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ORIGINAL RESEARCH



## Concerns that an opioid antidote could “make things worse”: Profiles of risk compensation beliefs using the Naloxone-Related Risk Compensation Beliefs (NaRRC-B) scale

Rachel P. Winograd, PhD<sup>a</sup>, Kim B. Werner, PhD<sup>a</sup>, Lauren Green, BS<sup>a</sup>, Sarah Phillips, MA<sup>a</sup>, Jenny Armbruster, MEd<sup>b</sup>, and Robert Paul, PhD<sup>a</sup>

<sup>a</sup>Missouri Institute of Mental Health, University of Missouri St. Louis, St. Louis, Missouri, USA; <sup>b</sup>National Council for Alcohol and Drug Abuse, St. Louis, Missouri, USA

### ABSTRACT

**Background and aims:** As opioid overdose death rates reach epidemic proportions in the United States, the widespread distribution of naloxone is imperative to save lives. However, concerns that people who use drugs will engage in riskier drug behaviors if they have access to naloxone remain prevalent, and the measurement scales to assess these risk compensation concerns remain under researched. This study aims to examine the validity of the Naloxone-Related Risk Compensation Beliefs (NaRRC-B) scale and to understand the effect of overdose education and naloxone distribution (OEND) training on risk compensation beliefs across demographic and professional populations. **Methods:** A total of 1424 participants, 803 police officers, 137 emergency medical services (EMS)/fire personnel, and 484 clinical treatment and social service providers were administered surveys before and after attending an OEND training. Survey items measured the endorsement of opioid overdose knowledge and attitudes, as well as risk compensation beliefs. **Results:** Police and EMS/fire personnel expressed greater endorsement of risk compensation beliefs than clinical treatment and social service providers at both pre- and post-OEND training. Although endorsement of risk compensation beliefs was significantly reduced in each of the 3 groups after the training, reductions were greatest among EMS/fire personnel, followed by providers, then police. Moreover, younger, male, and black participants endorsed greater beliefs in risk compensatory behaviors as compared with their older, female, and white counterparts. **Conclusion:** This study validated a novel measure of naloxone-related risk compensation beliefs and suggests participating in OEND trainings decreases beliefs in naloxone-related risk compensation behaviors. OEND trainings should consider addressing concerns about naloxone “enabling” drug use, particularly in law enforcement settings, to continue to reduce stigma surrounding naloxone availability.

### KEYWORDS

Harm reduction; naloxone; opioid overdose; overdose education; risk compensation

### Introduction

A formidable barrier to the widespread adoption of naloxone is the concern that access to the opioid antagonist will facilitate more dangerous drug use and/or reduce treatment initiation.<sup>1-3</sup> This concern has been described as “risk compensation,”<sup>4,5</sup> which posits that individuals engage in more frequent or intense risky behavior when they believe external resources exist to prevent or minimize deleterious outcomes (e.g., fatal overdose). Prior studies of risk compensation beliefs and naloxone for opioid overdose report concerns among medical providers,<sup>3,6</sup> policy makers,<sup>7</sup> and people who use drugs<sup>8,9</sup> about naloxone availability increasing drug use.

Specifically, risk compensation reflects a cognitive-behavioral process by which people may engage in riskier

behaviors when they perceive their environment to have greater safety measures in place to protect them from adverse consequences<sup>4,5</sup> and is well captured in empirical discussion of risk-compensating tendencies related to various potentially dangerous behaviors. Fears of risk compensation have been documented in response to harm reduction and public health strategies (e.g., needle exchanges, human immunodeficiency virus [HIV] prevention measures<sup>10</sup>), although empirical evidence demonstrating that naloxone availability exacerbates opioid use is lacking. Rather, multiple cross-sectional and prospective studies report no significant change in drug use behavior.<sup>8,11-15</sup> However, it should be noted that a recent qualitative interview study found some people who use drugs *did anecdotally report* a willingness to use more heroin/opioids (or use them in a riskier manner) if naloxone was present.<sup>16</sup> This conclusion

**CONTACT** Rachel P. Winograd  [rachel.winograd@mimh.edu](mailto:rachel.winograd@mimh.edu)  Missouri Institute of Mental Health, University of Missouri, 4633 World Parkway Circle, St. Louis, MO 63134, USA.

