People with active opioid use disorder as first responders to opioid overdoses: Improving implementation intentions to administer naloxone

George Franklin Edwards III

Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
In
Translational Biology, Medicine, and Health

Sarah Henrickson Parker
Samantha M. Harden
Kimberly Horn
Cassandra Mierisch
Brock Mutcheson

June 29th, 2023
Roanoke, Virginia

Keywords: opioid overdose prevention; naloxone; implementation intentions; harm reduction; thematic analysis; generalized linear mixed effects model

People with active opioid use disorder as first responders to opioid overdoses: Improving implementation intentions to administer naloxone

George Franklin Edwards III

ABSTRACT

The ongoing opioid crisis presents a significant public health challenge particularly for people who use opioids (PWUO). Naloxone is an opioid antagonist crucial to reducing opioid overdose mortality. Inconsistencies exist among PWUO in obtaining, carrying, discussing, and administering naloxone. Using sequential mixed methods, this study was aimed at investigating the use of implementation intentions on naloxone use among PWUO. Semi-structured interviews were conducted with 83 PWUO to gather individual experiences with using naloxone and contextual details regarding its use. An essentialist thematic analysis with inductive coding revealed valuable insights into *where*, *for whom*, and *when* naloxone is implemented. The analysis identified major themes such as caring for others' needs, knowledge gaps, reinforcement through overdose experiences, duality of overdose and compassion, and stigma. Minor themes related to syringe services program implementation and drug use were identified. Building on these qualitative findings a quantitative analysis determined the impact of implementation intentions on naloxone implementation. Participants were randomly assigned to develop implementation intentions or goal intentions for the use of naloxone. Follow-up surveys assessed changes in participants' intentions to obtain, carry, discuss, and administer naloxone and their actual implementation over a 6-month period. At the 3-month follow-up the experimental condition exhibited statistically significant positive intentions to obtain naloxone and engage in discussions about naloxone in social contexts of drug use. Changes in the magnitude of naloxone implementation were observed at the 3- and 6-month timepoints. Specifically, the self-reported discussion of naloxone showed noticeable changes in implementation frequency over time. This suggests that while implementation intentions may not have statistically significant effects on the use of naloxone it had some influence on the frequency of discussing naloxone prior to drug use. This work makes a valuable contribution to the existing literature because of its attempt to apply the Theory of Planned Behavior and implementation intentions in a novel way. Though the experimental hypothesis was not supported statistically significant observations were made for some behaviors at the 3-month follow-up. The pragmatic nature of the setting enhances the relevance of the findings and provides valuable insights for future interventions supporting PWUO.

People with active opioid use disorder as first responders to opioid overdoses: Improving implementation intentions to administer naloxone

George Franklin Edwards III

GENERAL AUDIENCE ABSTRACT

The ongoing crisis of opioid addiction poses a significant public health challenge particularly for individuals who use opioids. Naloxone is a medication that can reverse opioid overdoses and it plays a crucial role in saving lives. People who use opioids often face difficulties in accessing, carrying, discussing, and using naloxone consistently. This study was aimed at investigating the use of naloxone by employing qualitative and quantitative methods. We conducted interviews with 83 individuals who use opioids to explore their experiences and gather insights into naloxone use. These interviews provided valuable information about when, where, and for whom naloxone is used. Several important themes emerged including the significance of helping others, knowledge gaps, the influence of personal experiences, the conflict between the fear of overdose and caring for others, and the stigma associated with drug use. We investigated the impact of a specific approach called "implementation intentions" in improving naloxone use. Participants were randomly assigned to create specific plans or general goals for naloxone use. Through surveys conducted over a 6-month period we examined changes in participants' intentions and actions related to naloxone use. Although the specific approach did not yield significant improvements, we observed changes in how people discussed naloxone over time. This study contributes to the existing research by introducing innovative ideas to support positive behavioral changes among individuals who use opioids. The real-world setting in which the study took place enhances the applicability of the findings and offers valuable insights for future programs supporting individuals who use opioids.

Dedication

This dissertation is dedicated to the communities of southwest Virginia and the families and friends who have lost their loved ones to a preventable death.

Acknowledgements

I would like to express my deepest gratitude to my family and friends who have been a constant source of support throughout my journey. Your unwavering support and encouragement have been invaluable to me, and I could not have accomplished this without you.

I also owe a great deal of thanks to my community partners who have collaborated with me on this research project. I would like to acknowledge the members of the Council of Community Services' Drop-in Center North including Lisa Via, Tammy Crawford, LPN, B. Anderson, PRSS, and the LENOWISCO Health Department's comprehensive harm reduction program including Daniel Hunsucker, MS, Joie Cantrell, RN, and James Mills, PRSS. Your input and support have been instrumental in making this project a success.

I am also deeply grateful to my advisor, Dr. Sarah Henrickson Parker, for her exceptional mentorship and support throughout my training. Her guidance and unwavering belief in me have been crucial to my success. Additionally, I would like to thank my committee members, Dr. Samantha Harden, Dr. Kimberly Horn, Dr. Cassandra Mierisch, and Dr. Brock Mutcheson, for their invaluable input and support throughout my training. Lastly, I would like to express my gratitude to Dr. Nathaniel Porter, Social Science Data Consultant & Data Education Coordinator at Virginia Tech, for his superb guidance on qualitative analysis, and to Alicia Lozano, MS, Assistant Director of the Center for Biostatistics and Health Data Science at Virginia Tech, for her assistance with the quantitative analysis. Their contributions have been invaluable to the completion of this research.

I would also like to extend my appreciation to Whitney DeLong for her assistance with administrative tasks and to the graduate program staff and directors of the Translational, Biology, Medicine, and Health degree program for providing me with an exceptional graduate school experience. Thank you all for your time, knowledge, and unwavering support.

Lastly, I would like to thank the study participants who generously shared their time, experiences, and insights with me. This project would not have been possible without your contributions, and I am honored to have had the opportunity to work with you. Your willingness to participate in this study demonstrates your commitment to improving the health and well-being of your community, and I am humbled by your dedication.

In closing, I am grateful for the opportunities that have come my way and the individuals who have supported me throughout my academic journey. I look forward to continuing to work with and learn from the communities I serve.

Table of Contents

List of Abbreviations *9*

List of Tables *10*

List of Figures *11*

Chapter 1 Introduction to dissertation and context of the research *12*

1.1. Introduction to dissertation chapters **12**

1.2. Co-Authorship, competing interests, and funding **13**

1.3. A history of opioids, regulations, and current day challenges **14**

1.4. Opioid overdose education and naloxone distribution **18**

1.5. Syringe services programs and context for research in south-central Appalachia **21**

Chapter 2 Translational research perspective and contributions to the literature *22*

2.1. Translational research perspective **22**

2.2. Previous publications **24**

Chapter 3 Naloxone use among PWUO and opportunities for improvement *27*

3.1. Literature review on the use of naloxone among PWUO **27**

3.2. Theoretical considerations and applications to the use of naloxone **32**

3.3. A behavior change framework and its application to the use of naloxone **36**

3.4. Specific aims and research questions **38**

Chapter 4 Study One: Development of implementation intentions for obtaining, carrying, discussing, and administering naloxone: A qualitative analysis on the use of naloxone among PWUO *43*

4.1. Abstract **43**

4.2. Research questions **44**

4.3. Methods **45**

4.4. Analyses **58**

4.4.1. Participant demographics and characteristics 58

4.4.2. Contextual information on the use of naloxone 62

4.4.3. Goal intentions and implementation intentions 73

4.4.4. Major themes related to the use of naloxone 79

4.4.5. Minor themes related to the use of naloxone 87

4.5. Limitations **90**

4.6. Conclusion **93**

Chapter 5 Study Two: A longitudinal study of the impact of implementation intentions on naloxone implementation among PWUO *94*

5.1. Abstract **94**

5.2. Research question and hypotheses **95**

5.3. Methods **97**

5.4. Results **107**

5.4.1. Allocation check and combination of recruited samples 107

5.4.2. Attrition at 3- and 6-month follow-ups 119

5.4.3. Wilcoxon rank sum tests for Likert scale responses at baseline, 3- and 6-months 119

5.4.4. Generalized linear mixed effects models 129

5.5. Discussion **142**

5.6. Limitations **146**

5.7. Conclusion **150**

Chapter 6 Principal findings and dissertation conclusion ***151***

6.1. Principal findings and contributions to the literature **151**

6.1.1. Sample of PWUO 151

6.1.2. Effects on obtaining naloxone 152

6.1.3. Effects on carrying naloxone 153

6.1.4. Effects on discussing naloxone 153

6.1.5. Effects on administering naloxone 154

6.2. Strengths and weaknesses of the dissertation **156**

6.2.1. Strengths 156

6.2.2. Weaknesses 159

6.3. Unanswered questions and future research **165**

6.3.1. Theory and framework selection 166

6.3.2. Behavior change technique and operationalization 166

6.3.3. Intervention fidelity 167

6.3.4. Evaluation timepoints and follow-up period 168

6.3.5. Target population 168

6.4. Conclusion **169**

Bibliography ***170***

Appendix A. Recruitment flyer **199**

Appendix B. Recruitment email **200**

Appendix C. Screening survey **201**

Appendix D. Consent form **203**

Appendix E. Demographic survey **211**

Appendix F. Implementation intentions worksheet **214**

Appendix G. Goal intentions worksheet **218**

Appendix H. COREQ Checklist **219**

Appendix I. Implementation intentions **221**

Appendix J. Goal intentions **231**

Appendix K. Thematic map: Caring for others' needs and acting as a buffer 240
Appendix L. Thematic map: Quality of education and gaps in knowledge 241
Appendix M. Thematic map: Overdose experiences reinforce need for naloxone 242
Appendix N. Thematic map: Duality of life-threatening overdose and compassion for the victim 243
Appendix O. Thematic map: Ubiquitous stigma and displaced fear 244
Appendix P. Thematic map: SSP implementation 245
Appendix Q. Thematic map: Drug use and engaging recovery 246
Appendix R. Baseline data collection instrument 247
Appendix S. Comprehensive harm reduction program data 258
Appendix T. 3-month follow-up survey 261
Appendix U. 6-month follow-up survey 264
Appendix V. Survey response errors at each timepoint 267
Appendix W. Theory of planned behavior construct correlations: Obtaining naloxone 268
Appendix X. Theory of planned behavior construct correlations: Carrying naloxone 269
Appendix Y. Theory of planned behavior construct correlations: Discussing naloxone 270
Appendix Z. Theory of planned behavior construct correlations: Administering naloxone 271
Appendix AA. Proportion of Likert scale responses: Intention to obtain naloxone 272
Appendix AB. Proportion of Likert scale responses: Intention to carry naloxone 273
Appendix AC. Proportion of Likert scale responses: Intention to discuss naloxone 274
Appendix AD. Proportion of Likert scale responses: Intention to administer naloxone 275
Appendix AE. Obtaining naloxone in the past 3-months 276
Appendix AF. Obtaining naloxone in the past 6-months 278
Appendix AG. Carrying naloxone in the past 3-months 280
Appendix AH. Carrying naloxone in the past 6-months 282
Appendix AI. Discussing naloxone in the past 3-months 284
Appendix AJ. Discussing naloxone in the past 6-months 286
Appendix AK. Administering naloxone in the past 3-months 288
Appendix AL. Administering naloxone in the past 6-months 290

List of Abbreviations

AACTT: Action, Actor, Context, Target, Time

CI: confidence interval

FDA: Food and Drug Administration

GLMM: generalized linear mixed effects model

HAPA: Health Action Process Approach

HCV: Hepatitis C virus

HIV: human immunodeficiency virus

IQR: inter-quartile range

OEND: overdose education and naloxone distribution

OR: odds ratio

PWUO: people who use opioids

RR: rate ratio

SD: standard deviation

SE: standard error

SSP: syringe services program

THN: take home naloxone

TPB: Theory of Planned Behavior

US: United States

List of Tables

Table 1. Demographics and other characteristics between study conditions.....60
Table 2. Demographic and other characteristics between recruitment sites.....109
Table 3. Baseline attitudes, subjective norms, perceived behavioral control, and intentions to use naloxone between study conditions.....112
Table 4. Baseline attitudes, subjective norms, perceived behavioral control, and intentions to use naloxone between recruitment sites.....114
Table 5. Past behavior implementation between study conditions at baseline.....117
Table 6. Past behavior implementation between recruitment sites at baseline.....118
Table 7. Estimates for mixed effects models and interpretation.....129
Table 8. Generalized linear mixed effects model of obtaining naloxone (1-month).....131
Table 9. Generalized linear mixed effects model of carrying naloxone (1-month).....134
Table 10. Generalized linear mixed effects model of discussing naloxone (1-month).....137
Table 11. Generalized linear mixed effects model of administering naloxone (1-month).....140

List of Figures

Figure 1. Translation and delivery of naloxone to PWUO in community settings 28
Figure 2. Theory, model, and framework 37
Figure 3. Flowchart of study and data collection 52
Figure 4. Available data to answer research questions 1a-1c 53
Figure 5. CONSORT recruitment flow chart 57
Figure 6. Longitudinal timeline for data collection 103
Figure 7. Boxplots of 7-point Likert scale of intentions to obtain naloxone 122
Figure 8. Intention to obtain naloxone by condition across all timepoints 122
Figure 9. Boxplots of 7-point Likert scale of intentions to carry naloxone 124
Figure 10. Intention to carry naloxone by condition across all timepoints 124
Figure 11. Boxplots of 7-point Likert scale of intentions to discuss naloxone 126
Figure 12. Intention to discuss naloxone by condition across all timepoints 126
Figure 13. Boxplots of 7-point Likert scale of intentions to administer naloxone 128
Figure 14. Intention to administer naloxone by condition across all timepoints 128
Figure 15. Change in rate ratio for obtaining naloxone from baseline to 3-month follow-up 132
Figure 16. Change in rate ratio for obtaining naloxone from baseline to 6-month follow-up 132
Figure 17. Change in rate ratio for carrying naloxone from baseline to 3-month follow-up 135
Figure 18. Change in rate ratio for carrying naloxone from baseline to 6-month follow-up 135
Figure 19. Change in rate ratio for discussing naloxone from baseline to 3-month follow-up 138
Figure 20. Change in rate ratio for discussing naloxone from baseline to 6-month follow-up 138
Figure 21. Change in rate ratio for administering naloxone from baseline to 3-month follow-up 141
Figure 22. Change in rate ratio for administering naloxone from baseline to 6-month follow-up 141

Chapter 1 Introduction to dissertation and context of the research

1.1. Introduction to dissertation chapters

In the first chapter a historical account of opioids and substance use during the latter part of the 20th century is provided along with an overview of the current opioid overdose epidemic. This includes the origins of the epidemic, public health interventions, and the research setting and pragmatic considerations. The second chapter offers an overview of the existing body of work I contributed to opioid overdose response training and summarizes my previous publications in this field. Moving to the third chapter the literature on measures of naloxone use, health behavior theories, a behavior specification framework, and the research questions and specific aims of this dissertation are introduced. The fourth chapter details the approach taken to address the first aim of the research question and presents the findings. In the fifth chapter the approach to address the second and third aims of the research question is presented along with the corresponding findings. Finally, the sixth chapter outlines the principal findings of this dissertation, highlights the contributions to the literature, identifies the strengths and weaknesses of this dissertation, and addresses unanswered questions with potential areas for future research.

1.2. Co-Authorship, competing interests, and funding

The dissertation was co-authored by Dr. Sarah Henrickson Parker (Dissertation Committee Chair), Dr. Samantha Harden (Committee Member), Dr. Kimberly Horn (Committee Member), Dr. Cassandra Mierisch (Committee Member), and Dr. Brock Mutcheson (Committee Member). No competing interests are declared. Gratitude is expressed to the funders who supported this research, including the Human Factors and Ergonomics Society Training Technical Group (PI: Franklin Edwards), Fralin Biomedical Research Institute-Center for Health Behavior Research Pilot & Feasibility Funding (PIs: Parker, S., Horn, K., Mutcheson, B., Coleman, K.), the Virginia Tech Carilion School of Medicine, and Carilion Clinic, for their financial support.

1.3. A history of opioids, regulations, and current day challenges

The use of opioids has a long history dating back over 5,000 years to ancient civilizations such as the Sumerians in the Middle East. These civilizations were the first to extract opioids from the seeds of the poppy plant, *Papaver Somniferum* (Olsen & Sharfstein, 2019). Over time society has developed various derivatives of opioids including morphine, heroin, semi-synthetic opioids like oxycodone, hydrocodone, and buprenorphine, as well as synthetic opioids like methadone and fentanyl (Olsen & Sharfstein, 2019). Opioids are used for medicinal purposes such as managing pain during surgical procedures and relieving chronic or severe pain caused by cancer. When exogenous opioids bind to μ-opioid receptors in the brain, spinal cord, and gut, they produce analgesic effects and a sensation of euphoria (Pert & Snyder, 1973).

Opioids have a complex impact on human health with both positive and negative consequences depending on their usage. The body's own opioids, known as endogenous opioids, can provide pain relief following exercise or stress, contribute to maintaining homeostasis, and play a role in the natural pain response (Higginbotham et al., 2022). The excessive use of external opioids whether in the form of prescription medications or illicit substances like heroin can lead to addiction and pose a life-threatening risk of respiratory depression (Schiller et al., 2017; Valentino & Volkow, 2018). The development of tolerance to opioids can have negative implications as it can result in a diminished response to the drugs and a decrease in the production of opioid receptors, necessitating higher doses to achieve the desired pain relief or pleasurable effects (Olsen & Sharfstein, 2019). The regulation of opioid use is of utmost importance to prevent addiction and overdose.

In 1914 the United States (US) Congress enacted the Harrison Narcotic Tax Act as a response to the International Opium Convention of 1912. This act aimed to regulate the sale and

use of narcotics including drugs like morphine, heroin, and cocaine, by requiring prescriptions for their use (Kolb & Du Mez, 1924). Scholars argue that the primary objective of the law was not to address addiction but rather to exert control and impose punishment on specific populations (Brecher, 1986). The legislation received support from Southern Democrats who sought to expand police powers and specifically target Chinese laborers and African Americans, disproportionately affecting these communities compared to white Americans (Duncan et al., 2014). The discriminatory nature of this targeting has had long-lasting consequences for marginalized populations. At the time, limited evidence was available on addiction and its prevalence in the US, thus hindering a comprehensive understanding of the law's impact on addiction treatment and public health (Kolb & Du Mez, 1924; Duncan et al., 2014).

Drug use became more prevalent in the US during the 1950s and 60s, and imprisonment was the main approach to treating addiction or illicit substance use (Schur, 1962; Goode, 2006). The Vietnam War exacerbated the situation as many American soldiers used heroin and cannabis in Vietnam due to its availability and affordability (Stanton, 1976). This, combined with the trauma of war, led to a high rate of substance use disorders among returning soldiers, with at least 10 % requiring treatment for their addiction (Robins et al., 1974; Robins & Slobodyan, 2003). The prevalence of addiction among Vietnam veterans highlighted the inadequacy of imprisonment as a treatment for addiction and prompted research into alternative treatment options (Goode, 2006).

Addiction and substance use are complex public health issues closely linked to race and inequality (Provine, 2011). In the 1970s, President Richard Nixon declared the War on Drugs, which gained support for the Controlled Substances Act and the Comprehensive Drug Abuse Prevention and Control Act of 1970, replacing the Harrison Narcotic Tax Act (Duncan et al., 2014). Many scholars argue that these policies explicitly and implicitly targeted minorities and

marginalized groups, unfairly blaming them for America's illicit drug problem (Steiner & Argothy, 2000; Alexander, 2010). On the other hand, advocates pushed for more compassionate and evidence-based approaches to address substance use disorders during the 1970s and 80s leading to a shift towards treating addiction as a medical issue rather than a criminal issue. However, the moral panic continued into the 1980s as President Ronald Reagan and his administration continued to stigmatize addiction and illicit drug use as a moral failing (Hawdon, 2001).

During the 1990s and early 2000s Purdue Pharma L.P. (a pharmaceutical company formerly owned by the Sackler Family) marketed OxyContin® (a prescription opioid) as being "*...less addictive and less subject to abuse and diversion than other opioids*" (Van Zee, 2009). Research at the time did not adequately account for the risk of addiction among patients using OxyContin® daily for chronic pain focusing instead on its low risk for acute pain patients (Porter & Jick, 1980; Ballantyne, 2007a; Van Zee, 2009; Leung et al., 2017). This misrepresentation of OxyContin® coincided with the inclusion of pain as a vital sign in healthcare settings which led healthcare providers to treat pain more aggressively. Pain as a vital sign was later removed in 2016 (Scher et al., 2018). There was a significant increase in the use of prescription opioids among white Americans in suburban and rural areas as these drugs were frequently prescribed for surgeries and common conditions like back pain (Moody et al., 2017; Netherland & Hansen, 2017). The over-prescription and misuse of opioids contributed to the first wave of the current opioid overdose epidemic, which had devastating consequences across races and communities in the US.

At the beginning of the 21st century regulations for prescription opioids were tightened (Ballantyne, 2007b). Necessary revisions were made to opioid prescribing guidelines for chronic pain to prevent the over-prescription of opioids (Dowell et al., 2022). These changes resulted in a decrease in opioid prescriptions by US doctors as many were concerned about the legal

consequences associated with prescribing opioids (Richard & Reidenberg, 2005; Phillips et al., 2017). The lack of access to prescription opioids led individuals suffering from addiction to turn to the illicit drug market, which expanded to meet the demand for opioids to manage chronic pain and withdrawal symptoms (Phillips et al., 2017). This increased consumption of heroin and synthetic opioids in 2010 contributed to the second wave of the opioid overdose epidemic (CDC, 2018).

In the last decade (2010 to 2020) drug overdose deaths in the US experienced a fivefold increase (Spencer et al., 2022). Currently synthetic opioids are contributing the most to opioid overdose mortality (Irvine et al., 2018). The financial costs associated with opioid use disorder and fatal opioid overdose amount to trillions of dollars with approximately 187 people dying every day from opioid overdoses (CDC, 2018; Florence et al., 2021). The COVID-19 pandemic further exacerbated this dire situation leading to a significant rise in opioid overdose deaths from 2020 to 2022 (Ahmad et al., 2023). The pandemic brought about factors such as social isolation, job loss, and economic hardship (Linas et al., 2021). These factors have contributed to an increased risk of drug overdose among vulnerable populations including individuals struggling with substance use disorders (Kim et al., 2019).

1.4. Opioid overdose education and naloxone distribution

Naloxone, also known as Narcan®, is a medication that can mitigate an opioid overdose (Boyer, 2012; NIDA, 2021). It functions by binding to the μ-opioid receptors in the brain and can effectively reverse respiratory depression, a common cause of death in opioid overdoses. The US Food and Drug Administration (FDA) approved naloxone in 1971 specifically for the purpose of reversing respiratory depression during an opioid overdose (McDonald et al., 2017). Naloxone is considered a safe and effective medicine with no major long-term side effects, and it has no impact on individuals who have not consumed opioids (Handal et al., 1983; Chamberlain & Klein, 1994; Sporer & Kral, 2007). Naloxone was primarily accessible in US hospitals and ambulances, but advocacy efforts in the 90s led to its broader access (Bennett & Elliott, 2021).

Presently naloxone is either prescribed or accessible because of standing orders also known as a nonpatient specific prescription (Davis & Carr, 2015; Davis & Carr, 2017; Haffajee et al., 2020; Lieberman & Davis, 2021). Naloxone is often available from health centers and syringe services programs (SSPs) and is covered by some insurance[1] providers at pharmacies and medication-assisted treatment programs (Walley et al., 2013a; Wheeler et al., 2015; Morton et al., 2017; Lambdin et al., 2020). In March 2023, the FDA approved Narcan® nasal spray for nonprescription sale over the counter potentially increasing its accessibility and affordability[2] (Evoy et al., 2021; Tanne, 2023).

In the 1990s the rising mortality rates among white people brought attention to opioid overdose deaths (Netherland & Hansen, 2017; Bennett & Elliott, 2021). As a response overdose education and naloxone distribution (OEND), also known as take-home naloxone (THN), emerged

[1] In 2019, the CDC reported that more than half of naloxone prescriptions required a copay and that areas of the country that needed it most were not dispensing it enough (CDC, 2019).
[2] Non-profit agencies and state governments pay $47 for a package of two nasal sprays (Tanne, 2023).

as a critical community intervention (Strang & Farrell, 1992; Bennett & Elliott, 2021). OEND programs aim to educate laypersons on the signs and symptoms of an overdose, proper technique for rescue breathing, and the correct dose and timing of naloxone administration even if briefly covered (Wagner et al., 2014; Behar et al., 2015; Edwards et al., 2020; Edwards et al., 2023a). Pragmatic research trials and epidemiological evidence suggest OEND are cost-effective programs that reduce opioid overdose mortality (Coffin & Sullivan, 2013; Walley et al., 2013b; McDonald & Strang, 2016; Naumann et al., 2019; Townsend et al., 2020). Overall laypersons can administer naloxone with an intramuscular injection, intramuscular auto-injection (Evzio® by Kaleo, Inc.), multi-step intranasal atomizer spray, and single-step atomized intranasal spray (Narcan® by Adapt Pharma) (Jiang et al., 2018; Skolnick, 2018; Neale et al., 2019).

OEND can be compared to other public first aid programs such as using an EpiPen® for anaphylactic shock, automated external defibrillators for cardiac arrest, the Heimlich maneuver for choking, and Stop the Bleed for traumatic injuries (Buchman et al., 2018; Lei et al., 2019). OEND has remained the primary opioid overdose prevention strategy in the US for the past two decades (Carroll et al., 2018; Saloner et al., 2018). Literature reviews and meta-analyses suggest that OEND programs can improve knowledge and attitudes among learners (Clark et al., 2014; Giglio et al., 2015; McAuley et al., 2015; Razaghizad et al., 2021).

These programs aim to shift[3] the responsibility of opioid overdose resuscitation from medical professionals to laypersons including people who use opioids (PWUO) (Buchman et al., 2018; Mamdani et al., 2022). Research suggests that OEND programs have been successful in reaching and training PWUO to respond to opioid overdoses (Doe-Simkins et al., 2009; Lewis et al., 2017). However, PWUO may be hesitant to seek medical attention or call emergency services

[3] Defined as the rational redistribution of healthcare tasks within health workforce teams (WHO, 2007).

due to the fear of legal repercussions (Tobin et al., 2009; Koester et al., 2017; Mamdani et al., 2022). This fear of legal repercussions can hinder timely help-seeking and potentially impede life-saving interventions. Good Samaritan Laws[4] have been enacted to address this issue by providing legal protection to individuals who report drug overdoses (Kolodny et al., 2015; McClellan et al., 2018; Bennett & Elliott, 2021). These laws aim to encourage PWUO to seek help without fear of arrest or prosecution for drug-related offenses. For instance, in Virginia, PWUO who report drug overdoses are protected from arrest and prosecution for drug possession and paraphernalia (PDAPS, 2021).

Ensuring that PWUO have access to naloxone is critical for the success of overdose prevention efforts (Weiner et al., 2019; Kahn et al., 2022a). However, implementation research suggests that some regions in the United States are underutilizing OEND programs particularly rural areas in south-central Appalachia with high rates of opioid overdose mortality (Wagner et al., 2014; Lambdin et al., 2018; Thomas et al., 2020; NORC, 2021; Rochester & Graboyes, 2022). These findings highlight the need for increased implementation efforts in these regions (Lancaster et al., 2020).

The lack of adoption, implementation, and maintenance of OEND programs is often influenced by naloxone access laws, cost, and limited public investment (Saloner et al., 2018; Bessen et al., 2019; Rees et al., 2019; Smart et al., 2021; Behrends et al., 2022; Spector et al., 2022; Tse et al., 2022). Despite the evidence supporting the effectiveness of naloxone access laws in reducing opioid overdose mortality, beliefs rooted in stigma still hinder the implementation of OEND programs and limit PWUO access to this life-saving antidote (Faulkner-Gurstein, 2017; Latkin et al., 2019a; Bennett et al., 2020; Miller et al., 2022).

[4] Each state has different legislation. See PDAPS (2021) for more information.

1.5. Syringe services programs and context for research in south-central Appalachia

People who use or inject opioids face an increased risk of overdosing as well as contracting human immunodeficiency virus (HIV) or Hepatitis C virus (HCV) through sharing injection equipment (CDC, 2020; CDC, 2021). Authorized SSPs, often in combination with OEND programs, play a crucial role in addressing overdose-related fatalities and reducing the transmission of infectious diseases (Jarlais et al., 2015; Strike & Miskovic, 2018; Iyengar et al., 2019; CDC, 2020). Relevant authorities authorize these facilities to provide individuals with access to naloxone and sterile injection equipment. More than 30 years of research indicate that SSPs can reduce overdose deaths, curb the spread of HIV and HCV, increase entry into opioid use treatment programs, and do not increase illegal opioid use or crime (Hagan et al., 2000; Aspinall et al., 2014; CDC, 2020; Tse et al., 2022).

Opioid overdose is a significant public health crisis particularly in parts of south-central Appalachia like southwest Virginia (Moody et al., 2017; NORC, 2021). In 2017 the Virginia House of Delegates passed legislation authorizing the development of SSPs (Section 32.1-45.4 of the Code of Virginia). Currently the Virginia Department of Health's Division of Disease Prevention oversees eight SSPs in the state (VDH, 2023). One of these authorized programs is the Council of Community Services' Drop-in Center North in Roanoke City. This program provides sterile injection equipment, naloxone, harm reduction education, syringe disposal, housing assistance, and linkage to medication assisted treatment programs to over 600 or more individuals.

Chapter 2 Translational research perspective and contributions to the literature

2.1. Translational research perspective

As a translational scientist it is essential to acknowledge the social and cultural factors that influence the implementation of harm reduction research into practice (Woolf, 2008; Martignetti & Sun, 2022). For example, stigma reinforces the notion that PWUO are irresponsible further perpetuating the negative consequences of addiction (Cheetham et al., 2022). The education and research conducted in this field can help a community relearn the concept of addiction and embrace harm reduction approaches. The goal of harm reduction is to translate education to people who use drugs and to support their health and well-being.

The dissertation presented here is translational and acknowledges the inherent complexities and limitations of social science and mixed methods research. It recognizes that research is not conducted in isolation but is influenced by the experiences and beliefs of the investigator. To mitigate personal biases and address the complexity of drug use a multidisciplinary approach was adopted for this dissertation. This approach incorporates perspectives and insights from various fields including harm reduction, health behavior, implementation science, human factors, and clinical literature. Furthermore, conducting research with PWUO necessitates careful attention to ethical conduct. Ethical considerations outlined by Anderson and McNair (2018) such as informed consent, decision-making capacity, fair compensation, and risk awareness are integral to this research. Moreover, ethical research practices involve safeguarding the privacy and confidentiality of study participants and ensuring that the research findings are utilized in ways that benefit both the participants and society.

Naloxone can be viewed as an empowering tool that plays a crucial role in enabling PWUO to take control of their safety and potentially save lives. It is important to recognize that they often

encounter stigma and face health disparities within society which can hinder their access to and effective use of naloxone (Cheetham et al., 2022). Community partnerships with SSPs were essential to investigating the use of naloxone because it provides access to PWUO by creating a safe and judgement-free environment (Treloar et al., 2016; Lancaster et al., 2020).

The main objective of this dissertation was to enhance the utilization of naloxone among PWUO through the application of various theories, models, and frameworks (Nilsen, 2015). By utilizing a planning intervention designed with a behavior specification framework the aim was to amplify the motivation and intentions of PWUO to acquire, carry, discuss, and potentially administer naloxone. This innovative approach aimed to empower PWUO, improve their access to and knowledge about naloxone, and ultimately prevent opioid overdose fatalities.

The project expands upon the practical implementation of a cost-effective and adaptable planning intervention which is grounded in behavior change and implementation science research. It can be effectively employed in diverse settings. Notably this project stands out as one of the pioneering endeavors to specifically target naloxone use through a behavioral intervention distinct from previous interventions that primarily focused on reducing opioid use or injection behaviors.

Throughout the course of my doctoral journey, I have had the privilege of making valuable contributions to various research studies centered around opioid overdose response. These projects have focused on enhancing overdose response training, identifying knowledge gaps, and investigating topics related to opioid overdose response and naloxone education (Edwards et al., 2020; Edwards et al., 2023a; Edwards et al., 2023b; Edwards et al., under review). Building upon this previous work I have established a solid foundation for the present research which seeks to examine whether the formulation of plans pertaining to naloxone use can enhance individuals' intentions and facilitate its implementation.

2.2. Previous publications

2.2.1. A review of performance assessment tools for rescuer response in opioid overdose simulations and training programs

Edwards III, G. F., Mierisch, C., Mutcheson, B., Horn, K., & Parker, S. H. (2020). A review of performance assessment tools for rescuer response in opioid overdose simulations and training programs. Preventive Medicine Reports, 20, 101232. doi: 10.1016/j.pmedr.2020.101232

Abstract/Summary: Since the 1990s, more than 600 overdose response training and education programs have been implemented to train participants to respond to an opioid overdose in the United States. Given this substantial investment in overdose response training, valid assessment of a potential rescuers' proficiency in responding to an opioid overdose is important. The aim of this article is to review the current state of the literature on outcome measures utilized in opioid overdose response training. Thirty-one articles published between 2014 and 2020 met inclusion criteria. The reviewed articles targeted laypersons, healthcare providers, and first responders. The assessment tools included five validated questionnaires, fifteen non-validated questionnaires, and nine non-validated simulation-based checklists (e.g., completion of critical tasks and time to completion). Validated multiple choice knowledge assessment tools were commonly used to assess the outcomes of training programs. It is unknown how scores on these assessment tools may correlate with actual rescuer performance responding to an overdose. Seven studies reported ceiling effects most likely attributed to participants' background medical knowledge or experience. The inclusion of simulation-based outcome measures of performance, including the commission of critical errors and the time to naloxone administration, provides better insight into rescuer skill proficiency.

2.2.2. Evaluating rescuer performance in response to opioid overdose in a community setting: Evidence for medically appropriate process measures

Edwards III, G. F., Mierisch, C., Strauss, A., Mutcheson, B., Coleman, K., Horn, K., & Parker, S. H. (2023). Evaluating rescuer performance in response to opioid overdose in a community setting: Evidence for medically appropriate process measures. Preventive Medicine Reports, 102145. doi: 10.1016/j.pmedr.2023.102145

Abstract/Summary: Overdose education and naloxone distribution (OEND) programs are widely accepted to reduce opioid overdose deaths. However, there is currently no validated instrument to evaluate the skills of learners completing these programs. Such an instrument could provide feedback to OEND instructors and allow researchers to compare different educational curricula. The aim of this study was to identify medically appropriate process measures with which to populate a simulation-based evaluation tool. Researchers conducted interviews with 17 content experts, including healthcare providers and OEND instructors from south-central Appalachia, to collect detailed descriptions of the skills taught in OEND programs. Researchers used three cycles of open coding, thematic analysis, and consulted currently available medical guidelines to identify thematic occurrences in qualitative data. There was consensus among content experts that the appropriate nature and sequence of potentially lifesaving actions during an opioid overdose is dependent on clinical presentation. Isolated respiratory depression requires a distinct response compared to opioid-associated cardiac arrest. To accommodate these different clinical

presentations, raters populated an evaluation instrument with the detailed descriptions of overdose response skills, such as naloxone administration, rescue breathing, and chest compressions. Detailed descriptions of skills are essential to the development of an accurate and reliable scoring instrument. Furthermore, evaluation instruments, such as the one developed from this study, require a comprehensive validity argument. In future work, the authors will integrate the evaluation instrument in high-fidelity simulations, which are safe and controlled environments to study trainees' application of hands-on skills, and conduct formative assessments.

