned about the potential

From the Department of Environmental and Occupational Health Sciences, University of Washington School of Public Health, Seattle, Washington (P.S., E.S., C.Z., M.G.B.); and Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle, Washington (I.C.R.).

ORCID: 0000-0003-3815-3697

ORCID: 0000-0001-9731-8776

ORCID: 0000-0003-4058-0313

ORCID: 0000-0002-2233-2706

ORCID: 0000-0003-3136-0490

Funding source: This survey was funded through the University of Washington Harry Bridges Center for Labor Studies Washington State Labor Research Grant. The work was also funded through the Northwest Center for Occupational Health and Safety (NWCOS) under federal training grant T42OH008433. The findings of this survey do not necessarily reflect the opinion of the Harry Bridges Center for Labor Studies or the NWCOS.

Conflict of interest: None declared.

Authors' contributions: All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by P.S. and overseen by M.G.B. The first draft of the manuscript was written by P.S. P.S., I.C.R., E.S., C.Z., and M.G.B. commented on previous versions of the manuscript. P.S., I.C.R., E.S., C.Z., and M.G.B. read and approved of the final manuscript.

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

AI statement: AI was not utilized at any stage of research.

Ethical approval: This study was determined to be exempt from review by the University of Washington Human Subjects Division.

Address correspondence to: Pranav Srikanth, PhD, Department of Environmental and Occupational Health Sciences, University of Washington School of Public Health, 4225 Roosevelt Way NE, Ste 100, Seattle, WA 98105 (spranav@uw.edu).

Copyright © 2025 American College of Occupational and Environmental Medicine
DOI: 10.1097/JOM.0000000000003550

for adverse health outcomes.²⁸ The psychosocial effects of these risk perceptions may be further exacerbated by increased job stress associated with witnessing or experiencing a traumatic opioid overdose event.²⁹

Research has yet to assess risk perceptions of drug exposures among transit operators; most occupational drug exposure research focuses on first responders. Unlike first responders, who are called to respond to emergencies and arrive on scene with information regarding the situation from their dispatch, transit operators are already present when emergencies occur on their vehicle, are not necessarily expected to respond, and are likely less prepared to do so. Therefore, it reasons that their experiences and risk perceptions related to drug exposures are different than first responders.

Individuals' perceived risk is influenced by outrage factors (ie, emotional aspects of risk that influence how people perceive risk).³⁰ In the context of transit operators, outrage factors such as voluntariness (whether the exposure is imposed or voluntary), fairness (whether the exposure is equally distributed, or unique to a given population), process (whether employer decision-making seems fair to the worker, and decisions address worker concerns), and morality may impact transit operators' perceived risk of secondhand drug exposure.

Despite drug use occurring on transit, limited research has investigated how these incidents impact transit operators. Research in other occupations has suggested a positive relationship between perceived risk of a hazard and intent to leave the job^{31,32}; however, research has yet to investigate this relationship among transit operators with regard to secondhand drug exposures. Occupational research has shown that, when workers feel dissatisfied with their jobs, they are more likely to want to leave.^{33,34} Occupational stress is also related to intent to leave, but research has also shown that workers who have high occupational stress but high job satisfaction are less likely to want to leave.³⁴ Higher rates of intent to leave can result in increased attrition (through early departure or difficulty hiring for vacancies), leading to understaffing.³⁵ Understaffing can result in increased job demands and stress on remaining workers,^{36,37} contributing to burnout.³⁸ Therefore, it is important to investigate factors (such as perceived risk of health outcomes associated with passenger drug misuse on transit vehicles) that may contribute to intent to leave among transit operators, as well as factors such as perceived occupational stress and job satisfaction that may impact these associations, and identify areas of intervention. Research has yet to investigate methods to change risk perceptions of drug exposures among transit operators, although one study among first responders indicated that providing brief trainings and educational resources regarding the risks of secondhand occupational exposure to drugs can be effective in changing risk perceptions and correcting misconceptions.²¹

This study characterized the perceived risk of secondhand drug exposures among transit operators and investigated whether operators with higher perceived risk are more likely to express an intent to leave. This study addressed the current literature gap regarding the impact of transit operators' risk perceptions and investigates their intent to leave. We hypothesized that operators who perceived a higher risk due to secondhand drug exposures were more likely to express an intent to leave. We also hypothesized that operators with increased occupational stress and decreased job satisfaction were more likely to express an intent to leave. Understanding factors that contribute to transit operators' intent to leave and impact well-being can inform interventions that improve the work environment and experiences of these workers. This work also promotes worker voice, health self-advocacy, and workplace safety culture, which are crucial components of worker well-being.^{39,40} This study is also the first to explore transit operators' experiences with drug misuse incidents and characterize the frequency of these incidents aboard transit vehicles.

METHODS

We conducted a cross-sectional study from September 2023 to December 2023 designed to investigate the association between transit operators' risk perceptions of secondhand drug exposure and their intent to leave their job. We partnered with Amalgamated

Transit Union (ATU), which represents transit workers across the USA and Canada.⁴¹ In conjunction with ATU International and local ATU leadership, three ATU locals in WA (Seattle and Lynnwood) and OR (Portland) shared our survey with their membership. Transit operator perceived risk of secondhand drug exposure was assessed via survey. The survey also assessed perceived occupational stress, job satisfaction, intent to leave their job, workplace safety, and past experiences with passenger drug use on public transit.