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would need to be reproduced, as this single study contradicts multiple previous longitudinal studies finding no effect of naloxone access on drug use behaviors. Regardless of replicability, its content should not be ignored, as it serves as confirmation to those who already hold concerns about increased use.

Although researchers have attempted to better understand these concerns, prior studies of risk compensation related to naloxone have not examined variables related to demographics (age, sex, race, etc.) or profession (health care providers, law enforcement, etc.) that may moderate beliefs. Specifically, the interdependence between risk compensation beliefs and age, sex, race, and professional specialty are unknown but could prove useful when developing targeted training and educational material for distinct audiences. Relatedly, the extent to which the provision of structured information/professional training (e.g., overdose education and naloxone distribution [OEND]) impacts compensation beliefs has not been investigated previously, perhaps because there are no established measures of naloxone-related risk compensation *behaviors* in use in research on this topic. As a result, the construct of risk compensation belief in relation to increased naloxone access has not been thoroughly explored. The above points reflect gaps in the opioid overdose literature worthy of study.

To fill these research gaps, we conducted 2 studies, each with their own priorities: (1) to examine the psychometric properties of the Naloxone-Related Risk Compensation Beliefs (NaRRC-B) scale and (2) to examine demographic and profession-specific predictors of participants' responses on the NaRRC-B scale before and after their completion of an OEND training.

Specifically, the second study aimed to address the following questions: (1) What are the baseline differences in the endorsement of risk compensation beliefs across demographic and professional groups (i.e., different types of emergency responders and clinical treatment and social service providers)? (2) Does OEND training modify risk compensation beliefs among training recipients? (3) If so, do demographic variables or profession type moderate pretest versus posttest differences in such beliefs?

## Methods

### Participants and procedure

Participants ( $N = 1424$ ) included police officers (Police;  $n = 803$  [56.4%]), emergency medicine services/fire personnel (EMS/Fire;  $n = 137$  [9.6%]), and substance use/mental health/social service providers (Providers;  $n = 484$  [34.0%]) who completed OEND training. Participants identified as white ( $n = 1,119$  [78.7%]), black ( $n = 195$  [13.7%]), and multiracial ( $n = 102$  [7.2%]). Slightly more than half of the sample were male ( $n = 914$  [65.8%]), and the average age of the total sample was 40.3 (SD = 10.8). Professional groups differed significantly on race, sex, and age (see Table 1). The study was approved by the local institutional review board, and all participants provided informed consent to complete assessments before and after the training.

Comprehensive OEND trainings included the following components, with some content tailored to the best address the professional makeup of distinct audiences: (1) Opioid Overdose Background: Overview of opioid overdose causes and trends; (2) Responses to the Opioid Epidemic: Overview of existing efforts to combat the opioid crisis and legislative protections for naloxone use and dispensing; (3) Opioid Use Disorder Overview: Overview of opioid use disorder, including a brief overview the effects of opioids on the brain; (4) Opioid Overdose Prevention, Recognition, and Response: Instruction on how to correctly identify and respond to an overdose event (including how to administer naloxone) and how to prevent future overdoses; and (5) Delivering Overdose Education and Naloxone Distribution (OEND): Instruction on how to provide clients with overdose education and either distribute or recommend how and where a client can acquire naloxone. All trainings also included a brief review of the concept of risk compensation and an acknowledgement that concern about an enabling effect of naloxone is among the most significant barriers to widespread program adoption. The trainers compared naloxone-related risk compensation beliefs with other familiar concerns about public health interventions such as safe sex education, HIV prophylaxis, and wearing a seatbelt or helmet. Trainers then highlighted findings from key longitudinal studies<sup>11–13</sup> finding no evidence of compensatory