2.2.3. Development of medical simulations for opioid overdose response training: Evidence from firsthand accounts of out-of-hospital overdoses

Edwards III, G. F., Mierisch C., Mutcheson B., Strauss A., Coleman K., Horn K., & Parker S. H. Development of Medical Simulations for Opioid Overdose Response Training: Evidence from Firsthand Accounts of Out-of-Hospital Overdoses. (under review)

Abstract/Summary: Medical simulation offers a controlled environment to study difficult to observe clinical care situations. Overdose education and naloxone distribution (OEND) programs train potential rescuers to respond to opioid overdoses, but to observe rescuer performance in the field prior to emergency medical service arrival would be very difficult. There is opportunity to integrate individuals who have firsthand experience treating out-of-hospital overdoses into simulation development of these types of scenarios. Realistic overdose simulations could provide OEND programs with additional tools for effectively translating hands-on skills and supporting context-sensitive training regimens. Researchers conducted semi-structured interviews with 17 individuals with experience responding to opioid overdoses including emergency department physicians, first responders, OEND program instructors, and peer recovery specialists. Two coders conducted qualitative content analysis using open and axial thematic coding to identify nuances of out-of-hospital overdoses including illicit and prescription opioids. Results were presented as narrative findings supplemented by summaries of the frequencies of themes across interviews. Over 20 hours of audio recording were transcribed verbatim and coded. During open and axial thematic coding, the researchers identified several primary and secondary themes and subthemes that highlight the nuances between out-of-hospital overdoses involving illicit opioids or prescription opioids. The researchers used distinct contextual details including locations, clinical presentations, bystanders' behavior, and the presence of drug paraphernalia to develop four example simulations of out-of-hospital overdoses. The narrative findings in this qualitative study provided context-sensitive information for the development of out-of-hospital overdose scenarios applicable in simulation training. These findings could help instructors or researchers by providing systematically developed evidence-based scenarios for training or research purposes.

2.2.4. Designing healthcare for human use: Human factors and practical considerations for the translational process

Edwards III, G. F., Zagarese, V., Tulk Jesso, S., Jesso, M., Harden, S. M., & Parker, S. H. (2023). Designing healthcare for human use: Human factors and practical considerations for the translational process. Frontiers in Health Services, 2, 136. doi: 10.3389/frhs.2022.981450

Abstract/Summary: In recent years, the focus of implementation science (IS) shifted to emphasize the influence of contextual factors on intervention adaptations in clinical, community, and corporate settings. Each of these settings represent a unique work system with varying contexts that influence human capabilities, needs, and performance (otherwise known as "human factors"). The ease of human interaction with a work system or an intervention is imperative to IS outcomes, particularly adoption, implementation, and maintenance. Both scientific approaches consider the "big picture" when designing interventions for users and stakeholders to improve work and health outcomes. IS and human factors are therefore complementary in nature. In this paper, the authors will (1) provide perspective on the synergistic relationship between human factors and IS using two illustrative and applied cases and (2) outline practical considerations for human factors-based strategies to identify contextual factors that influence intervention adoption, implementation, and maintenance dimensions of the RE-AIM framework. This article expands on recent research that developed user- and human-centered design strategies for IS scientists to use. However, defining the complementary relationship between IS and human factors is a necessary and valuable step in maximizing the effectiveness of IS to transform healthcare. While IS can complement practitioners' identification of intervention adaptations, human interaction is a process in the work system often overlooked throughout implementation. Further work is needed to address the influence that organizational endorsement and trust have on intervention adaptations and their translation into the work system.

Chapter 3 Naloxone use among PWUO and opportunities for improvement

3.1. Literature review on the use of naloxone among PWUO

In 2022 approximately 107,000 overdose deaths occurred with over 70 % of these deaths involving synthetic opioids, illicit heroin, or prescription opioids (Ahmad et al., 2023). Public health professionals and legislators in the United States have explored various implementation strategies to address the overdose crisis and enhance the dissemination of naloxone in communities (Carroll et al., 2018; Weiner et al., 2019). Researchers continue their efforts to study "*saturation*" or the point at which additional naloxone distribution no longer results in a significant reduction in opioid overdose mortality (Madah-Amiri et al., 2019). The translation and delivery of naloxone, as well as the measurement of saturation, are essential and valuable efforts (**Figure 1**). However, determining the appropriate number of naloxone kits for a specific location presents challenges, which adds complexity to the evaluation of dissemination strategies (Bennett & Elliott, 2021). Conversely, there is a wealth of health behavior research available that can be applied and potentially beneficial to PWUO (Mathis et al., 2018; Perri & Strike, 2020). Efforts by PWUO to obtain, carry, discuss, and administer naloxone could be enhanced through a health behavior intervention that supports the delivery of the intervention, fitting seamlessly into the scaffolding of dissemination and implementation.

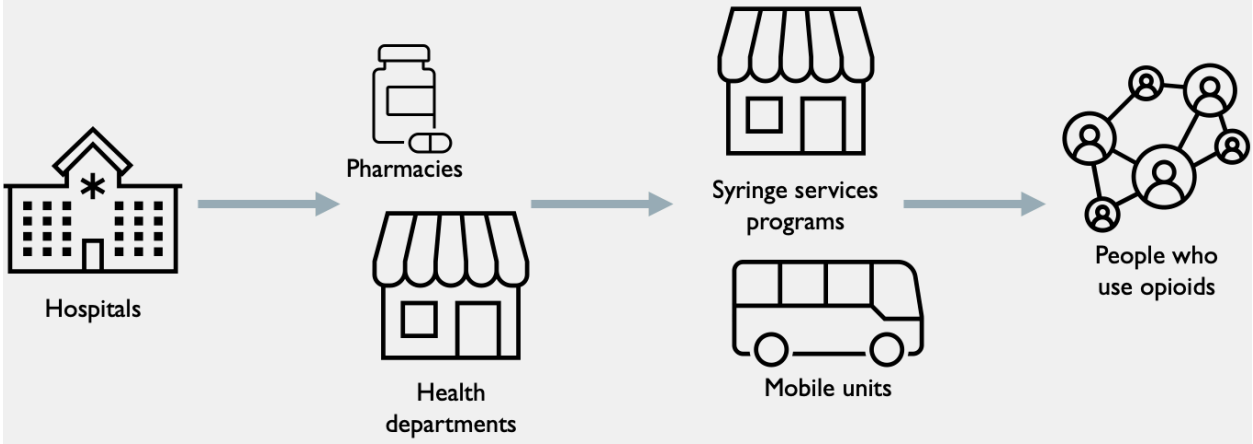


Figure 1. Translation and delivery of naloxone to PWUO in community settings

Scholars have identified ongoing barriers that impede PWUO from effectively executing the first responder role in social contexts of drug use. These barriers can be categorized into three distinct categories which are particularly relevant to the focus of this dissertation. The categories and corresponding examples include:

1. Adoption: This category encompasses human factors constraints that hinder PWUO's ability to effectively respond to overdoses. Examples of these constraints include limited knowledge of and training in hands-on resuscitation skills (Edwards et al., 2020; Edwards et al., 2023a).
2. Implementation: The implementation category highlights barriers related to the lack of OEND programs and the varying structures of OEND curricula. Examples of these barriers include the lack of widespread availability and inconsistent training programs for PWUO (Kerensky & Walley, 2017; Moustaqim-Barrette et al., 2021; Sellen et al., 2023).
3. Maintenance: This category focuses on the challenges associated with sustaining naloxone ownership and carriage among PWUO. Heterogeneous measures of naloxone ownership and carriage practices contribute to these barriers (Burton et al., 2021; McDonald et al., 2021).

Given the scope of this dissertation the author has chosen to specifically address the barriers related to implementation and maintenance. The research aims to delve deeper into interventions that can enhance naloxone ownership, carriage, facilitate discussions in social contexts of drug use, and support the decision to administer naloxone.

The studies reviewed by Heavey et al. (2018), Tobin et al. (2018), Dayton et al. (2019), Latkin et al. (2019b), Burton et al. (2021), and Lipira et al. (2021) suggest that ownership of naloxone ranges from 57 % to 90 % while carriage of naloxone ranges from 17 % to 26 % among

PWUO. Factors such as male gender, housing stability and instability, drug of choice, and fear of overdose victim's aggressiveness or law enforcement presence have been found to be associated with decreased ownership and carriage of naloxone. These findings suggest the need for targeted health behavior interventions that can increase the awareness, ownership, and carriage of naloxone among PWUO particularly those who are most vulnerable and at risk of opioid overdose. To the author's knowledge no studies report on the discussion of naloxone in social contexts of drug use.

Various studies conducted in North America and Europe have shown that ownership and carriage of naloxone are positively associated with several factors including female gender, race, housing stability and instability, drug of choice, injection, frequency of injection, personal overdose experience, ever administering naloxone, contact with SSPs, or receiving treatment for substance use (Tobin et al., 2018; Madah-Amiri et al., 2019; Moustaqim-Barrette et al., 2019; Reed et al., 2019; Buresh et al., 2020; Kinnard et al., 2021; Lipira et al., 2021; Hughto et al., 2022; Rivera et al., 2022; Spring et al., 2022; Kozak et al., 2023; Spadaro et al., 2023). The impact of housing stability or instability on ownership and carriage of naloxone is still inconclusive. Each investigation on the ownership and carriage of naloxone used different measures, which leads to inconsistencies and limited understanding of these behaviors (McDonald et al., 2021). These findings underscore the importance of developing targeted interventions to increase ownership and carriage of naloxone among PWUO.

Studies suggest that PWUO view themselves as lifesavers after administering naloxone and have pride in their actions, but they also experience complex emotions such as fear and frustration (Banjo et al., 2014; Wagner et al., 2014; McAuley et al., 2018). Naloxone administration is not just an action taken in response to an overdose but a complex social responsibility. Administering naloxone involves multiple individuals including the person who

overdosed, other bystanders, and the environment in which the overdose occurred. The social complexity of overdose response affects how people behave and respond in overdose situations. This highlights the need for a comprehensive understanding of the social role and actions taken leading up to an overdose (Rochester & Graboyes, 2022). This study aims to apply knowledge from the health behavior and motivation science literature to further explore *where*, *for whom*, and *when* PWUO engage in the use of naloxone (Aim 1) while also attempting to improve the ownership, carriage, discussion, and administration of naloxone (Aims 2 and 3).

3.2. Theoretical considerations and applications to the use of naloxone

It is assumed that people with sufficient motivation will pursue a goal (e.g., build muscle) and that the behavior will occur (e.g., lift weights). In fact, the correlations between goal intentions and subsequent behavior are strong (r = .53; Sheeran, 2002) but goal attainment often requires detailed steps for achievement. For example, humans can be highly motivated to perform specific behaviors but often fail to implement them (Sheeran & Orbell, 1999; Sheeran & Orbell, 2000; Sheeran & Silverman, 2003; Achtziger et al., 2008; Sheeran & Webb, 2016). Simply having the intention to do X behavior (e.g., lose weight) does not mean Y action (e.g., eat differently or exercise) will occur (Sheeran & Webb, 2016).

To bridge the gap between naloxone availability, ownership, carriage, discussion, and administration the research team theorizes that lessons from the health behavior and motivation science literature are highly applicable (Michie & Johnston, 2004; Glanz & Bishop, 2010; Michie et al., 2011; Gardner et al., 2012). Health behavior and motivation science is a field that focuses on understanding the factors that influence people's health behaviors including their decision to implement behaviors, maintain them, and change them over time.

The Theory of Planned Behavior (TPB) provides a framework for understanding the factors that influence a person's behavior (Ajzen, 1985; Ajzen, 1991; Ajzen, 2009; Ajzen, 2011, Ajzen, 2020). It proposes that behavior is primarily determined by an individual's intentions which in turn are influenced by their attitudes towards the behavior, subjective norms (i.e., perceived social pressure to perform or not perform the behavior), and perceived behavioral control (i.e., perceived ability to perform the behavior). Interventions aimed at increasing naloxone ownership, carriage, discussion, and administration among PWUO could target these factors to increase their motivation and ability to acquire, carry, discuss, and administer naloxone.

The Health Action Process Approach (HAPA) is another theoretical framework that could be used to guide an intervention aimed at increasing naloxone ownership and carriage. HAPA posits that behavior change occurs through a two-stage process involving a motivational phase and a volitional phase (Schwarzer et al., 2003; Schwarzer & Luszczynska, 2008; Schwarzer et al., 2011; Schwarzer, 2016; Zhang et al., 2019). The motivational phase includes the formation of intentions and the development of outcome expectancies (i.e., beliefs about the consequences of performing the behavior) while the volitional phase involves the translation of intentions into action through the formation of implementation intentions (i.e., specific plans for when, where, and how to perform the behavior). An intervention using HAPA could target the motivational and volitional phases to increase PWUO intentions to acquire and carry naloxone and their ability to translate these intentions into action.

Overall using theories such as TPB and HAPA to guide an intervention could help to bridge the gap between motivation (i.e., attitudes, subjective norms, control beliefs, and intentions) and volition (i.e., performing the behavior) (Ajzen, 1991; Schwarzer, 2016). However, an intervention is needed to move someone with high motivation to volition thus providing an impetus for implementation intentions (Hagger & Luszczynska, 2014). Development of implementation intentions is like a self-regulation strategy that helps people translate their motivation into performance (Armitage, 2015). Implementation intentions are often developed in the form of if-then plans (e.g., "If situation X is encountered, then I will perform Y behavior") (Gollwitzer, 1993; Gollwitzer, 1999). Bieleke & Keller (2021) provide a clear explanation of if-then plans, stating:

> "*The if-part pertains to a critical situation in which one wants to act while the then-part pertains to a goal-directed behavior that one wants to perform in that situation.*

> *Importantly, this is not merely a conceptual distinction: Specifying situations in the if-part and linking them to behaviors in the then-part is assumed to elicit distinct cognitive processes that underlie the behavioral effects of if-then plans*" (pg. 2 Section 1.1 in Bieleke & Keller, 2021).

Research indicates identifying critical situations and planning for goal-directed behaviors helps forge a link between a situational cue and permits an automatic or planned response (Orbell et al., 1997; Brandstätter et al., 2001; Webb & Sheeran, 2004; Webb & Sheeran, 2007; Sutton, 2008; Gollwitzer, 2014; Bieleke & Keller, 2021). The positive effects of if-then plans on behavior are often related to mental simulations (Martiny-Huenger et al., 2017). For example, Bieleke et al. (2021) state:

> "*...perceptual and motor areas in the brain – representing the critical situation and the planned behaviour, respectively – are concurrently activated when people form implementation intentions. This is assumed to create a cerebral blueprint for the behaviour that is then activated again when the critical situation is encountered...*" (pg. 113 of Bieleke et al., 2021).

The if-then format of implementation intentions holds significance due to its ability to establish a clear sequence of events. When individuals encounter a critical situation (the "if" component) this format prompts them to engage in goal-directed behavior (the "then" component) increasing the likelihood of following through with the intended behavior (Martiny-Huenger et al., 2017). This format is particularly valuable in bridging the gap between motivation and behavior because it offers a specific plan of action for critical situations (van Osch et al., 2010; de Vet et al., 2011). By formulating implementation intentions in the if-then format individuals can enhance their preparedness and increase the likelihood of effectively executing the intended behavior.

This dissertation is based on a robust body of literature demonstrating the effectiveness of implementation intentions (Gollwitzer, 1993; Gollwitzer & Brandstätter, 1997; Gollwitzer, 1999; Sheeran, 2002; Gollwitzer & Sheeran, 2006; Gollwitzer et al., 2008; Gollwitzer et al., 2014; Gollwitzer & Oettingen, 2015; Gollwitzer et al., 2017; Gollwitzer & Oettingen, 2019; Keller et al., 2019; Fishman et al., 2020; Gollwitzer & Sheeran, 2020; Wang et al., 2021; Bieleke & Keller, 2021; Bieleke et al., 2021). Numerous studies have shown that implementation intentions can lead to increased physical activity, reduced alcohol consumption, and reduced smoking (Bélanger-Gravel et al., 2013; Epton & Armitage, 2017; Silva et al., 2018; McWilliams et al., 2019; Cooke et al., 2023). In a review of 37 quasi-experimental or randomized controlled trials on implementation intentions to promote physical activity, Bélanger-Gravel et al. (2013) and Silva et al. (2018) found an overall effect size of 0.31 post-intervention and 0.24 at follow-up. Similarly, Epton & Armitage (2017) reported that participants who formed implementation intentions showed increased physical activity at a 2-month follow-up compared to a control group. Furthermore, in a review of 12 smoking cessation studies, McWilliams et al. (2019) found that implementation intentions as a single intervention reduced smoking at follow-up by 10 % in the intervention group. Notably using implementation intentions to study and potentially improve the use of naloxone among PWUO is a novel application of this intervention approach (Toli et al., 2016; Malaguti et al., 2020).

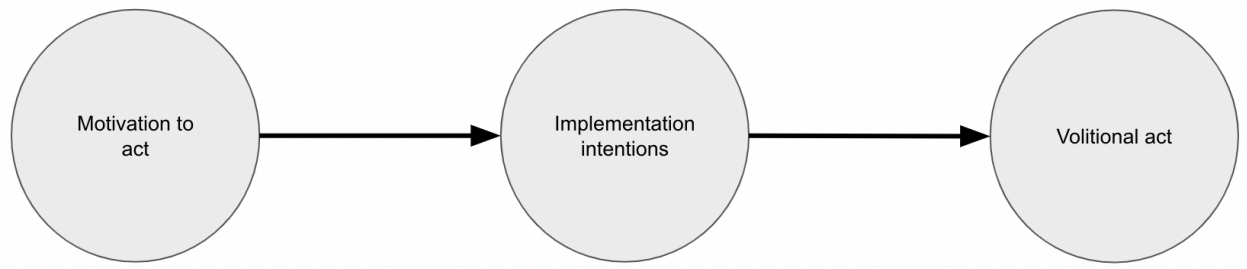
3.3. A behavior change framework and its application to the use of naloxone

Implementation intentions are commonly developed using available resources such as implementation intention or volitional help sheets. These tools provide cues and specific responses to assist participants in creating appropriate plans (Armitage, 2008; Armitage & Arden, 2010; Arden & Armitage, 2012; Armitage & Arden, 2012; Armitage et al., 2014; Armitage, 2015; Brewster et al., 2015; Armitage et al., 2016; Armitage, 2016; Epton & Armitage, 2017). However, no such resources currently exist for naloxone use, and the target population in this study has demonstrated low to moderate health literacy levels (Degan et al., 2019). To address this gap, the Action, Actor, Context, Target, Time (AACTT) framework was employed. This behavior specification framework was specifically developed for health services research and the workflow of healthcare providers (Presseau et al., 2019; Rudd et al., 2020; Patey et al., 2022). The AACTT framework builds upon the original Target, Action, Context, Time (TACT) framework, which was derived from the literature on the TPB and the Theory of Reasoned Action. The AACTT framework incorporates additional elements of human behavior and reorganizes them into a sequential design (Presseau et al., 2019; Ajzen, 2020).

The AACTT framework provides an easily defined sequence for specifying the behavior, the person performing it, the context, the reason or target, and the moment in time. The AACTT framework could offer a useful structure for developing implementation intentions, especially for participants with low to moderate health literacy levels. The use of the AACTT framework to create implementation intentions for naloxone use is a potentially innovative and practical application. Presseau et al. (2019) developed the AACTT framework for healthcare settings but suggested its applicability in community settings among other agents tasked with responsibilities such as PWUO and naloxone.

The AACTT framework has been successfully applied in various healthcare settings to improve the implementation and delivery of evidence-based practices including COVID-19 vaccination (Vallis et al., 2021), Alzheimer's treatment (Godbee et al., 2022), ketoacidosis management (Koripalli et al., 2022), oral hygiene (Klaic et al., 2021), antibiotic use (Pouly et al., 2022), recruitment to clinical trials (Gillies et al., 2021; Hanrahan et al., 2022), and reducing plastic waste (Allison et al., 2022). By specifying the action, actor, context, target, and time components the AACTT framework may help PWUO develop implementation intentions for naloxone ownership, carriage, discussion with peers, and administration.

Addiction is a complex issue compounded by stigma therefore implementation intentions alone may not be sufficient to promote behavior change among PWUO. However, this dissertation could provide valuable insights into the potential effectiveness of the TPB, implementation intentions, and AACTT framework in promoting harm reduction behaviors and improving the use of naloxone in the context of drug use (**Figure 2**). Overall, this dissertation has the potential to contribute to the development of more effective harm reduction strategies that can help reduce the number of overdose deaths among PWUO.



"If situation X is encountered, then I will perform Y behavior"

Figure 2. Theory, model, and framework

3.4. Specific aims and research questions

3.4.1. Overarching research question: Does an implementation intentions intervention improve *intentions* to use naloxone and increase the *implementation* of naloxone among PWUO?

3.4.2. Aim 1: Identify the experiences among PWUO for obtaining, carrying, discussing, and administering naloxone, analyze goal intentions and implementation intentions, and identify the factors that influence the use of naloxone.

> ***Research question 1a:*** *What are the contextual details of PWUO performance of obtaining, carrying, discussing, and administering naloxone?*
>
> ***Research question 1b:*** *What are the critical situations or goal behaviors of PWUO for obtaining, carrying, discussing, and administering naloxone?*
>
> ***Research question 1c:*** *What are the factors influencing PWUO performance of obtaining, carrying, discussing, and administering naloxone?*

Approach: As part of the longitudinal study investigating the impact of implementation intentions, individuals who use opioids participated in semi-structured interviews lasting 15-to-30-minutes. These interviews were conducted either in-person or virtually and focused on discussing the specific details of obtaining, carrying, discussing, and administering naloxone, including *where, for whom*, and *when* these behaviors occur. During the interviews, participants also created subsequent implementation intentions or goal intentions for each behavior of interest.

To ensure accessibility and accommodate the typically low to moderate health literacy levels among the participants, all study materials were prepared at an 8th-grade reading level. The interviews were audio recorded and transcribed verbatim. An essentialist thematic analysis with

an inductive approach, following the guidelines proposed by Braun and Clarke (2006), was used to analyze the interview data.

Expected outcome: The primary objective of Aim 1 was to identify the contextual information related to how PWUO engage in the use of naloxone, themes of goal intentions and implementation intentions, and major or minor themes across the dataset.

3.4.3. Aim 2: Determine if PWUO *intentions* to use naloxone improve from baseline to a 3- and 6-month follow-up.

> ***Hypothesis 2a:*** *The intentions to obtain naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*
>
> ***Hypothesis 2b:*** *The intentions to carry naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*
>
> ***Hypothesis 2c:*** *The intentions to discuss naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*
>
> ***Hypothesis 2d:*** *The intentions to administer naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Approach: To assess *motivations* and *intentions* of PWUO regarding naloxone use, a modified 7-point Likert scale was employed. This scale measured the constructs of the TPB, including 20 items measuring attitudes, 4 items measuring subjective norms, 12 items measuring perceived behavioral control, and 4 items measuring intentions. Participants completed the survey assessing *motivations* and *intentions* at baseline, and then completed follow-up surveys on intentions at the 3-month and 6-month time points.

Expected outcome: The hypothesis for Aim 2 is that participants who developed implementation intentions to use naloxone will have significantly improved *intentions* at 3- and 6-month follow-ups compared to participants in the control group who only formed goal intentions.

3.4.4. Aim 3: Determine if PWUO *implementation* of naloxone improves from baseline to a 3- and 6-month follow-up.

> ***Hypothesis 3a:*** *Obtaining naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*
>
> ***Hypothesis 3b:*** *Carrying naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*
>
> ***Hypothesis 3c:*** *Discussing naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*
>
> ***Hypothesis 3d:*** *Administering naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Approach: To assess the implementation of naloxone among PWUO, a quantitative survey was utilized to measure the counts or frequency of obtaining, carrying, discussing, and administering naloxone within the previous 1-month, 3-months, and 6-months. Participants were instructed to provide numerical values, although qualitative responses were accepted if they represented a number (e.g., three, four, etc.). For qualitative responses that did not include a numerical value (e.g., sometimes, often, etc.), they were considered as at least once. The survey was administered at baseline and repeated at 3- and 6-month follow-ups to track changes in implementation over time.

Expected outcome: The hypothesis for Aim 3 is that participants who developed implementation intentions to use naloxone will have significantly improved *implementation* in the previous 1-month, 3-months, and 6-months at follow-up compared to PWUO in the control group.

3.4.5. Exploratory Aim 4: Determine if PWUO who practice naloxone administration in simulation and create implementation intentions, *implementation* of naloxone from baseline to a 3- and 6-month follow-up improve.

> ***Hypothesis 4a:*** *Obtaining naloxone will improve at 3- and 6-months among PWUO who practiced naloxone administration in simulation and created implementation intentions versus only creating implementation intentions.*
>
> ***Hypothesis 4b:*** *Carrying naloxone will improve at 3- and 6-months among PWUO who practiced naloxone administration in simulation and created implementation intentions versus only creating implementation intentions.*
>
> ***Hypothesis 4c:*** *Discussing naloxone will improve at 3- and 6-months among PWUO who practiced naloxone administration in simulation and created implementation intentions versus only creating implementation intentions.*
>
> ***Hypothesis 4d:*** *Administering naloxone will improve at 3- and 6-months among PWUO who practiced naloxone administration in simulation and created implementation intentions versus only creating implementation intentions.*

Approach: The potential benefits of using simulations in training and education are well-established. In this study, the combined impact of practicing naloxone administration in simulation and creating implementation intentions was investigated. A subset of participants (n = 3) in the

experimental group underwent a single low-fidelity simulation of an out-of-hospital opioid overdose emergency. Due to under recruitment in this exploratory condition, statistical analyses were not conducted. Further research is needed to address this aim. It is possible that the benefits of simulation, in combination with creating implementation intentions, may justify the higher level of resource utilization required for this intervention.

By the end of this dissertation, the overarching research question and three main aims of the study were addressed. Firstly, the experiences of PWUO in obtaining, carrying, discussing, and administering naloxone were identified, along with analyzing goal intentions and implementation intentions for the use of naloxone, and identifying the factors influencing these behaviors. Secondly, the study aimed to determine whether the *intentions* of PWUO to use naloxone improved from baseline to a 3- and 6-month follow-up. Lastly, the study aimed to determine whether the *implementation* of naloxone by PWUO improved from baseline to a 3- and 6-month follow-up.

Chapter 4 Study One: Development of implementation intentions for obtaining, carrying, discussing, and administering naloxone: A qualitative analysis on the use of naloxone among PWUO

4.1. Abstract

The increasing number of opioid overdose deaths in the United States has underscored the importance of distributing naloxone, an overdose antidote, to PWUO. However, behaviors related to obtaining, carrying, discussing, and administering naloxone vary among PWUO and are not well understood. To develop more effective interventions, it is crucial to gain insights into the thought processes underlying these behaviors. To address this issue, researchers conducted semi-structured interviews with PWUO to gather contextual information regarding their implementation of naloxone.

In this study, 83 individuals with active opioid use disorder were recruited from two SSPs in south-central Appalachia to investigate their experiences and gather contextual details regarding the implementation of naloxone, including *where*, *for whom*, and *when*. As part of a longitudinal study with randomization, trial participants were randomly assigned to either developing an implementation intention (with the AACTT framework) or a goal intention for each behavior throughout the interview. Fifteen-to-thirty-minute semi-structured interviews with PWUO were audio recorded and transcribed. Three coders analyzed interviews using an essentialist thematic analysis with an inductive approach, and two coders reviewed the goal and implementation intentions separately for themes within participants' intentions.

The study revealed valuable contextual information about the *where*, *for whom*, and *when* of the use of naloxone among PWUO. The experimental group created implementation intentions and identified a variety of critical situations linking them to a goal-directed behavior, whereas the control group developed a variety of goal directed behaviors. The study also identified five major themes including (1) caring for others' needs, (2) quality of education and gaps in knowledge, (3) reinforcement of naloxone through overdose experiences, (4) the duality of life-threatening overdose and compassion for the victim, and (5) ubiquitous stigma and displaced fear, and two minor themes (1) SSP implementation, and (2) drug use and engaging recovery. To our knowledge, this study is the first to use implementation intention theory with PWUO and provides valuable insights into the detailed descriptions of the use naloxone.

The study provides valuable insights into the potential effectiveness of implementation intentions in promoting harm reduction behaviors and improving naloxone use among PWUO. However, further research is necessary to determine the extent to which implementation intentions improve ownership, carriage, discussion, and administration of naloxone. In addition, this research attempted to apply the AACTT framework as a novel method for developing implementation intentions for behaviors that previously lacked volitional help sheets. The study's application of this framework in a community setting highlights its potential use beyond healthcare settings and with non-clinician populations.

4.2. Research questions

Research question 1a: *What are the contextual details of PWUO performance of obtaining, carrying, discussing, and administering naloxone?*

Research question 1b: *What are the critical situations or goal directed behaviors of PWUO for obtaining, carrying, discussing, and administering naloxone?*

Research question 1c: *What are the factors influencing PWUO performance of obtaining, carrying, discussing, and administering naloxone?*

4.3. Methods

4.3.1. Reflexivity statement

FE, the primary researcher, conducted all interviews and conceptualized this study. With a background in community engagement, translational research, and interviewing techniques, FE assumed the role of an informed "outsider" who was well-versed in the technical terminology relevant to both the evidence producers and consumers. This background also provided FE with an understanding of potential sensitivities when probing participants about drug use and overdose exposure.

Furthermore, FE's personal background is rooted in south-central Appalachia, granting him cultural competency essential for establishing rapport with harm reduction leaders and clients in this region (D'Alonzo, 2010). By sharing a common experience with community partners and participants, FE was able to ask relevant follow-up questions and bridge any perceived distance during the interviews. Moreover, this position enabled FE to grasp implied content while analyzing the data.

The researchers acknowledge the inherent risks associated with research conducted by an informed "outsider," such as the potential imposition of personal beliefs and biases (Berger, 2013). However, in this study, the researchers deemed cultural competency crucial for establishing rapport with a marginalized and vulnerable population in south-central Appalachia. This trade-off was made with awareness and caution, recognizing the need to navigate these potential challenges and mitigate biases.

4.3.2. Community engagement research and study sites

Establishing community partnerships poses a significant challenge due to the "*invisible work*" involved, which is time-intensive and emotionally demanding (Daniels, 1987; Steketee et

al., 2022). This aspect often goes unarticulated in academic research as it does not fit into easily defined methods. However, the complexity of building relationships becomes even greater when cultural competency aligned with the community partners' and participants' culture or background is necessary (D'Alonzo, 2010). In the case of Appalachia, cultural competency plays a crucial role in effectively engaging the local population. This region experiences opioid overdose mortality rates that are twice as high as the national average, underscoring the importance of cultural understanding (NORC, 2021; Huttlinger, 2013; Elder et al., 2018; Purnell & Fenkl, 2019).

To establish community partnerships that are mutually beneficial, trustworthy, and transparent, researchers must possess cultural competency and engage in the invisible work that is time-intensive and emotionally demanding (Greer et al., 2016; Treloar et al., 2016; Han et al., 2021). In this study, the formation of partnerships with harm reduction leaders was vital in gaining access to a safe and non-judgmental space for PWUO. The researchers proactively reached out to eight SSPs in Virginia, presenting the study objectives, purpose, goals, and potential outcomes. As a result, two SSPs allowed the researchers to be present during their operational hours, facilitating the opportunity to learn from and interact with clients. This collaboration played a critical role in the success of the study by enabling the collection of valuable data from a population that is often challenging to engage.

The research study received approval from the Virginia Tech (#21-037) and Virginia Department of Health Institutional Review Boards. In-person procedures were conducted in a private office and audio recorded. On request, recorded audio-only virtual interviews were conducted using the Zoom secure web-based platform.

4.3.3. Recruitment and syringe services programs

Recruitment for the study was conducted between July 2021 and December 2022 using flyers, emails, word of mouth, and in-person recruiting. In-person recruiting took place at a mobile outreach SSP (i.e., distribute resources from a van) in an urban community and a fixed site SSP (i.e., distribute resources from a building) in a rural community in southwest Virginia.

Researchers attended both programs during their hours of operation which varied between twice a week for a three-hour timeframe and three times a week for a seven-hour timeframe. The programs have a manager, public health nurse, and peer recovery specialist present who helped distribute recruitment flyers and discuss the research with clients (VDH, 2023). Participants spread the word about the research study to their peers, leading to further recruitment. Copies of all recruitment materials can be found in **Appendices A** and **B**.

4.3.4. Eligibility criteria

Prospective participants in the study were asked to complete a REDCap screening survey through a URL or QR code (Harris et al., 2009; Harris et al., 2019). The survey included a brief 10-item Drug Abuse Screening Test to self-screen for active opioid use disorder, in line with the criteria set by the APA (1980) and adapted from Yudko et al. (2007). Eligibility for the study required reporting three or more active symptoms of opioid use disorder and being at least 18 years of age. The screening survey is available in **Appendix C**. Responses were electronically stored in REDCap. Participants who met the eligibility criteria and completed the screening in-person at the brick-and-mortar site of either SSP were consented and interviewed in a private office. Otherwise, eligible participants who remotely completed the screening survey were contacted to schedule an in-person or virtual interview. As a compensation for participating in the study and completing the interview, participants received a $25 gift card (Festinger & Dugosh, 2012; Anderson & McNair, 2018).

4.3.5. Informed consent and randomization

Prior to participation, researchers explained the purpose of the research and consent form to participants (see **Appendix D** for a copy of the consent form). All study procedures took place in a private and confidential setting to maximize participants' anonymity. For the overall research study, participants agreed to participate in the initial interview, and then be contacted at 3- and 6-month intervals. Prior to recruitment, a single-blind randomization approach was applied using an online random generator to create a consecutive list of numbers ranging from 1 to 100, based on power analysis. After obtaining informed consent from participants who passed the screening, they were sequentially assigned to the randomized list of group assignments based on their screening order (e.g., the 10th participant screened was assigned to the 10th number in the randomized list). This process continued until the desired sample size was reached. Furthermore, this process ensured that participants were randomly and impartially assigned to either the experimental or control group, following best practices for research design (Altman, 1999; Schulz et al., 2010; Suresh, 2011). In the results section, excerpts from participants' transcripts will be identified using the letter 'P' followed by their associated screening number.