Recruitment

Survey Participants

Each local sent the online survey link to their membership. Eligible respondents included actively driving transit operators who were at least 18 years old; eligibility was assessed in the first two questions of the survey. One local requested that the survey be available on paper at a union meeting; here, we administered paper copies in addition to promoting the link.

Participants were compensated with a \$20 gift card upon survey completion. This study was determined to be exempt from review by the University of Washington Human Subjects Division.

Relationships of Interest

Informed by previous literature, we propose that perceived risk of secondhand exposure to drugs, perceived occupational stress, and job satisfaction are related to intent to leave. We propose that three confounders impact these relationships: passenger drug incidents, workplace safety, and individual demographic information; these confounders are further described hereinafter.

Data Collection

Before accessing the survey, participants read a description of the study and indicated that their participation was voluntary; subsequent entry into the survey was considered consent. This survey was administered online via REDCap (or via paper for one local) and included items and validated scales to measure variables of interest and potential confounders.

Six questions asked about perceived severity of and susceptibility to drug exposures, adapted from the Risk Perception Attitude Framework.²⁴ For all questions, responses were on a 5-point Likert scale. The two perceived susceptibility questions rated how operators felt about their risk of exposure to illicit drugs (ie, drugs that are illegal in WA and OR for use without a prescription or under the care of a licensed physician and therefore excluding cigarettes, marijuana/cannabis, and vaping) and the likelihood that they would get sick from this exposure (1, extremely low; 2, low; 3, neither high nor low; 4, high; 5, extremely high), whereas the four perceived severity questions asked operators to rate agreement with statements about their risk of getting sick or dying from exposure (1, strongly disagree; 2, disagree; 3, neither disagree nor agree; 4, agree; 5, strongly agree). Per the framework,²⁴ we scored perceived severity and perceived susceptibility as an average of the questions out of five and subsequently scored perceived risk as the product of perceived severity and perceived susceptibility (highest possible perceived risk score, 25).

To assess perceived occupational stress, the Perceived Occupational Stress Scale⁴² was used. The Perceived Occupational Stress Scale is a validated measure to characterize work-related stress, asking respondents to rate their agreement to four statements about work stress using Likert response options (1, strongly disagree; 2, disagree; 3, neither disagree nor agree; 4, agree; 5, strongly agree). The measure asks respondents whether their work is stressful, if thinking about work makes them feel tense, whether they feel pressured at work, and if their work has negative health effects. Per its established scoring conventions, a score of 3.50 or greater, averaged across the four questions, indicates high strain.⁴³ Research evaluating the psychometric properties of the Perceived Occupational Stress Scale confirms its high

internal reliability (Cronbach's $\alpha = 0.82$) and high test-retest reliability (correlation, 0.86).⁴²

Job satisfaction was measured via one question. Operators rated how satisfied they were overall with their job (1, very unsatisfied; 2, unsatisfied; 3, satisfied; 4, very satisfied).

Intent to leave was assessed via one question that asks respondents if they are likely to leave their job within the next year (1, not at all likely; 2, somewhat likely; 3, very likely).

The survey also collected information on three confounders: experiences with drug use incidents, workplace safety, and individual demographic information. Operators were asked about past experiences with passenger drug use aboard their vehicles by rating how often they have observed passengers using drugs on their vehicle and whether they have ever had a passenger aboard their vehicle require medical attention from emergency medical services due to a drug-related incident. Operators were also asked whether they had ever experienced a family member or friend overdosing on drugs. We measured self-efficacy among operators with two questions that asked them to rate (1, strongly disagree; 2, disagree; 3, neither disagree nor agree; 4, agree; 5, strongly agree) whether they believe they can confidently protect themselves from exposure to drugs and if they believe there are things they can do to ensure they do not get sick due to exposure to passenger drug use. We also asked operators whether they had ever been provided with guidance on what to do if a passenger uses drugs aboard their vehicle (yes/no). Workplace safety was assessed via two separate questions; the first asked operators to rate their overall perceived workplace safety on a 4-point Likert scale (1, very unsafe; 2, somewhat unsafe; 3, somewhat safe; 4, very safe), and the second question asked whether operators had been attacked by a passenger at work in the past year (yes/no). The survey also gathered demographic information (age, gender, and length of employment).

Analysis

All analysis was conducted using R statistical software.⁴⁴ Survey data were first analyzed descriptively, tabulating means and proportions for the measures included in the survey. Measures were then stratified by each response option of intent to leave, and one-way ANOVAs (for continuous variables) and χ^2 tests (for categorical variables) were used to compare values across the three intent to leave groups and identify significant differences. Perceived risk, perceived occupational stress, and job satisfaction were compared to each other using Pearson's correlation coefficients to determine if any were highly correlated.

To investigate the proposed relationships described earlier, we conducted a regression analysis using ordinal logistic regression models. We first fit individual base ordinal logistic regression models for intent to leave as the outcome, with each of the predictors of interest (ie, one model for each of perceived risk, perceived occupational stress, and job stress as the predictor of interest). We then fit one complete ordinal logistic regression model for intent to leave including all three predictors of interest. Prior to including variables in our models, we checked for skewness and excluded variables that were heavily skewed. Throughout this analysis, we controlled for demographics (groups with $n < 10$ were combined together), workplace safety, whether they had been attacked at work, whether they had been provided with guidance on handling passenger drug use, the number of times operators had observed drug use on their vehicle, past experiences with passengers requiring medical attention due to drugs, and past experiences with family and friends overdosing. Robust standard errors were used to account for any heteroskedasticity. Variance inflation factors (VIFs) were calculated to check for multicollinearity; any variables with $VIF > 5$ were excluded from the models. Responses with missing data (missing completely at random) for variables included in the model were excluded in the regression analysis. Odds ratios (ORs) were calculated by exponentiating the point estimates from the regression model; in an ordinal logistic regression, the OR reflects the odds of being in a higher outcome category associated with a one-unit increase in exposure.