**Table 1.** Participant demographic information by profession.

Characteristic	Total ( $N = 1424$ ) 40.3 (10.80)		Providers ( $n = 484$ ) 41.79 (12.56)		Police ( $n = 803$ ) 39.63 (9.73)		EMS/Fire ( $n = 137$ ) 39.48 (9.67)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Mean age (SD)*								
Sex*								
Male	914	64.20%	137	28.30%	678	84.40%	99	72.30%
Female	476	33.40%	340	70.20%	103	12.80%	33	24.10%
Race*								
White	1119	78.60%	318	65.70%	676	84.20%	125	91.20%
Black	195	13.70%	131	27.10%	63	7.80%	1	0.70%
Multiracial/Other	108	7.60%	35	7.20%	62	7.70%	11	8.00%

Note. EMS/Fire = emergency medical service providers and firefighters.

\*Asterisk indicates significant differences ( $P < .05$ ) between professional groups in the noted demographic characteristic were observed; therefore, these variables were adjusted for in the multivariate analyses.

drug use following OEND and allow time for facilitated participant discussion. (See [Supplemental Appendix A](#) for additional information on training duration and content.)

Trainings included in this analysis were conducted between November 28, 2016, and November 9, 2017, primarily in the high-need eastern region of Missouri (a 7-county region including St. Louis City and surrounding counties). Of the 31 emergency responder trainings, 87% ( $n = 27$ ) were conducted in the eastern region. Similarly, of the 17 treatment provider trainings, 94% ( $n = 16$ ) were conducted eastern region.

## Measures

Participants completed items from the Opioid Overdose Knowledge Scale (OOKS; 10 items) and the Opioid Overdose Attitudes Scale (OOAS; 5 items)<sup>17</sup> that appeared across surveys for the different professions (some items were modified or omitted to better reflect the responding sample; see [Supplemental Appendix A](#) for all items as they appeared). Participants also completed an adapted 5-item NaRRC-B scale (for original application of items, see Winograd et al.<sup>3</sup>) focused specifically on beliefs about compensatory and otherwise iatrogenic drug use or health behavior in the context of naloxone access. To ensure robust content validity of the NaRRC-B, items were included that captured concerns about drug use behavior specifically (e.g., “Opioid/heroin users will use more opioids/heroin if they know they have access to naloxone”) as well as broader, more communication-focused effects (e.g., “Providing naloxone to overdose victims sends the message that I am condoning opioid misuse”; see Appendix A for all items). OOKS, OOAS, and NaRRC-B items were scored on a 5-point scale, ranging from “Strongly disagree” (1) to “Strongly agree” (5). Higher scores on the NaRRC-B scale indicate greater endorsement of naloxone-related risk compensation beliefs. (A complete list of NaRRC-B, OOKS, and OOAS items is included in [Supplemental Appendix B](#).)

## Analytic approach

The goals of this study were to demonstrate acceptable psychometric properties of the NaRRC-B scale and subsequently use the scale to assess differences in endorsement of naloxone-related risk compensation beliefs across professions and demographic groups before and after receiving training on OEND. To accomplish these goals, we performed Pearson correlations and analysis of variance (ANOVA), respectively. Prior to conducting the primary analyses, chi-square test and ANOVA were conducted to identify existing demographic differences in profession group makeup. Specifically, ANOVA models were run to examine group differences in NaRRC-B baseline scores. To examine the moderating effect of demographics on baseline NaRRC-B scores of the 3 professional groups, interactions between profession with age and sex were included in the model. (The interaction of profession and race was not included, as only one EMS/Fire personnel reported their

**Table 2.** Baseline and posttest correlations of NaRRC-B items.

Item	1	2	3	4	5
1	–	0.77	0.58	0.46	0.69
2	0.82	–	0.57	0.47	0.65
3	0.72	0.69	–	0.57	0.62
4	0.58	0.58	0.66	–	0.59
5	0.71	0.67	0.71	0.65	–

*Note.* Correlations of items at baseline are presented above the diagonal. Correlations of items at posttest are presented below the diagonal. 1 = “Opioid/heroin users will use more opioids/heroin if they know they have access to naloxone”; 2 = “Opioid/heroin users will be less likely to seek out treatment if they have access to naloxone”; 3 = “Providing naloxone to overdose victims sends the message that I am condoning opioid misuse”; 4 = “There should be a limit on the number of times one person receives naloxone to reverse an overdose (refers to multiple overdose events, do not count repeated dose administrations during one overdose event)”; and 5 = “Naloxone is enabling for drug users (i.e., it enables them to continue or increase drug use when they otherwise might not).” All pairwise comparisons were significant at  $P < .001$ .