In order to accommodate the logistics and specific circumstances of the recruitment sites, adjustments were made to the interview process. The fixed site SSP, where participants typically arrived for services on a drop-in basis, presented challenges in scheduling interviews due to time constraints. On the other hand, the participants at the mobile outreach SSP were recruited on the street, contacted in advance, and their interviews were scheduled, allowing for separate and longer interviews of approximately one hour. It is important to note that the experimental group had four "*piggyback*" interviews, where two participants, often partners or friends, were interviewed and created implementation intentions together, while the control group had three piggyback

interviews. Additionally, the group assignments of three participants were modified based on their interview partner who had been screened prior to the study. It is worth mentioning that one participant was mistakenly assigned to the wrong group. These adaptations and occurrences were documented and accounted for to ensure the integrity of the study design and data collection process.

Participation in this research study was completely voluntary and posed minimal risk to participants. The greatest risk to participants was a breach in confidentiality, but researchers took precautions including deidentifying study materials with a unique identifier (see **Appendix E**), using secure data storage, and limiting access to data to only authorized personnel. Additionally, participants were informed of their rights to confidentiality and their data was kept strictly confidential in accordance with the Institutional Review Board guidelines. In addition, participants were informed that they could withdraw from the study at any time without consequence. Overall, these measures aimed to minimize potential risks and ensure that the study was conducted in an ethical and responsible manner.

4.3.6. Data collection instruments

Participants completed a 13-question multiple choice survey on their demographics, which included questions about their gender, ethnicity, race, education, employment, and receipt of naloxone administration training (**Appendix E**). Furthermore, this survey included multiple-choice questions about their experience treating opioid overdoses and administering naloxone, and free-response questions about the number of overdoses treated and witnessed, which helped inform potential follow up questions during the semi-structured interview.

4.3.7. Semi-structured interviews and development of intentions

Researchers utilized an exploratory sequential design as part of a longitudinal study to investigate the impact of implementation intentions on naloxone use (Lewin et al., 2009; Hamilton & Finley, 2019; Busetto et al., 2020). This design involved conducting qualitative research as a first step to gain insights into phenomena that may be difficult to quantify or not well-studied using quantitative methods (Tenny et al., 2017). Researchers conducted semi-structured interviews lasting between 15-to-30-minutes with participants from either the experimental or control group, using additional probing methods to extract more detailed information on their use of naloxone including obtainment, carriage, discussion with peers, and administration (Britten, 1995). The interviews served two purposes: to gather contextual information on *where*, *for whom*, and *when* PWUO engage in naloxone use, and to help PWUO develop implementation intentions (with the AACTT framework) or goal intentions. See **Figure 3** for an overview of the first study's flow, including screening, randomization, interviews, and data collection. **Figure 4** provides a visual representation of the available data for addressing research questions 1a-c.

During the semi-structured interviews, all participants were asked to record contextual information. Experimental group participants received additional prompts to develop implementation intentions with the AACTT framework. The AACTT framework could be considered an extra dose or higher intensity exercise to thoroughly link critical situations to behaviors. Participants in the control group did not receive this extra dose or higher intensity exercise. However, all participants were encouraged to document their intentions, and support was provided to those who encountered challenges with writing. For participants who preferred not to write or had time constraints, intentions were captured through audio recording. This approach ensured that participants had options for expressing their intentions and accommodated individual preferences and time limitations. The interview protocol and intervention materials are available

in **Appendices F** and **G**, respectively. All interviews were recorded and transcribed verbatim using Rev.com.

The AACTT framework was chosen as an appropriate tool for developing implementation intentions due to its foundation in the TPB and reasoned action, which were used as guiding principles throughout this dissertation (Presseau et al., 2019). Additionally, since there were no pre-existing implementation intentions or volitional help sheets available for the behaviors under investigation, the AACTT framework provided a structured approach for specifying the behaviors of interest. Only participants in the experimental group were exposed to the framework to develop their implementation intentions. To minimize any potential priming or leading question effects from the use of the AACTT framework in just one condition, all participants, regardless of their study group, were asked the same questions regarding their use of naloxone, including *where*, *for whom*, and *when* they engaged in such behaviors (Webb, 2017).

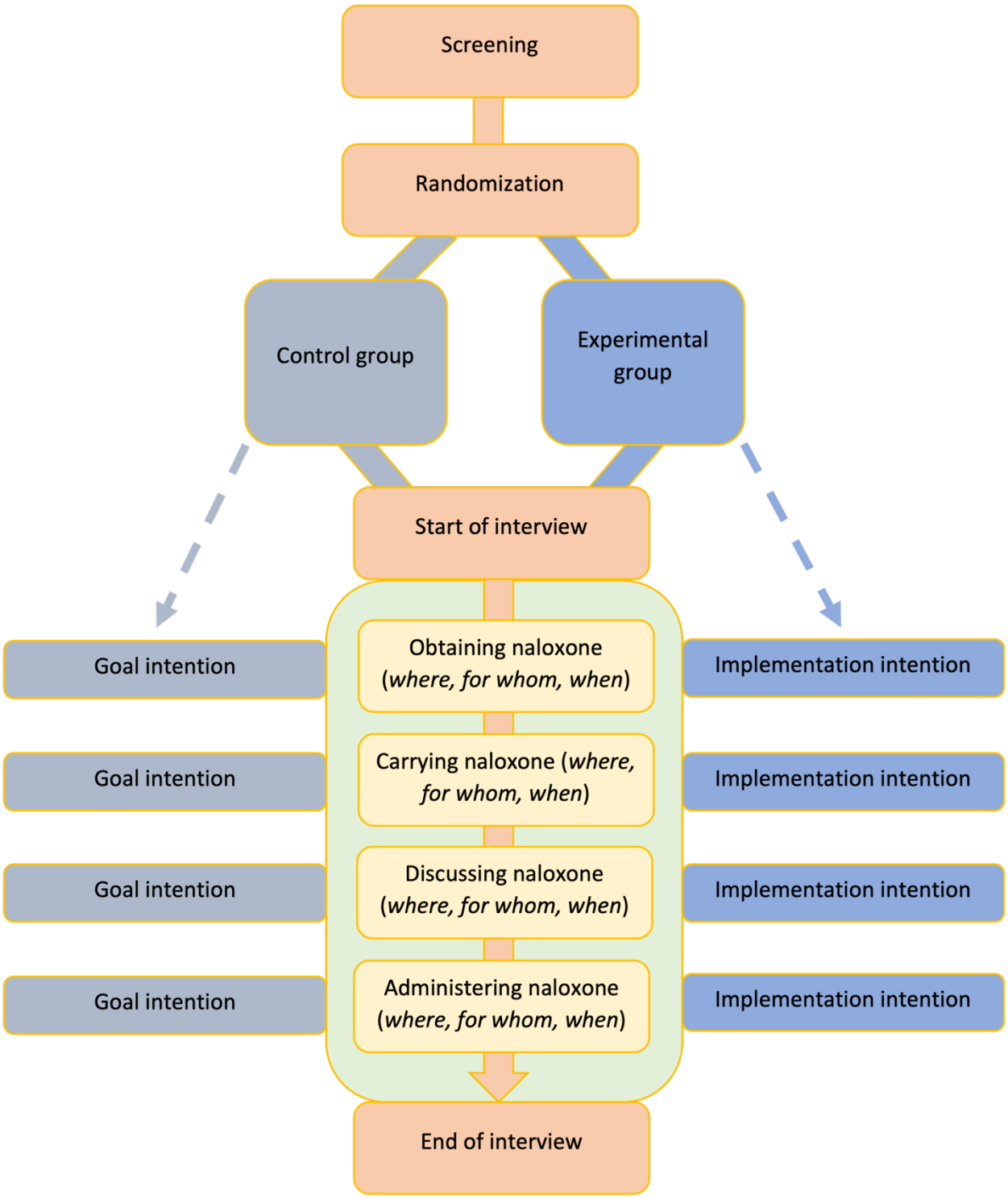


Figure 3. Flowchart of study and data collection

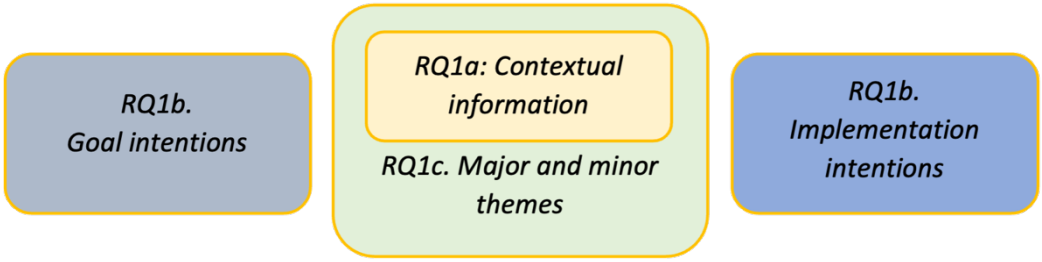


Figure 4. Available data to answer research questions 1a-1c

4.3.8. Qualitative analysis of contextual information

Overall, the coders utilized essentialist thematic analysis with an inductive approach to identify patterns and themes in the data (Patton, 1990; Patton, 1999; Braun & Clarke, 2006; Clarke & Braun, 2013). The essentialist approach aims to capture the participants' experiences, meanings, and reality (Braun & Clarke, 2006). See **Appendix H** for the completed consolidated criteria for reporting qualitative research (COREQ) checklist (Tong et al., 2007).

4.3.8.1. Analysis for research question 1a

The analysis of the data was conducted using NVivo12 software, released in March 2020, which facilitated the organization and management of the coding process. To ensure a thorough and reliable analysis, three trained coders carefully examined the transcripts from both the control and experimental groups (Bazeley, 2018). Each coder independently reviewed the transcripts and extracted relevant information pertaining to the four behaviors of interest: obtaining, carrying, discussing, and administering naloxone. Additionally, the coders analyzed the contextual details surrounding these behaviors, such as *where*, *for whom*, and *when* they occurred among PWUO, across the entire sample.

To maintain the accuracy and reliability of the interpretations, the coders held regular meetings to discuss the coding results, resolve any discrepancies, and unify coding methods (Roberts et al., 2019). This rigorous approach allowed for a comprehensive analysis of the

contextual data, leading to a nuanced understanding of the diverse situations in which individuals utilized naloxone. The discussions among the coders played a vital role in ensuring the precision and accuracy of the interpretations, thereby enhancing the overall quality of the analysis.

While traditional experimental approaches prioritize balance in terms of similar participant characteristics between groups, qualitative research focuses on achieving balance by ensuring sufficient information from all relevant sample groups, known as saturation, or surfacing all relevant codes (Hennink et al., 2017). Although the concepts differ, their underlying goals converge in aiming for comprehensive groups in both categories (Zahle, 2021). A post-hoc qualitative balance check was conducted using NVivo12 to examine the distribution of codes across groups rather than group characteristics and aimed to identify potential pre-existing conditions or experimental effects, such as priming from the AACTT framework (Webb, 2017). The analysis revealed that code contributions ranged from 46 % to 53 % between the experimental and control groups, respectively, indicating a nearly equal spread of coding across both groups. It is important to note that this finding does not imply that the experimental manipulation had no effect, but rather that it did not significantly alter the topics discussed at a surface level.

4.3.8.2. Analysis for research question 1b

Two coders reviewed implementation intentions and goal intentions for similarities and differences in critical situations or goal directed behaviors. This distinction was made intentionally as part of the longitudinal study, which aimed to investigate whether developing implementation intentions could lead to improved use of naloxone. The implementation intentions and goal intentions are available in **Appendices I** and **J**.

4.3.8.3. Analysis for research question 1c

Following the coding process, the team of three coders analyzed the coded contextual information and identified major and minor themes (Patton 1990, 1999). They examined the sorted codes related to these themes, employing an iterative process to uncover potential influences on participants' use of naloxone. This iterative approach allowed for a deeper understanding of the factors impacting the utilization of naloxone.

Appendices K-Q provide a visual representation of this process. These appendices showcase the codes that led to the central organizing concepts of the major and minor themes associated with use of naloxone. They serve as illustrative examples of how the coding process contributed to the identification and exploration of these themes.

4.3.8.4. Inter-coder reliability

In the analysis phase, three coders were involved in the examination of at least 10 % of the total transcripts using an inductive coding approach (Campbell et al., 2013). The primary tool for assessing reliability was subjective assessment, where coders relied on their expertise and judgment. To supplement this, inter-coder (inter-rater) reliability was measured using Cohen's Kappa (Cohen, 1988; Campbell et al., 2013; O'Connor & Joffe, 2020).

Given the extensive and context-rich nature of the data, numerous niche codes were developed during the coding process. Across multiple codes and semantic content of interest, the Kappa values between coders ranged from 0.44 to 0.52, indicating moderate agreement (Landis & Koch, 1977; McHugh, 2012; Xie, 2013; O'Connor & Joffe, 2020).

Remaining transcripts that had not been analyzed by all three coders were coded independently, and then all coding was integrated for further analysis (Campbell et al., 2013). This comprehensive approach ensured that the analysis captured a wide range of perspectives and insights from the data.

4.3.9. Statistical analysis

Descriptive statistics were employed to summarize participant characteristics, including measures such as means, medians, standard deviations, interquartile ranges, and frequencies. Comparative statistics, such as t-tests, Pearson's Chi-squared test with Yates' continuity correction, Fisher's Exact test, or Wilcoxon rank-sum test with continuity correction, were used to analyze baseline differences between study conditions in demographic characteristics and naloxone use experience. When analyzing contingency tables with two or more options and cell counts less than five, Fisher's Exact test was utilized instead of Pearson's Chi-squared test. Any significant differences identified through these analyses are presented in **Chapter 5** of the dissertation. **Figure 5** provides a visual representation of the recruitment process for both the qualitative and quantitative studies, offering an overview of the participant recruitment.

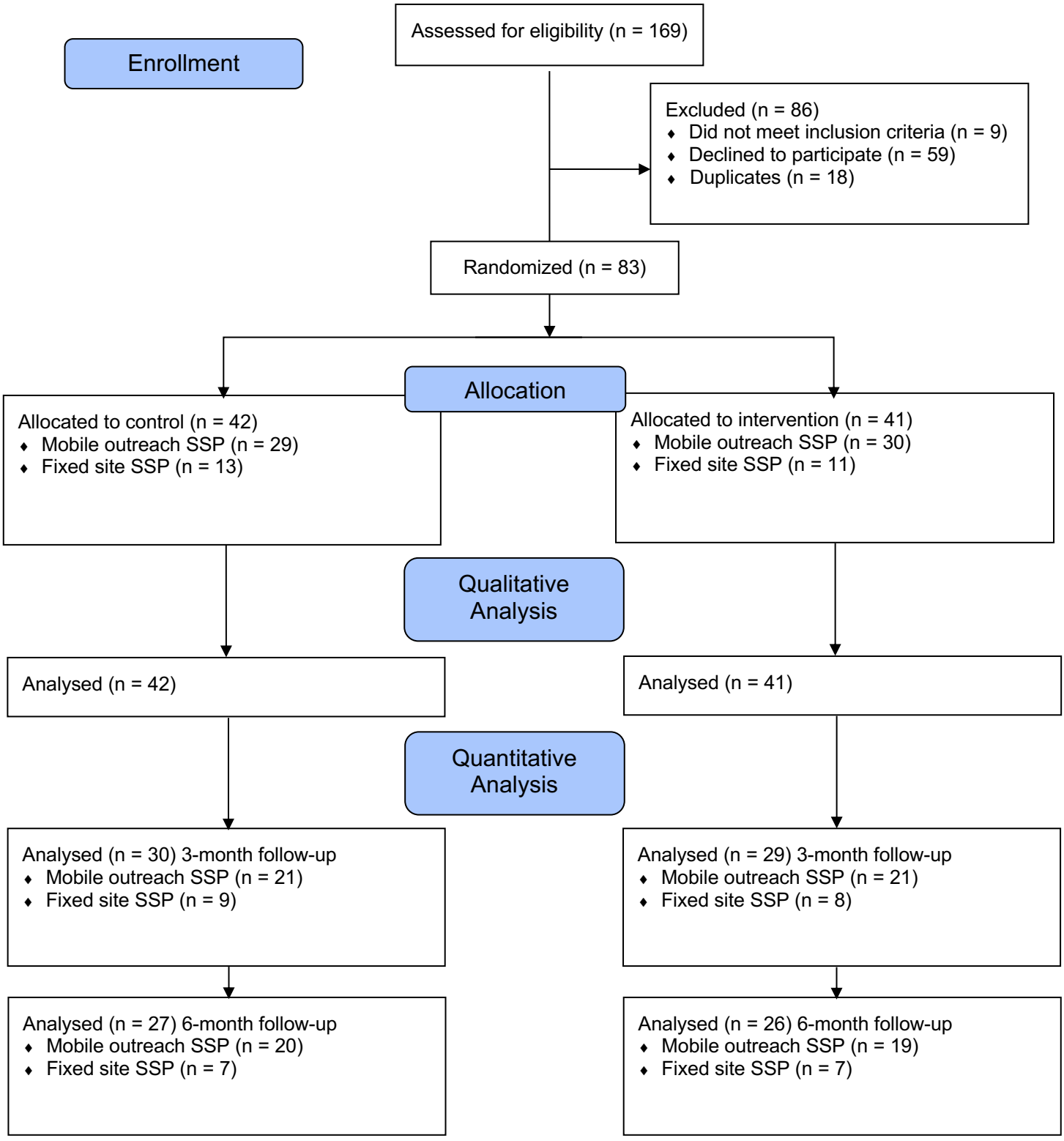


Figure 5. CONSORT recruitment flow chart

4.4. Analyses

4.4.1. Participant demographics and characteristics

The qualitative analysis included a total sample size of 83 participants. The sample of participants is 51 % female, predominantly non-Hispanic (92 %), and white (90 %), with an average age of 38 (SD = 10) (**Table 1**). Most participants graduated high school or completed a GED certificate (53 %), while 23 % completed trade school or vocational training. The unemployment rate was high, with 35 % of participants seeking work and 23 % unable to work at the time of the study.

Before taking part in this study, 73 % of the participants reported having received prior training on naloxone administration (**Table 1**). Among the participants who received training, 27 % reported receiving overdose response education from a peer, while 24 % received it from a community program. More than 70 % of the participants had previously treated an opioid overdose and administered naloxone. At the time of the study, the participants reported treating a median of two overdoses (IQR = 7.5) and witnessing a median of five overdoses in their lifetime (IQR = 9). The participants reported using various naloxone delivery devices, including Narcan® (65 %), intramuscular naloxone (38 %), and multi-step intranasal naloxone with an atomizer attachment (4 %). Thirty percent of the participants had no experience using any naloxone preparation.

The average length of semi-structured interviews with participants creating implementation intentions was 26 minutes (SD = 6 minutes) and 21 minutes (SD = 7 minutes) with participants creating goal intentions. There was a significant difference in the length of the interviews between the two groups (t = -3.43, df = 79, p = 0.001). This difference simply highlights the effect that creating implementation intentions had on the length of the interview. It is plausible that within the average 5-minute difference more information could have been gleaned from the

interviews with the participants in the experimental group; however, a qualitative balance check insured that equivalent information was collected and coded.

Table 1. Demographics and other characteristics between study conditions

	Control (n=42)	Experimental (n=41)	Total (n=83)	*P*	Test statistic (χ^2, *t*, W, CI, *df*)
Recruitment site, n (%)				0.86[a]	$\chi^2 = 0.03$, 1
Mobile outreach	29 (69)	30 (73)	**59 (71)**		
Fixed site	13 (31)	11 (27)	**24 (29)**		
Years of age, mean (SD)	39 (10)	37 (9)	**38 (10)**	0.41[b]	$t = 0.82$, 79.87
Gender, n (%)				0.28[c]	
Male	22 (52)	17 (41)	**39 (47)**		
Female	20 (48)	22 (54)	**42 (51)**		
Self-describe		2 (5)	**2 (2)**		
Ethnicity, n (%)				0.61[c]	
Hispanic	2 (5)	1 (2)	**3 (4)**		
Non-Hispanic	39 (93)	37 (90)	**76 (92)**		
No answer	1 (2)	3 (7)	**4 (5)**		
Race, n (%)				1.00[c]	
White	38 (90)	37 (90)	**75 (90)**		
Black	2 (5)	1 (2)	**3 (4)**		
Other	1 (2)	1 (2)	**2 (2)**		
No answer	1 (2)	2 (5)	**3 (4)**		
Education, n (%)				0.45[c]	
Did not complete HS	5 (12)	3 (7)	**8 (10)**		
HS diploma	19 (45)	25 (61)	**44 (53)**		
Trade/vocational	13 (31)	10 (24)	**23 (28)**		
Associate degree	4 (10)	1 (2)	**5 (6)**		
Bachelor's degree	1 (2)	2 (5)	**3 (4)**		
Employment status, n (%)				0.15[c]	
Employed full time	1 (2)	4 (10)	**5 (6)**		
Employed part time	7 (17)	3 (7)	**10 12)**		
Unemployed/looking for work	13 (31)	16 (39)	**29 (35)**		
Unemployed/not looking for work	5 (12)	1 (2)	**6 (7)**		
Student	2 (5)		**2 (2)**		
Retired		1 (2)	**1 (1)**		
Stay-at-home parent	1 (2)	1 (2)	**2 (2)**		
Self-employed	6 (14)	3 (7)	**8 (10)**		
Unable to work	7 (17)	12 (29)	**19 (23)**		

Are you trained to administer naloxone, n (%)				0.07[a]	$\chi^2 = 3.26, 1$
Yes	35 (83)	26 (63)	**61 (73)**		
No	7 (17)	15 (37)	**22 (27)**		
If yes, where did you receive training, n (%)				0.09[c]	
Hospital/medical supervision	6 (14)	5 (12)	**11 (13)**		
Community	9 (21)	11 (27)	**20 (24)**		
Peer	17 (40)	5 (12)	**22 (27)**		
Other	3 (7)	5 (12)	**8 (10)**		
Have you rescued an overdose victim, n (%)				1.00[a]	$\chi^2 = 0, 1$
Yes	31 (74)	31 (76)	**62 (75)**		
No	11 (26)	10 (24)	**21 (25)**		
Have you ever administered naloxone, n (%)				0.68[a]	$\chi^2 = 0.17, 1$
Yes	28 (67)	30 (73)	**58 (70)**		
No	14 (33)	11 (27)	**25 (30)**		
Estimate overdoses treated, median (IQR)	2 (7.5)	3 (9)	**2 (7.5)**	0.43[d]	W = 774.5
Estimate overdoses witnessed, median (IQR)	5 (9.5)	4 (8)	**5 (9)**	0.53[d]	W = 930.5
Naloxone preparation used (select all that apply), n (%)					
Narcan®	27 (64)	27 (66)	**54 (65)**	1.00[a]	$\chi^2 = 4.353e\text{-}31, 1$
Multi-step intranasal naloxone	2 (5)	1 (2)	**3 (4)**	1.00[c]	CI: 0.0008, 10.04
Intramuscular naloxone	15 (36)	18 (44)	**33 (38)**	0.59[a]	$\chi^2 = 0.29, 1$
None	14 (33)	11 (27)	**25 (30)**	0.68[a]	$\chi^2 = 0.17, 1$

[a]Pearson's Chi-squared test with continuity correction, [b]Student's t-Test, [c]Fisher's Exact test, [d]Wilcoxon rank sum test with continuity correction

One participant in the control group identified as American Indian or Alaska Native. One participant in the experimental group identified as Native Hawaiian or Other Pacific Islander.

CI; confidence interval, df; degrees of freedom, IQR; interquartile range, PBC; perceived behavioral control, SD; standard deviation

4.4.2. Contextual information on the use of naloxone

4.4.2.1. Obtaining naloxone

Where?

Across all conversations with participants many contextual details were elicited including locations naloxone is acquired such as the mobile outreach or fixed site SSPs, as a prescription from the pharmacy, and as part of attending a medication-assisted treatment program. For example, a participant stated, "*...when I was in the streets, I got Naloxone when I came to the needle exchange...It was in every bag* [P13]." Although not as common some participants reported obtaining naloxone from friends or peers in their social network or from people dealing illicit drugs. For instance, a participant reported, "*...people bring it to me…And break out all these boxes and stuff. And they're like, "Here, you need some?"* [P138]." Some participants reported receiving naloxone or Narcan from drug dealers when purchasing heroin.

For whom?

Participants in the study reported obtaining naloxone not only for themselves but also for their peers, family members, and others in their community who may need it. They recognized the importance of having naloxone readily available in case of an overdose and saw it as their responsibility to provide it to others who may not have access to it. Some participants even kept extra naloxone on hand specifically for this purpose. However, some individuals were hesitant to obtain naloxone due to concerns about transportation, fear of legal consequences, or fear of being labeled as a "*junkie*" and experiencing embarrassment. One participant even re-claimed the term "*junkie*" to describe themselves and expressed frustration with the negative attitudes towards drug use, stating:

"*A lot of people are scared that their name's going to get out there...seen going there, and getting supplies...and it's going to label them as a junkie. There's a lot of [stigma] about that. It doesn't bother me, I am a junkie* [P6]."

When?

Participants reported obtaining naloxone at least once or twice a week or whenever they needed it, often alongside sterile injection equipment like syringes, cookers, and wound care kits. Obtaining naloxone was secondary to obtaining sterile injection equipment according to some participants. For instance, a participant mentioned that people would not go as often to get naloxone if syringes were not offered, stating:

"*I think more people get it, because they also get their [syringes] and other stuff. If people didn't get that, I don't think they'd go so much. I think the incentive is because you're getting the other stuff* [P35]."

Participants reported several reasons for not going to mobile units at specific times or on a weekly basis such as forgetting SSP operating hours, lack of transportation, and having a large enough supply of naloxone. Some participants reported stockpiling naloxone, with one participant stating they had not obtained more in a while due to having a large supply of 50 at home [P148]. However, participants' ability to obtain naloxone was often restricted by the schedules of the SSPs they attended. For example, participants recruited from mobile outreach SSP reported going to one or both existing SSPs in their community while those recruited from fixed site SSP reported attending their SSP once every two weeks. A participant stated that they could obtain naloxone anytime they asked for it during their biweekly visits for needle exchange [P151].

4.4.2.2. Carrying naloxone

Where?

Participants reported taking naloxone to a variety of locations including the homes of peers and strangers, hotels, motels, and locations where drugs are sold. Those with more transient lifestyles were more likely to take naloxone to high-risk environments, such as meeting the "*dope man*" at a "*trap house*" [P39]. In contrast, a participant who tended to use methamphetamines at home noted that their drug use patterns, and location may affect their risk for overdose [P152]. Regardless of location, the experiences shared by participants emphasize the critical importance of making naloxone readily available to prevent fatal overdoses from heroin or contaminated methamphetamines.

Participants in the study reported frequently carrying naloxone in their bags and vehicles, with one participant mentioning always carrying it in their purse [P22]. Female participants were more likely to report carrying naloxone compared to male participants. Additionally, participants reported storing both nasal and intramuscular naloxone preparations in their homes, with some participants having a large stockpile of up to 30 doses stored in various places [P59]. It is important to note that while some participants reported having a large stockpile of naloxone, this does not necessarily indicate hoarding behavior. Participants may be distributing naloxone to others in their community or simply ensuring they have enough on hand in case of an emergency. It is also possible that some participants acquired naloxone from multiple sources, such as purchasing it themselves or receiving it from harm reduction programs. Overall, the high level of ownership and availability of naloxone among PWUO highlights the importance of making this life-saving medication easily accessible to those who need it.

For whom?

Many participants in the study reported carrying naloxone not only for themselves but also for others, such as their peers, family, and community members who may not have access to it.

For example, some participants mentioned always carrying naloxone when buying drugs [P28] or receiving calls from others who need it because they know the participant has a lot of it [P81]. Additionally, some participants reported carrying naloxone for specific people, particularly those who use heroin or other opiates. For instance, one participant explained that they always carry naloxone because they are frequently around heroin users [P52]. However, some participants noted that the decision to carry naloxone may be influenced by the type of drug used and the route of administration [P20]. For example, opiate users were more likely to carry naloxone than those who use stimulants. One participant suggested that stimulant users tend to rely on opiate users to have naloxone readily available, stating, "*I think it's very specific to what kind of drugs you're using…people that use other stimulants and stuff, they don't necessarily make it a point to have [naloxone]* [P170]."

When?

Participants in the study reported carrying naloxone with them almost all the time, whether in a bag or vehicle, as it has become second nature [P23] and they would never leave home without it [P44]. Participants also mentioned specific times they carry naloxone, such as when they go out to purchase drugs. This behavior was especially evident among PWUO, with one participant stating, "*I've never met [PWUO] that doesn't have Narcan around* [P165]." Participants also reported carrying naloxone when they know they or others will be using drugs. A notable discrepancy in naloxone-carrying behavior was observed between participants recruited from mobile outreach and fixed site SSP. Specifically, participants from the fixed site SSP reported carrying naloxone less frequently. This difference was attributed to their concerns about potential law enforcement harassment and their preference for using drugs exclusively in the safety of their own homes.

4.4.2.3. Discussing naloxone

Where?

Participants discussed naloxone in various settings such as homes, vehicles, hotels, and motels. They often shared where naloxone is in their homes and expected the same information to be reciprocated. For instance, a participant stated, "*...just as much as I want to know where [naloxone] is at somebody else's house, I want everyone that's there with me to know where [naloxone] is in my house* [P58]." Conversations about naloxone typically occurred in social settings, particularly when using drugs with others. Participants stressed the importance of never using drugs alone and having naloxone available, which has been cited as a frequent occurrence among PWUO in other research (Wojcicki et al., 2018; Winiker et al., 2020). As one participant noted, "*There's two simple rules to follow and you won't die if you follow them. Never use alone, never use without Narcan* [P108]." One participant shared a personal experience of overdosing while using heroin and almost asphyxiating on their own vomit, which emphasizes the importance of not using alone [P122]. If someone uses drugs alone, then naloxone cannot be administered, which is a concern raised by some participants. For example, one participant mentioned that they knew someone who does drugs alone and wouldn't be able to administer naloxone to themselves [P152].

For whom?

Participants in the study frequently discussed naloxone with their peers, family members, and others, which reflects their care for others' needs. They emphasized the importance of naloxone for both users and non-users, as well as for first-time users who may not be familiar with it. For instance, one participant mentioned discussing naloxone with everyone they could, even non-users, stating, "*I tell everybody about it, even if they're not users, even if they're not addicts, even*

if they're not using [P6]." Another participant stated that they would discuss it anywhere anyone would listen [P65]. Participants brought up the topic of naloxone in various settings, with social gatherings being a common location. The act of discussing naloxone with others was considered a crucial step in preventing overdose deaths.

The participants had varied experiences when discussing naloxone with others. While naloxone is an effective medication, some participants reported encountering resistance from others when discussing it. Some participants found it easy to discuss naloxone, especially when they were with others who had similar experiences. However, others found it challenging, either because they felt intimidated by the topic or because some people did not want to admit their experiences with overdose. For instance, one participant said that they found discussing naloxone easy, but acknowledged that some people might be unwilling to admit that they or someone they know has overdosed [P42].

Some participants reported encountering mixed responses from others regarding their willingness to have naloxone administered. Some individuals who use opioids may express their desire to have naloxone even before they stop breathing, while others may cite their resistance to it until it is necessary. For example, one participant stated, "*Don't Narcan me if you don't have to* [P22]." In contrast, some participants reported encountering individuals who would rather die than receive naloxone, as another participant shared, "*Don't use it on me, just let me go* [P30]." A participant highlighted the contrast between naloxone, a lifesaving medication, and the fear of "*precipitated withdrawal*," stating that some individuals are so terrified of the withdrawal symptoms that they would rather die than be administered naloxone [P155]. These mixed responses reflect the complex attitudes and emotions surrounding naloxone administration and underscore the importance of continued education and awareness about the medication.

When?

The participants described discussing naloxone as a natural part of their routine before using drugs or traveling to obtain them. Some participants were more cautious than others and made sure that the location of naloxone was known to everyone present. They mentioned storing it in various places, such as bathroom cabinets, dresser drawers, backpacks, or vehicle glove boxes. Some participants also emphasized the importance of reminding others of its location in case of an emergency. For example, participants mentioned telling their peers, "*If y'all need [naloxone], tell me; I'll give you some* [P40]" and "*If I'm using with people, I'll be like, '...Narcan's in the big pocket...'* [P170]." Overall, the participants viewed discussing naloxone and its location as a critical aspect of harm reduction and overdose prevention.

Some participants feel that discussing naloxone every time they use it is unnecessary, especially if they are with peers who already know how to use it. They may assume that everyone present has received training on naloxone administration or has had prior conversations about its use. One participant noted that conversations about naloxone ownership and administration would never be explicit but may arise organically when discussing previous overdose experiences, stating:

> "*Well, it's not…like, "Okay guys, are you ready to use? Does everyone have their Naloxone and know how to use it?" It's not going to be like that ever. But…at some point someone's going to mention, "Such and such overdosed. I had to hit her three times with Narcan."* [P59]."

4.4.2.4. Administering naloxone

Where?

Participants reported administering naloxone in various locations, including their own home or others, in a vehicle, or in a hotel or motel room. One participant mentioned administering naloxone in multiple locations, such as their house, a Days Inn, and even in their car while driving [P70]. Another participant shared a harrowing experience when three people overdosed simultaneously in different rooms of a hotel they were staying at [P89]. They described how the first responders went from room to room, providing naloxone to those who needed it. These experiences highlight the unpredictable nature of opioid overdoses and the importance of having naloxone readily available in high-risk environments.

Participants shared that PWUO often use bathrooms to administer drugs to avoid doing it in front of others and limit sharing their products. They reported that if someone asks to use a bathroom in their home, it often means they are going to use drugs [P75]. One participant even mentioned carrying naloxone with them to gas stations, as they have seen frequent overdoses occurring in the gas station bathrooms [P120]. This phenomenon of using bathrooms to take drugs seems to be well-understood by many PWUO. One participant highlighted that they and others often check on people who have gone to the bathroom in social settings where drugs are available to ensure their safety, stating: "*We check if someone's in the bathroom, we make sure that they're okay* [P108]." Participants in the study reported that administering naloxone in public locations, such as gas stations, commercial stores, and on the streets, was not a common occurrence. However, they acknowledged that drug use can happen anywhere, and therefore, the need for naloxone administration can arise in various locations.

For whom?