RESULTS

Descriptive Statistics

We recruited and surveyed 273 transit operators, of which paper copies were administered to 19 operators. The membership across these three locals is approximately 11,000,⁴⁵ but not all members would meet our survey inclusion criteria, making it challenging to estimate a survey response rate, although we estimate it to be low. Demographic characteristics of surveyed transit operators ($n = 273$) are summarized in Table 1. The sample was predominantly male (60.8%), with 112 operators (41.0%) over the age of 55 years. The majority of respondents were employed for 5 to 9 years (37.4%).

Table 2 outlines descriptive statistics for predictors and outcomes of interest, both overall and stratified by intent to leave responses. Operators had an average perceived risk score of 15.29 out of 25, with a perceived severity score of 3.46 out of 5 and a perceived susceptibility score of 4.30 out of 5. Transit operators had an average perceived occupational stress score of 3.88 (on a scale of 1 to 5). A total of 197 operators (72.2%) reported high perceived occupational stress (score ≥ 3.5). Average self-efficacy scores were low and heavily right-skewed among operators (mean score of 4.57 out of 25).

Whereas 129 operators (47.3%) reported they were not at all likely to leave, 93 operators (34.1%) reported they were somewhat likely, and 48 operators (17.2%) reported they were very likely to leave. A total of 167 operators (61.2%) reported being somewhat or very satisfied with their job, with 102 operators (37.3%) indicated being somewhat or very unsatisfied with their job.

A total of 228 operators (83.5%) reported observing passenger drug use aboard their vehicle, 88 operators (32.2%) reported observing drug use two to five times per week, 95 operators (34.8%) reported a passenger requiring medical attention due to drug use aboard their vehicle, 166 operators (60.8%) indicated not receiving guidance on handling passenger drug use incidents, and 101 operators (37.0%) have experienced a family or friend overdose due to drugs in the past.

TABLE 1. Characteristics of Surveyed Transit Operators (n = 273)

	n (%)
Gender	
Female	66 (24.2%)
Male	166 (60.8%)
Other/prefer not to answer	34 (12.5%)
Missing	7 (2.5%)
Age	
18–25	0
26–34	22 (8.1%)
35–44	68 (24.9%)
45–54	65 (23.8%)
55+	112 (41.0%)
Missing	6 (2.2%)
Union affiliation	
Seattle	215 (78.8%)
Portland	27 (9.9%)
Lynnwood	20 (7.3%)
Other/missing	11 (4.0%)
Current job	
Bus driver	230 (84.2%)
Light rail, subway, or streetcar operator	39 (14.3%)
Other transit operator	4 (1.5%)
Length of employment	
<1 y	6 (2.2%)
1–4 y	51 (18.7%)
5–9 y	102 (37.4%)
10–14 y	32 (11.7%)
15–19 y	29 (10.6%)
>20 y	53 (19.4%)

TABLE 2. Descriptive Statistics: Overall and Stratified by Intent to Leave Responses

Predictor	Stratified by Intent to Leave			
	Overall (n = 273)	Not at All Likely (n = 129; 47.3%)	Somewhat Likely (n = 93; 34.1%)	Very Likely (n = 47; 17.2%)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Perceived risk*	15.29 (5.18)	14.09 (4.95)	15.48 (4.84)	17.95 (5.28)
Perceived severity*	3.46 (0.86)	3.30 (0.81)	3.48 (0.85)	3.80 (0.90)
Perceived susceptibility*	4.30 (0.76)	4.12 (0.82)	4.38 (0.69)	4.67 (0.57)
Perceived occupational stress†	3.88 (0.89)	3.58 (0.95)	4.01 (0.78)	4.45 (0.54)
Number of times observing drug use on vehicle per week over past year‡	2.36 (1.55)	2.18 (1.61)	2.37 (1.44)	2.83 (1.55)
Overall workplace safety†	1.90 (0.82)	2.15 (0.81)	1.80 (0.79)	1.37 (0.64)
Overall job satisfaction†	2.64 (0.86)	2.97 (0.79)	2.51 (0.76)	1.98 (0.79)
Self-efficacy‡	4.57 (5.07)	5.19 (5.32)	4.56 (4.82)	2.87 (4.36)
	n (%)	n (%)	n (%)	n (%)
Distribution of perceived occupational stress scores§				
High (≥3.50)	197 (72.2%)	85 (65.8%)	70 (75.3%)	44 (93.6%)
Low (<3.50)	65 (23.8%)	44 (34.1%)	17 (18.3%)	3 (6.4%)
Job satisfaction responses§				
Very unsatisfied	32 (11.7%)	8 (6.0%)	10 (10.3%)	14 (27.5%)
Somewhat unsatisfied	70 (25.6%)	17 (12.8%)	31 (32.0%)	21 (41.2%)
Somewhat satisfied	131 (48.0%)	73 (54.9%)	47 (48.5%)	11 (21.6%)
Very satisfied	36 (13.2%)	29 (21.8%)	5 (5.2%)	1 (2.0%)
Satisfied with response to drug use aboard vehicles§				
Very unsatisfied	204 (74.7%)	79 (59.4%)	78 (80.4%)	46 (90.2%)
Somewhat unsatisfied	40 (14.7%)	32 (24.1%)	7 (7.2%)	0
Somewhat satisfied	19 (7.0%)	10 (7.5%)	8 (8.2%)	1 (2.0%)
Very satisfied	6 (2.2%)	6 (4.5%)	0	0
Overall workplace safety responses§				
Very unsafe	101 (37.0%)	30 (22.6%)	39 (40.2%)	32 (62.7%)
Somewhat unsafe	103 (37.7%)	54 (40.6%)	35 (36.1%)	12 (23.5%)
Somewhat safe	61 (22.3%)	41 (30.8%)	18 (18.6%)	1 (2.0%)
Very safe	6 (2.2%)	4 (3.0%)	1 (1.0%)	1 (2.0%)
Number of times observing rider drug use on vehicle over past year				
0 times	45 (16.5%)	26 (19.5%)	12 (12.4%)	6 (11.8%)
<1 per week	47 (17.2%)	26 (19.5%)	17 (17.5%)	4 (7.8%)
1 per week	34 (12.5%)	16 (12.0%)	13 (13.4%)	5 (9.8%)
2–5 times per week	88 (32.2%)	34 (25.6%)	35 (36.1%)	16 (31.4%)
5–10 times per week	31 (11.4%)	14 (10.5%)	8 (8.2%)	9 (17.6%)
>10 times per week	28 (10.3%)	13 (9.8%)	8 (8.2%)	7 (13.7%)
Attacked at work by a passenger§				
Yes	73 (26.7%)	25 (18.8%)	29 (29.9%)	18 (35.3%)
No	199 (72.9%)	104 (78.8%)	64 (66.0%)	29 (56.9%)
Provided guidance about what to do if a passenger uses drugs (responded yes)	103 (37.7%)	49 (36.8%)	33 (34.0%)	20 (39.2%)
Passenger requiring medical attention (responded yes)	95 (34.8%)	47 (35.3%)	26 (26.8%)	21 (41.2%)
Family/friends OD (responded yes)	101 (37.0%)	49 (36.8%)	30 (30.9%)	22 (43.1%)