**Table 3.** Correlations of measures between OOKS, OOAS, and NaRRC-B at baseline and posttest.

Scale	OOKS	OOAS	NaRRC-B
OOKS	–	0.41*	–0.04
OOAS	0.13*	–	–0.05
NaRRC-B	–0.04	–0.33*	–

*Note.* Correlations of measures at baseline are presented above the diagonal. Correlations of measures at posttest are presented below the diagonal. All pairwise comparisons were significant at  $P < .001$ .

race as Black.) Repeated-measures analysis of covariance (ANCOVA) was utilized to assess within-subject changes in NaRRC-B scores (baseline to posttest), and the moderating effects of profession and demographics on those pre-post changes. Of note, significant demographic differences were identified between professions in the domains of race (Police and EMS/Fire groups had greater proportions of whites than the Provider group;  $\chi^2 = 116.32$ ,  $P < .001$ ), sex (the Provider group had larger proportion of females;  $\chi^2 = 449.33$ ,  $P < .001$ ), and age (those in the Provider group were slightly older than Police and EMS/Fire;  $F(2, 1367) = 6.29$ ;  $P < .001$ ) (see [Table 1](#)). Therefore, later multivariate analyses adjusted for significant between-group differences in sex, race, and age.

## Results

### NaRRC-B psychometric properties

Analyses were completed in SAS 9.2 (SAS Institute, 2002; Cary NC). Item-level reliability analyses of the NaRRC-B scale confirmed internal reliability at both time points (baseline and posttest). Pairwise comparisons via Pearson correlations were computed, with item correlations ranging from 0.46 to 0.82 (see [Table 2](#)), indicating sufficient association without redundancy across items. Reliability calculations indicated strong internal reliability at both baseline ( $\alpha = .88$ ) and posttest ( $\alpha = .91$ ). In the full sample, baseline scores ( $M = 13.50$ ,  $SD = 4.49$ ) and posttest scores ( $M = 11.82$ ,  $SD = 4.75$ ) suggested a moderate level of risk compensation beliefs (possible range: 5–25) in our total sample.

**Table 4.** Mean NaRRC-B scores at baseline and posttest by profession group and demographic characteristic.

Characteristic	Baseline			Posttest		
	<i>M</i>	<i>SE</i>	Significance differences ( $P < .05$ )	<i>M</i>	<i>SE</i>	Significance differences ( $P < .05$ )
<b>Profession</b>						
Providers	10.93	0.21	Providers < Police;	9.10	0.22	Providers < Police;
Police	15.00	0.15	Providers < EMS/Fire;	13.53	0.16	Providers < EMS/Fire;
EMS/Fire	14.42	0.34	Police = EMS/Fire	11.56	0.36	EMS/Fire < Police
<b>Sex</b>						
Male	14.2	0.23	Male > Female	12.26	0.24	Male > Female
Female	13.29	0.27		10.92	0.29	
<b>Race</b>						
White	13.12	0.15	White = Multi/Other;	10.99	0.16	White = Multi/Other;
Black	14.24	0.32	White < Black;	12.53	0.35	White < Black;
Multiracial/Other	13.88	0.46	Black = Multi/Other	11.26	0.49	Black > Multi/Other

Note. A < B indicates that Group A scored lower on the NaRRC-B scale than Group B; B > A indicates that Group B scored higher on the NaRRC-B scale than Group A; A = B indicates that Group A and Group B did not significantly differ in NaRRC-B scores at the indicated time point.