Participants reported being willing to administer naloxone to friends, family members, and others, as the person who is overdosing cannot administer naloxone to themselves. Some

administered naloxone because their friends had not used drugs for a while and were not aware of the potency of the drugs, while others did so because they noticed drug paraphernalia or because someone was using frequently. One participant even described administering naloxone to a friend who had received a drug injection from a peer or had injected themselves without their knowledge. Overall, these accounts highlight the importance of naloxone as a life-saving tool and its association with high-risk use. One participant noted, "*…there was a time when [my partner] was overdosing two or three, four times a week…If there was room for [my partner] to use, there was room for Narcan* [P120]."

Some participants expressed frustration towards individuals who put them in a situation where they must intervene and administer naloxone. One participant even stated that they hated it when people were careless and that they would administer naloxone regardless because they did not want anyone to die around them [P141]. Another concern was the potential backlash from the person who had overdosed after receiving naloxone. Some participants reported that individuals might become angry or upset because they felt they were not overdosing and were just enjoying the high. However, the reality was that they were overdosing, and it was essential to administer naloxone to save their life [P84]. Despite these concerns, most participants emphasized the importance of administering naloxone in case of an overdose, regardless of the circumstances or the reactions of the person who had overdosed. Others indicated that they would want someone to administer naloxone to them if they were in a similar situation, stating, "*Just give it to me if you think I'm going to die* [P48]." Overall, these accounts suggest that the decision to administer naloxone is complex and influenced by a variety of factors, including personal beliefs, relationships with the person overdosing, and perceived risks and benefits of intervening.

Some participants reported feeling fearful and stressed while administering naloxone, particularly when they were unsure of what to do or how the person would react. Others expressed frustration towards those who left the scene, potentially leaving the person to die, or who were reluctant to call emergency services due to fear of legal consequences. One participant even reported having to stash their own drugs while attempting to administer CPR and calling for help [P122]. Additionally, a participant spoke about warning their child who uses opioids about the importance of having trustworthy friends who will not leave them in an emergency [P97]. These accounts highlight the difficult and often scary situations that arise when someone is experiencing an overdose, and the importance of being prepared to intervene and seek emergency help.

When?

Participants frequently described administering naloxone after observing the typical signs and symptoms of an opioid overdose, such as blue skin color, respiratory depression, and unresponsiveness. One participant highlighted the various indicators of an opioid overdose and the importance of recognizing them, such as when someone's breathing slows down, they have difficulty waking up, or they collapse [P138]. The participant also mentioned seizures as another symptom to watch out for, stating that there are many ways an overdose can present itself.

Some participants are more proactive and will administer naloxone as soon as they notice any signs of an overdose, even if it means potentially risking a negative reaction from the person, they are administering it to. Others are more cautious and will wait until it is necessary to administer naloxone. Additionally, some participants expressed a keen awareness of the signs and symptoms of an overdose, particularly in people they are close with. This suggests that experience and familiarity with opioid use can play a role in recognizing and responding to an overdose.

It seems that participants use their own experiences and observations to determine when someone needs naloxone. They may delay administering naloxone if they believe that someone is just "*nodding out*," a term used to describe a high but not an overdose. Participants provided descriptions of what "*nodding out*" looks like, but there was no clear definition. Once someone surpasses the "*nodding out*" stage and becomes unresponsive, participants are more likely to administer naloxone. However, it is important to note that nodding out can still be a sign of overdose, and it may be difficult for non-medical professionals to distinguish between the two. It is recommended to err on the side of caution and administer naloxone if there is any suspicion of overdose.

According to the study, participants have administered a moderately high number of doses of naloxone, ranging from one to more than five doses to a single person. While nasal naloxone is commonly used, some participants prefer the intramuscular injection due to their experiences. They believe that the intramuscular naloxone works more slowly, which limits the withdrawal experience afterwards. However, the commonly available intranasal naloxone is not preferred because it works faster and can worsen the negative withdrawal experience. Some participants describe feeling sick, experiencing headaches, throwing up, or entering a state of precipitated withdrawal, which they find vicious. They also report that naloxone (specifically intranasal naloxone) may induce withdrawal, highlighting the importance of compassion towards the person overdosing. The participants emphasized the need for a dual approach in treating overdoses among their peers, which involves recognizing the life-threatening situation while also being mindful of how the victim will feel afterwards. This underscores the importance of not only providing life-saving interventions but also taking into consideration the individual's physical and emotional well-being.

4.4.3. Goal intentions and implementation intentions

As part of a longitudinal study, researchers determined the effects of personal and individualized implementation intentions on the use of naloxone among PWUO. However, some participants were noncompliant with either condition, possibly because they expected a shorter interaction. To respect their wishes and the dynamic nature of recruiting PWUO, these participants were allowed to share their experiences with obtaining, carrying, discussing, and administering naloxone without being required to adhere to the interview protocol. As a result, some participants did not physically write out implementation or goal intentions for each behavior, but still expressed their intentions sufficiently to justify their inclusion in the study. The implementation and goal intentions of all participants can be found in **Appendices I** and **J**.

4.4.3.1. Obtaining naloxone

Goal intentions (control group)

Four participants in the control group did not create goal intentions for obtaining naloxone. However, a minor proportion of control group participants (37 %, or 14 out of 38) created goal intentions to obtain naloxone more frequently or in greater amounts in the future. Interestingly, most control group participants (61 %, or 23 out of 38) did not express a desire to obtain more naloxone, but instead stated their intention to continue obtaining naloxone at their current frequency or from their usual source. These participants seemed satisfied with their current use of naloxone, expressing intentions to maintain receiving naloxone at least once a month or a specific number of boxes per week. One participant even reported a decrease in their behavior around obtaining naloxone because they were focused on starting their recovery, stating: "*I would totally do it again. But at the same time, I want out of the whole drug thing. So, if it comes down to it, I'd*

rather not even see it [P77]." For example, three exemplar goal intentions for obtaining a higher quantity/frequency are presented below:

> "*I would hope to be able to find more rides to my typical place…keep it with me more, or to keep more on me just in case of any scenario.*" [P16]
>
> "*I would like to start getting Naloxone each time I go to drop in. So twice a week, at least one box or two doses with each visit.*" [P22]
>
> "*If there is a way to obtain more sooner if needed without any questions.*" [P145]

Implementation intentions (experimental group)

Five participants in the experimental group did not create implementation intentions, but the majority (94 %, or 34 out of 36) did create implementation intentions based on the operating hours of the SSPs. Only a small minority (less than 6%, or 2 out of 36) created implementation intentions to obtain naloxone through alternative means, indicating that most experimental group participants preferred to obtain naloxone through the SSPs according to their hours of operation. For instance, examples of implementation intentions are shown below:

> "*If I am near the exchange or drop in center on a Friday in the AM, then I would obtain Naloxone.*" [P20]
>
> "*If it's mid-afternoon or towards the end of the day on Tuesday or Friday, then I would go to the mobile unit to get naloxone for myself, girlfriend, and peers*." [P47]
>
> "*If it's Tuesday or Friday between 1:00 and 4:00 PM or Monday or Wednesday between 3:00 and 6:00 PM, then I will go to the mobile unit or coalition to get naloxone for myself and peers.*" [P95]

4.4.3.2. Carrying naloxone

Goal intentions (control group)

Six control group participants did not form goal intentions for carrying naloxone. Overall, 42 % of control group participants (15 out of 36) created goal intentions to start carrying naloxone and 11 % (4 out of 36) created goal intentions to carry more naloxone. In contrast, nearly half of the control group participants (47 %, or 17 out of 36) did not create a goal intention to start carrying naloxone or increase the quantity they carried, but instead intended to continue their current behavior indicated by their use of the word 'continue.' They expressed intentions such as "*Continue to carry with myself like I currently am* [P57]," "*Continue to carry it in the trunk of car and purse and keep it at home* [P155]," and "*I'll always try to have at least one in my car and a few in my home* [P156]." For example, three exemplar goal intentions with specific themes are presented below:

"*I will try to carry more naloxone than I already do. Will carry it in bigger quantity.*" [P5, higher quantity]

"*I will carry Naloxone in my backpack.*" [P108, start carrying]

"*I'll try to start carrying it more often with me.*" [P160, start carrying]

Implementation intentions (experimental group)

Five experimental group participants did not form implementation intentions. Among the remaining 36 experimental group participants, the majority (47 %) created implementation intentions to carry naloxone regularly in a bag or vehicle when leaving home, while 39 % created implementation intentions to carry naloxone to locations where drug use or overdose is common. A smaller proportion (14 %) created implementation intentions to carry naloxone to specific locations, such as a peer's home or a hotel. For example, three exemplar implementation intentions for each common theme are presented below:

"*[If] I carry it all the time in a harm reduction bag, then I can save my peers.*" [P23, regularly carrying]

"*If I'm going to my friend's house where I know myself or others will be using, then I will carry Naloxone in my car.*" [P48, products available/in use/overdose]

"*If I'm going to the Days Inn at any time during the week, then I will carry Narcan in my car console for friends and associates.*" [P70, specific location]

4.4.3.3. Discussing naloxone

Goal intentions (control group)

Three control group participants did not create goal intentions for discussing naloxone with peers. Otherwise, 49 % of control group participants (19 out of 39) created goal intentions to continue discussing naloxone like they already were stating, "*Maintain my efforts to educate as many people as I can about the proper use and benefits of naloxone* [P17]," and "*Continue to tell people about Narcan and how to use it, and not to panic* [P108]." Twenty-six percent of control group participants (10 out of 39) created goal intentions to specifically educate their peers on naloxone and *how to use it*, while 18 % of control group participants (7 out of 39) created goal intentions to increase their frequency of discussing naloxone with peers. Lastly, 8 % of control group participants (3 out of 39) created goal intentions to share their overdose experiences with participants. For example, three exemplar goal intentions that highlight these themes are presented below:

"*Help people that may not know how to use it.*" [P49, mobile outreach, educate]

"*If you're using this stuff, make sure people know, "Hey man, I got it. If I go down.""*" [P122, frequently discuss]

"*Usually after experiencing someone OD-ing, then we talk about ways and experiences with Narcan.*" [P153, overdose experience]

Implementation intentions (experimental group)

Overall, five participants did not create implementation intentions. Most experimental group participants (61 %, or 22 out of 36) created implementation intentions to discuss naloxone when products are available, in use, or where an overdose is likely to happen. This suggests that participants are aware of the importance of discussing naloxone in high-risk situations. Additionally, 25 % (9 out of 36) of experimental group participants created implementation intentions to discuss naloxone when recent overdose experiences are brought up, indicating that participants recognize the value of using these experiences as a teachable moment. Finally, 14 % (5 out of 36) of experimental group participants created implementation intentions to discuss naloxone in specific locations, which may indicate that certain settings or events may serve as prompts for discussing naloxone. For example, three exemplar implementation intentions that highlight these themes are presented below:

"*If I am out with my friends [and they] are using heroin, [then] I would discuss the use of Naloxone.*" [P8, products available/in use/overdose]

"*If I'm in the motel room and somebody says someone OD'd, then I need to talk about Naloxone.*" [P28, overdose experience]

"*If I'm at my peers home, [then] I'll ask or they'll ask if I have it and if I do I give.*" [P72, specific location]

4.4.3.4. Administering naloxone

Goal intentions (control group)

Out of the control group, nine participants did not create goal intentions for administering naloxone. Among those who did, 42 % (14 out of 33) created a goal intention to seek education on naloxone delivery devices, signs and symptoms, and overdose resuscitation techniques. Another 36 % (12 out of 33) created a goal intention to identify signs and symptoms of opioid overdose before administering naloxone. Interestingly, 15 % (5 out of 33) created a goal intention to manage the emotional and psychological aspects of administering naloxone, such as remaining calm or reducing stress. Finally, 6 % (2 out of 33) created a goal intention to continue administering naloxone as they were currently doing. These findings highlight the importance of addressing both the practical and emotional aspects of administering naloxone in high-stress situations. For example, three exemplar goal intentions that highlight the themes are presented below:

> "*Make sure I stay current on the proper ways to administer naloxone, just to make sure if I was put in that situation, I'd know what to do or how to instruct someone else to do so.*" [P17, seeking education]
>
> "*Recognize unresponsive and skin color of victim, and loss of breathing.*" [P75, signs and symptoms]
>
> "*Maybe I could be more calmer more effective and clear headed if I encounter someone I need to give Narcan to.*" [P145, remain calm]

Implementation intentions (experimental group)

Out of the 41 participants in the experimental group, only five did not create implementation intentions. Among the 36 who did create implementation intentions, the majority (83 %) specified administering naloxone after recognizing the signs and symptoms of an opioid overdose, such as bluish skin pallor, unresponsiveness, and lack of breathing. A minority (17 %) specified administering naloxone during an opioid overdose without detailing the signs and

symptoms. These findings suggest that participants may be more focused on the practical aspects of administering naloxone during an overdose rather than on the broader context of overdose prevention and education. For example, three exemplar implementation intentions that highlight these themes are presented below:

> "*If I realize an OD is happening, then I administer Naloxone to my peers immediately.*" [P23, overdose]
>
> "*If I'm in the home and someone is not breathing and not responsive because of opiates, then I would administer Narcan.*" [P44, signs and symptoms]
>
> "*If at a peer's place that I know had used and starts to become unresponsive and in and out of consciousness, [then] I would administer naloxone.*" [P144, signs and symptoms]

Overall participants willingly engaged in either condition: implementation intentions or goal intentions. Interestingly, participants that created implementation intentions often identified the operating hours or locations of their respective SSPs as the critical situation to obtain naloxone, whereas participants identified carrying naloxone in their bag or car to locations products are available and in use as the critical situation for carrying naloxone. Participants also identified product availability and use as a critical situation for discussing naloxone, and the recognition of signs and symptoms as the critical situation to administer naloxone. It appears that *context* is critical for obtaining and carrying naloxone, whereas *timing* is more important for discussing and administering naloxone.

4.4.4. Major themes related to the use of naloxone

The contextual information dataset contained five major themes according to the behaviors of interest and each theme is presented below with an associated thematic map available in

Appendices K-O. The thematic maps provide a visual representation of each theme as the central organizing concept and the corresponding codes that contributed to its development.

Caring for others' needs and acting as a buffer

The first major theme identified in the study is the motivation of PWUO to care for others and act as a buffer to prevent harm. This theme highlights the participants' willingness to save the lives of their peers, family members, and others, which gives them a sense of responsibility. They recognize that some individuals may face challenges in accessing harm reduction services, and therefore, take it upon themselves to distribute supplies and educate others on harm reduction practices such as not using alone, using less, and using sterile supplies. The participants expressed their commitment to spreading the word and training others on these practices, as exemplified by quotes such as "*I'm like a buffer in between...It's harder for them to get what they need* [P39]," "*If you're my friend, when you're leaving this house, take [naloxone]* [P168]," and "…*it's always good to make sure you have [naloxone] close by* [P84]." This theme underscores the crucial role of peer education and support in addressing the opioid epidemic and highlights the need for easily accessible and non-judgmental harm reduction services.

There have been similar findings by other researchers on the willingness of PWUO to respond to community-based opioid overdoses, even before the availability of naloxone (Strang et al., 1999; Lagu et al., 2006). In a recent qualitative research study, PWUO expressed that "*You've got to care to carry this stuff*" (Kano et al., 2020), emphasizing the importance of conscientiousness among PWUO. This conscientiousness is crucial in developing implementation intentions and may lead to improvements in the ownership, carriage, discussion, and administration of naloxone among PWUO (Webb et al., 2007; Ajzen et al., 2009; Ludwig et al., 2019). It is also important to share this perspective with people who do not use drugs and the wider community, as it can help

to reduce stigma, normalize the use of harm reduction practices, and emphasize the responsibility of PWUO in mitigating opioid overdose mortality (Faulkner-Gurstein, 2017; McAuley et al., 2018). By doing so, it challenges the prevailing stereotypes that portray drug users as immoral, irresponsible, and uncaring (Wagner et al., 2014).

Quality of education and gaps in knowledge

In this study, participants reported varying experiences and backgrounds in administering naloxone, which highlights the second major theme of this research: quality of education and gaps in knowledge. Although over 70 % of participants considered themselves trained to administer naloxone, their prior training was almost equally received from a community-based program (i.e., SSP) or from a peer. Some participants reported they were informed by friends and had never taken a formal class, while others had only witnessed someone else treating an overdose and had no formal training. The semi-structured interviews revealed several gaps in knowledge expressed by participants, which could potentially hinder the perceived benefits of naloxone and lead to disengagement with this intervention. Participants asked a range of questions, such as the expiration date of naloxone and the time between doses, indicating the need for SSP programs to fill in knowledge gaps during each visit.

Some participants in the study reported using alternative resuscitation techniques before administering naloxone, which they learned from others in their community. These techniques included painful stimulation such as slapping or using ice or placing the person in a cold shower. One participant even reported using forceful measures, stating that they were "*freaking out*" and hitting the person to revive them [P145]. While these techniques may be well-intentioned, they are not evidence-based and may even be harmful (Edwards et al., 2023a). Therefore, it is important to emphasize the importance of naloxone administration as the first-line intervention for opioid

overdose and to make training on its use widely available. Despite gaps in knowledge, it is encouraging to note that PWUO are willing to intervene in an overdose regardless of their familiarity with best practices. In general, PWUO mentioned using techniques such as rescue breathing, chest compressions, and the recovery position. Other studies have shown that training on response techniques like rescue breathing can improve confidence in dealing with future overdoses (Wagner et al., 2014).

This study found that participants administered a range of doses of naloxone to overdose victims, from one to more than five doses. With the recent increase in overdoses potentially due to potent synthetic opioids such as illicitly manufactured fentanyl, multiple doses of naloxone may be required, but timing between doses is likely to prevent precipitated withdrawal. Therefore, it is crucial to provide continued education on naloxone to PWUO upon distribution, considering their varying levels of experience. The study also found that participants had frequent access to and use of an atomized intranasal naloxone (Narcan®), while intramuscular naloxone was less accessible and used less frequently, despite being preferred by many participants due to its perceived advantage of not eliciting withdrawal symptoms and providing users with control over the dosage administered (Kano et al., 2020). Previous studies by Lankenau et al. (2013) and Madah-Amiri et al. (2017) have also reported similar findings of participants titrating or "*calibrating*" the naloxone dose. However, the user-friendly design of Narcan®, as reported by Krierter et al. (2016) and Tippey et al. (2019), reduces the risk of incorrect naloxone administration and supports continued distribution of this form of naloxone.

Overdose experiences reinforce need for naloxone

Participants in the study shared that they discussed naloxone in response to hearing about a recent overdose from their peers or others in social settings. They talked about various aspects

of the experience, including whether naloxone was used and how successful the revival was. Participants also discussed the strength of the nasal naloxone and advised others not to leave the scene of an overdose. They often shared their own experiences with others, such as how they felt after being revived or how long it took for them to recover. Sharing experiences with naloxone reinforces the importance of having it on hand, particularly among PWUO. One participant noted that such discussions are not random and usually stem from a recent overdose experience, stating, "*…we'll just get to discussing it and talking about their experiences with it…It's not something we decide to talk about just [randomly]* [P153]." It is crucial for PWUO to have open and honest discussions with their peers about naloxone to increase awareness and promote its use in the event of an overdose.

The study revealed a wide range of experiences with loss among the participants, with some individuals having encountered more loss than others. Despite this variability, a significant number of PWUO in the sample demonstrated awareness of the high likelihood of encountering an opioid overdose. This awareness plays a critical role in their engagement with naloxone use, indicating its importance among this population. However, it raises important considerations regarding the sustainability of PWUO's concern about overdose in light of its frequent occurrence. Will participants' awareness of overdose and naloxone diminish over time (Wygonik et al., 2021)? Moreover, how does the loss of peers or others to overdose impact PWUO's adoption of harm reduction strategies, including naloxone (Schlosser & Hoffer, 2022)? These questions necessitate further investigation to gain deeper insights into the evolving attitudes of PWUO towards naloxone and its utilization over time, as well as the potential influence of social support in promoting its use and recovery afterwards (Bagley et al., 2019; Wagner et al., 2022).

The experiences of individuals who have survived opioid overdoses are a powerful motivator for discussions about the importance of naloxone in preventing fatal overdoses. However, these conversations may also result in the dissemination of inaccurate information about overdose response techniques. It is crucial to conduct further research on these non-random tendencies and tailor educational interventions to disseminate evidence-based techniques, such as timely naloxone administration. It is worth noting that the frequency and depth of these discussions may vary depending on the social context and relationships between individuals. Additionally, cultural differences across the United States may impact this behavior, and therefore, the findings may be specific to the south-central Appalachia region (Oettingen et al., 2008).

Duality of life-threatening overdose and compassion for the victim

The theme of duality emerged as a crucial aspect for PWUO in balancing the urgency of responding to a life-threatening overdose situation with compassion towards the victim. Participants emphasized the importance of being aware of the severity of the overdose situation and the emotions of the person affected when administering treatment. The perceived and lived experience among PWUO that intranasal naloxone may cause withdrawal symptoms highlighted the significance of exhibiting compassion towards the individual overdosing. One participant recounted feeling cold and unable to warm up, vomiting, and attributing the reaction to their use of methamphetamines and heroin together [P52]. Several participants referred to naloxone as the "*worst feeling in the world*," causing "*…a week's worth of withdrawal in about 10 minutes* [P72]," or that they would rather die [P138]. The empathy expressed by participants highlights the withdrawal concern that many PWUO share (Neale & Strang, 2015; Sondhi et al., 2016; Parkin et al., 2020; Lai et al., 2021; Kahn et al., 2022a). One participant noted that while there is empathy

among "*junkies*", there is often not much sympathy from those who aren't heroin addicts but have to give the naloxone, treating people poorly despite feeling awful [P108].

Recent studies conducted by Kruis et al. (2021, 2022) have found that PWUO tend to demonstrate more empathy and concern towards naloxone administration compared to first responders, including law enforcement officers. These studies provide evidence that PWUO may exhibit greater empathy in their actions related to naloxone, highlighting a noteworthy contrast with the attitudes and behaviors of certain first responders. These findings highlight the need for further research to effectively educate and reduce stigma among healthcare providers, particularly those in first responder and law enforcement roles (Bascou et al., 2022). In addition to their empathy, peer administrators' communication and actions during resuscitation and when first responders arrive could potentially impact the victim's attitude and aggression following an overdose. It has been suggested that utilizing a positive and reassuring communication style during resuscitation could help mitigate any negative effects (Neale et al., 2020). Therefore, it is important that SSPs and OEND programs continue to educate PWUO on appropriate resuscitation techniques and effective communication styles with first responders to minimize any potential harm.

Ubiquitous stigma and displaced fear

The fifth major theme, *ubiquitous stigma and displaced fear*, highlights the levels of both internal and external stigma experienced by PWUO. While stigma is not a new concept in the literature, this study sheds light on how it induces fear and distrust among PWUO (Latkin et al., 2019a). For instance, many participants reported both positive and negative experiences with healthcare providers and law enforcement officers, with positive experiences mostly linked to SSP programs or seeking medication-assisted treatment. However, such experiences were not as common as negative ones. For example, a participant shared their experience with healthcare

providers when they brought someone experiencing an overdose to an emergency department. The providers initially refused to help and even sent a security guard out, saying, "*We can't do anything. They'll fire us for trying to help you* [P38]." This highlights the impact of stigma on the willingness of healthcare providers to offer help, despite being trained to respond to medical emergencies (Bascou et al., 2022).

Many participants in the study expressed their belief that society holds negative attitudes towards people who use drugs, seeing them as "*addicts*," "*junkies*," and "*dope fiends*," which contributes to the internalized stigma experienced by PWUO. This stigma could have harmful effects on PWUO, as some participants reported being afraid to carry naloxone due to fear of law enforcement harassment and legal consequences. Several participants described being harassed by law enforcement, and they felt that carrying naloxone was associated with their drug use and paraphernalia, which could give law enforcement probable cause to search them. As one participant stated, "*If you're carrying it, you're giving them reason, a probable cause* [P145]." Another participant reported that they stopped carrying naloxone after being searched and having the medication found on them, which led law enforcement to assume that they had other drugs as well [P163]. These findings highlight the importance of addressing the stigma associated with drug use and promoting harm reduction strategies, such as carrying naloxone, without fear of negative consequences, especially in rural communities with less visible harm reduction outreach.

Stigma is a prevalent issue that affects PWUO in many ways, from a lack of participation in SSP programs due to fear of legal consequences, to naloxone confiscation, and fear of legal consequences if emergency medical services are alerted (Wagner et al., 2014; Deonarine et al., 2016; Koester et al., 2017; Fadanelli et al., 2020; Hanson et al., 2020; Ibragimov et al., 2021). Despite positive research showing that rural first responders view naloxone training similarly to

cardiopulmonary resuscitation training (Filteau et al., 2022), the pervasive stigma towards PWUO remains a significant barrier. Participants in the study highlighted the negative attitudes and beliefs surrounding drug use, such as the idea that saving a life doesn't change the perception that one is a "*drug addict*." This fear of law enforcement can make planning for the use of naloxone insufficient. Top-down policy changes, such as implementing Good Samaritan Laws or providing education to rural first responders and law enforcement officers, may be necessary to see changes in the use of naloxone and reduce the impact of stigma on PWUO.

4.4.5. Minor themes related to the use of naloxone

Overall, there were two minor themes recognized and agreed upon throughout coding the contextual information. These minor themes include (1) SSP implementation and (2) drug use and engaging recovery. Thematic maps for the minor themes are available in **Appendices P** and **Q**.

SSP Implementation

One minor theme that emerged from the data was the impact of SSP implementation on participants' ability to access resources, such as naloxone and sterile supplies (Schneider et al., 2021). Many participants reported difficulties with transportation and distance to their SSP programs, which can be an insurmountable barrier for some and an issue of health equity (Martignetti & Sun, 2022). Despite this, some participants viewed the trip as worthwhile, stating "*It's worth the drive and it's worth the gas money because we can stay clean and keep the Narcan* [P161]." Participants who acquired resources not only for themselves but also for others felt a heightened sense of responsibility to ensure that their peers had access to resources to prevent infectious diseases. Thus, SSP implementation affects more than just naloxone ownership and availability, and future research could investigate more effective methods for disseminating resources to harder-to-reach populations (Boeri & Lamonica, 2020).

Drug use and engaging recovery

This study primarily focused on the use of naloxone, but participants were also willing to share their experiences with drug use. As naloxone use is often linked with opioid use, many participants reported using various substances, including illicit opioids like heroin and fentanyl, prescription opioids such as oxycontin, suboxone, and methadone, and stimulants such as methamphetamines and cocaine. Despite using different substances, most participants were not in treatment. As mentioned in the contextual information, some participants believed that the type of drug someone uses affects their ownership and use of naloxone, a finding that has also been highlighted in previous research (Madah-Amiri et al., 2019; Lipira et al., 2021; Daniulaityte et al., 2022; Spring et al., 2022). Notably, several participants recruited from the fixed site SSP reported using methadone or suboxone. One participant even stated that their perceived risk of overdose was lower with suboxone [P162].

The findings suggest that there is a complex relationship between engaging in recovery and the willingness to carry naloxone. While some participants mentioned engaging in recovery through medication-assisted treatments, abstinence, or peer support housing, they also expressed a hesitancy to carry naloxone for themselves. However, many participants were willing to continue carrying naloxone for others. It is important to consider the effectiveness of naloxone distribution if individuals choose to leave the "*drug scene*" and no longer carry naloxone for fear of relapse. This highlights the need for further research to better understand how naloxone distribution and recovery programs can work together (Kahn et al., 2022b). For example, Kelly et al. (2021) found that participants in a recovery community center highly valued OEND, but a lower percentage used these services, suggesting the need for more research to better understand barriers to accessing naloxone in recovery settings.

It is important to note that the use of drugs is a sensitive topic, and the participants' willingness to share their experiences is a testament to the established rapport. The diversity of substances used by participants reinforces the need for harm reduction approaches that do not stigmatize drug users and recognize the complexity of substance use. The finding that some participants believed ownership and carriage of naloxone were dependent on the type of drug used highlights the need for education and destigmatization of naloxone use across all substance use disorders. The perception that the risk of overdose is lower with suboxone also highlights the need for education and awareness about the limitations and potential risks associated with all types of substance use. This finding also suggests that providing harm reduction services that are tailored to specific substance use patterns and needs may be beneficial in engaging individuals in recovery and reducing overdose risk.

4.5. Limitations

It is important to acknowledge the limitations of any research study and this study is no exception. One potential limitation is the use of single-blind randomization which could have introduced bias or leading questions during the semi-structured interviews with participants. However, a qualitative balance check was conducted to ensure that equivalent information was obtained and that the same topics were discussed at least at a surface level. This helped to enhance the confidence in the analysis.

Overall, efforts were made to maintain consistency in the interview process throughout the study. However, it is worth considering that as the interviewer gained more experience, there might have been refinements made to the interview process, including the formulation of follow-up questions to elicit more precise and detailed answers from participants. These potential refinements could have influenced the data collection process and the quality of the responses obtained. While precautions were taken to minimize any potential impact, it is important to acknowledge that the evolving nature of the interviewer's skills and techniques may have introduced some variability into the interviews.

The interview protocol was adapted to accommodate the specific circumstances of the fixed site SSP recruitment location. As part of this adaptation, a technique called "*piggyback*" interviews was employed. In the experimental group, four interviews were conducted in a piggyback fashion, where pairs of participants, often partners or friends, were interviewed and created implementation intentions together. Similarly, in the control group, three interviews followed the piggyback format. These adaptations and occurrences were carefully documented and considered throughout the study to ensure the integrity of the study design and data collection process. However, it is important to acknowledge that these modifications and occurrences may

have introduced certain limitations and potential biases that should be considered when interpreting the findings.

For example, the presence of another person during the interviews of participants interviewed together may have influenced their level of sharing and disclosure. Importantly, in this study, the group assignments of three participants were modified to match their interview partner, which introduces a potential bias into the results. This modification is inextricably tied to the findings of this study and may have implications for other potential intervention effects. It is crucial to consider these factors when interpreting the results and generalizing the findings. Additionally, future research should explore strategies to address the challenges associated with multi-site recruitment to ensure the integrity of study design, randomization, and data collection. It is important to find methods that minimize the potential effects of multi-site recruitment on translational research while maximizing external validity. These considerations will contribute to the robustness and generalizability of findings in future studies involving diverse recruitment sites.

Social desirability bias is an important consideration in any study that relies on participant self-reporting (Nederhof, 1985). Participants may have been inclined to present themselves in a favorable light or provide responses that they perceive as more socially desirable. This could potentially lead to an overestimation or distortion of the reported behaviors related to naloxone use. However, it is worth noting that participants had nothing to gain from providing inaccurate or misleading information. The research focused on understanding the use of naloxone and did not involve any consequences for the participants. This can increase the confidence in the data collected as participants were likely motivated to provide honest and genuine responses.

Another potential limitation is the possibility of bias during the qualitative analysis. However, steps were taken to mitigate this by involving multiple coders who independently

reviewed at least 10 % of transcripts and coded the data. This approach aimed to minimize individual bias and increase the reliability of the findings. The agreement among coders was assessed using Cohen's Kappa and the observed values ranged from 0.44 to 0.52 indicating a moderate level of agreement. Despite these efforts it is important to acknowledge that subjectivity may still exist in the qualitative analysis process. The interpretation of data and the identification of themes can be influenced by individual perspectives. However, the use of multiple coders and their collaborative discussions helped to mitigate this potential bias and enhance the overall rigor of the analysis.

The sample size in this study was determined based on the power needed for quantitative analysis which may have influenced the saturation of information and the identification of relevant codes during the qualitative analysis. However, considering the sample size of 83 PWUO from south-central Appalachia there is confidence that saturation was achieved. The generalizability of the findings to other populations or regions may be limited because of the specific context of this research. The study focused on PWUO from south-central Appalachia and the unique characteristics of this population and region may influence the results. Therefore, caution should be exercised when applying the findings to different contexts. Additionally, it is worth mentioning that the recruitment of participants from the fixed site SSP was smaller compared to the mobile outreach SSP. This discrepancy in recruitment numbers could potentially impact the representativeness of the sample and introduce bias.

4.6. Conclusion

This study offers a comprehensive account of the contextual details surrounding naloxone use among PWUO, along with the process of developing implementation intentions and goal intentions. The utilization of thematic analysis aided in identifying insightful perspectives on PWUOs' engagement in obtaining, carrying, discussing, and administering naloxone in south-central Appalachia. This research complements existing evidence on OEND and SSPs by providing a thorough and nuanced examination of the contextual details for the use of naloxone. It also represents a novel attempt to employ the AACTT framework to facilitate the development of implementation intentions. Moving forward, future research should aim for larger and more diverse samples, explore alternative interventions, and adopt mixed methods approaches to advance the understanding of the use of naloxone among PWUO. These endeavors will contribute to the development of effective strategies to address the opioid overdose epidemic.

Chapter 5 Study Two: A longitudinal study of the impact of implementation intentions on naloxone implementation among PWUO

5.1. Abstract

Opioid overdose deaths continue to be a pressing public health crisis, particularly among PWUO. Naloxone, an opioid antagonist, plays a crucial role in reducing opioid overdose mortality. However, there have been inconsistencies among PWUO in obtaining, carrying, discussing, and administering naloxone. This study aims to evaluate the effectiveness of an intervention based on P.M. Gollwitzer's concept of implementation intentions in improving naloxone use.

A total of 83 PWUO were recruited from two SSPs and completed measures assessing variables related to the TPB using a 7-point Likert scale. Participants also provided free-form responses on their previous performance of obtaining, carrying, discussing, and administering naloxone. Half of the participants were then prompted to develop implementation intentions, specifying critical situations in which they would engage in naloxone-related behaviors. Follow-up surveys were conducted at 3- and 6-month intervals to assess changes in intentions and implementation. Statistical analyses included multiple Wilcoxon rank sum tests and negative binomial generalized linear mixed effects models (GLMMs). Overall, attrition rates remained low, with 71 % of participants completing the 3-month follow-up (n = 59) and 90 % completing the 6-month follow-up (53 out of the 59 who completed the 3-month follow-up).

The analysis of Likert scale responses showed that over 90 % of participants expressed positive intentions throughout the study. Statistically significant differences and small effect sizes were observed at the 3-month follow-up among the experimental condition in their intention to obtain naloxone ($p = 0.044$, $\delta = 0.271$) and discuss naloxone ($p = 0.030$, $\delta = 0.270$). Further analysis using a negative binomial GLMM revealed a statistically significant decrease at the 3-month follow-up in the experimental group's obtainment of naloxone. In contrast, the experimental group exhibited observable changes in the magnitude of implementation at the 3- and 6-month follow-up in their discussion of naloxone in social contexts of drug use.

The primary conclusion drawn from this study is that the intervention could have a positive impact on the intentions to obtain and discuss naloxone, with differential effects observed on their implementation. These findings highlight the importance of further investigating the effectiveness of implementation intentions, particularly when targeting behaviors that are closely related and occur prior to drug use.