Missing data are not included; as such, percentages may not sum to 100%.

*Significant differences in perceived risk were detected between those who were not at all likely and very likely to leave, and those who were somewhat likely and very likely to leave, but not those who were not at all likely and somewhat likely to leave. Significant differences in perceived severity were only detected between those who were not at all likely and very likely to leave. Significant differences in perceived susceptibility were detected between those who were not at all likely and somewhat likely to leave, and those who were not at all likely and very likely to leave, but not those who were somewhat likely and very likely to leave.

†Significant differences were detected between all response options for intent to leave.

‡Significant differences were only detected between those who indicated being not at all likely and very likely to leave.

§Indicates significant differences in the distribution of proportions between intent to leave response options.

When stratified by responses for intent to leave (Table 2), there were significant differences between response options in respondents' mean scores for perceived risk (higher scores among those more likely to leave), perceived occupational stress (higher scores among those more likely to leave), overall job satisfaction (lower scores among those more likely to leave), the frequency of observing drug use on transit (higher frequency among those more likely to leave), and self-efficacy (lower scores among those more likely to leave). Furthermore, when stratified by intent to leave responses, there were significant differences in the distribution of responses for satisfaction with employers' response to drug use on transit (lower satisfaction among those more likely to leave), overall workplace safety (lower workplace safety among those more likely to leave), and whether they

had been attacked at work by a passenger (higher rate among those more likely to leave).

Perceived risk scores had a moderate positive correlation with perceived occupational stress scores (Pearson's $R = 0.32$) and a low negative correlation with job satisfaction (Pearson's $R = -0.29$). Perceived occupational stress scores and job satisfaction had a moderate negative correlation (Pearson's $R = -0.43$).

Regression Models

In the base regression models (Table 3), we found that operators who reported higher perceived risk scores had significantly higher odds of expressing an intent to leave (OR, 1.08; 95% CI, 1.02–1.14),

TABLE 3. Base Ordinal Logistic Regression Models for Intent to Leave, With Overall Perceived Risk, Perceived Occupational Stress, and Job Satisfaction as the Predictor of Interest Respectively

Predictors	Overall Perceived Risk (n = 249)		Perceived Occupational Stress (n = 249)		Job Satisfaction (n = 254)	
	OR	95% CI	OR	95% CI	OR	95% CI
Predictor of interest	1.08	1.02–1.14	2.21	1.56–3.22	0.35	0.25–0.49
Family/friend overdose (yes/no)	1.19	0.70–2.01	0.92	0.53–1.59	1.09	0.63–1.88
Passenger required medical attention (yes/no)	1.80	1.01–3.26	1.97	1.09–3.62	1.91	1.05–3.54
Number of times observing drug use on transit	1.03	0.85–1.26	1.13	0.93–1.38	1.10	0.90–1.34
Length of employment (y)	1.00	0.81–1.23	0.98	0.80–1.22	1.02	0.83–1.26
Overall workplace safety	0.49	0.34–0.70	0.56	0.37–0.79	0.56	0.38–0.80
Attacked at work by a passenger (ref: no)	1.93	1.11–3.38	1.68	0.94–2.96	1.68	0.94–3.00
Provided guidance to handle drug incidents (yes/no)	1.15	0.68–1.95	1.23	0.72–2.10	1.54	0.89–2.67
Age (age categories)	1.03	0.76–1.40	0.89	0.65–1.21	0.85	0.62–1.17
Gender (ref: male)						
Female	0.68	0.37–1.24	0.84	0.45–1.56	0.75	0.40–1.39
Other	0.54	0.24–1.17	0.50	0.22–1.10	0.53	0.23–1.17