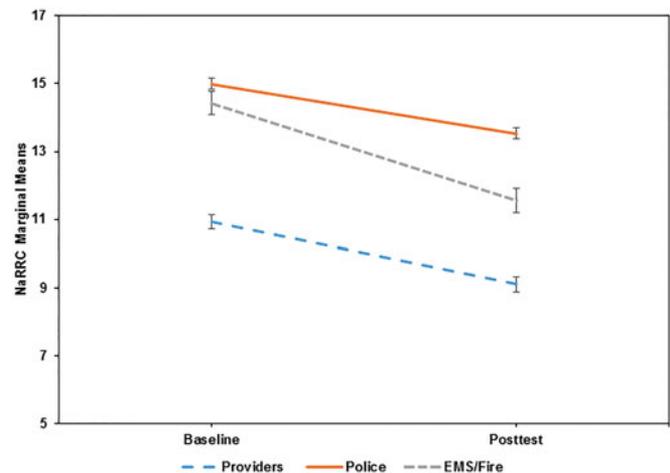
Correlations of the NaRRC-B scale with the OOKS and OOAS (see Table 3) were run to establish construct validity of the NaRRC-B scale. Of the 4 possible correlations (NaRRC-B scale with the OOKS and OOAS at both baseline and posttest), there was a negative association between OOAS and NaRRC-B scores at posttest (i.e., the more positive attitudes one holds about overdose victims and responding to overdoses, the lesser their endorsement of risk compensation beliefs;  $r = -0.33$ ,  $P < .001$ ).

### Pretraining NaRRC-B scores by demographic and professional groups

Findings revealed a significant main effect for profession ( $F(2, 1313) = 207.88$ ;  $P < .001$ ) in which Police and EMS/Fire scored higher (i.e., greater beliefs in risk compensation) than Providers. Significant main effects for sex ( $F(1, 1313) = 9.11$ ;  $P = .003$ ) and race ( $F(2, 1313) = 6.54$ ;  $P = .002$ ) were also observed, with males scoring higher than females and black participants scoring higher (i.e., endorsing more risk compensation beliefs) than white participants, with no conclusive findings indicating a significant difference between multiracial and black or white participants at baseline. A main effect for age was also observed, with higher risk compensation concerns expressed among older individuals ( $F(1, 1312) = 17.25$ ;  $P < .001$ ) (see Figures 1–3). Moreover, an interaction effect of profession and age was observed ( $F(2, 1313) = 6.15$ ;  $P = .002$ ) in which age did not significantly impact NaRRC-B baseline scores for treatment providers but was significantly associated for Police and EMS/Fire such that older age was associated with greater endorsement of risk compensation beliefs. There was no profession by sex interaction ( $F(1, 1313) = 0.41$ ;  $P = .67$ ) at baseline.

### Impact of OEND training on risk compensation beliefs

Overall, participants reported lower levels of risk compensation concerns after completing OEND ( $F(1, 1336) = 17.72$ ;  $P < .001$ ) (see Table 4). Significant effects were observed in all 3 professional groups: Provider ( $F(1, 1336) = 90.22$ ;  $P < .001$ ), Police ( $F(1, 1336) = 74.29$ ;  $P < .001$ ), and EMS/Fire ( $F(1, 1336) = 89.68$ ;  $P < .001$ ). A moderating effect of



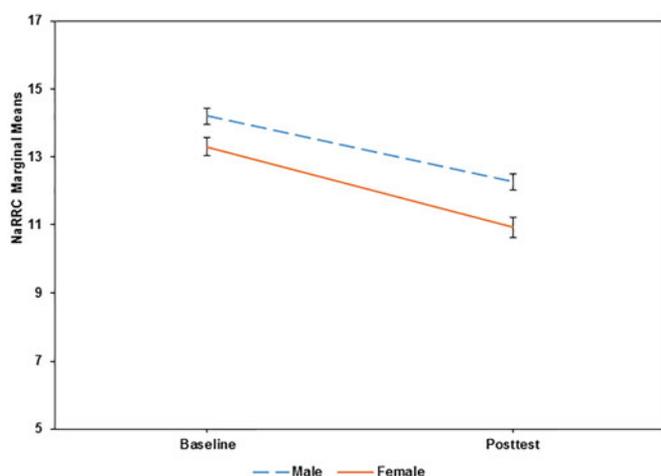
**Figure 1.** Within- and between-professional group differences in NaRRC-B scores from baseline to posttest. Higher scores indicate higher risk compensation beliefs. Marginal means adjusted for all other variables in the model, including race, sex, and age; error bars represent standard errors.