5.2. Research question and hypotheses

Research question: *Does an implementation intentions intervention improve intentions to use naloxone and increase the implementation of naloxone among PWUO?*

5.2.1. Aim 2: Determine if PWUO *intentions* to use naloxone improve from baseline to a 3- and 6-month follow-up.

Hypothesis 2a: *The intentions to obtain naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Hypothesis 2b: *The intentions to carry naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Hypothesis 2c: *The intentions to discuss naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Hypothesis 2d: *The intentions to administer naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

5.2.2. Aim 3: Determine if PWUO *implementation* of naloxone improves from baseline to a 3- and 6-month follow-up.

Hypothesis 3a: *Obtaining naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Hypothesis 3b: *Carrying naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Hypothesis 3c: *Discussing naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

Hypothesis 3d: *Administering naloxone will improve at 3- and 6-months among PWUO who created implementation intentions versus goal intentions.*

5.3. Methods

5.3.1. Power analysis

The sample size estimation for this study was determined using G*Power software (Faul et al., 2007), taking into consideration previous literature on implementation intentions (Knäuper et al., 2011; Morgan & Atkin, 2016; Jensen et al., 2020). The calculations were based on a desired power of 90 % (Bland & Altman, 1995). Based on these parameters it was determined that a minimum of 68 participants would be necessary to achieve the desired power. To account for potential attrition and ensure an adequate sample size a total of 83 participants were initially recruited for the study. This larger sample size was chosen to ensure a power of 90 % even if some participants dropped out or were lost to follow-up (Loveland & Driscoll, 2014). By recruiting a larger sample than the minimum required the researchers aimed to ensure robust statistical power for their analyses. The significance level for statistical analysis was set at 0.05.

5.3.2. Effect of recruitment site on opioid overdose exposure

The quantitative analysis combined samples recruited from different SSPs to enhance the sample size and strengthen the statistical power. There were differences in measures related to opioid overdose response between the samples. Descriptive data illustrating the characteristics of these populations, collected from July 2021 to December 2022, can be found in **Appendix R**.

According to the program data, gathered by each SSP, the mobile outreach program serves a more racially diverse and unstably housed population. The primary drug of choice for this population is heroin, accounting for 38 % of individuals. In terms of consumption practices, the mobile outreach population reports a significant percentage of individuals who engage in snorting and smoking drugs. Additionally, the average frequency of drug injection among the mobile outreach participants is 5.46 times per day (SD = 3.76).

On the other hand, the fixed site program reports a different profile. The primary drug of choice for this population is suboxone/Subutex, representing 31 % of individuals. Interestingly, there were less reports of snorting, smoking, or taking drugs orally among fixed site participants. The average frequency of drug injection for this group is 3.77 times per day (SD = 1.66).

In the following sections additional information is provided regarding the data collection instruments, characteristics of the study samples as well as an explanation of the selected statistical models. These models were chosen to appropriately analyze the data while considering the potential influence of recruitment site and other relevant factors.

5.3.3. Data collection procedure and instruments

A longitudinal design was implemented with three evaluation time periods: baseline, 3-month follow-up, and a 6-month follow-up. Prior to completing any survey participants were reminded of the behaviors of interest including obtaining, carrying, discussing, and administering naloxone and provided a definition of each behavior. The definitions were as follows: (1) obtaining naloxone at a syringe services program, overdose education and naloxone distribution program (OEND), local pharmacy, or from a friend; (2) carrying naloxone in a bag or pocket; (3) discussing the use of naloxone with peers in case someone was to overdose; and (4) administering naloxone to save someone's life or attempting to save someone's life.

5.3.3.1. Baseline surveys

At the baseline assessment, participants were asked to complete a modified TPB survey consisting of 44 items (Ajzen & Fishbein, 1980; Sheeran & Orbell, 1999; Sheeran & Orbell, 2000; Sheeran & Silverman, 2003; Achtziger et al., 2008). The survey aimed to assess various factors related to their attitudes, subjective norms, perceived behavioral control, and behavioral intentions. These items were presented in a non-random order. This survey was administered before the

randomization process and the development of implementation intentions or goal intentions, ensuring that participants were not biased towards any specific condition.

Attitudes

Attitudes towards four behaviors related to naloxone (obtaining, carrying, discussing, and administering) were measured independently using five 7-point Likert scales of the importance (Q1), worth (Q2), usefulness (Q3), wisdom (Q4), and benefits (Q5) associated with each behavior. The internal reliability of these attitude scales was satisfactory, with alpha values of 0.70, 0.95, 0.95, and 0.90, respectively.

Subjective norms

Subjective norms were assessed independently using a single item for each behavior: "Most people who are important to me think that I should _____ naloxone," rated on a 7-point 'disagree-agree' Likert scale. According to Ajzen and Fishbein (1980) a single item measure is sufficient for assessing subjective norms.

Perceived behavioral control

Perceived behavioral control was evaluated using three items for each behavior. Each item was rated on a 7-point Likert scale measuring the perceived difficulty (Q1), confidence (Q2), and perceived ease (Q3) of performing the behavior. These items formed reliable scales, with alpha values of 0.82, 0.82, 0.83, and 0.73, respectively.

Intentions

Intentions were measured by a single item for each behavior, asking participants to indicate their intention to perform the behavior on a 'disagree-agree' Likert scale.

Past behavior

Past behavior was assessed using three free-response items for each behavior, asking participants to report the number of times they had engaged in the behavior in the past month, past three months, and past six months.

These measures were chosen based on their previous use in the literature and their relevance to capturing attitudes, subjective norms, perceived behavioral control, intentions, and past behavior related to naloxone use.

5.3.3.2. Experimental manipulation

Participants in the experimental group were prompted to create implementation intentions by recording the details of *where*, *for whom*, and *when* they would engage in the behaviors related to obtaining, carrying, discussing, and administering naloxone. The implementation intentions worksheet, available in **Appendix F**, included the following paragraph:

> "*Imagine that in the next 1-, 3-, and 6-months that you will obtain, carry, discuss the use of naloxone with your peers, and administer naloxone. To administer naloxone in the moment of need, one would need to obtain, carry, and discuss the use of naloxone with your peers. You are more likely to be successful in your intentions to perform overdose prevention behaviors if you decide when, where, and how you will obtain, carry, discuss the use of naloxone with your peers, and administer naloxone.*"

The implementation intentions worksheet was designed to encourage participants to form a strong association between the critical situations and the corresponding naloxone-related behaviors, thereby increasing the likelihood of their execution (Gollwitzer, 1993). The surveys for the control

group were identical in all respects to that of the experimental group except for the omission of the excerpt above and the prompts to record the contextual information.

Given the complexity of recruiting participants from separate SSPs, adaptations to the interview protocol were necessary. For instance, the experimental group included four "*piggyback*" interviews, where two participants, often partners or friends, engaged in the development of implementation intentions together. In contrast, the control group had three piggyback interviews. Furthermore, the group assignments of three participants were modified based on their interview partner, who had undergone screening prior to the study. These adaptations and occurrences were carefully documented and accounted for to maintain the integrity of the study design and data collection process. However, it is important to acknowledge that these adaptations introduce bias that is inextricably tied to the results and should be taken into consideration when interpreting any findings.

5.3.3.3. Follow-up surveys

At the 3- and 6-month follow-up assessments, participants completed a brief 8-item survey to capture changes in their behaviors over time. The use of a concise survey instrument aimed to minimize respondent errors resulting from fatigue or inattentiveness (Glasgow, 2013; Fishman et al., 2020). The items assessing intentions and past behavior were presented in a non-random order.

Intentions were measured using a single item for each behavior, where participants indicated their agreement or disagreement with the statement, "I intend to _____ naloxone" on a response scale. This item served to gauge participants' ongoing commitment to engaging in the specific behaviors of obtaining, carrying, discussing, and administering naloxone.

Past behavior was assessed using three free-response items for each behavior, inquiring about the frequency of naloxone use within different timeframes: the past month, the past three

months, and the past six months. Participants were asked to provide the number of times they had engaged in each behavior during these time periods. By employing this brief survey, the study aimed to capture essential information on participants' intentions and recent behavior related to naloxone use.

5.3.3.4. Additional information on study procedures

The surveys used in this study were designed to be accessible and convenient for participants. They were available in both hard copy and electronic formats and the complete surveys can be found in **Appendices S-U** for reference. To accommodate participants' preferences and schedules at least three attempts were made to reach participants in-person at their respective SSP or by email, text messaging, and phone calls before considering them lost to follow-up. Participants who completed both the 3- and 6-month follow-ups were provided with an additional $25 compensation as a token of appreciation for their time and valuable information (Festinger & Dugosh, 2012; Anderson & McNair, 2018).

The language used in the data collection instruments was kept at an 8th grade reading level or lower to ensure that the surveys were understandable and accessible to the participants. This decision was based on previous research indicating that health literacy levels among PWUO are generally low to moderate (Degan et al., 2019). By using language that is easily comprehensible the study aimed to promote accurate and meaningful responses from the participants. Lastly, to maintain confidentiality and security of the collected data all hard copy survey data were deidentified and securely uploaded to REDCap (Harris et al., 2009; Harris et al., 2019). The data were stored on a secure drive for subsequent analysis.

Figure 6 provides an illustration of the timeline for this longitudinal study which included baseline measures (white), 3-month follow-up measures (yellow), and 6-month follow-up

measures (green). Participants were asked to recall their implementation of each behavior in the past month (< 1), 3-months, (< 3) and 6-months (< 6). Overall, this design allowed for a comprehensive examination of *intentions* to use naloxone and *implementation* of naloxone over time and provided valuable insights into the effectiveness of the implementation intentions intervention.

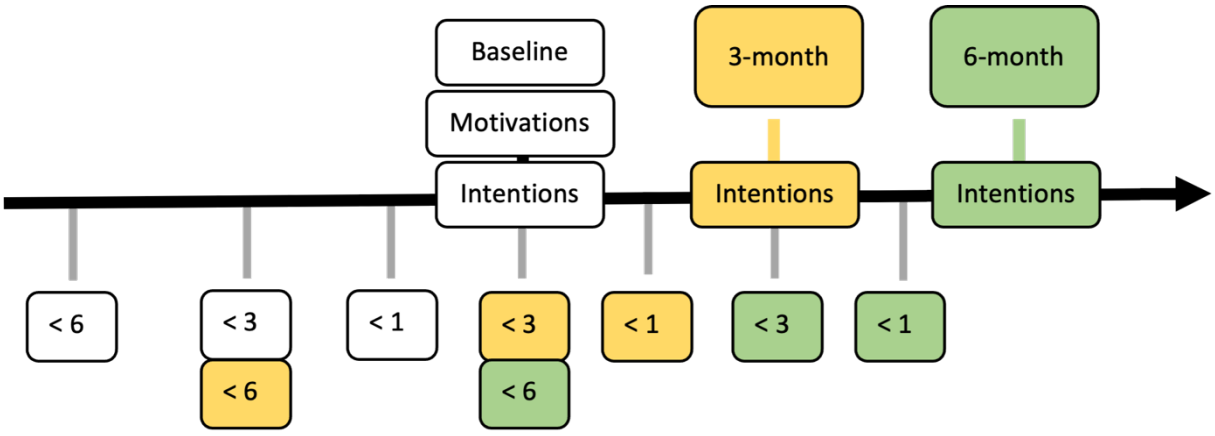


Figure 6. Longitudinal timeline for data collection

The design of the free-response items for past behavior allowed participants to provide both numerical and qualitative responses regarding their use of naloxone, resulting in a rich dataset for analysis. However, it is important to note that this approach introduced some degree of human error among participants. A summary of the input errors observed at each timepoint can be found in **Appendix V**. Examples of these errors included numerical quantity qualitative responses (e.g., every day, daily, once, twice, none, never), quantity qualitative responses (e.g., every time, often), entering letters instead of digits, and inconsistent numerical responses that did not follow a logical increase (e.g., inputting 2 for the past month, 1 for the past 3 months, and 0 for the past 6 months).

Several corrections were implemented to ensure data accuracy and minimize the potential impact of missing data on statistical analyses. These corrections addressed potential errors in the data through the following procedures:

1. Numerical qualitative responses were corrected by assuming a corresponding numerical value based on the behavior being measured. For example, if a response indicated "once" it was considered as 1 occurrence.
2. Quantity qualitative responses were corrected by assuming that the behavior of interest had been performed at least once. For instance, if a response indicated "sometimes" it was considered as 1 occurrence.
3. Input errors were corrected by assuming that the corrected response would be consistent with the participant's previous response. For example, if the previous response indicated performance within the past month a value consistent with that time frame was assigned to the corrected response.
4. Inconsistent numerical responses were adjusted based on the participant's previous response. For instance, if the response for the past month indicated 2 occurrences and the response for the past 3 months indicated 3 occurrences, but the response for the past 6 months was left blank, it was adjusted to 3 occurrences as well.

By applying these corrections, the study aimed to enhance the accuracy and integrity of the data for subsequent statistical analyses. However, it should be noted that these corrections could introduce a marginal level of error.

5.3.4. Statistical methods

All analyses were performed in R version 4.0.5 (RStudio Team, 2020). Researchers used various statistical tests to compare demographics, TPB measures, and baseline implementation between different groups. Specifically, t-tests, Pearson's chi-squared test with Yates' continuity correction, Fisher's exact test (in cases where cell counts were less than 5), and Wilcoxon rank sum test with continuity correction were employed (Szumilas, 2010; Kim, 2017).

The choice of statistical tests depended on the nature of the variables being compared and their distributional properties. T-tests were used for continuous variables while chi-squared tests and Fisher's exact tests were applied for categorical variables. The Wilcoxon rank sum test was utilized when the assumptions for parametric tests were not met or when comparing ordinal variables.

5.3.5. Implementation intentions compared to goal intentions

In this study generalized linear mixed effects models (GLMMs) were employed to evaluate changes in count data (Legrand et al., 2017; Bieleke et al., 2018; Moody et al., 2018; Norman et al., 2018). GLMMs are well-suited for analyzing count data as they can accommodate non-normal distributions and account for the correlated nature of repeated measurements within individuals (Baayen et al., 2008; Judd et al., 2012; Boisgontier & Cheval, 2016).

The GLMMs used in this study analyzed the relationship between predictor variables and count responses derived from participants' historical recall within different time frames (1-month, 3-months, and 6-months). Using this approach estimates are interpreted on a log-scale and need to be exponentiated to be interpretable (i.e., incidence rate ratio) (Atkins et al., 2013; Brown, 2021; Peugh et al., 2021). The incidence rate ratio (RR) represents the expected increase in the count rate for each unit increase in the predictor variable.

Given that the data exhibited over-dispersion (i.e., the variance was greater than the mean), a negative binomial mixed effects model was utilized. This model, represented by **Equation 1**, was employed to account for the excess variability in the count responses:

$$\log(p/(1-p)) = b_{0li} + b_{1li}\text{Group} + b_{2li}\text{Time} + b_{3li}\text{Group*Time} + b_{4li}\text{Subject} + b_{5li}\text{Location} + e_{0li} \quad (\mathbf{E1})$$

In **Equation 1**, *i* is the index of the participant and *l* indicates parameters from the logistic regression model. Group and time are fixed effects, meaning they are held constant, and subject and location are random effects, meaning they can vary across participants. The models are implemented using the *glmmTMB* package, and the associated RRs were plotted using the *ggplot2* package (Wickham, 2016; Brooks et al., 2017).

5.4. Results

The data analysis for this study was conducted in three stages. In the first stage, several comparisons were made to ensure the randomization and allocation of participants were appropriate. This included (1a) comparing demographics and other characteristics between the study conditions and samples to verify their similarity, (1b) comparing baseline measures of motivation and intentions between the study conditions and samples to identify any potential differences, and (1c) comparing baseline past behavior between the study conditions and samples to examine their equivalence.

The second stage of the study involved analyzing the participants' intentions between the experimental conditions at baseline to the 3- and 6-month follow-ups. The purpose of this analysis was to examine any changes in intentions and evaluate the impact of the intervention on participants' intentions regarding naloxone use.

The third stage of the study involved the analysis and interpretation of GLMMs to investigate the changes in the implementation of naloxone within and between the experimental conditions. This comprehensive analysis allowed for a thorough investigation of the effectiveness of implementation intentions in influencing both the intentions and actual implementation of behaviors related to naloxone use.

5.4.1. Allocation check and combination of recruited samples

5.4.1.1. Differences between recruitment sites

The samples recruited from the mobile outreach SSP and the fixed site SSP differed significantly in terms of prior experience rescuing an overdose victim ($\chi^2 = 9.14$, $df = 1$, $p = 0.003$ [**Table 2**]). Among participants from the mobile outreach SSP at least 80 % had previously administered naloxone while only 46 % of participants from the fixed site SSP had done so.

Similarly, there was a statistically significant difference in prior experience administering naloxone ($\chi^2 = 7.74$, $df = 1$, $p = 0.005$).

Furthermore, participants from the mobile outreach SSP had treated a higher number of overdoses compared to participants from the fixed site SSP (median of four [IQR = 8] vs. median of one [IQR = 2], respectively; Wilcoxon rank sum test, $W = 311.5$, $p < 0.05$). The mobile outreach participants also witnessed a higher number of overdoses compared to the fixed site participants (median of six [IQR = 17] vs. median of two [IQR = 3], respectively; Wilcoxon rank sum test, $W = 333.5$, $p = 0.0002$).

The use of Narcan® ($\chi^2 = 9.64$, $df = 1$, $p = 0.002$) and intramuscular naloxone ($p < 0.05$) differed significantly between the mobile outreach and fixed site samples. However, the use of multi-step intranasal naloxone or the Evzio® auto-inject delivery device did not show a statistically significant difference between the samples. Additionally, never using a naloxone delivery device was statistically significant between the samples ($\chi^2 = 7.74$, $df = 1$, $p = 0.005$).

These findings highlight important differences between the mobile outreach and fixed site samples in terms of prior experience with naloxone administration, exposure to overdose incidents, and the use of specific naloxone delivery devices. These differences should be considered when interpreting and comparing the outcomes of the study.

Table 2. Demographic and other characteristics between recruitment sites

	Mobile outreach SSP (n=59)	Fixed site SSP (n=24)	*P*	Test statistic (X^2, t, W, CI, df)
Condition, n (%)			0.86[a]	$\chi^2 = 0.03$, 1
Control	29 (49)	13 (54)		
Experimental	30 (51)	11 (46)		
Years of age, mean (SD)	39 (10)	38 (9)	0.68[b]	$t = 0.42$, 47.58
Gender, n (%)			0.24[c]	
Male	25 (42)	14 (58)		
Female	33 (56)	9 (38)		
Self-describe	1 (2)	1 (4)		
Ethnicity, n (%)			0.44[c]	
Hispanic	3 (5)			
Non-Hispanic	54 (92)	22 (92)		
No answer	2 (3)	2 (8)		
Race, n (%)			0.52[c]	
White	53 (90)	22 (92)		
Black	2 (3)	1 (4)		
Other	1 (2)	1 (4)		
No answer	3 (5)			
Education, n (%)			0.73[c]	
Did not complete HS	4 (7)	4 (17)		
HS diploma	32 (54)	12 (50)		
Trade/vocational	17 (29)	6 (25)		
Associate degree	4 (7)	1 (4)		
Bachelor's degree	2 (3)	1 (4)		
Employment status, n (%)			0.78[c]	
Employed full time	4 (7)	1 (4)		
Employed part time	9 (15)	1 (4)		
Unemployed/looking for work	18 (31)	11 (46)		
Unemployed/not looking for work	5 (8)	1 (4)		
Student	2 (3)			
Retired	1 (2)			
Stay-at-home parent	1 (2)	1 (4)		
Self-employed	6 (10)	3 (13)		

Unable to work	13 (22)	6 (25)		
Are you trained to administer naloxone, n (%)			0.10[c]	CI: 0.82, 19.29
Yes	40 (68)	21 (88)		
No	19 (32)	3 (13)		
If yes, where did you receive training, n (%)			0.75[c]	
Hospital/medical supervision	6 (10)	5 (21)		
Community	13 (22)	7 (29)		
Peer	16 (27)	6 (25)		
Other	5 (8)	3 (13)		
Have you rescued an overdose victim, n (%)			0.003[a]*	$\chi^2 = 9.14$, 1
Yes	50 (85)	12 (50)		
No	9 (15)	12 (50)		
Have you ever administered naloxone, n (%)			0.005[a]*	$\chi^2 = 7.74$ 1
Yes	47 (80)	11 (46)		
No	12 (20)	13 (54)		
Estimate overdoses treated, median (IQR)	4 (8)	1 (2)	< 0.05[d]*	W = 311.5
Estimate overdoses witnessed, median (IQR)	6 (17)	2 (3)	0.0002[d]*	W = 333.5
Naloxone preparation used (select all that apply), n (%)				
Narcan®	45 (76)	9 (38)	0.002[a]*	$\chi^2 = 9.64$, 1
Multi-step intranasal naloxone	2 (3)	1 (4)	1.00[c]	CI: 0.02, 24.83
Intramuscular naloxone	32 (54)	1 (4)	< 0.05[c]*	CI: 0.0009, 0.26, OR: 0.04
None	12 (20)	13 (54)	0.005[a]*	$\chi^2 = 7.74$, 1

[a]Pearson's Chi-squared test with continuity correction, [b]Student's t-Test, [c]Fisher's Exact test, [d]Wilcoxon rank sum test with continuity correction

*p-value is < 0.05

CI; confidence interval, df; degrees of freedom, IQR; interquartile range, PBC; perceived behavioral control, SD; standard deviation

5.4.1.2. Baseline measures of attitudes, subjective norms, perceived behavioral control, and intentions

The TPB measures used in this study including attitudes, subjective norms, perceived behavioral control, and intentions exhibited high internal consistency with Cronbach's alpha values greater than or equal to 0.70 (DeVellis, 2006). There were no significant differences observed between the study conditions or recruitment sites on any of the TPB measures as determined by multiple Wilcoxon rank sum tests with continuity correction (**Tables 3** and **4**). These results indicate that the baseline characteristics related to the TPB constructs were comparable across the study conditions and recruitment sites.

Spearman's rank correlation coefficient tests were conducted to examine the relationship between study condition and TPB measures (Akoglu, 2018). The results indicated weak correlations ranging from -0.16 to 0.27 suggesting that the study condition had a limited impact on the TPB measures assessed in this study (**Table 3**). However, it is important to note that due to unbalanced sample sizes a direct comparison between recruitment site samples was not possible. Within each sample the correlations among the TPB measures were generally weakly to moderately correlated. Notably, the obtainment and administration constructs exhibited weaker correlations within the samples.

The measures for attitudes, subjective norms, and perceived behavioral control demonstrated moderate positive correlations with intentions in line with previous research on TPB constructs. These results indicate that individuals who held more positive attitudes, positive subjective norms, and perceived a higher degree of control over their behavior were more likely to express positive intentions to obtain, carry, discuss, and administer naloxone. For more comprehensive information and visual representations of the TPB behavioral constructs and Spearman's rank correlation coefficients, please refer to **Appendices W-Z**.

Table 3. Baseline attitudes, subjective norms, perceived behavioral control, and intentions to use naloxone between study conditions

	Control (n=42)	Experimental (n=41)	*P*	Test statistic	Cronbach's alpha	Spearman's correlation coefficient
Attitudes, median (IQR)						
Obtain					0.70 [0.59, 0.79]	-0.10
Q1	7.00 (1)	7.00 (1)	0.25[a]	W = 757		
Q2	7.00 (1)	7.00 (0)	0.34[a]	W = 777.5		
Q3	7.00 (1)	7.00 (1)	0.51[a]	W = 802		
Q4	7.00 (1)	7.00 (1)	0.69[a]	W = 826.5		
Q5	7.00 (1)	7.00 (1)	0.58[a]	W = 789.5		
Carry					0.95 [0.94, 0.97]	0.10
Q1	7.00 (1)	7.00 (1)	0.54[a]	W = 800.5		
Q2	7.00 (1)	7.00 (1)	0.93[a]	W = 870.5		
Q3	7.00 (1)	7.00 (1)	0.46[a]	W = 790.5		
Q4	7.00 (1)	7.00 (1)	0.44[a]	W = 935		
Q5	7.00 (1)	7.00 (1)	0.75[a]	W = 892		
Discuss					0.95 [0.93, 0.96]	0.06
Q1	7.00 (1)	7.00 (1)	0.76[a]	W = 891.5		
Q2	7.00 (1)	6.00 (2)	0.43[a]	W = 941		
Q3	7.00 (1)	6.00 (1)	0.13[a]	W = 1013		
Q4	7.00 (1)	6.00 (1)	0.21[a]	W = 984.5		
Q5	7.00 (1)	6.00 (1)	0.11[a]	W = 1020.5		
Administer					0.89 [0.85, 0.93]	0.05
Q1	7.00 (0)	7.00 (0)	0.91[a]	W = 852		
Q2	7.00 (1)	7.00 (0)	0.24[a]	W = 759		
Q3	7.00 (0)	7.00 (0)	0.55[a]	W = 815		
Q4	7.00 (1)	7.00 (1)	0.61[a]	W = 816.5		
Q5	7.00 (1)	7.00 (1)	0.69[a]	W = 896.5		
Subjective norms, median (IQR)					0.87 [0.82, 0.91]	
Obtain	6.00 (2)	6.00 (2)	0.58[a]	W = 804		0.11
Carry	6.00 (1)	6.00 (2)	0.50[a]	W = 931.5		-0.11
Discuss	6.00 (2)	6.00 (2)	0.66[a]	W = 813.5		-0.10

Administer	6.00 (1)	6.00 (2)	1.00[a]	W = 860		9.88e-05
PBC, median (IQR)						
Obtain					0.82 [0.74, 0.88]	0.27
Q1	7.00 (1)	7.00 (1)	0.64[a]	W = 908.5		
Q2	7.00 (1)	7.00 (1)	0.39[a]	W = 780.5		
Q3	7.00 (1)	7.00 (1)	0.50[a]	W = 925.5		
Carry					0.82 [0.74, 0.88]	0.0007
Q1	7.00 (1)	7.00 (1)	0.62[a]	W = 813		
Q2	6.00 (1)	7.00 (1)	0.04[a]	W = 658.5		
Q3	7.00 (1)	7.00 (1)	0.91[a]	W = 871.5		
Discuss					0.83 [0.75, 0.88]	0.15
Q1	6.00 (2)	6.00 (2)	0.64[a]	W = 813		
Q2	6.50 (1)	7.00 (1)	0.30[a]	W = 759		
Q3	7.00 (1)	7.00 (1)	0.64[a]	W = 814.5		
Administer					0.73 [0.61, 0.82]	-0.16
Q1	6.50 (1)	6.00 (2)	0.31[a]	W = 966.5		
Q2	7.00 (1)	7.00 (1)	0.57[a]	W = 804.5		
Q3	7.00 (1)	7.00 (1)	0.75[a]	W = 830.5		
Intentions, median (IQR)					0.83 [0.76, 0.88]	
Obtain	7.00 (1)	7.00 (1)	0.50[a]	W = 796.5		-0.10
Carry	7.00 (1)	7.00 (1)	0.95[a]	W = 867.5		0.009
Discuss	6.00 (1)	6.00 (2)	0.60[a]	W = 915.5		-0.02
Administer	7.00 (1)	7.00 (1)	0.27[a]	W = 967.5		-0.02

[a]Wilcoxon rank sum test with continuity correction

Q; question, IQR; interquartile range, PBC; perceived behavioral control

Table 4. Baseline attitudes, subjective norms, perceived behavioral control, and intentions to use naloxone between recruitment sites

	Mobile outreach SSP (n=59)	**Fixed site SSP (n=24)**	***P***	**Test statistic**
Attitudes, median (IQR)				
Obtain				
Q1	7.00 (1)	7.00 (1)	0.71[a]	W = 677
Q2	7.00 (1)	7.00 (1)	0.51[a]	W = 655
Q3	7.00 (1)	7.00 (1)	0.66[a]	W = 743.5
Q4	7.00 (1)	7.00 (0.25)	0.79[a]	W = 729
Q5	7.00 (1)	7.00 (1)	0.60[a]	W = 721
Carry				
Q1	7.00 (1)	6.50 (1)	0.35[a]	W = 624.5
Q2	7.00 (1)	6.50 (1.25)	0.23[a]	W = 600
Q3	7.00 (1)	7.00 (1)	0.58[a]	W = 660
Q4	7.00 (1)	7.00 (1)	0.54[a]	W = 654
Q5	7.00 (1)	7.00 (1)	0.30[a]	W = 618
Discuss				
Q1	7.00 (1)	6.50 (1)	0.50[a]	W = 648
Q2	7.00 (1)	6.00 (2)	0.39[a]	W = 628.5
Q3	7.00 (1)	6.00 (1.25)	0.47[a]	W = 642
Q4	7.00 (1)	6.00 (1)	0.32[a]	W = 618.5
Q5	7.00 (1)	6.00 (1.25)	0.26[a]	W = 606
Administer				
Q1	7.00 (0)	7.00 (0.25)	0.64[a]	W = 674
Q2	7.00 (1)	7.00 (1)	0.62[a]	W = 668.5
Q3	7.00 (0)	7.00 (0)	0.68[a]	W = 679
Q4	7.00 (1)	7.00 (1)	0.47[a]	W = 650.5
Q5	7.00 (1)	7.00 (1)	0.99[a]	W = 706
Subjective norms, median (IQR)				
Obtain	6.00 (1)	6.00 (2.25)	0.23[a]	W = 595.1
Carry	6.00 (1)	6.50 (1.25)	0.81[a]	W = 731
Discuss	6.00 (2)	6.00 (1.5)	0.24[a]	W = 595
Administer	6.00 (1)	6.00 (2.25)	0.53[a]	W = 648.5
PBC, median (IQR)				
Obtain				

Q1	7.00 (1)	6.50 (1.25)	0.55[a]	W = 653.5
Q2	7.00 (1)	7.00 (1)	0.86[a]	W = 692
Q3	7.00 (1)	7.00 (1)	0.14[a]	W = 834.5
Carry				
Q1	7.00 (1)	7.00 (1)	0.89[a]	W = 696
Q2	7.00 (1)	6.50 (1)	0.35[a]	W = 625
Q3	7.00 (1)	7.00 (1)	0.75[a]	W = 734.5
Discuss				
Q1	7.00 (2)	6.00 (2)	0.66[a]	W = 666
Q2	7.00 (1)	6.50 (1)	0.65[a]	W = 667
Q3	7.00 (1)	7.00 (1)	0.47[a]	W = 773
Administer				
Q1	7.00 (1)	6.00 (2.25)	0.07[a]	W = 536.5
Q2	7.00 (1)	6.50 (1)	0.20[a]	W = 598
Q3	7.00 (1)	6.50 (1)	0.20[a]	W = 598
Intentions, median (IQR)				
Obtain	7.00 (1)	7.00 (1)	0.52[a]	W = 652
Carry	7.00 (1)	6.00 (1)	0.19[a]	W = 590.5
Discuss	6.00 (1)	6.00 (1.25)	0.47[a]	W = 641
Administer	7.00 (1)	6.50 (1)	0.14[a]	W = 579

[a]Wilcoxon rank sum test with continuity correction
IQR; interquartile range, PBC; perceived behavioral control

5.4.1.3. Past behavior implementation of naloxone at baseline

The analysis of the difference between study conditions in terms of previous implementation of naloxone in the past 1-month, 3-months, and 6-months did not yield statistically significant results as indicated in **Table 5**. However, there were statistically significant differences observed between study conditions in terms of baseline past 1-month ($W = 608$, $p = 0.011$), baseline past 3-months ($W = 617$, $p = 0.014$), and baseline past 6-months ($W = 602.5$, $p = 0.010$) carriage of naloxone. This suggests that the experimental and control groups had different levels of naloxone carriage at the baseline assessment.

Table 6 highlights the statistically significant differences between the samples recruited from the mobile outreach and fixed site. However, it should be noted that the samples are unbalanced, and the significance is attributed to the unequal sample sizes between the recruitment sites.

Intentions (at baseline) were not highly correlated with past behavior for both the experimental group (0.18, 0.45, 0.27, 0.14) and control group (0.29, 0.27, 0.29, 0.19) which is consistent with previous research on implementation intentions. Similarly, within the recruitment sites the correlation coefficients between past behavior and intentions were not highly correlated for both the mobile outreach (0.21, 0.24, 0.26, 0.23) and fixed site (0.26, 0.46, 0.39, -0.21). It is important to note that the small sample size may have influenced the accuracy of the correlation coefficient estimates.

Table 5. Past behavior implementation between study conditions at baseline

	Control (n=42)	**Experimental (n=41)**	***P***	**W-statistic**	**Spearman's correlation coefficient**
Naloxone use in previous 1-month, median (IQR)					
Obtain	1 (1.75)	1 (3)	0.13[a]	700.5	0.18
Carry	4 (29.8)	30 (25)	0.011[a]*	608	0.12
Discuss	2 (4)	2 (3)	0.24[a]	987.5	-0.05
Administer	0 (1)	0 (1)	0.59[a]	811.5	-0.10
Naloxone use in previous 3-months, median (IQR)					
Obtain	2 (3.75)	3 (9)	0.13[a]	695.5	-0.03
Carry	27.5 (89)	90 (75)	0.014[a]*	617	0.12
Discuss	4 (10.5)	4 (5)	0.53[a]	930.5	-0.02
Administer	1 (1)	1 (2)	0.70[a]	821.5	0.19
Naloxone use in previous 6-months, median (IQR)					
Obtain	4 (4.75)	6 (16)	0.07[a]	663	0.006
Carry	40 (179)	180 (150)	0.010[a]*	602.5	0.17
Discuss	5 (18)	7 (10)	0.67[a]	908.5	0.12
Administer	1 (2.75)	1 (4)	0.42[a]	774.5	0.06

[a]Wilcoxon rank sum test with continuity correction
*p-value is < 0.05
IQR; interquartile range

Table 6. Past behavior implementation between recruitment sites at baseline

	Mobile outreach SSP (n=59)	**Fixed site SSP (n=24)**	***P***	**W-statistic**
Naloxone use in previous 1-month, median (IQR)				
Obtain	1 (3)	0 (1)	0.002[a]*	414.5
Carry	30 (26)	1 (30)	0.0004[a]*	390.5
Discuss	2 (4)	1 (2)	0.003[a]*	420.5
Administer	0 (1)	0 (0.25)	0.29[a]	622
Naloxone use in previous 3-months, median (IQR)				
Obtain	3 (8)	1 (2.25)	0.0004[a]*	357
Carry	90 (80.5)	2 (90)	0.0005[a]*	396
Discuss	4 (9.5)	1 (3)	0.0002[a]*	339.5
Administer	1 (2)	0 (1)	0.005[a]*	446
Naloxone use in previous 6-months, median (IQR)				
Obtain	6 (16)	2 (4.25)	0.0004[a]*	358.5
Carry	180 (156)	2.5 (165)	0.0004[a]*	387.5
Discuss	9 (20)	1.5 (3)	< 0.05[a]*	288.5
Administer	2 (4)	0 (1.25)	0.002[a]*	413.5

[a]Wilcoxon rank sum test with continuity correction
*p-value is < 0.05
IQR; interquartile range

5.4.2. Attrition at 3- and 6-month follow-ups

Attrition was low as depicted in **Figure 5**. At the 3-month follow-up, 71 % of participants (59 out of 83) remained in the study. The completion of the 3-month follow-up was not statistically different between study conditions (χ^2 = 5.26e-31, *df* = 1, p = 1) or between recruitment sites (χ^2 = 1.14e-31, *df* = 1, p = 1). This suggests that the attrition rate was not influenced by the study conditions or the recruitment sites.