Bold indicates $P < 0.05$.

such that a 1-unit increase in perceived risk score was associated with an 8% higher odds of being in the next higher category of intent to leave. Higher perceived occupational stress was also significantly associated with higher odds of intent to leave (OR, 2.21; 95% CI, 1.56–3.22), whereas greater job satisfaction was significantly associated with lower odds of intent to leave (OR, 0.35; 95% CI, 0.25–0.49). However, in the full regression model (Table 4), perceived risk was not significantly associated with intent to leave (OR, 1.04; 95% CI, 0.98–1.12), whereas perceived occupational stress (OR, 1.63; 95% CI, 1.10–2.43) and job satisfaction (OR, 0.41; 95% CI, 0.28–0.59) remained significantly associated with intent to leave. Self-efficacy was excluded from models due to skewness.

DISCUSSION

Transit operators' perceived risk of secondhand exposure to secondhand drugs was significantly positively associated with intent to leave in our base ordinal logistic regression model. Perceived risk scores of drug misuse among transit operators were on the higher range of scores per the Risk Perception Attitude framework²⁴; in particular, operators had high mean perceived susceptibility scores, indicating that operators felt they were highly susceptible to health effects due to drug misuse aboard their vehicles. In our base ordinal logistic regression model, we found that these perceived risk scores were significantly associated with intent to leave, suggesting that operators who felt they were at a greater risk due to drug use on their vehicles were more likely to consider leaving their job.

Consistent with literature in other occupational settings,^{33,34} our regression analyses showed that transit operators with higher perceived occupational stress and lower job satisfaction were significantly more likely to express an intent to leave. In our full regression model, the inclusion of perceived occupational stress and job satisfaction attenuated the relationship between perceived risk and intent to leave, such that the relationship between perceived risk and intent to leave was no longer significant; this is likely due to the observed low to moderate correlation between these predictors. These findings may suggest a pathway where perceived occupational stress and job satisfaction mediate the relationship between perceived risk and intent to leave, such that higher perceived risks of health effects due to exposure to drug use are related to increased perceived occupational stress and decreased job satisfaction, which in turn are related to intent to leave. Although the cross-sectional nature of this study prevented us from assessing this potential mediation, future research with longitudinal data should aim to elucidate these pathways, which can help better understand how perceived risk of secondhand exposure to drugs can impact transit operators. To our knowledge, this study was the first to investigate

the association between risk perceptions related to passenger drug misuse and intent to leave among transit operators. These results build on previous literature that has identified possible relationships between perceived risks and intent to leave^{31,32} and between stress, job satisfaction, and intent to leave.^{33,34}

The findings of this study highlight the importance of perceived risk; however, it remains unclear what specific factors contribute to perceived risk. Although this survey does not thoroughly capture all factors that may contribute to perceived risk, we did find that operators reported low self-efficacy scores. If operators feel that they cannot protect themselves from the health risks posed by secondhand exposure to drugs, this may increase outrage.⁴⁶ Research on perceived risk has postulated that perceived risk is influenced by the hazard itself, as well as outrage factors surrounding the hazard⁴⁶; therefore, increased outrage can increase perceived risk. Although eliminating passenger drug misuse on transit would be the most effective solution to create a safer workplace,⁴⁷ interventions that target outrage factors may be beneficial in changing perceived risk and possibly mental health, through improved job satisfaction and decreased stress and intent to leave.

Although not a primary aim, it was notable that this study captured transit operators' experiences with passenger drug misuse. The majority of operators indicated that they observed passengers using drugs more than once a week, highlighting the prevalence of this issue

TABLE 4. Full Ordinal Logistic Regression Models for Intent to Leave

Predictors	OR	95% CI
Overall perceived risk	1.04	0.98–1.12
Perceived occupational stress	1.63	1.10–2.43
Job satisfaction	0.41	0.28–0.59
Family/friend overdose (yes/no)	0.87	0.49–1.54
Passenger required medical attention (yes/no)	1.96	1.05–3.70
Number of times observing drug use on transit	1.04	0.84–1.28
Length of employment (y)	1.08	0.86–1.35
Overall workplace safety	0.64	0.43–0.96
Attacked at work by a passenger (ref: no)	1.80	0.98–3.29
Provided guidance to handle drug incidents (yes/no)	1.67	0.94–2.97
Age (age categories)	0.81	0.58–1.12
Gender (ref: male)		
Female	0.75	0.39–1.44
Other	0.55	0.24–1.24

Bold indicates $P < 0.05$.

across public transit in the Pacific Northwest; however, our survey did not gather information on specific drugs that operators observed passengers using, as we do not expect operators to be able to accurately identify drug types, especially while focusing on driving. Previous research has found that operators in the Pacific Northwest are at risk of exposure to secondhand drug residue from passenger drug use of fentanyl and methamphetamine,⁶ aligning with data showing a national increase in the misuse of these drugs in the past 2 years.⁴ Per the hierarchy of controls,⁴⁷ eliminating a hazard is the most effective method to protect workers from its health effects; therefore, it is of public health importance to reduce passenger drug use on transit vehicles. Doing so not only protects operators from secondhand exposure to drug residue but also reduces workplace stress, as observing drug use incidents at work can be distressing.⁴⁸

It was also notable that 34.8% of operators reported experiencing passengers on their vehicle requiring medical attention from EMS; these situations may be particularly distressing and can have adverse mental health effects.^{49–51} Therefore, although reducing the frequency of such distressing incidents should be prioritized, providing mental health supports for operators who experience such events not only promotes the well-being of operators but also may reduce the impact that such incidents have on operators, which can in turn reduce intent to leave. Providing operators with naloxone and appropriate training for how and when to use it may empower operators during drug overdose incidents and allow them, if they are comfortable, to intervene during high-risk drug use incidents. However, this intervention may be practically limited, as operators may not be able or comfortable intervening. Systematic changes to reduce the frequency of these incidents and reduce the impact on operators are higher on the hierarchy of controls⁴⁷ and should therefore be prioritized, rather than relying on the operator to intervene in high risk situations.