time point (baseline vs. posttest) by profession was found ( $F(2, 1336) = 11.42$ ;  $P < .001$ ), such that EMS/Fire participants demonstrated larger pre-post differences than Police or Providers (Figure 1). Any interactions between time and sex ( $F(1, 1336) = 3.83$ ;  $P = .05$ ), age ( $F(1, 1336) = 3.24$ ;  $P = .07$ ), or race ( $F(1, 1336) = 2.26$ ;  $P = .11$ ) could not be identified.

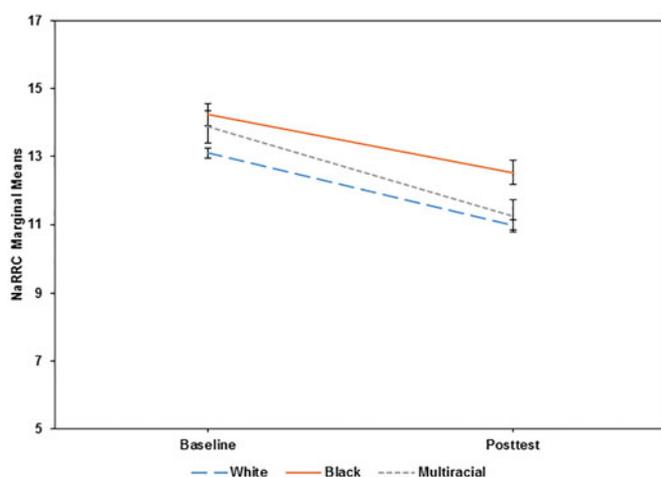
Finally, when examining baseline to posttest changes in each of the 5 individual NaRRC items across professional and demographic groups, changes in each item were consistent with the direction of the overall NaRRC-B scale differences described above. This indicates that no specific items accounted for (or diverged from) the effects observed in the overall analyses.

### Discussion

Despite a lack of empirical evidence, concerns about naloxone access leading to increased drug use and otherwise “enabling” behavior among people who use drugs remain sizable.<sup>2,3,6</sup> Results from this study support the use of the NaRRC-B scale to assess beliefs in this construct of



**Figure 2.** Within- and between-sex differences in NaRRC-B scores from baseline to posttest. Higher scores indicate higher risk compensation beliefs. Marginal means adjusted for all other variables in the model including race and age; error bars represent standard errors.



**Figure 3.** Within- and between-race differences in NaRRC-B scores from baseline to posttest. Higher scores indicate higher risk compensation beliefs. Marginal means adjusted for all other variables in the model, including sex and age; error bars represent standard errors.

naloxone-related risk compensation, with analyses revealing profession-, sex-, and age-specific belief endorsement patterns, as well as an effect of OEND training. Prior to attending the training, emergency responders (Police and Fire/EMS) expressed greater belief in risk compensation than Providers. Risk compensation beliefs were significantly reduced after participation in OEND training among all 3 groups, with response patterns differing by respondents' age and identified sex. Specifically, females, white individuals, and older emergency responders were more likely to report fewer risk compensation beliefs.

EMS/Fire personnel reported the most experience administering (or otherwise handling or discussing) naloxone, and these experiences may explain the relatively larger baseline to posttest decreases in risk compensation concerns expressed by this group. Specifically, 86.9% of EMS/Fire trainees reported prior experience administering naloxone, compared with 2.1% of Police and 1.8% of Providers. Although any explanation for EMS/Fire participants demonstrating the largest reduction in risk compensation beliefs

would be largely speculative, it is possible that this groups' prior naloxone experience *alone* did not convince them of its benefits and lack of risk-compensating effects, but that experience did make them more open and willing to absorb the information presented to them in the training than they otherwise would have been. Indeed, ad hoc analyses revealed that prior experience with naloxone was associated with more change in risk compensation beliefs after the training across all participants ( $F(2, 908) = 4.59, P = .0323$ ). Conceivably, the EMS/Fire group was originally (relatively) hesitant to express their acceptance of naloxone (which they acquired from witnessing its life-saving effects), but the training reinforced this acceptance enough for it to be legitimized and captured in the posttests.