At the 6-month follow-up 90 % of participants (53 out of 59) remained in the study. Similarly, the completion of the 6-month follow-up was not statistically significant between study conditions (χ^2 = 0, *df* = 1, p = 1) or between recruitment sites (χ^2 = 0.17, *df* = 1, p = 0.68). This indicates that the attrition rate was comparable across study conditions and recruitment sites among the participants who completed the 6-month follow-up.

Overall, 53 out of the original 83 participants (64 %) completed the study. Therefore, there is good reason to believe that the participants who remained in the study are representative of the original sample. The reasons for attrition included factors such as the inability to contact participants due to incorrect phone numbers, disconnected cell phones, no email, or no contact through the SSP. Researchers were notified of the death of a few participants (n = 3). It is important to note that these reasons for attrition are random occurrences and were beyond the control of the research study.

5.4.3. Wilcoxon rank sum tests for Likert scale responses at baseline, 3- and 6-months

To compare intentions among the study conditions at baseline, 3-month follow-up, and 6-month follow-up multiple Wilcoxon rank sum tests were performed. The Wilcoxon rank sum test is a non-parametric test that is appropriate for comparing ordinal data such as Likert scale

responses. In addition to assessing statistical significance the effect size was evaluated using Cliff's Delta (δ) (Cliff, 1993; Torchiano, 2020).

A total of 59 participants completed the 3-month follow-up survey of intentions. The internal consistency of this survey was satisfactory with a Cronbach's alpha value of 0.81 (CI: 0.72, 0.88). A total of 53 participants completed the 6-month follow-up survey of intentions. The internal consistency of this survey was satisfactory with a Cronbach's alpha value of 0.66 (CI: 0.48, 0.79). This indicates a strong reliability of the survey in measuring intentions among the participants.

Furthermore, over 90 % of the responses on the 7-point Likert scale for intentions were equal to or greater than 5 at baseline, 3-month, and 6-month follow-ups. This indicates that participants expressed positive intentions to obtain, carry, discuss, and administer naloxone throughout the study duration. The distribution of responses can be found in **Appendices AA-AD**.

5.4.3.1. Intention to obtain naloxone from baseline to 3- and 6-month follow-up

During the baseline period (n = 59) no significant difference was observed in the intention to obtain naloxone between the experimental group (n = 29) and the control group (n = 30). Both groups reported a median intention score of 7.00 (IQR = 1) indicating high self-reported intentions to obtain naloxone (**Figure 7**). The Wilcoxon rank sum test did not reveal a significant difference between the groups (W = 381.5, p = 0.348).

At the 3-month follow-up (n = 59) the median intention to obtain naloxone was 6.00 (IQR = 1) for the control group and 7.00 (IQR = 1) for the experimental group. The Wilcoxon rank sum test revealed a statistically significant difference between the groups (W = 317, p = 0.044). This suggests that the experimental group had significantly higher self-reported intentions to obtain naloxone compared to the control group at this time point as depicted in **Figure 7**. The effect size was estimated to be 0.271 (95% CI: 0.006, 0.501) indicating a small effect size.

At the 6-month follow-up (n = 53) the control group (n = 27) reported a median intention of 6.00 (IQR = 1.5) while the experimental group (n = 26) reported a median intention of 7.00 (IQR = 1) (**Figure 8**). The difference in intentions between the two groups was not statistically significant based on the Wilcoxon rank sum test (W = 264.5, p = 0.086). However, a small effect size (δ = 0.246, 95% CI [-0.038, 0.494]) was observed at this time point. These results suggest a potential effect of the implementation intentions intervention in maintaining higher intentions to obtain naloxone in the experimental group compared to the control group over the 6-month period.

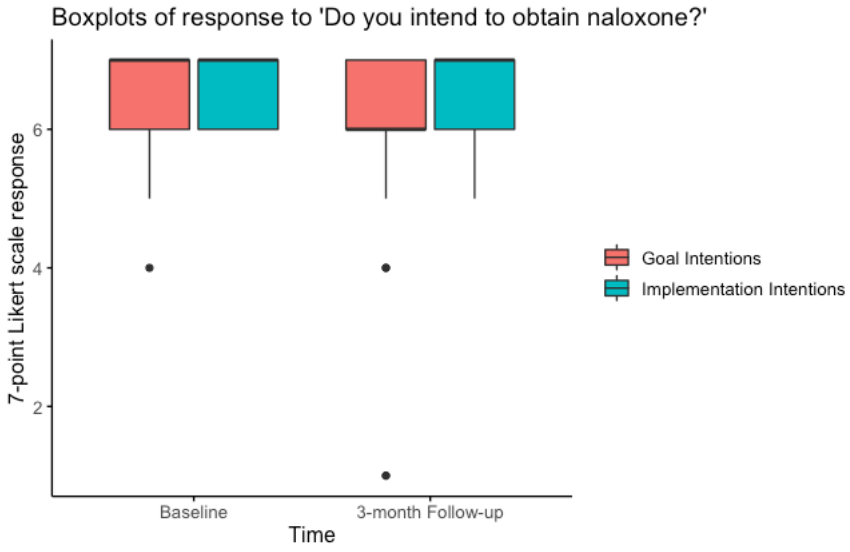


Figure 7. Boxplots of 7-point Likert scale of intentions to obtain naloxone

Baseline to 3-month follow-up (n=59)

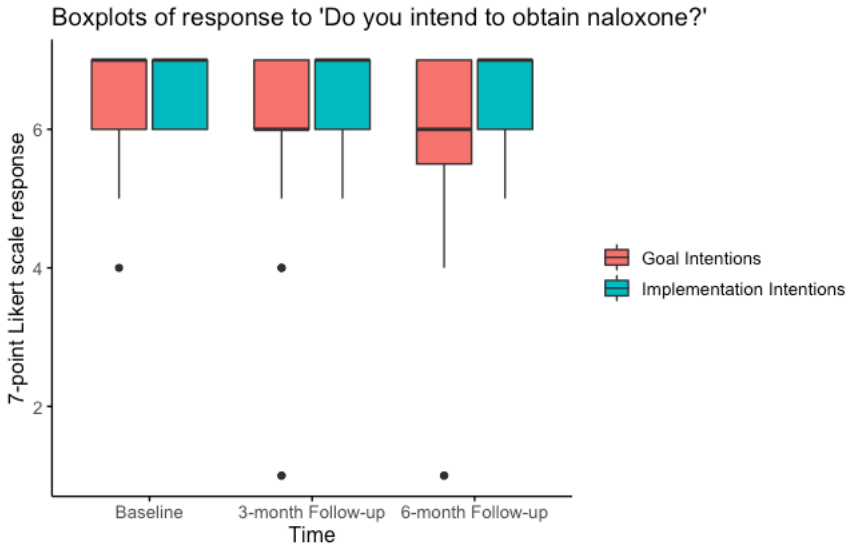


Figure 8. Intention to obtain naloxone by condition across all timepoints

Only participants that completed all timepoints (n=53) were included in this analysis and figure.

5.4.3.2. Intention to carry naloxone from baseline to 3- and 6-month follow-up

During the baseline period there was no significant difference in the intention to carry naloxone between the experimental group and the control group. Both groups had a median intention score of 7.00 (IQR = 1) indicating high self-reported intentions to carry naloxone (**Figure 9**). The Wilcoxon rank sum test did not indicate a significant difference between the groups (W = 420.5, p = 0.809).

At the 3-month follow-up the control group participants reported a median intention of 6.00 (IQR = 1) while the experimental group participants reported a median intention of 7.00 (IQR = 1) (**Figure 9**). The difference between the groups was not statistically significant as determined by the Wilcoxon rank sum test (W = 341.5, p = 0.113). The effect size was estimated to be 0.215 (95% CI: -0.054, 0.455) indicating a small effect size.

Similar results were observed at the 6-month follow-up. The control group participants reported a median intention of 6.00 (IQR = 1) while the experimental group participants reported a median intention of 7.00 (IQR = 1) (**Figure 10**). However, the Wilcoxon rank sum test did not reveal a significant difference between the groups (W = 285.5, p = 0.195). A small effect size (δ = 0.187, 95% CI [-0.099, 0.443]) was observed at this time point.

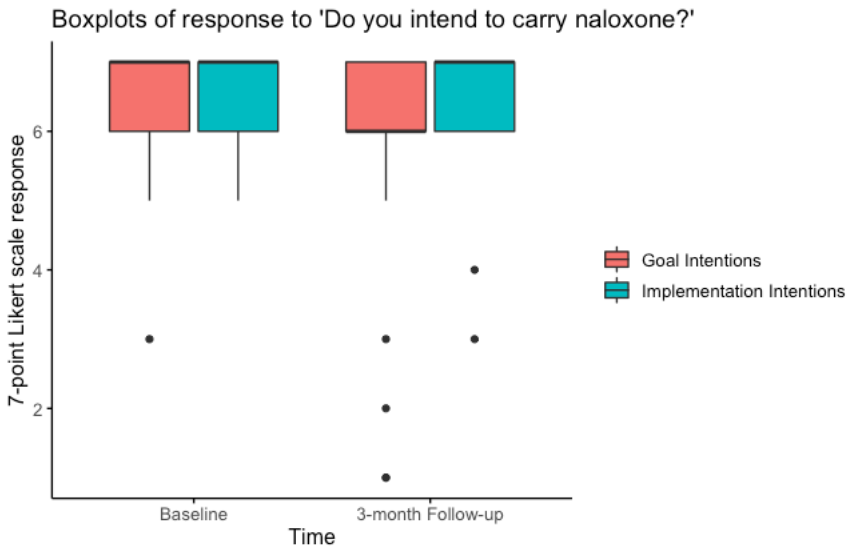


Figure 9. Boxplots of 7-point Likert scale of intentions to carry naloxone

Baseline to 3-month follow-up by condition (n=59)

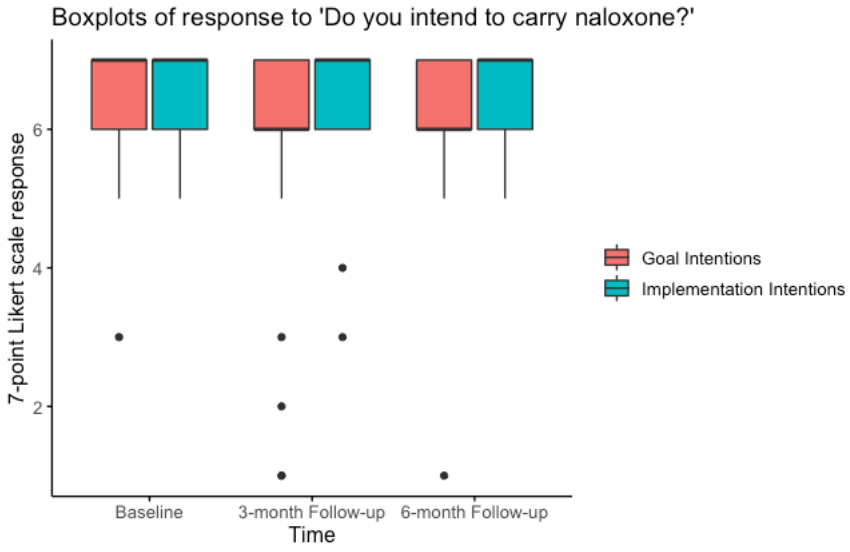


Figure 10. Intention to carry naloxone by condition across all timepoints

Only participants that completed all timepoints (n=53) were included in this analysis and figure.

5.4.3.3. Intention to discuss naloxone from baseline to 3- and 6-month follow-up

During the baseline period the median intention to discuss naloxone was 7.00 (IQR = 1) for the experimental group and 6.50 (IQR = 1) for the control group. The Wilcoxon rank sum test did not reveal a significant difference between the groups (W = 434.5, p = 1.00) indicating similar intentions to discuss naloxone at baseline (**Figure 11**).

At the 3-month follow-up the control group participants reported a median intention of 7.00 (IQR = 1) while the experimental group participants reported a median intention of 7.00 (IQR = 0) (**Figure 11**). The Wilcoxon rank sum test revealed a significant difference between the groups (W = 317.5, p = 0.030) suggesting that the experimental group maintained consistently positive intentions to discuss naloxone compared to the control group at this time point. The effect size was estimated to be 0.270 (95% CI: 0.018, 0.490) indicating a small effect size.

In contrast, at the 6-month follow-up there was no significant difference in the intention to discuss naloxone between the control group participants with a median intention of 7.00 (IQR = 1) and the experimental group participants with a median intention of 7.00 (IQR = 1) (**Figure 12**). The Wilcoxon rank sum test did not indicate a significant difference between the groups (W = 324, p = 0.584). Additionally, a negligible effect size ($\delta = 0.077$, 95% CI [-0.198, 0.341]) was observed at this time point.

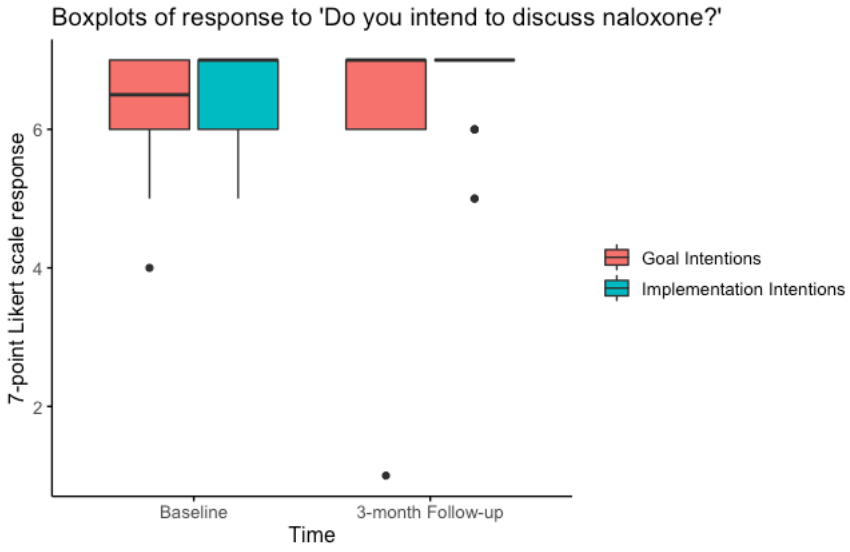


Figure 11. Boxplots of 7-point Likert scale of intentions to discuss naloxone

Baseline to 3-month follow-up by condition (n=59)

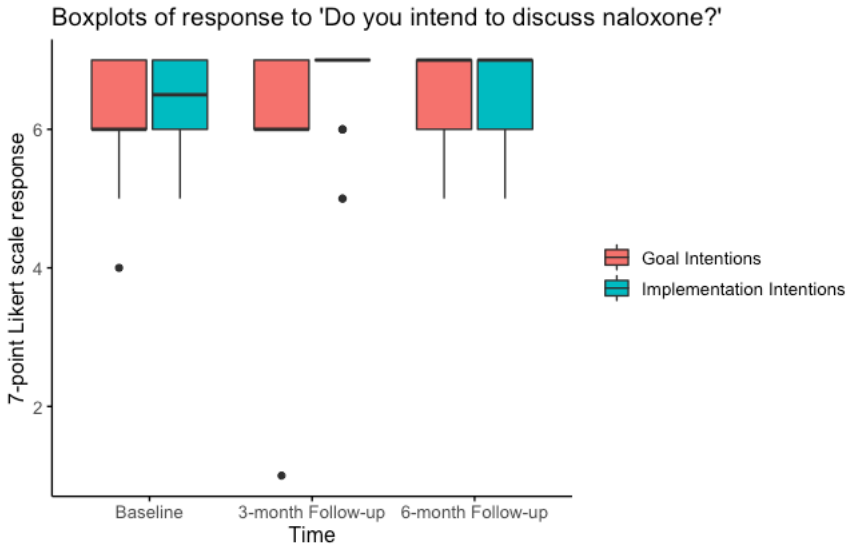


Figure 12. Intention to discuss naloxone by condition across all timepoints

Only participants that completed all timepoints (n=53) were included in this analysis and figure.

5.4.3.4. Intention to administer naloxone from baseline to 3- and 6-month follow-up

During the baseline period both the experimental group and the control group reported a median intention of 7.00 (IQR = 1) to administer naloxone. The Wilcoxon rank sum test did not indicate a significant difference between the groups (W = 464.5, p = 0.602) suggesting that their intentions to administer naloxone were similar at baseline. These findings are depicted in **Figure 13**.

At the 3-month follow-up the control group participants reported a median intention of 7.00 (IQR = 1) while the experimental group participants reported a median intention of 7.00 (IQR = 0) to administer naloxone (**Figure 13**). However, the Wilcoxon rank sum test did not show a significant difference between the groups (W = 374, p = 0.240). The effect size was estimated to be 0.140 (95% CI: -0.095, 0.361) indicating a negligible effect size.

Similarly, at the 6-month follow-up there was no significant difference in the intention to administer naloxone between the control group participants with a median intention of 7.00 (IQR = 1) and the experimental group participants with a median intention of 7.00 (IQR = 0) (**Figure 14**). The Wilcoxon rank sum test did not indicate a significant difference between the groups (W = 265, p = 0.070). However, a small effect size (δ = 0.245, 95% CI [-0.022, 0.480]) was observed at this time point.

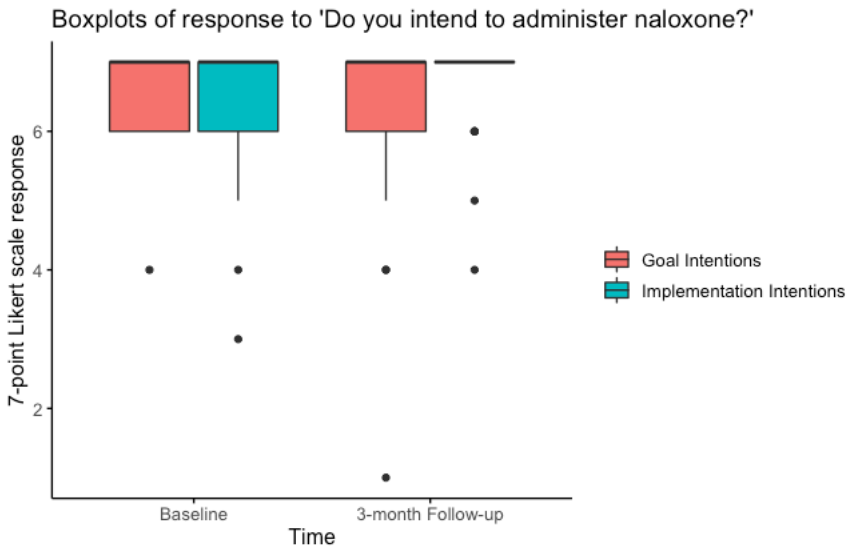


Figure 13. Boxplots of 7-point Likert scale of intentions to administer naloxone Baseline to 3-month follow-up by condition (n=59)

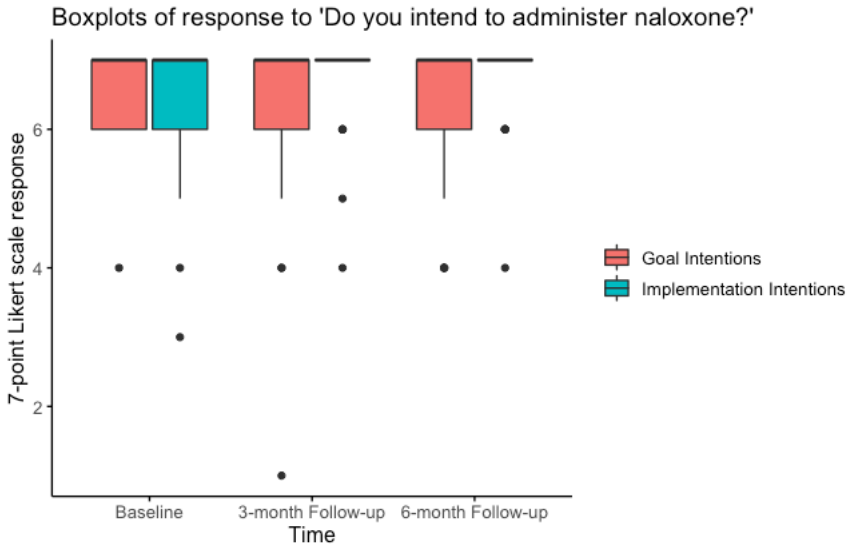


Figure 14. Intention to administer naloxone by condition across all timepoints

Only participants that completed all timepoints (n=53) were included in this analysis and figure.

5.4.4. Generalized linear mixed effects models

The GLMM analysis compared study conditions across four behaviors including obtaining, carrying, discussing, and administering naloxone from baseline to the 3- and 6-month follow-up. However, due to the potential impact of recency effect and recall bias on memory only the models for the past 1-month behavior implementation are reported in the main text (Greene, 1986; Coughlin, 1990). The models for the past 3-months and 6-months can be found in **Appendices AE-AL**.

When conducting GLMMs in R the output is based on an ordered reference level of the predictor variable which serves as a baseline for comparison. In this analysis statistical significance is determined based on the reported estimates. The intercept estimate represents the control group and is compared to a value of one while all other estimates are compared to the preceding estimate. To facilitate interpretation probabilities are calculated by taking the inverse log of the estimates. The *plogis* function available in base R (RStudio Team, 2020) was used for this purpose. **Table 7** provides a helpful reference for interpreting the output and subsequent tables of the GLMMs.

Table 7. Estimates for mixed effects models and interpretation

	Condition	
Timepoint	Goal intentions (0)	Implementation intentions (1)
Baseline (0)	Intercept (b_0)	Intercept (b_0) +/- Condition (b_1)
Follow-up (1)	Intercept (b_0) +/- Timepoint (b_2)	Intercept (b_0) +/- Condition (b_1) +/- Timepoint (b_2) +/- Interaction (b_3)

5.4.4.1. Obtaining naloxone in the past 1-month from baseline to 3- and 6-month follow-up

In the month prior to study enrollment (n = 58), participants in the control condition (i.e., goal intentions) had a 47 % probability of obtaining naloxone (based on the *plogis* [-0.11]) and a nonsignificant rate ratio 0.89 times lower than one (RR = 0.89 [$e^{-0.11}$], 95 % CI [0.41, 1.94], p = 0.772) (**Table 8**). Participants in the experimental group had a 63 % probability of obtaining naloxone (based on the *plogis* [-0.11 + 0.64]) and a statistically significant rate ratio 1.90 times ([$e^{-0.11 + 0.64}$] or [0.89 * 1.90 ≈ 1.69]) higher than the control group (RR = 1.90 [$e^{0.64}$], 95 % CI [1.03, 3.52], p = 0.042) (**Figure 15**).

At the 3-month follow-up (n = 58) the control group had a 53 % probability of obtaining naloxone (based on the *plogis* [-0.11 + 0.25]) and an observable change in the magnitude of the rate ratio to 1.15 ([$e^{-0.11 + 0.25}$] or [0.89 * 1.28 ≈ 1.15]) (RR = 1.28 [$e^{0.25}$], 95 % CI [0.68, 2.42], p = 0.439). On the other hand, the experimental group had a 46 % probability of obtaining naloxone (based on *plogis* [-0.11 + 0.64 + 0.25 + -0.95]) and a statistically significant decrease in the rate ratio to 0.84 ([$e^{-0.11 + 0.64 + 0.25 + -0.95}$] or [0.89 * 1.90 * 1.28 * 0.39 ≈ 0.84]) (RR = 0.39 [$e^{-0.95}$], 95 % CI [0.16, 0.95], p = 0.038).

At the 6-month follow-up (n = 52) the experimental group had a 65 % probability of obtaining naloxone (based on *plogis* [-0.32 + 0.71 + 0.60 + -0.38]) and a nonsignificant but observable change in the magnitude of the rate ratio to 1.84 ([$e^{-0.32 + 0.71 + 0.60 + -0.38}$] or [0.73 * 2.04 * 1.82 * 0.68 ≈ 1.84]) (RR = 0.68 [$e^{-0.38}$], 95 % CI [0.27, 1.74], p = 0.424). The control group had a 57 % probability of obtaining naloxone (based on *plogis* [-0.32 + 0.60]) and a nonsignificant but observable change in the magnitude of the rate ratio to 1.32 ([$e^{-0.32 + 0.60}$] or [0.73 * 1.82 ≈ 1.32) (RR = 1.82 [$e^{0.60}$], 95 % CI [0.91, 3.61], p = 0.088) (**Figure 16**).

Table 8. Generalized linear mixed effects model of obtaining naloxone (1-month)

	RR	***2.5 %***	***97.5 %***	***b***	***SE***	***z***	***p***
Baseline to 3-months (n=58)							
Intercept	0.89	0.41	1.94	-0.11	0.40	-0.29	0.772
Condition	1.90	1.03	3.52	0.64	0.32	2.04	0.042*
Timepoint	1.28	0.68	2.42	0.25	0.32	0.77	0.439
Condition x Timepoint	0.39	0.16	0.95	-0.95	0.46	-2.07	0.038*
Baseline to 6-months (n=52)							
Intercept	0.73	0.31	1.69	-0.32	0.43	-0.74	0.461
Condition	2.04	0.92	4.49	0.71	0.40	1.76	0.078
Timepoint 1	1.36	0.67	2.76	0.31	0.36	0.85	0.395
Timepoint 2	1.82	0.91	3.61	0.60	0.35	1.70	0.088
Condition x Timepoint 1	0.29	0.10	0.80	-1.25	0.52	-2.39	0.017*
Condition x Timepoint 2	0.68	0.27	1.74	-0.38	0.48	-0.80	0.424

*p-value is < 0.05
RR; rate ratio, SE; standard error

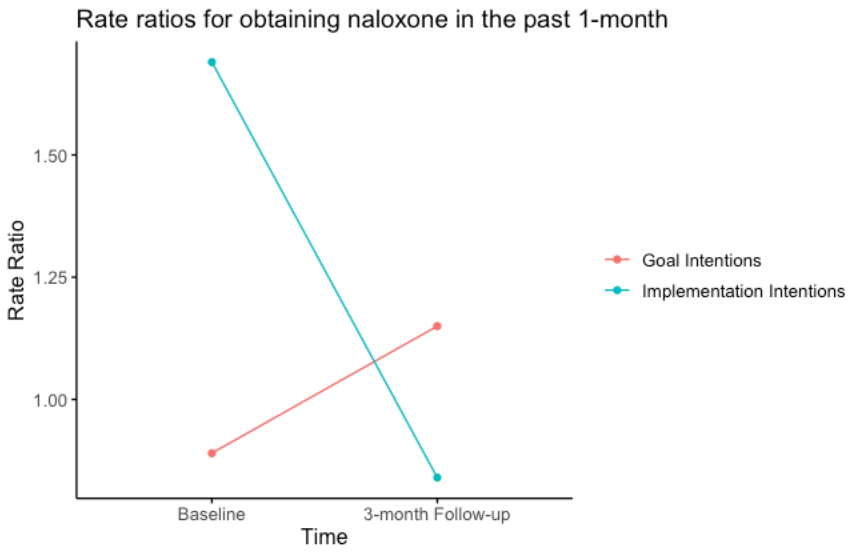


Figure 15. Change in rate ratio for obtaining naloxone from baseline to 3-month follow-up

Rate ratio from baseline to 3-month follow-up by condition (n=58).

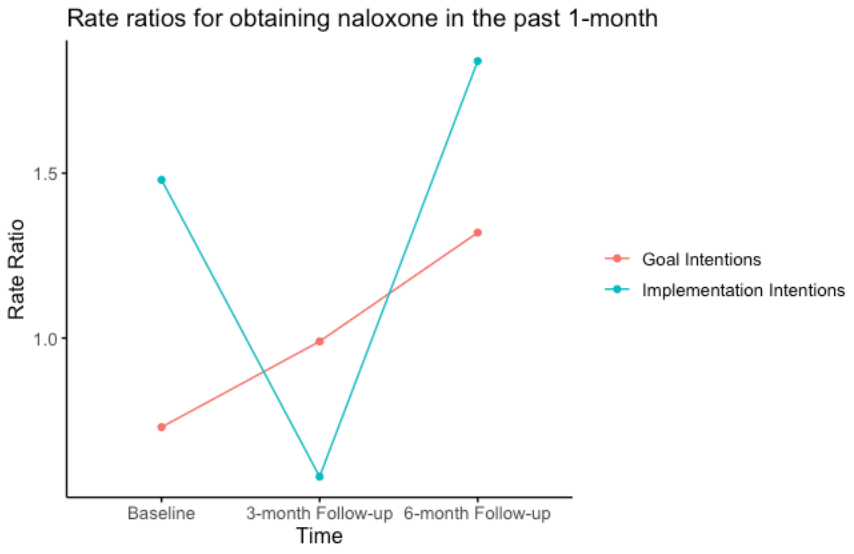


Figure 16. Change in rate ratio for obtaining naloxone from baseline to 6-month follow-up

Rate ratio from baseline to 6-month follow-up by condition. Note: Only participants that completed all timepoints (n=52) were included in this analysis and figure.

5.4.4.2. Carrying naloxone in the past 1-month from baseline to 3- and 6-month follow-up

In the month prior to study enrollment (n = 57) participants in the control condition had a 93 % probability of carrying naloxone and a statistically significant rate ratio 12.85 times higher than one (RR = 12.85, 95 % CI [7.81, 21.12], p = <2e-16) (**Table 9**). Participants in the experimental group had a 96 % probability of carrying naloxone and a statistically significant rate ratio 1.82 times higher than the control group (RR = 1.82, 95 % CI [1.03, 3.24], p = 0.041) (**Figure 17**).

At the 3-month follow-up (n = 57) the control group had a 95 % probability of carrying naloxone and an observable change in the magnitude of the rate ratio to 18.58 (RR = 1.45, 95 % CI [0.83, 2.52], p = 0.192). The experimental group had a 96 % probability of carrying naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 23.72 (RR = 0.70, 95 % CI [0.31, 1.56], p = 0.384).

At the 6-month follow-up (n = 52) the experimental group had a 96 % probability of carrying naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 22.17 (RR = 0.66, 95 % CI [0.31, 1.41], p = 0.281). The control group had a 94 % probability of carrying naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 14.50 (RR = 1.53, 95 % CI [0.90, 2.60], p = 0.117) (**Figure 18**).

Table 9. Generalized linear mixed effects model of carrying naloxone (1-month)

	RR	***2.5 %***	***97.5 %***	***b***	***SE***	***z***	***p***
Baseline to 3-months (n=57)							
Intercept	12.85	7.81	21.12	2.55	0.25	10.07	<2e-16*
Condition	1.82	1.03	3.24	0.60	0.29	2.05	0.041*
Timepoint	1.45	0.83	2.52	0.37	0.28	1.30	0.192
Condition x Timepoint	0.70	0.31	1.56	-0.36	0.41	-0.87	0.384
Baseline to 6-months (n=52)							
Intercept	9.48	4.70	19.11	2.25	0.36	6.29	<2e-16*
Condition	2.33	1.33	4.06	0.84	0.28	2.97	0.003*
Timepoint 1	1.54	0.90	2.62	0.43	0.27	1.58	0.114
Timepoint 2	1.53	0.90	2.60	0.43	0.27	1.57	0.117
Condition x Timepoint 1	0.63	0.29	1.36	-0.46	0.39	-1.17	0.241
Condition x Timepoint 2	0.66	0.31	1.41	-0.42	0.39	-1.08	0.281

*p-value is < 0.05

RR; rate ratio, SE; standard error

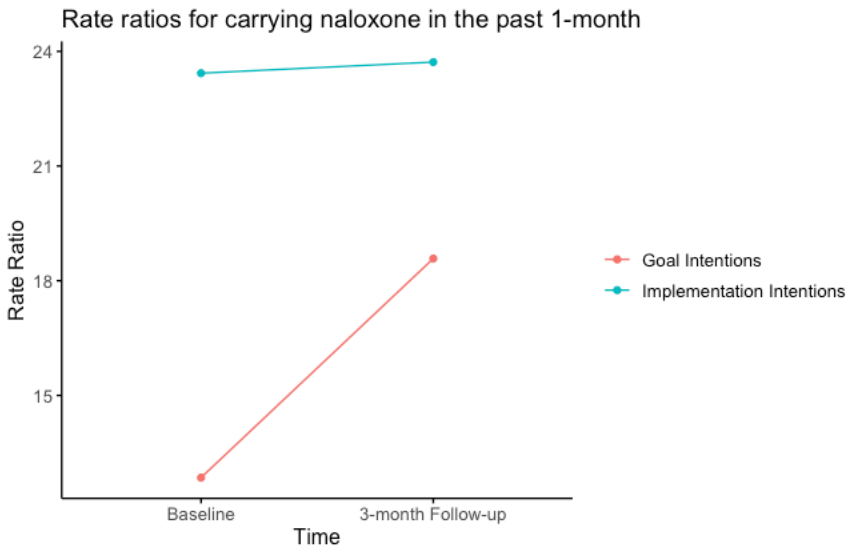


Figure 17. Change in rate ratio for carrying naloxone from baseline to 3-month follow-up

Rate ratio from baseline to 3-month follow-up by condition (n=57).

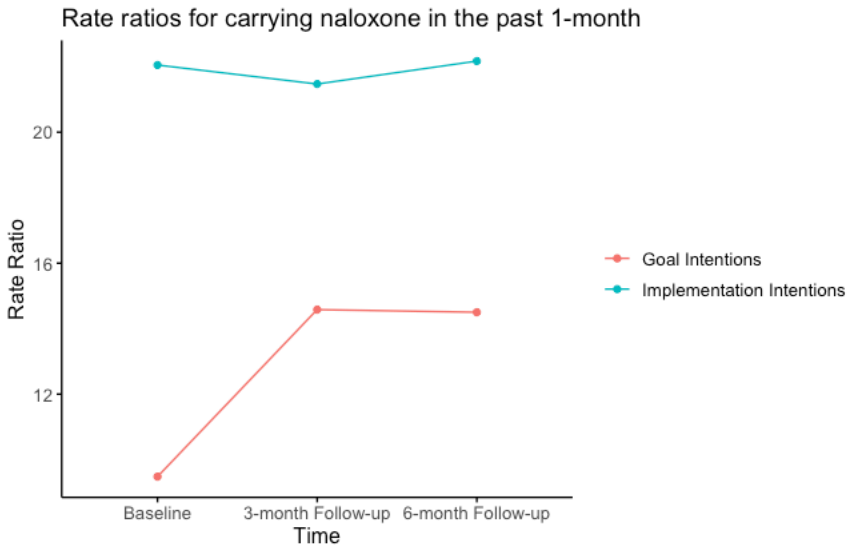


Figure 18. Change in rate ratio for carrying naloxone from baseline to 6-month follow-up

Rate ratio from baseline to 6-month follow-up by condition. Note: Only participants that completed all timepoints (n=52) were included in this analysis and figure.