The majority of operators in our study reported receiving no guidance on how to handle passenger drug use incidents, and our regression results indicated that receiving trainings did not significantly impact intent to leave. It is possible that the context of increasing fentanyl misuse since 2021^{1,4} and the misconceptions that exist about the hazard of fentanyl exposure^{27,28} can impact risk perceptions among transit operators. Research has shown that brief trainings regarding the risks of secondhand occupational exposure to drugs can be effective in increasing knowledge and changing risk perceptions about secondhand drug exposures.²¹ Future research should investigate the types of guidance and trainings currently provided to transit operators, and how these trainings can be changed to better address operators' needs.

Open and transparent risk communication to workers,⁵² from sources of information that workers trust (eg, their unions or physicians, as was also found in our survey),⁵³ can be effective in changing risk perceptions. Additionally, communication from leadership on how concerns about passenger drug use are being addressed, as well as worker engagement in this process, can help workers feel validated and reduce outrage.⁴⁶ Future research should seek a deeper understanding of operators' risk perceptions of exposure to drug use and their unfulfilled workplace support needs (for example, via focus groups and qualitative interviews), which can inform further interventions that change these risk perceptions and reduce its impacts.

This study only surveyed transit operators and not other types of transit workers (eg, maintenance, security), who may have different work experiences. The majority of respondents in this study were bus drivers, who often have more passenger interactions than other types of transit operators; therefore, the attitudes reflected by this study may not be generalizable to other transit operators with different levels of passenger interaction. This study was also estimated to have a low response rate (2.8%), which could further impact generalizability. Survey respondents were recruited via their union and only within the Pacific Northwest; therefore, the findings of this study may not be generalizable to operators affiliated with different unions or in different

regions. The majority of respondents in this study reported they were affiliated with the Seattle ATU local, with lower representation from the Portland ATU local and Lynnwood ATU Local, limiting comparison between cities that have different policies or practices regarding the use of drugs in public. Despite these concerns with generalizability, our sample was demographically consistent with national trends in gender and age of transit operators.^{9,54} Additionally, 37.0% of respondents indicated experiencing a family or friend overdose due to drugs in the past, which is only a slightly higher rate than in the general US population (32%).⁵⁵ This consistency with the larger population improved the generalizability of this study.

This survey was cross-sectional and therefore only reflects attitudes at the time of the survey. Because of the cross-sectional nature of this survey, it is unable to identify causal relationships. This survey relies on self-report and is therefore prone to reporting bias, as respondents may not accurately recall or report past events or experiences. This reliance on self-report also limited the identification of specific drugs being used on transit vehicles, as operators cannot be expected to accurately identify drugs, especially while focusing on driving.

CONCLUSIONS

Given the importance of transit operators to the communities they serve, investigating the impacts of transit operators' experiences with passenger drug use incidents is crucial to promote their workplace safety and health, especially as increasing drug misuse on transit in the Pacific Northwest^{1–5} creates potential for operators' secondhand exposure.⁶ We found that perceived risk of drug exposures, perceived occupational stress, and job satisfaction have an impact on operator intent to leave. Operator turnover can potentially be reduced by increasing supports that target risk perceptions of drugs. Furthermore, operators routinely experience drug use incidents on their vehicles, which can be distressing. Reducing the occurrence of drug use on transit and providing supports such as mental health resources can further benefit operators by reducing stress and improving job satisfaction.

ACKNOWLEDGMENTS

We thank our community partners at the Amalgamated Transit Union, for their partnership and expertise in designing, promoting, and disseminating the survey. We acknowledge the transit operators at Local 587 (Seattle), Local 1015 (Lynnwood), and Local 757 (Portland), who were willing to take our survey and contribute to our work. Finally, we thank Dr. Sophia Chiu and the Health Evaluations and Technical Assistance Branch at the National Institute for Occupational Safety and Health for their contributions to the development of the survey.