These findings underscore the importance of considering profession and demographic or culturally specific interests in the development and implementation of tailored training modules for effective overdose education and naloxone training programs. Specifically, results indicate that OEND training should pay particular attention to overdose-related stigma in black males and young emergency responders when aiming to improve attitudes about naloxone use and people who experience overdoses.

### **Risk equilibrium as a reality?**

As posited by Hogben and Liddon's discussion of a variety of inherently dangerous health behaviors, "Instead of treating unintended consequences such as risk compensation as purely negative, one could reframe the events as opportunities for further and more complete intervention."<sup>5</sup> Compensatory risk behaviors can sometimes still be evident in a small subset of the target population; for example, when increased condom use did not decrease overall HIV risk because participants also increased their number of sexual partners.<sup>18</sup> Indeed, perhaps training curricula should acknowledge naloxone-related risk compensation as a possibility—even if remote—rather than denying its existence and refusing to engage in dialog with those who hold concerns. Ideally, OEND trainers could sensitively navigate this subject while still underscoring how any potential secondary harms resulting from increased naloxone access are negligible when compared with the costs of lives lost from lack of such access.

Several study limitations should be noted. First, we do not have data on how participants' NaRRC-B score is associated with posttraining naloxone administration and distribution practices. A negative association (e.g., a low NaRRC-B score and frequent naloxone distribution practices) would be a valuable marker of external validity of the NaRRC-B scale and demonstrate the practical impact of reducing beliefs in naloxone-related risk compensation. However, prior studies of health practice education have found little effect of a single training on clinical behavior,<sup>19</sup> so it is likely that changes in naloxone distribution efforts would not be immediately impacted or detectable in follow-up evaluations of our OEND trainings. Regardless, gaining both factual and procedural knowledge has been identified as precursor for

eventual clinical behavior change,<sup>20</sup> meaning that these OEND trainings are likely valuable in “setting the stage” for later practice modifications. However, to accurately gauge criterion validity and the practical significance of reducing NaRRC-B scores, future research must assess the association between changes in scores and changes in naloxone administration or distribution behaviors. Second, the findings may not generalize to populations with more racial and geographic diversity than the sample described here. Third, our NaRRC-B scale consisted of only 5 items, making it possible that they did not fully capture the range of potential aspects of risk compensation beliefs. With more items, we may have been able to obtain facet information with greater detail and find group differences at a more highly resolved level. For example, future additions to the NaRRC-B scale could assess participants’ belief that increased naloxone access will increase the number of *new* heroin or opioid users due to perceived lack of deadly consequences of heroin/opioid use. Last, this study was not a randomized control trial on the influence of OEND on risk compensation beliefs; such a design, directly comparing those who did and did not participate in the training, would be necessary to infer causal impact.

Given a persisting belief in enabling effects of naloxone, researchers should continue to explore the construct of naloxone-related concerns about risk compensation and how unease or disapproval impacts naloxone distribution and use. For example, it is possible that clients who are working with therapists with high NaRRC-B scores are less likely to ask for naloxone, accept it if offered, or view it as a critical component of their opioid use disorder (OUD) treatment and recovery processes. Additionally, among people who use drugs, the increasing presence of fentanyl test strips<sup>21</sup> may interact with naloxone availability to impact use behaviors. To explore these possibilities and others, the existence and magnitude of naloxone-related risk compensation should be investigated empirically using data other than self-reported information alone, which has been the default data source in studies to date.

### Author contributions

The corresponding author (R.P.W.) contributed to the conception, design, and implementation of the research. Authors Green and Phillips collected the data, which were analyzed and interpreted by Author Werner. The corresponding author developed and wrote the manuscript, with critical revisions provided by Authors Werner, Green, Phillips, Armbruster, and Paul. All authors have reviewed and approved the manuscript.

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preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

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