5.4.4.3. Discussing naloxone in the past 1-month from baseline to 3- and 6-month follow-up

In the month prior to study enrollment (n = 57) participants in the control condition had a 73 % probability of discussing naloxone and a statistically significant rate ratio 2.70 times higher than one (RR = 2.70, 95 % CI [1.51, 4.83], p = 0.001) (**Table 10**). Participants in the experimental group had a 71 % probability of discussing naloxone and a nonsignificant but observable rate ratio 0.89 times lower than the control group (RR = 0.89, 95 % CI [0.45, 1.75], p = 0.732) (**Figure 19**).

At the 3-month follow-up (n = 57) the control group had a 78 % probability of discussing naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 3.45 (RR = 1.28, 95 % CI [0.74, 2.21], p = 0.380). The experimental group had an 79 % probability of discussing naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 3.80 (RR = 1.24, 95 % CI [0.57, 2.72], p = 0.588).

At the 6-month follow-up (n = 52) the experimental group had an 85 % probability of discussing naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 5.49 (RR = 1.80, 95 % CI [0.81, 4.00], p = 0.150). The control group had a 75 % probability of discussing naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 3.04 (RR = 1.10, 95 % CI [0.62, 1.93], p = 0.747) (**Figure 20**).

Table 10. Generalized linear mixed effects model of discussing naloxone (1-month)

	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=57)							
Intercept	2.70	1.51	4.83	0.99	0.30	3.35	0.001*
Condition	0.89	0.45	1.75	-0.12	0.35	-0.34	0.732
Timepoint	1.28	0.74	2.21	0.24	0.28	0.88	0.380
Condition x Timepoint	1.24	0.57	2.72	0.22	0.40	0.54	0.588
Baseline to 6-months (n=52)							
Intercept	2.77	1.67	4.58	1.02	0.26	3.95	7.72e-05*
Condition	1.01	0.49	2.06	0.01	0.37	0.01	0.988
Timepoint 1	1.25	0.71	2.22	0.23	0.29	0.78	0.438
Timepoint 2	1.10	0.62	1.93	0.09	0.29	0.32	0.747
Condition x Timepoint 1	1.12	0.50	2.50	0.11	0.41	0.27	0.784
Condition x Timepoint 2	1.80	0.81	4.00	0.59	0.41	1.44	0.150

*p-value is < 0.05

RR; rate ratio, SE; standard error

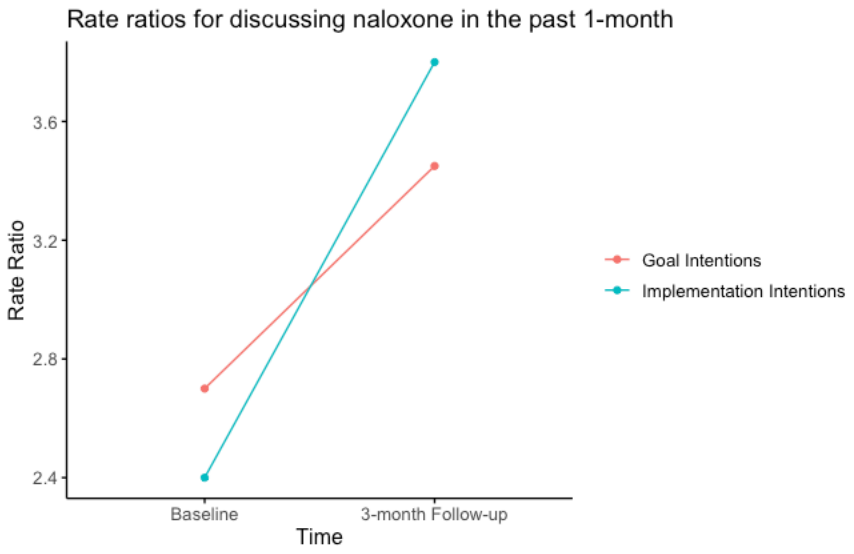


Figure 19. Change in rate ratio for discussing naloxone from baseline to 3-month follow-up

Rate ratio from baseline to 3-month follow-up by condition (n=57).

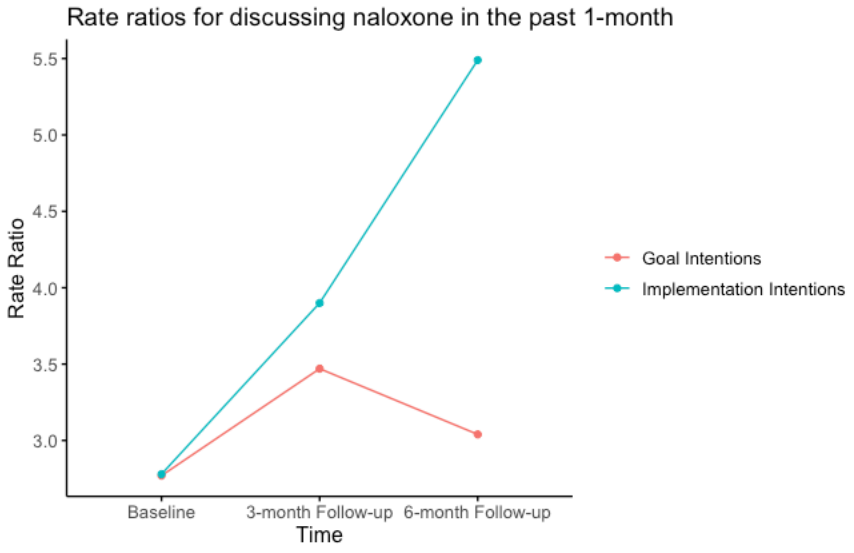


Figure 20. Change in rate ratio for discussing naloxone from baseline to 6-month follow-up

Rate ratio from baseline to 6-month follow-up by condition. Note: Only participants that completed all timepoints (n=52) were included in this analysis and figure.

5.4.4.4. Administering naloxone in the past 1-month from baseline to 3- and 6-month follow-up

In the month prior to study enrollment (n = 57) participants in the control condition had a 21 % probability of administering naloxone and a nonsignificant but observable rate ratio 0.26 times lower than one (RR = 0.26, 95 % CI [0.07, 1.05], p = 0.058) (**Table 11**). Participants in the experimental group had a 20 % probability of administering naloxone and an observable rate ratio 0.96 times less than the control group (RR = 0.96, 95 % CI [0.27, 3.38], p = 0.950) (**Figure 21**).

At the 3-month follow-up (n = 57) the control group had a 23 % probability of administering naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 0.30 (RR = 1.14, 95 % CI [0.34, 3.75], p = 0.835). The experimental group had a 13 % probability of administering naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 0.14 (RR = 0.50, 95 % CI [0.08, 3.12], p = 0.462).

At the 6-month follow-up (n = 52) the experimental group had a 55 % probability of administering naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 1.23 (RR = 3.97, 95 % CI [0.81, 19.41], p = 0.088). The control group had a 22 % probability of administering naloxone and a nonsignificant but observable change in the magnitude of the rate ratio to 0.27 (RR = 0.82, 95 % CI [0.25, 2.67], p = 0.741) (**Figure 22**).

Table 11. Generalized linear mixed effects model of administering naloxone (1-month)

	RR	***2.5 %***	***97.5 %***	***b***	***SE***	***z***	***p***
Baseline to 3-months (n=57)							
Intercept	0.26	0.07	1.05	-1.34	0.71	-1.89	0.058
Condition	0.96	0.27	3.38	-0.04	0.64	-0.06	0.950
Timepoint	1.14	0.34	3.75	0.13	0.61	0.21	0.835
Condition x Timepoint	0.50	0.08	3.12	-0.68	0.93	-0.74	0.462
Baseline to 6-months (n=52)							
Intercept	0.33	0.13	0.87	-1.09	0.49	-2.24	0.025*
Condition	1.13	0.34	3.70	0.12	0.61	0.20	0.841
Timepoint 1	1.28	0.42	3.88	0.25	0.57	0.44	0.662
Timepoint 2	0.82	0.25	2.67	-0.20	0.60	-0.33	0.741
Condition x Timepoint 1	0.08	0.01	0.89	-2.58	1.25	-2.06	0.040*
Condition x Timepoint 2	3.97	0.81	19.41	1.38	0.81	1.70	0.088

*p-value is < 0.05

RR; rate ratio, SE; standard error

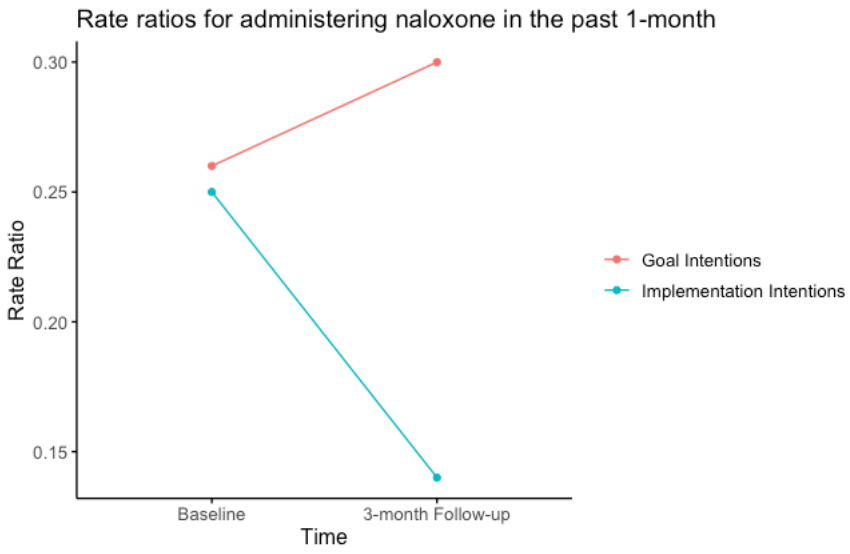


Figure 21. Change in rate ratio for administering naloxone from baseline to 3-month follow-up

Rate ratio from baseline to 3-month follow-up by condition (n=57).

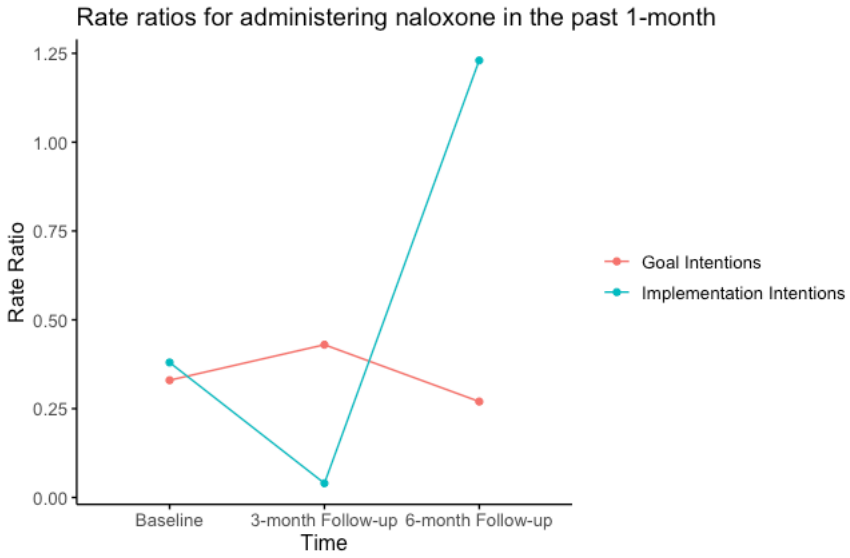


Figure 22. Change in rate ratio for administering naloxone from baseline to 6-month follow-up

Rate ratio from baseline to 6-month follow-up by condition. Note: Only participants that completed all timepoints (n=52) were included in this analysis and figure.

5.5. Discussion

Prior to data collection, it was anticipated that intentions to obtain, carry, discuss, and administer naloxone among the recruited PWUO would vary. Considering the inconsistencies in behavior reported in the literature, it was anticipated that there would be potential for enhancing intentions in the study. However, the Likert scales used to assess intentions encountered ceiling effects with most participants consistently selecting higher ratings (greater than or equal to 5). Overall, the study revealed statistically significant differences between study conditions and small effect sizes on the experimental group's intention to obtain naloxone ($\delta = 0.271$) and discuss naloxone with peers ($\delta = 0.270$) at the 3-month follow-up. Overall, there were no statistically significant reductions in intentions over time indicating that the PWUO in this study maintained positive intentions throughout. It is worth noting that scholars argue that the development of implementation intentions does not directly impact intention or motivation but acts as a bridge for implementation (Sheeran & Orbell, 1999). Therefore, the maintenance of positive intentions among participants throughout the study is crucial as it can facilitate increased implementation of naloxone.

The GLMMs conducted in this study revealed a statistically significant decrease in the experimental group's obtainment of naloxone at the 3-month timepoint. Although there were some observable changes in the magnitude of the rate ratios for obtainment, carriage, discussion, and administration of naloxone at the 3- and 6-month timepoints, these variations may be attributed to chance or other factors rather than the intervention itself. Therefore, it is crucial to interpret these findings with caution and acknowledge that the intervention did not have a statistically significant effect on the behaviors of interest in this study.

In the negative binomial model examining the probability and rate ratio of obtaining naloxone observable changes in the magnitude of implementation were made between the experimental and control groups at different time points. At the 3-month follow-up there was a statistically significant rate ratio for the interaction estimate indicating that the experimental group had a lower rate ratio compared to the control group. However, at the 6-month follow-up the experimental group had an observable change in the magnitude of both the probability and rate ratio for obtaining naloxone.

While these changes in patterns are intriguing it is unclear what factors contributed to the observed fluctuations in obtaining naloxone among the experimental and control groups. The statistically significant decrease in rate ratio at the 3-month follow-up for the experimental group may suggest a perceived lack of need for naloxone because they already had it while the control group could have a heightened and sustained perceived need because they did not have it.

In the negative binomial model analyzing the carrying of naloxone both the experimental and control groups exhibited a high probability of carrying naloxone at baseline with rates exceeding 90 %. This contrasts with the levels of carriage often reported in the literature which are lower (Burton et al., 2021). Participants frequently reported carrying naloxone in a purse or bag as well as in their vehicles during the follow-up period. While carrying naloxone in a purse or bag is considered ideal due to its proximity to the social context of drug use, carrying naloxone in a vehicle is still preferable to not having it at all. It is possible that the social context of drug use for some participants occurs inside the vehicle although specific information on the location of drug use was not collected in this study.

It is important to note that the experimental group had a statistically significant rate ratio at baseline compared to the control group despite random assignment. Despite best efforts, there

is a possibility that the distinction between carrying naloxone on oneself versus carrying it in a car may have been conflated in the data collection process. Furthermore, the experimental group participants consistently maintained observable changes in the magnitude of rate ratios for carrying naloxone over time compared to the control group. The specific reasons for these patterns and the differential rates between the study conditions remain unclear and warrant further investigation.

In the negative binomial model analyzing the discussion of naloxone both the experimental and control groups exhibited consistent and observable changes in the magnitude of rate ratios for discussing naloxone over time although these changes were not statistically significant. There was a noticeable ~10 % change in the magnitude of the probability of discussing naloxone in the past month at the 3-month follow-up for both study conditions. While the act of discussing naloxone with peers may not be extensively covered in the literature its potential significance within the social contexts of drug use highlights its relevance as an actionable behavior that can be addressed through health behavior change interventions such as implementation intentions.

It is plausible that participants may not have initially considered discussing naloxone as a behavior they frequently engage in at the baseline stage. However, through the process of articulating and recording their implementation intentions or goals specifically related to discussing naloxone their awareness of this behavior and its importance may have been heightened. By consciously focusing on when and how they discuss naloxone participants could have become more attentive to these instances and more likely to engage in discussions over time.

The literature may not extensively cover the topic of discussing naloxone with peers, but its potential role within the social context of drug use emphasizes its significance for promoting the use of naloxone. Further research is needed to explore the factors influencing the discussion of

naloxone among PWUO and to investigate the effectiveness of interventions targeting this behavior.

The results from the negative binomial model examining the administration of naloxone showed no statistically significant changes in implementation over time. However, there were observable changes in the magnitude of the rate ratios between the experimental and control groups at the 3-month and 6-month follow-ups. At the 3-month follow-up the control group had a higher probability and observable change in the magnitude of the rate ratio for administering naloxone compared to the experimental group. In contrast, at the 6-month follow-up the experimental group exhibited an observable change in the magnitude of both the probability and rate ratio for administering naloxone while the control group's probability and rate ratio remained relatively stable. It is interesting to note that this observable change in the magnitude of the rate ratio for naloxone administration among the experimental group parallels their obtainment at the 6-month follow-up.

Although the observed differences between the study conditions were not statistically significant, the fluctuations in the experimental group's probability and rate ratio of naloxone administration over time are worth noting. They suggest the possibility of varying trends in naloxone administration among participants who developed implementation intentions. However, it is important to interpret these findings with caution and consider them as exploratory observations rather than conclusive evidence of the effectiveness of the intervention. Further research and investigation are necessary to better understand the underlying factors influencing the changes in obtainment, carriage, discussion, and administration of naloxone among PWUO and to determine the true impact of implementation intentions on these behaviors.

5.6. Limitations

This longitudinal research study has several notable limitations. While it may have limitations in terms of internal validity it compensates by demonstrating strong external validity (Tebes, 2000). The study's application of implementation intentions to a vulnerable population and its focus on the use of naloxone contribute to its uniqueness and generalizability. Community-engaged research often faces challenges in maintaining high internal validity, but these limitations are justified and enhance the confidence in the study's findings. The study's findings provide valuable insights for future interventions and policies targeting similar populations and contexts.

A second limitation of this study is the lack of reminders or artifacts for participants to take home or be reminded of their implementation intentions or goal intentions (Strohmetz, 2008). This decision was made to minimize attrition rates and focus on capturing changes in obtainment, carriage, discussion, and administration of naloxone. The study aimed to evaluate improvements in behaviors rather than participants' memory recall or long-term intention maintenance. While this approach may have impacted participants' ability to consistently maintain their intentions, future research could explore the use of reminders or physical artifacts to reinforce implementation intentions for naloxone use over time. Overall, the absence of reminders or artifacts was a deliberate choice aligned with the study's objectives and design.

A third limitation of this study was the presence of attrition which is commonly encountered in longitudinal research. To address this concern the sample size was increased by 10 % to compensate for anticipated attrition and participants were offered $25 as compensation for completing the 3-month and 6-month follow-ups. The attrition rates observed in this study were relatively low with 30 % attrition from baseline to the 3-month follow-up and 10 % attrition from the 3-month to 6-month follow-up. The low attrition rates may be attributed to the rapport

established with participants, community-based partnerships with SSPs, and the additional compensation provided. These efforts aimed to maintain participant engagement and mitigate the potential impact of attrition, but it is important to acknowledge that attrition can introduce biases and limitations to the study findings.

A fourth limitation of this study pertains to the necessary corrections made to address potential errors that could affect the statistical analyses. These corrections were aimed at addressing inaccuracies and missing information, including the assignment of numerical values to qualitative responses, assuming at least one occurrence for quantity qualitative responses, correcting input errors based on participants' previous responses, and adjusting inconsistent numerical responses for consistency. While these corrections were implemented to enhance the integrity of the data, it is crucial to recognize that they may introduce a bias and an additional level of error into the analysis.

It is important to avoid manipulating participants' responses as it can be seen as fabricating data. While data fabrication did not occur directly in this dissertation, participants' data was manipulated based on the logic used to address missing data. Imputation methods, which introduce bias and error, were not employed in this study. Instead, simple logic was used to minimize the frequency and occurrence of missing data. However, it is worth noting that the method referred to as 'logical sequence error' involved data manipulation and introduced systematic bias by significantly inflating the reported frequency of the behaviors of interest. For instance, if a participant reported obtaining naloxone four times in the past month but only two times in the past three months, adjusting the past three-month count to six times would greatly increase the reported frequency of implementation.

Longitudinal data collection has the potential for systematic errors, and it is crucial to have robust methods in place to prevent or address inconsistent data. One weakness of this dissertation was providing participants with an electronic survey without measures to prevent contradictory data. Future research should consider implementing mechanisms to ensure input responses do not contradict prior responses, particularly when there is a decrease in behavior over a longer duration of time. Additionally, it may be necessary to discard fully contradictory data rather than manipulating it, as was done in this study. Finally, it is important to consider utilizing participants' data as it is, without further manipulation, once data cleaning procedures have been performed.

A fifth limitation of this study is the relatively small sample size especially considering the use of GLMMs. GLMMs typically require larger samples and observations to achieve sufficient statistical power for detecting meaningful effects. However, it is worth noting that the sample size used in this study is comparable to a previous study that employed implementation intentions and GLMMs to analyze frequency count data (Moody et al., 2018). Additionally, the sample size was like what is often observed in pilot studies utilizing GLMMs (Hertzog, 2008; Coffin et al., 2017). It is important to acknowledge that the underpowered statistical models in this study do not render the results meaningless. However, the small sample size may limit the generalizability of the findings and increase the risk of Type II errors.

A sixth limitation of this study is the ethical challenge of ensuring participants' prior exposure to an overdose which makes it impossible to directly measure the implementation of naloxone administration. In this study, intentions to administer naloxone were used as a proxy measure for actual implementation particularly for participants who remained unexposed to overdose during the study period (Ajzen, 2020). However, no significant differences in intentions were observed between the experimental and control groups. In addition to exposure, it is

important to acknowledge the potential presence of bias such as recency effect, social desirability bias, and recall bias which could have influenced participants' responses and behaviors (Nederhof, 1985; Greene, 1986; Coughlin, 1990). To address these limitations and potential bias additional de-identified data was collected from the SSPs' data collection system including information on site visits, naloxone distribution, and overdose reversal. However, the collected data was found to be insufficient and incomplete to be included in the statistical models.

A seventh limitation of this study is its geographical restriction to southwestern Virginia which may limit the generalizability of the findings to other regions or populations of PWUO. Future research could consider expanding recruitment efforts to include participants from different regions or diverse populations of PWUO to enhance the generalizability and increase the sample size. Furthermore, integrating the study measures into the existing workflow or data collection systems of SSPs could provide a more comprehensive and accurate representation of participants' behaviors and experiences over time. This approach would not only enhance the feasibility of data collection but also ensure the inclusion of a wider range of participants and settings.

5.7. Conclusion

It is crucial to acknowledge the limitations of this study as they inform future research directions. Although this study did not yield statistically significant results it contributes a unique perspective to the existing literature on implementation intentions. The findings emphasize the ongoing need for research into interventions that aim to enhance the use of naloxone among PWUO as well as the significance of establishing partnerships with community organizations to effectively engage this population. Implementation intentions while a valuable intervention present challenges in maintaining both effectiveness and internal validity.

Chapter 6 Principal findings and dissertation conclusion

6.1. Principal findings and contributions to the literature

To make a significant and lasting impact in a south-central Appalachian community a meticulous approach was adopted involving the collaboration of SSP programs and a sample of PWUO in a comprehensive and long-term research project focused on health behaviors. Building on existing health behavior literature this research aimed to examine the sequential behaviors leading to naloxone administration within the social contexts of drug use (Tobin et al., 2018). The specific behaviors investigated in this research included obtaining naloxone, carrying naloxone, discussing naloxone, and ultimately administering naloxone among PWUO. By targeting these behaviors, the study aimed to gain insights into the multifaceted aspects of naloxone use among this population. The contribution of this work to the literature is a novel application of TPB, implementation intentions, and the AACTT framework to an understudied and marginalized population of PWUO that are tasked with the social responsibility of responding to out-of-hospital opioid overdoses.

6.1.1. Sample of PWUO

The study recruited a racially and culturally homogenous sample of 83 PWUO from south-central Appalachia. The retention rates were 71 % at the 3-month follow-up with 59 participants completing the assessment and 90 % of those who completed the 3-month follow-up (53 participants) completing the full 6-month participation. The sample demonstrated diverse experiences with drug use and encounters with opioid overdoses with over 70 % of participants having treated an opioid overdose and a higher percentage reporting witnessing an overdose. Overall, prioritizing the inclusion of a marginalized and vulnerable sample of PWUO from south-central Appalachia helps to generalize the findings and strengthens the external validity.

6.1.2. Effects on obtaining naloxone

In this dissertation participants in the experimental group created specific implementation intentions to obtain naloxone at certain times and days at their respective SSPs. In contrast participants in the control group formulated goal intentions focused on maintaining their current behavior or increasing the frequency of obtaining naloxone. Surprisingly, there was a statistically significant interaction between group assignment and the 3-month follow-up self-report of naloxone obtainment. The control group exhibited an observable change in the magnitude of the rate ratio of naloxone obtainment, while the experimental group exhibited a statistically significant decrease at the 3-month follow-up. The reasons underlying these findings are not fully understood within the scope of this research, but it can be speculated that the behavior of obtaining naloxone may not be well-suited for an intervention like implementation intentions for a couple of reasons.

For example, interviews with participants from both groups indicated that they were already well-informed about the location and operating hours of the SSPs, suggesting that identifying critical situations for naloxone obtainment may not have been a necessary planning detail for PWUO. Additionally, some participants reported having a surplus of naloxone in their homes and mentioned that they did not frequently obtain it due to the abundance already stored. Therefore, an intervention targeting a behavior like obtaining naloxone may not be essential if the critical situations to obtain naloxone are already learned, an individual already has an abundance of the medication, and if an individual exhibits a positive intention. However, it is possible that individuals who do not use illicit drugs may benefit from a planning intervention like implementation intentions when obtaining naloxone. Further research is needed to explore these dynamics and shed light on the potential factors influencing naloxone obtainment behaviors among different populations.

6.1.3. Effects on carrying naloxone

In contrast to previous research, the probability of carrying naloxone was already high (over 90 %) among the sample of PWUO in this study (Burton et al., 2021). This rendered the hypothesis that implementation intentions would improve this behavior null. It is worth noting that the interpretation of carrying naloxone varied among participants. While a definition was provided, some participants considered carrying the medication in their vehicle as sufficient for fulfilling this behavior. Furthermore, the experimental group had a statistically significant rate ratio for their self-reported carriage of naloxone compared to the control condition at baseline.

Participants in the experimental group often recorded specific locations or situations when they would carry naloxone such as when traveling to a peer's home, in social situations, or in their vehicle. In contrast, participants in the control group created goal intentions to either continue carrying the medication, start carrying it, or placing it in their vehicle. It is important to acknowledge that a participant's vehicle could serve as a social context where drug use occurs although the study did not directly investigate specific locations of drug use. Therefore, any conclusions regarding these alternatives can only be speculative due to the potential variability in how drug use is carried out. However, a key finding from this study is that the creation of implementation intentions did not have a statistically significant impact on the carriage of naloxone among PWUO possibly because the participants already had a high rate of carrying naloxone.

6.1.4. Effects on discussing naloxone

The literature often overlooks the importance of discussing naloxone with peers, but this behavior was purposefully targeted in this research due to its logical significance. In the cascade of behaviors leading to naloxone administration it becomes apparent that initiating a conversation about naloxone with peers is a crucial missing component. Similar to the use of contraception for

safer sex where consent and the proper use of contraception devices are emphasized, discussing naloxone with peers may need to be considered a critical health behavior to address through interventions like implementation intentions. Such discussions can increase awareness, promote preparedness, and potentially reduce harm. By encouraging open dialogue and knowledge sharing among peers, individuals can enhance their understanding of naloxone, its availability, and its life-saving potential, ultimately contributing to a safer drug-using environment.

Participants in the experimental group frequently recorded specific occasions, often in social drug-use settings and prior to drug consumption, where they intended to engage in discussions about naloxone with their peers. On the other hand, participants in the control group recorded goal-directed behaviors such as seeking further education on naloxone and sharing their personal overdose experiences. The discussions on naloxone among participants followed two main paths: (1) sharing the location or presence of naloxone in social drug-use contexts, and (2) sharing personal experiences of recent overdoses, emphasizing the importance of having naloxone readily available in drug-related environments. Notably, the discussion of naloxone among PWUO showed observable changes in the magnitude of the rate ratio throughout the study, regardless of the experimental condition. At the 3-month follow-up, there was an observed approximately 10 % change in the probability of engaging in discussions about naloxone among participants. These findings suggest that the intervention, specifically the use of implementation intentions, could influence the behavior of discussing naloxone with peers.

6.1.5. Effects on administering naloxone

In this study, the administration of naloxone, being an unpredictable event, was expected to be improved with implementation intentions. However, the analysis revealed nonsignificant but observable changes in the magnitude of the rate ratios for the administration of naloxone

throughout the study. This suggests that implementation intentions may not effectively target this behavior, or the intervention is not strong enough to sustain impact at 1-month, 3-months, or 6-months.

It was found that participants already displayed sufficient knowledge of overdose signs and symptoms which they often recorded in their implementation intentions or goal intentions. These findings suggest that implementation intentions may be more effective for behaviors preceding naloxone administration in the cascade of events such as obtaining naloxone or discussing it with peers. Additionally, emphasizing education on overdose recognition and the necessary skills for intervention may continue to enhance the engagement of PWUO in naloxone use.

6.2. Strengths and weaknesses of the dissertation

6.2.1. Strengths

6.2.1.1. Community engagement

A major strength of this research project is its innovative methodology and its application in a real-world context which enhances the potential for generalizability of implementation intentions. One notable aspect is the inclusion of strong community research partnerships which addresses a common oversight by academic institutions (Glover & Silka, 2013). Traditional academic research often fails to fully engage with community organizations and stakeholders resulting in a disconnect between research findings and the realities of the community (Silka, 1999; Silka, 2006). This research project actively collaborated with community partners, recognizing their invaluable expertise, and lived experiences. By involving community organizations in the research process this project ensures that the findings are more applicable and relevant to the target population in south-central Appalachia. The engagement of community research partnerships not only strengthens the research process but also enhances the potential for sustainable impact and effective interventions in the community. Furthermore, the inclusion of these partnerships fosters a sense of ownership and collaboration, empowering community members to actively participate in research and contribute their insights and perspectives (Silka et al., 2008).

Sustaining community engagement efforts was important in this project, as it aimed to introduce community partners to future avenues of research that were mutually beneficial and went beyond transactional interactions. The project provided an opportunity for community partners to engage in research that was meaningful and addressed their needs. For future researchers interested in translating implementation intentions to the community setting, it is crucial to prioritize community engagement throughout the research process. This requires ongoing communication, active collaboration, and a commitment to respecting and valuing the contributions of community

partners. Through these efforts, future researchers can further advance the translation of implementation intentions into real-world community settings.

6.2.1.2. Recruitment of PWUO and retention

Engaging PWUO in research is indeed a challenging task but the strong community partnerships established in this study played a crucial role in facilitating access to this vulnerable population (El-Bassel et al., 2021). These partnerships helped establish trust and rapport with PWUO and helped to keep them engaged in the study (Treloar et al., 2016). The high retention rates observed at the 3- and 6-month follow-ups with 64 % of participants (53 out of 83) completing the entire study are a testament to the effectiveness of these community partnerships. The high retention rate of PWUO participants not only ensured the availability of valuable contextual information on the use of naloxone but also enhanced the external validity of conducting research in south-central Appalachia (Tebes, 2000).

Recruiting PWUO in south-central Appalachia posed additional challenges due to the cultural context and specific characteristics of the region. However, the researcher's deep familiarity with the local culture and their understanding of the unique needs and sensitivities of the population added a tailored purpose to the research project (Hockey, 1993; Huttlinger, 2013; Elder et al., 2018; Purnell & Fenkl, 2019). This cultural competency was instrumental in designing the study in a way that resonated with the participants and created an environment of understanding and collaboration. The findings from this study can be more confidently generalized to similar populations in the region thanks to the robust representation and engagement of the target population.

6.2.1.3. Translational research

This dissertation took important strides in bridging the gap between theory and practice by carefully translating extensive prior empirical research and behavior change theory into a pragmatic and real-world setting. The resulting intervention was thoughtfully tailored to meet the specific needs and characteristics of PWUO and increased the likelihood of its effectiveness and relevance in addressing the use of naloxone in this population. This approach fostered a meaningful connection between theoretical concepts and their practical application which helped to enhance the relevance and applicability of the study's findings.

Throughout the study there was an initial belief that the behaviors of interest could be effectively addressed using implementation intentions within the AACTT framework in a real-world setting. However, the analysis revealed significant challenges in targeting these behaviors within the complex context of real-world situations despite the behaviors themselves being considered discrete. This realization prompts important questions and opens the door to critique the applicability of the TPB, implementation intentions, and the AACTT framework in such contexts. These theories and frameworks often focus on individualistic behaviors that are relatively simpler in nature and used as examples in their application. However, targeting health behaviors particularly in the context of illegal drug use and harm reduction can present challenges to the real-world application of these theories and frameworks.

The behaviors investigated in this study are intricately connected to societal pressures and stigmatizations, making them challenging to address through traditional behavioral interventions. These behaviors extend beyond individual actions and are influenced by broader social contexts. For instance, discussing naloxone with peers who use opioids may be more effective within a specific group where shared experiences and understanding exist. These behaviors are embedded in complex social dynamics that cannot be easily tackled through simplistic interventions. It is

crucial to adopt a comprehensive approach that considers the larger social, cultural, and systemic factors that shape these behaviors (Saloner et al., 2018). Recognizing naloxone administration as a multifaceted social responsibility is essential. The social complexity surrounding overdose response impacts people's behavior and reactions during overdose situations emphasizing the need for substantive efforts in obtaining and applying this social role. Moreover, addressing the actions leading up to a possible overdose and those involved in overdose response is crucial for effective interventions.

In conclusion, the findings suggest that while implementation intentions and the AACTT framework can be effective for targeting specific discrete behaviors, they may have limitations when applied to complex behaviors influenced by societal pressures and stigmatizations. Future research should focus on developing more holistic approaches that consider the multifaceted nature of these behaviors and address the underlying structural factors that contribute to their complexity. Additionally, given the intersection of this novel research and the complexities of translational research, incorporating autoethnographic techniques alongside primary data collection may offer valuable insights into the gaps in translation that researchers may encounter throughout the study duration (Steketee et al., 2020).

6.2.2. Weaknesses

6.2.2.1. Piggyback interviewing and breaking randomization

Deviation from the randomization protocol in experimental research has significant implications for internal validity and generalizability. Such deviations introduce substantial bias to hypothesis tests and associated statistical analyses, diminishing the likelihood that intervention effectiveness cannot be attributed to chance or other factors. Adjusting group assignment may result in the inclusion of participants who are more responsive to the intervention, compromising

the control established by randomization. Consequently, these deviations introduce systematic bias that cannot be fully accounted for in the completed research, highlighting a noteworthy weakness of the dissertation.