REFERENCES

1. Addiction, Drugs, and Alcohol Institute. Washington state drug trends. 2023. Available at: https://adaai.washington.edu/wadata/stateMOP_cases.htm. Accessed November 15, 2022.
2. Oregon Health Authority. Fentanyl Facts : Opioid Overdose and Misuse. 2024. Available at: <https://www.oregon.gov/oha/ph/preventionwellness/substanceuse/opioids/pages/fentanylfacts.aspx>. Accessed September 12, 2023.
3. Spencer MR, Garnett MF, Miniño AM. Drug Overdose Deaths in the United States, 2002–2022. 2023. Available at: <https://stacks.cdc.gov/view/cdc/135849>. Accessed July 18, 2024.
4. National Institute on Drug Abuse. Drug Overdose Death Rates | National Institute on Drug Abuse (NIDA). 2024. Available at: <https://nida.nih.gov/research-topics/trends-statistics/overdose-death-rates>. Accessed July 18, 2024.
5. Han B, Compton WM, Jones CM, Einstein EB, Volkow ND. Methamphetamine use, methamphetamine use disorder, and associated overdose deaths Among US adults. *JAMA Psychiatry* 2021;78:1329–1342.
6. Beaudreau M, Srikanth P, Zuidema C, et al. Assessing fentanyl and methamphetamine in air and on surfaces of transit vehicles. *J Occup Environ Hyg* 2025;22:300–310.
7. Federal Transit Administration. Complete Monthly Ridership (with adjustments and estimates) | FTA. 2023. Available at: <https://www.transit.dot.gov/ntd/data-product/monthly-module-adjusted-data-release>. Accessed September 12, 2023.

8. Doyle T. Public Transportation Ridership Rises to More than 70 Percent of Pre-Pandemic Levels. 2022. American Public Transportation Association. Available at: <https://www.apta.com/news-publications/press-releases/releases/public-transportation-ridership-rises-to-more-than-70-percent-of-pre-pandemic-levels/>. Accessed September 12, 2023.
9. Bureau of Labor Statistics. Employed persons by detailed industry and age. Bureau of Labor Statistics. 2024. Available at: <https://www.bls.gov/cps/cpsaat18b.htm>. Accessed February 5, 2025.
10. American Public Transportation Association. Transit Workforce Shortage: Root Causes, Potential Solutions, and the Road Ahead. October 2022. Available at: <https://www.apta.com/wp-content/uploads/APTA-Transit-Workforce-Shortage-Report.pdf>. Accessed August 4, 2025.
11. Bureau of Labor Statistics. Employee Tenure in 2024. USDL-24-1971. September 26, 2024. Available at: <https://www.bls.gov/news.release/pdf/tenure.pdf>. Accessed August 4, 2025.
12. Moffat GK, Ashton AH, Blackburn DR. A Challenged Employment System: Hiring, Training, Performance Evaluation, and Retention of Bus Operators. TCRP Synthesis 40; Washington, DC: Transportation Research Board, National Research Council. Available at: <https://www.trb.org/Publications/Blurbs/160920.aspx>. Accessed August 4, 2025.
13. Bureau of Labor Statistics. Washington — May 2024 OEWS State Occupational Employment and Wage Estimates. 2024. Available at: https://www.bls.gov/oes/current/oes_wa.htm. Accessed August 6, 2025.
14. Bureau of Labor Statistics. Oregon - May 2024 OEWS State Occupational Employment and Wage Estimates. 2024. Available at: https://www.bls.gov/oes/current/oes_or.htm. Accessed August 6, 2025.
15. Selsky A. Oregon leads the way in decriminalizing hard drugs. AP News. 2020. Available at: <https://apnews.com/article/oregon-first-decriminalizing-hard-drugs-01edca37c776c9ea8bfd4afdd7a7a33e>. Accessed August 1, 2025.
16. Oregon Health Authority. Cannabis Laws in Oregon. 2025. Available at: <https://www.oregon.gov/oha/ph/preventionwellness/marijuana/pages/laws.aspx>. Accessed August 18, 2025.
17. Washington State Liquor and Cannabis Board. Using and Having Cannabis. 2025. Available at: https://lcb.wa.gov/education/using_and_having_cannabis. Accessed August 18, 2025.
18. del Pozo B, Rich JD, Carroll JJ. Reports of accidental fentanyl overdose among police in the field: toward correcting a harmful culture-bound syndrome. *Int J Drug Policy* 2022;100:103520.
19. Beletsky L, Seymour S, Kang S, et al. Fentanyl panic goes viral: the spread of misinformation about overdose risk from casual contact with fentanyl in mainstream and social media. *Int J Drug Policy* 2020;86:102951.
20. Attaway PR, Smiley-McDonald HM, Davidson PJ, Kral AH. Perceived occupational risk of fentanyl exposure among law enforcement. *Int J Drug Policy* 2021;95:103303.
21. Winograd RP, Phillips S, Wood CA, et al. Training to reduce emergency responders' perceived overdose risk from contact with fentanyl: early evidence of success. *Harm Reduct J* 2020;17:58.
22. Taxel S. Fentanyl Facts and Fiction: A Safety Guide for First Responders. JEMS: EMS, Emergency Medical Services — Training, Paramedic, EMT News. 2019. Available at: <https://www.jems.com/operations/fentanyl-facts-and-fiction-a-safety-guide-for-first-responders/>. Accessed November 15, 2022.
23. Moss MJ, Warrick BJ, Nelson LS, et al. ACMT and AACT position statement: preventing occupational fentanyl and fentanyl analog exposure to emergency responders. *Clin Toxicol* 2018;56:297–300.
24. Rimal RN, Real K. Perceived risk and efficacy beliefs as motivators of change: use of the risk perception attitude (RPA) framework to understand health behaviors. *Hum Commun Res* 2003;29:370–399.
25. Colloca L. Nocebo effects can make you feel pain. *Science* 2017;358:44.
26. Lynch MJ, Suyama J, Guyette FX. Scene safety and force protection in the era of ultra-potent opioids. *Prehosp Emerg Care* 2018;22:157–162.
27. Persaud E, Jennings CR. Pilot study on risk perceptions and knowledge of fentanyl exposure among New York state first responders. *Disaster Med Public Health Prep* 2020;14:437–441.
28. Thompson RA, Sanderson WT, Westneat S, et al. Perceptions of opioid and other illicit drug exposure reported among first responders in the southeast, 2017 to 2018. *Health Sci Rep* 2021;4:e335.
29. Chiu S, Wiegand DM, Broadwater K, Li JF. Interim report: evaluation of occupational exposures to opioids, mental health symptoms, exposure to traumatic events, and job stress in a city fire department. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health [published online February 1, 2019]. doi:10.26616/NIOSHHE20180015b.
30. Northwest Center for Public Health Practice. What Increases Outrage? | Introduction | Emergency Risk Communication. 2024. Available at: <https://www.nwcp.org/docs/percolate/erc/section1/outrage.html>. Accessed May 2, 2024.
31. McCaughey D, Turner N, Kim J, DelliFraine J, McGhan GE. Examining workplace hazard perceptions & employee outcomes in the long-term care industry. *Saf Sci* 2015;78:190–197.
32. Elshaer IA. Social-psychological risk perception impacts on job insecurity and turnover intention: a mediation model using PLS-SEM technique. *Cogent Psychol* 2024;11:2303219.
33. Hellman CM. Job satisfaction and intent to leave. *J Soc Psychol* 1997;137:677–689.
34. Jiang N, Zhang H, Tan Z, et al. The relationship between occupational stress and turnover intention among emergency physicians: a mediation analysis [published online June 16, 2022]. *Front Public Health*. doi:10.3389/fpubh.2022.901251.
35. Wasserman JL, Padgett A, Do KK-A. Transit, Belabored: Issues and Futures for California's Frontline Transit Workforce [published online February 22, 2024]. doi:10.7922/G2S180TK.
36. Hudson CK, Shen W. Understaffing: an under-researched phenomenon. *Organ Psychol Rev* 2015;5:244–263.
37. Hung J-Y, Fisher R, Gapp R, Carter G. Work-related stress impacts on the commitment of urban transit drivers. *J Manag Organ* 2012;18:220–230.
38. Crawford ER, LePine JA, Rich BL. Linking job demands and resources to employee engagement and burnout: a theoretical extension and meta-analytic test. *J Appl Psychol* 2010;95:834–848.
39. Darbra RM, Crawford JFE, Haley CW, Morrison RJ. Safety culture and hazard risk perception of Australian and New Zealand maritime pilots. *Mar Policy* 2007;31:736–745.
40. Marshall TM. Risk perception and safety culture: tools for improving the implementation of disaster risk reduction strategies. *Int J Disaster Risk Reduct* 2020;47:101557.
41. ATU. Our Work. Amalgamated Transit Union. 2023. Available at: <https://www.atu.org/union/our-work>. Accessed March 14, 2023.
42. Marcatto F, Di Blas L, Luis O, Festa S, Ferrante D. The perceived occupational stress scale: a brief tool for measuring workers' perceptions of stress at work. *Eur J Psychol Assess* 2022;38:293–306.
43. Marcatto F, Di Blas L, Ferrante D. Diagnostic utility of the perceived occupational stress scale [published online September 6, 2023]. *Eur J Psychol Assess*. doi:10.1027/1015-5759/a000789.
44. R Core Team. R: A Language and Environment for Statistical Computing. 2025. Available at: <https://www.R-project.org>. Accessed March 7, 2025.
45. Center for Union Facts. Union Facts. Union Facts. 2025. Available at: <https://www.unionfacts.com/>. Accessed March 19, 2025.
46. Sandman PM. *Responding to Community Outrage: Strategies for Effective Risk Communication*. Fairfax, VA: AIHA; 1993.
47. National Institute for Occupational Safety and Health. Hierarchy of Controls. 2022. Available at: <https://www.cdc.gov/niosh/learning/safetymodulehierarchy/module-3/2.html>. Accessed December 17, 2024.
48. Kovalesski J, Vaccarelli J. "It's scary. It's unsafe": Drug use still rampant on RTD property, Denver7 Investigates learns. Denver 7 Colorado News (KMGH). 2023. Available at: <https://www.denver7.com/news/investigations/its-scary-its-unsafe-drug-use-still-rampant-on-rtd-property-denver7-investigates-learns>. Accessed October 12, 2024.
49. Alexander DA, Klein S. Ambulance personnel and critical incidents: impact of accident and emergency work on mental health and emotional well-being. *Br J Psychiatry J Ment Sci* 2001;178:76–81.
50. Boland LL, Kinzy TG, Myers RN, et al. Burnout and exposure to critical incidents in a cohort of emergency medical services workers from Minnesota. *West J Emerg Med* 2018;19:987–995.
51. Donnelly E. Work-related stress and posttraumatic stress in emergency medical services. *Prehospital Emerg Care Off J Natl Assoc EMS Physicians Natl Assoc State EMS Dir* 2012;16:76–85.
52. Pastides H. Managing measurable and perceived risk in the occupational setting. *J Ambulatory Care Manage* 1994;17:44–52.
53. Siegrist M, Cvetkovich G. Perception of hazards: the role of social trust and knowledge. *Risk Anal Off Publ Soc Risk Anal* 2000;20:713–719.
54. Bureau of Labor Statistics. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity. Bureau of Labor Statistics. 2024. Available at: <https://www.bls.gov/cps/cpsaat11.htm>. Accessed February 5, 2025.
55. Kennedy-Hendricks A, Ettman CK, Gollust SE, et al. Experience of personal loss due to drug overdose among US adults. *JAMA Health Forum* 2024;5:e241262.