Interviewing participants together can influence the information shared during an interview designed to elicit individual and specific behaviors. Conducting interviews with two participants simultaneously can introduce conformity bias and social desirability more than when conducting individual interviews. Participants may not share their own insights if another participant is present who shares or answers more dominantly. Overall, participants may conform to what the additional participant is stating, even though their true behavior may differ.

The development of intentions by paired participants can also introduce conformity or social desirability bias. Participants who develop intentions together may deviate the intervention away from changing individual-level behaviors. Additionally, participants who develop intentions together may have different intentions, which are not captured in the paired development process. Overall, paired development of intentions reduces the likelihood that intervention effectiveness cannot be attributed to random chance or other factors. It is possible that paired development increases participants' awareness of the need to implement the desired behaviors, or vice versa.

Furthermore, piggyback interviews and paired development of intentions strongly influence the data collected. Participants interviewed together may limit the data collected from one participant, as the other individual present might dominate the interview and intention development process or prevent the person from providing their true insights.

In conclusion, there are several opportunities for refinement of this research, particularly in the context of multiple recruitment sites. It is crucial to maintain the randomization protocol to ensure tests for intervention effectiveness could not be attributed to random chance or other factors.

Conducting separate interviews with participants should be prioritized to minimize biases introduced by interviewing participants together. If deviations from the randomization process are made, they must be acknowledged and considered when interpreting the results of intervention effectiveness. Finally, conducting community engaged research requires tradeoffs between internal and external validity, and it is important to clearly articulate research questions that can be addressed in complex and uncontrolled environments.

6.2.2.2. Sample size

While this dissertation demonstrated significant strengths in terms of external validity and community engagement it is important to acknowledge the limitations that affected the internal validity and the ability to detect significant effects of implementation intentions on obtainment, carriage, discussion, and administration of naloxone. One such limitation is the relatively small sample size used in the GLMM analyses and unequal samples recruited from the mobile outreach and fixed site SSP which may have reduced the statistical power to detect significant findings. Despite the limitations posed by the sample size in this study it is important to note that the retained sample size aligns with similar research studies that have utilized implementation intentions and conducted pilot feasibility studies (Hertzog, 2008; Coffin et al., 2017; Moody et al., 2018). Coffin et al. (2017) and Moody et al. (2018) highlights the challenges inherent in recruiting and retaining vulnerable populations for research purposes and conducting studies in real-world settings.

To address the non-normal distribution of the collected data GLMMs were employed which provide a suitable approach for analyzing count or frequency data with repeated measures. While an *a priori* power analysis was conducted based on previous studies using traditional statistical methods, conducting a *post hoc* power analysis was unfeasible due to the relative novelty of the modeling methods used and the complexities involved in accurately calculating power in

such cases (Kumle et al., 2021). Acknowledging the practical considerations and limitations faced by researchers it is important to emphasize the need for further research with larger sample sizes and refined methodologies to enhance the generalizability and robustness of the findings in the context of targeting complex behaviors in real-world settings.

6.2.2.3. Dosage strength

It is possible that the interview to develop implementation intentions was an intervention, and therefore the nuance of implementation intentions was lost. Given the lack of volitional help sheets to develop implementation intentions for naloxone use, the AACTT framework was chosen as a novel tool to assist with their creation. Therefore, an interview was necessary to help participants construct their implementation intentions. Perhaps the AACTT framework served as an extra dose or higher intensity exercise for PWUO to successfully link critical situations to behaviors. Overall, development of implementation intentions may require a more intense exercise or to be compared to the lack of an interview to develop goal intentions or implementation intentions.

6.2.2.4. Long-term behavior change

The objective of this study was to promote lasting behavior change by focusing on planning and engagement in key behaviors related to naloxone use. The behaviors of obtaining, carrying, discussing, and administering naloxone were specifically targeted to facilitate behavior change among individuals who use opioids and those who may encounter overdose situations. Implementation intentions were employed as a tool to support the adoption and execution of these behaviors. However, despite the efforts no significant long-term behavior changes were observed, which highlights the need to carefully select and target behaviors that are susceptible to intervention. It is possible that while the behaviors themselves may be suitable for intervention the

tools used to record behavioral intentions may not be adequately designed for complex behaviors in real-world settings. Further research is necessary to explore alternative strategies and approaches that effectively address the challenges associated with promoting behavior change in such contexts.

It is important to recognize that sustaining behavior change over time is often challenging (Bouton, 2014). Individuals may face various barriers, relapse risks, or fluctuations in motivation that can attenuate the desired changes. However, harm reduction programs such as SSPs can play a crucial role in supporting and reinforcing continued engagement in naloxone-related behaviors (Saloner et al., 2018).

SSPs are well-positioned to provide ongoing support and education on obtaining, carrying, and discussing naloxone (Strike & Miskovic, 2018; Iyengar et al., 2019; CDC, 2020; Lancaster et al., 2020). They can serve as a reliable resource for individuals to access naloxone, receive guidance on its proper use, and engage in discussions about its availability and importance within their social networks. By fostering a culture of naloxone awareness and accessibility, SSPs contribute to mitigating the impact of the opioid epidemic and saving lives (Saloner et al., 2018). While sustained behavior change may be challenging, the continued involvement of SSPs can help maintain and reinforce the desired behaviors related to naloxone use. By offering a supportive environment, education, and access to resources, SSPs can help individuals navigate the complexities of naloxone engagement and increase the likelihood of long-term behavior change.

6.2.2.5. Intervention reminders and follow-ups

A notable weakness to acknowledge in this dissertation is the lack of reminders for participants regarding their implementation intentions or goal intentions at the follow-up stage. This can be considered a methodological flaw often referred to as an artifact in psychology

research (Strohmetz, 2008). There are several factors that contribute to the feasibility challenges of implementing reminders in this study.

Firstly, it is difficult to ensure that participants, particularly those in active addiction, remember what they wrote or the reasons behind their intentions. The nature of addiction can affect memory and cognitive functioning, making it unreliable to assume participants would recall their intentions accurately.

Secondly, it is important to clarify that the primary focus of this research was not to improve implementation intentions but rather to examine the impact, if any, that the development of implementation intentions had on the use of naloxone. Therefore, the study design did not prioritize the implementation intention reminders as a means of intervention or improvement.

Lastly, the diverse methods of completing the follow-up including electronic options such as text or email, as well as in-person interactions with the SSP staff further complicate the feasibility of providing reminders. With multiple options available, ensuring that participants across all modalities are reminded of their intentions would be logistically challenging. Additionally, there may be benefits to reinforcing, celebrating, or rewarding completion of goals or implementation intentions.

While the lack of reminders may limit the internal validity of the research it aligns with the real-world conditions and challenges faced in a community setting thereby potentially enhancing the generalizability and applicability of the findings to similar contexts.

6.3. Unanswered questions and future research

The utilization of implementation intentions to influence behavior has shown promise in various domains, but its application in substance use disorder and mental health research remains limited (Toli et al., 2016). Given the inconsistent rates of naloxone ownership, carriage, and other aspects of the naloxone cascade, implementing an intervention based on implementation intentions could potentially enhance these behaviors among PWUO. The present study aimed to investigate whether the development of implementation intentions, utilizing the AACTT framework, would improve intentions and actual implementation of naloxone among PWUO at 3- and 6-month follow-ups.

The application of the AACTT framework in this context represents a novel approach that provides a logical sequence for PWUO to develop implementation intentions specifically for naloxone use. The hypothesis was that participants who developed implementation intentions would exhibit improved *intentions* to use naloxone and increased *implementation* of naloxone compared to those who developed goal intentions. While previous research has demonstrated medium-to-large effect sizes for implementation intentions in other contexts (Gollwitzer & Sheeran, 2006) no studies have explored the use of this behavior change intervention specifically for the use of naloxone among PWUO.

The existing health behavior literature on naloxone use has predominantly focused on naloxone distribution sites and the evaluation of knowledge and attitudes (Perri & Strike, 2020). However, the mere presence and availability of naloxone does not guarantee its implementation and sustained use among PWUO. Therefore, the current research project aimed to study the impact of implementation intentions on the use of naloxone, contribute to building research capacity within SSPs and similar settings, and provide an evidence-based strategy to promote the adoption

and implementation of naloxone among PWUO. Ultimately, the findings of this research project have the potential to inform future interventions, improve harm reduction efforts, and contribute to saving lives in the context of the opioid epidemic.

An intervention, like the one used in this dissertation may fail to be effective for a range of reasons and it is important to acknowledge and address these limitations to improve future research and interventions. Below is a list of additional considerations:

6.3.1. Theory and framework selection

Investigating multiple theories and frameworks and their diverse applications across contexts can offer valuable insights for adapting them to novel research inquiries or populations. Although the TPB, implementation intentions, and the AACTT framework were employed in this study, it is worthwhile to explore additional theories and frameworks that have the potential to enhance complex behaviors associated with drug use and harm reduction in real-world settings. In the context of improving obtainment, carriage, discussion, and administration of naloxone, future research could examine theories that focus on the risk environment, such as Rhodes' risk environment framework (2002, 2009) and Ibragimov et al.'s conceptualizations (2020), or just-in-time adaptive interventions (Nahum-Shani et al., 2014; Nahum-Shani et al., 2018). Furthermore, a different framework may be preferred for a higher health literacy population. By considering these alternative perspectives researchers can broaden their understanding and potentially develop more effective interventions for promoting harm reduction and optimizing naloxone utilization.

6.3.2. Behavior change technique and operationalization

While implementation intentions have demonstrated potential in facilitating behavior change it is crucial to acknowledge that their effectiveness may vary across individuals and behaviors. Future research should explore and compare different behavior change techniques to

continue advancing the field and consider their suitability for specific populations and behaviors. For instance, conducting studies that examine the outcomes of participants using the AACTT framework to develop implementation intentions compared to those using alternative methods or adaptations of volitional help sheets could yield valuable insights into their relative effectiveness. By expanding the scope of investigation researchers can enhance society's understanding of behavior change strategies and tailor interventions to maximize their impact.

6.3.3. Intervention fidelity

The delivery of the intervention and its intensity can impact its effectiveness (O'Carroll, 2014; Dombrowski et al., 2016). It is important to ensure that the techniques employed in the intervention are delivered at an appropriate intensity and in a manner that effectively translates the concept of implementation intentions to the target population. Consideration should be given to alternative methods of developing implementation intentions and incorporating reminders to promote their use (Chapman & Armitage, 2010; Cooke et al., 2023).

The primary focus of this research was to evaluate the effectiveness of implementation intentions in enhancing naloxone use. However, it is essential to recognize that additional factors, including intervention packaging and delivery, may contribute to the overall effectiveness of the intervention. To further explore this, future research should consider investigating the concept of "*program drift*" or "*voltage drop*" within the context of implementation intentions (Chambers et al., 2013). This would involve examining changes in program delivery or the level of implementation over time, providing valuable insights into the dynamics and sustainability of the intervention.

6.3.4. Evaluation timepoints and follow-up period

The timing of evaluations and the length of the follow-up period can impact the identification of behavior changes. Although the follow-up timepoints in this study may have been distant the retrospective assessment of behavior implementation over the preceding months offered a comprehensive view of changes over time. Future research could incorporate additional evaluation timepoints and modify the duration of the follow-up period to capture more immediate changes in behavior implementation. Additionally, it is important for future studies to consider integrating data collection or enhancing transparency with SSPs to improve the accuracy and reliability of the findings. By addressing these considerations researchers can strengthen the validity and timeliness of their assessments that could lead to more robust insights into behavior change and harm reduction.

6.3.5. Target population

It is important to consider the diversity within the target population and explore how behavior change models may differ among different racial and ethnic groups (Khan et al., 2023). Additionally, considering the factors related to naloxone carriage such as access, personal experience, comfort with administration, and societal influences, can inform strategies to promote its adoption and availability (Spadaro et al., 2023). Furthermore, collaboration with medication-assisted treatment programs and the inclusion of high-risk areas known for drug use could enhance the effectiveness and reach of interventions (Schneider et al., 2022; Kozak et al., 2023).

6.4. Conclusion

Designing implementation interventions often requires considering trade-offs between desirable and less desirable activities, as well as the practical logistics of delivery in routine general practice (Edwards et al., 2023b). One approach to address these considerations is incorporating contextual details into training programs. For instance, providing harm reduction leaders with tools to effectively convey the concept of implementation intentions in a brief and concise manner could support the role adequacy and legitimacy needed by PWUO. Educational materials could include practical information about critical locations and times for engaging in naloxone-related behaviors, enabling individuals to develop clear plans, and be prepared in real-world situations. This approach bridges the gap between intention and action, fostering sustained engagement in the use of naloxone among individuals who use opioids and ultimately contributing to harm reduction efforts. The proactive nature of this approach supports a culture of safety and empowerment within this population.

In summary, it is important to acknowledge that the smaller sample size of this dissertation limits the internal validity and generalizability of the statistically significant findings. Nonetheless, this research provides valuable insights to the field by shedding light on the realities and complexities of conducting research with PWUO and implementing it in a pragmatic setting (Tebes, 2000). The findings contribute to a broader understanding of the use of naloxone and the relevance of implementation intentions in this population, particularly by emphasizing the significance of community partnerships and the experiences of PWUO in south-central Appalachia. To enhance the effectiveness of future research and interventions, it is crucial to address these limitations and consider the diverse factors influencing behavior change. By doing so, we can further improve harm reduction efforts and potentially save lives.

Bibliography

Achtziger, A., Gollwitzer, P. M., & Sheeran, P. (2008). Implementation intentions and shielding goal striving from unwanted thoughts and feelings. Personality and Social Psychology Bulletin, 34(3), 381-393. doi: 10.1177/0146167207311201

Ahmad FB, Cisewski JA, Rossen LM, Sutton P. (2023). Provisional drug overdose death counts. National Center for Health Statistics. Updated February 15, 2023. Available at: https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm

Ajzen, I., Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs.

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In: Kuhl, J., Beckmann, J. (eds) Action Control. SSSP Springer Series in Social Psychology. Springer, Berlin, Heidelberg. doi: 10.1007/978-3-642-69746-3_2

Ajzen, I. (1991). The theory of planned behavior. Organizational behavior and human decision processes, 50(2), 179-211. doi: 10.1016/0749-5978(91)90020-T

Ajzen, I., Czasch, C., & Flood, M. G. (2009). From intentions to behavior: Implementation intention, commitment, and conscientiousness 1. Journal of applied social psychology, 39(6), 1356-1372. doi: 10.1111/j.1559-1816.2009.00485.x

Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. Psychology & health, 26(9), 1113-1127. doi: 10.1080/08870446.2011.613995

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. Human Behavior and Emerging Technologies, 2(4), 314-324. doi: 10.1002/hbe2.195

Akoglu, H. (2018). User's guide to correlation coefficients. Turkish journal of emergency medicine, 18(3), 91-93. doi: 10.1016/j.tjem.2018.08.001

Alexander, M. (2010). The new Jim Crow: Mass incarceration in the age of colorblindness. The New Press. ISBN: 978-1-59558-643-8

Allison, A. L., Baird, H. M., Lorencatto, F., Webb, T. L., & Michie, S. (2022). Reducing plastic waste: A meta-analysis of influences on behaviour and interventions. Journal of Cleaner Production, 134860. doi: 10.1016/j.jclepro.2022.134860

Altman, D. G., & Bland, J. M. (1999). How to randomise. BMJ, 319(7211), 703-704. doi: 10.1136/bmj.319.7211.703

American Psychiatric Association. (1980). Diagnostic and statistical manual of mental disorders (Vol. 3). Washington, DC: American Psychiatric Association.

Anderson, E., & McNair, L. (2018). Ethical issues in research involving participants with opioid use disorder. Therapeutic innovation & regulatory science, 52, 280-284. doi: 10.1177/2168479018771682

Arden, M. A., & Armitage, C. J. (2012). A volitional help sheet to reduce binge drinking in students: a randomized exploratory trial. Alcohol and alcoholism, 47(2), 156-159. doi: 10.1093/alcalc/agr164

Armitage, C. J. (2008). A volitional help sheet to encourage smoking cessation: A randomized exploratory trial. Health Psychology, 27(5), 557–566. doi: 10.1037/0278-6133.27.5.557

Armitage, C. J., & Arden, M. A. (2010). A volitional help sheet to increase physical activity in people with low socioeconomic status: a randomised exploratory trial. Psychology and Health, 25(10), 1129-1145. doi: 10.1080/08870440903121638

Armitage, C. J., & Arden, M. A. (2012). A volitional help sheet to reduce alcohol consumption in the general population: a field experiment. Prevention Science, 13, 635-643. doi: 10.1007/s11121-012-0291-4

Armitage, C. J., Norman, P., Noor, M., Alganem, S., & Arden, M. A. (2014). Evidence that a very brief psychological intervention boosts weight loss in a weight loss program. Behavior Therapy, 45(5), 700-707. doi: 10.1016/j.beth.2014.04.001

Armitage, C. J. (2015). Field experiment of a very brief worksite intervention to improve nutrition among health care workers. Journal of behavioral medicine, 38, 599-608. doi: 10.1007/s10865-015-9634-5

Armitage, C. J., Rahim, W. A., Rowe, R., & O'Connor, R. C. (2016). An exploratory randomised trial of a simple, brief psychological intervention to reduce subsequent suicidal ideation and behaviour in patients admitted to hospital for self-harm. The British Journal of Psychiatry, 208(5), 470-476. doi: 10.1192/bjp.bp.114.162495

Armitage, C. J. (2016). Evidence that implementation intentions can overcome the effects of smoking habits. Health Psychology, 35(9), 935–943. doi: 10.1037/hea0000344

Aspinall, E. J., Nambiar, D., Goldberg, D. J., Hickman, M., Weir, A., Van Velzen, E., Palmateer, N., Doyle, J. S., Hellard, M. E., & Hutchinson, S. J. (2014). Are needle and syringe programmes associated with a reduction in HIV transmission among people who inject drugs: a systematic review and meta-analysis. International journal of epidemiology, 43(1), 235-248. doi: 10.1093/ije/dyt243

Atkins, D. C., Baldwin, S. A., Zheng, C., Gallop, R. J., & Neighbors, C. (2013). A tutorial on count regression and zero-altered count models for longitudinal substance use data. Psychology of Addictive Behaviors, 27(1), 166–177. doi: 10.1037/a0029508

Baayen, R. H., Davidson, D. J., & Bates, D. M. (2008). Mixed-effects modeling with crossed random effects for subjects and items. Journal of Memory and Language, 59(4), 390–412. doi: 10.1016/j.jml.2007.12.005

Bagley, S. M., Schoenberger, S. F., Waye, K. M., & Walley, A. Y. (2019). A scoping review of post opioid-overdose interventions. Preventive Medicine, 128, 105813. doi: 10.1016/j.ypmed.2019.105813

Ballantyne, J. C., & LaForge, K. S. (2007a). Opioid dependence and addiction during opioid treatment of chronic pain. Pain, 129(3), 235-255. doi: 10.1016/j.pain.2007.03.028

Ballantyne, J. C. (2007b). Regulation of opioid prescribing. BMJ, 334(7598), 811-812. doi: 10.1136/bmj.39175.458275.BE

Banjo, O., Tzemis, D., Al-Qutub, D., Amlani, A., Kesselring, S., & Buxton, J. A. (2014). A quantitative and qualitative evaluation of the British Columbia Take Home Naloxone program. Canadian Medical Association Open Access Journal, 2(3), E153-E161. doi: 10.9778/cmajo.20140008

Bascou, N. A., Haslund-Gourley, B., Amber-Monta, K., Samson, K., Goss, N., Meredith, D., Friedman, A., Needleman, A., Kumar, V. K., & Fischer, B. D. (2022). Reducing the stigma surrounding opioid use disorder: evaluating an opioid overdose prevention training program applied to a diverse population. Harm reduction journal, 19(1), 5. doi: 10.1186/s12954-022-00589-6

Bazeley, P. (2018). Complementary analysis of varied data sources. Integrating Analyses in Mixed Methods Research; SAGE Publications Ltd.: Thousand Oaks, FL, USA, 91-125. doi: 10.4135/9781526417190

Behar, E., Santos, G. M., Wheeler, E., Rowe, C., & Coffin, P. O. (2015). Brief overdose education is sufficient for naloxone distribution to opioid users. Drug and alcohol dependence, 148, 209-212. doi: 10.1016/j.drugalcdep.2014.12.009

Behrends, C. N., Gutkind, S., Winkelstein, E., Wright, M., Dolatshahi, J., Welch, A., Paone, D., Kunins, H. V., & Schackman, B. R. (2022). Costs of opioid overdose education and naloxone distribution in New York City. Substance abuse, 43(1), 692-698. doi: 10.1080/08897077.2021.1986877

Bélanger-Gravel, A., Godin, G., & Amireault, S. (2013). A meta-analytic review of the effect of implementation intentions on physical activity. Health psychology review, 7(1), 23-54. doi: 10.1080/17437199.2011.560095

Bennett, A. S., Freeman, R., Des Jarlais, D. C., & Aronson, I. D. (2020). Reasons people who use opioids do not accept or carry no-cost naloxone: qualitative interview study. JMIR formative research, 4(12), e22411. doi: 10.2196/22411

Bennett, A. S., & Elliott, L. (2021). Naloxone's role in the national opioid crisis—past struggles, current efforts, and future opportunities. Translational Research, 234, 43-57. doi: 10.1016/j.trsl.2021.03.001

Berger, R. (2015). Now I see it, now I don't: Researcher's position and reflexivity in qualitative research. Qualitative research, 15(2), 219-234. doi: 10.1177/1468794112468475

Bessen, S., Metcalf, S. A., Saunders, E. C., Moore, S. K., Meier, A., McLeman, B., Walsh, O., & Marsch, L. A. (2019). Barriers to naloxone use and acceptance among opioid users, first responders, and emergency department providers in New Hampshire, USA. International Journal of Drug Policy, 74, 144-151. doi: 10.1016/j.drugpo.2019.09.008

Bieleke, M., Legrand, E., Mignon, A., & Gollwitzer, P. M. (2018). More than planned: Implementation intention effects in non-planned situations. Acta Psychologica, 184, 64-74. doi: 10.1016/j.actpsy.2017.06.003

Bieleke, M., & Keller, L. (2021). Individual differences in if-then planning: Insights from the development and application of the If-Then Planning Scale (ITPS). Personality and Individual Differences, 170, 110500. doi: 10.1016/j.paid.2020.110500

Bieleke, M., Keller, L., & Gollwitzer, P. M. (2021). If-then planning. European Review of Social Psychology, 32(1), 88-122. doi: 10.1080/10463283.2020.1808936

Bland, J. M., & Altman, D. G. (1995). Multiple significance tests: the Bonferroni method. Bmj, 310(6973), 170. doi: 10.1136/bmj.310.6973.170

Boeri, M., & Lamonica, A. K. (2020). Naloxone perspectives from people who use opioids: findings from an ethnographic study in three states. Journal of the American Association of Nurse Practitioners, 33(4), 294. doi: 10.1097/JXX.0000000000000371

Boisgontier, M. P., & Cheval, B. (2016). The anova to mixed model transition. Neuroscience & Biobehavioral Reviews, 68, 1004-1005. doi: 10.1016/j.neubiorev.2016.05.034

Bouton, M. E. (2014). Why behavior change is difficult to sustain. Preventive medicine, 68, 29-36. doi: 10.1016/j.ypmed.2014.06.010

Boyer, E. W. (2012). Management of opioid analgesic overdose. New England Journal of Medicine, 367(2), 146-155. doi: 10.1056/NEJMra1202561

Brandstätter, V., Lengfelder, A., & Gollwitzer, P. M. (2001). Implementation intentions and efficient action initiation. Journal of personality and social psychology, 81(5), 946. doi: 10.1037/0022-3514.81.5.946

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101. doi: 10.1191/1478088706qp063oa

Brecher, E. M. (1986). Drug laws and drug law enforcement: A review and evaluation based on 111 years of experience. Drugs & Society, 1(1), 1-28. doi: 10.1300/J023v01n01_01

Brewster, S. E., Elliott, M. A., & Kelly, S. W. (2015). Evidence that implementation intentions reduce drivers' speeding behavior: testing a new intervention to change driver behavior. Accident Analysis & Prevention, 74, 229-242. doi: 10.1016/j.aap.2014.11.006

Britten, N. (1995). Qualitative research: qualitative interviews in medical research. Bmj, 311(6999), 251-253. doi: 10.1136/bmj.311.6999.251

Brooks, M. E., Kristensen, K., Van Benthem, K. J., Magnusson, A., Berg, C. W., Nielsen, A., Skaug, H. J., Mächler, M., & Bolker, B. M. (2017). glmmTMB balances speed and flexibility among packages for zero-inflated generalized linear mixed modeling. The R journal, 9(2), 378-400.

Brown, V. A. (2021). An introduction to linear mixed-effects modeling in R. Advances in Methods and Practices in Psychological Science, 4(1), 2515245920960351. doi: 10.1177/2515245920960351

Buchman, D. Z., Orkin, A. M., Strike, C., & Upshur, R. E. (2018). Overdose education and naloxone distribution programmes and the ethics of task shifting. Public Health Ethics, 11(2), 151-164. doi: 10.1093/phe/phy001

Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. Neurological Research and practice, 2, 1-10. doi: 10.1186/s42466-020-00059-z

Buresh, M., Gicquelais, R. E., Astemborski, J., Kirk, G. D., Mehta, S. H., & Genberg, B. L. (2020). Fatal overdose prevention and experience with naloxone: A cross-sectional study from a community-based cohort of people who inject drugs in Baltimore, Maryland. PLoS One, 15(3), e0230127. doi: 10.1371/journal.pone.0230127

Burton, G., McAuley, A., Schofield, J., Yeung, A., Matheson, C., & Parkes, T. (2021). A systematic review and meta-analysis of the prevalence of take-home naloxone (THN) ownership and carriage. International Journal of Drug Policy, 96, 103298. doi: 10.1016/j.drugpo.2021.103298

Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. K. (2013). Coding in-depth semistructured interviews: Problems of unitization and intercoder reliability and agreement. Sociological methods & research, 42(3), 294-320. doi: 10.1177/0049124113500475

Carroll, J. J., Green, T. C., & Noonan, R. K. (2018). Evidence-based strategies for preventing opioid overdose: what's working in the United States: an introduction for public heath, law enforcement, local organizations, and others striving to serve their community. Available at: https://stacks.cdc.gov/view/cdc/59393

Centers for Disease Control and Prevention. (2018). Understanding the Opioid Overdose Epidemic. Available at: https://www.cdc.gov/opioids/basics/epidemic.html

Centers for Disease Control and Prevention. (2019). Still not enough naloxone where it's most needed: despite huge overall increase in prescribing, more needed in rural areas. Available at: https://www.cdc.gov/media/releases/2019/p0806-naloxone.html

Centers for Disease Control and Prevention. (2020). Summary of information on the safety and effectiveness of syringe services programs (SSPs). Available at: https://www.cdc.gov/ssp/syringe-services-programs-summary.html

Centers for Disease Control and Prevention. (2021). Infectious diseases, opioids and injection drug use. Available at: https://www.cdc.gov/pwid/opioid-use.html

Chamberlain, J. M., & Klein, B. L. (1994). A comprehensive review of naloxone for the emergency physician. The American journal of emergency medicine, 12(6), 650-660. doi: 10.1016/0735-6757(94)90033-7

Chapman, J., & Armitage, C. J. (2010). Evidence that boosters augment the long-term impact of implementation intentions on fruit and vegetable intake. Psychology and Health, 25(3), 365-381. doi: 10.1080/08870440802642148

Cheetham, A., Picco, L., Barnett, A., Lubman, D. I., & Nielsen, S. (2022). The impact of stigma on people with opioid use disorder, opioid treatment, and policy. Substance abuse and rehabilitation, 1-12. doi: 10.2147/SAR.S304566

Clark, A. K., Wilder, C. M., & Winstanley, E. L. (2014). A systematic review of community opioid overdose prevention and naloxone distribution programs. Journal of addiction medicine, 8(3), 153-163. doi: 10.1097/ADM.0000000000000034

Clarke, V., & Braun, V. (2013). Successful qualitative research: A practical guide for beginners. Successful qualitative research, 1-400. ISBN: 9781847875822

Cliff, N. (1993). Dominance statistics: Ordinal analyses to answer ordinal questions. Psychological Bulletin, 114(3), 494–509. doi: 10.1037/0033-2909.114.3.494

Coffin, P. O., & Sullivan, S. D. (2013). Cost-effectiveness of distributing naloxone to heroin users for lay overdose reversal. Annals of internal medicine, 158(1), 1-9. doi: 10.7326/0003-4819-158-1-201301010-00003

Coffin, P. O., Santos, G. M., Matheson, T., Behar, E., Rowe, C., Rubin, T., Silvis, J., & Vittinghoff, E. (2017). Behavioral intervention to reduce opioid overdose among high-risk persons with opioid use disorder: A pilot randomized controlled trial. PloS one, 12(10), e0183354. doi: 10.1371/journal.pone.0183354

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. Routledge. doi: 10.4324/9780203771587

Comprehensive harm reduction programs, Va. Code Ann. § 32.1-45.4 (2020). Available at: https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP0839&201+ful+CHAP0839

Cooke, R., McEwan, H., & Norman, P. (2023). The effect of forming implementation intentions on alcohol consumption: A systematic review and meta-analysis. Drug and alcohol review, 42(1), 68-80. doi: 10.1111/dar.13553

Coughlin, S. S. (1990). Recall bias in epidemiologic studies. Journal of clinical epidemiology, 43(1), 87-91. doi: 10.1016/0895-4356(90)90060-3

D'Alonzo, K. T. (2010). Getting started in CBPR: lessons in building community partnerships for new researchers. Nursing inquiry, 17(4), 282-288. doi: 10.1111/j.1440-1800.2010.00510.x

Daniels, A. K. (1987). Invisible work. Social problems, 34(5), 403-415.

Daniulaityte, R., Silverstein, S. M., Getz, K., Juhascik, M., McElhinny, M., & Dudley, S. (2022). Lay knowledge and practices of methamphetamine use to manage opioid-related overdose risks. International Journal of Drug Policy, 99, 103463. doi: 10.1016/j.drugpo.2021.103463

Davis, C. S., & Carr, D. (2015). Legal changes to increase access to naloxone for opioid overdose reversal in the United States. Drug and alcohol dependence, 157, 112-120. doi: 10.1016/j.drugalcdep.2015.10.013

Davis, C., & Carr, D. (2017). State legal innovations to encourage naloxone dispensing. Journal of the American Pharmacists Association, 57(2), S180-S184. doi: 10.1016/j.japh.2016.11.007

Dayton, L., Gicquelais, R. E., Tobin, K., Davey-Rothwell, M., Falade-Nwulia, O., Kong, X., Fingerhood, M., Jones, A. A., & Latkin, C. (2019). More than just availability: Who has access and who administers take-home naloxone in Baltimore, MD. PloS one, 14(11), e0224686. doi: 10.1371/journal.pone.0224686

Degan, T. J., Kelly, P. J., Robinson, L. D., & Deane, F. P. (2019). Health literacy in substance use disorder treatment: A latent profile analysis. Journal of substance abuse treatment, 96, 46-52. doi: 10.1016/j.jsat.2018.10.009

Deonarine, A., Amlani, A., Ambrose, G., & Buxton, J. A. (2016). Qualitative assessment of take-home naloxone program participant and law enforcement interactions in British Columbia. Harm reduction journal, 13(1), 1-8. doi: 10.1186/s12954-016-0106-1

DeVellis, R. F. (2006). Classical test theory. Medical care, S50-S59. doi: 10.1097/01.mlr.0000245426.10853.30

de Vet, E., Oenema, A., & Brug, J. (2011). More or better: Do the number and specificity of implementation intentions matter in increasing physical activity?. Psychology of Sport and Exercise, 12(4), 471-477. doi: 10.1016/j.psychsport.2011.02.008

Doe-Simkins, M., Walley, A. Y., Epstein, A., & Moyer, P. (2009). Saved by the nose: bystander-administered intranasal naloxone hydrochloride for opioid overdose. American journal of public health, 99(5), 788-791. doi: 10.2105/AJPH.2008.146647

Dombrowski, S. U., O'Carroll, R. E., & Williams, B. (2016). Form of delivery as a key 'active ingredient' in behaviour change interventions [Editorial]. British Journal of Health Psychology, 21(4), 733–740. doi: 10.1111/bjhp.12203

Dowell, D., Ragan, K. R., Jones, C. M., Baldwin, G. T., & Chou, R. (2022). Prescribing opioids for pain—the new CDC clinical practice guideline. New England Journal of Medicine, 387(22), 2011-2013. doi: 10.1056/NEJMp2211040

Duncan, D. F., Nicholson, T., White, J. B., & Ellis-Griffith, G. (2014). A brief history of prohibition and treatment solutions for substance abusers. International Journal of Criminology and Sociology, 3, 186. doi: 10.6000/1929-4409.2014.03.17

Edwards III, G. F., Mierisch, C., Mutcheson, B., Horn, K., & Parker, S. H. (2020). A review of performance assessment tools for rescuer response in opioid overdose simulations and training programs. Prev. Med. Rep., 20, 101232. doi: 10.1016/j.pmedr.2020.101232

Edwards III, G. F., Mierisch, C., Strauss, A., Mutcheson, B., Coleman, K., Horn, K., & Parker, S. H. (2023a). Evaluating Rescuer Performance in Response to Opioid Overdose in a Community Setting: Evidence for Medically Appropriate Process Measures. Preventive Medicine Reports, 102145. doi: 10.1016/j.pmedr.2023.102145

Edwards III, G. F., Zagarese, V., Tulk Jesso, S., Jesso, M., Harden, S. M., & Parker, S. H. (2023b). Designing healthcare for human use: Human factors and practical considerations for the translational process. Frontiers in Health Services, 2, 136. doi: 10.3389/frhs.2022.981450

El-Bassel, N., Gilbert, L., Hunt, T., Wu, E., Oga, E. A., Mukherjee, T. I., Campbell, A. N., Sabounchi, N., Gutnick, D., Kerner, R., Venner, K. L., Lounsbury, D., Huang T. T.K., & Rapkin, B. (2021). Using community engagement to implement evidence-based practices for opioid use disorder: a data-driven paradigm & systems science approach. Drug and alcohol dependence, 222, 108675. doi: 10.1016/j.drugalcdep.2021.108675

Elder, M., Griffith, J., Merkel, R. L., Robinson, D. M. (2018). Working with Appalachian Patients. Available at: https://www.psychiatry.org/psychiatrists/diversity/education/best-practice-highlights/working-with-appalachian-patients

Epton, T., & Armitage, C. J. (2017). Does situation-specificity affect the operation of implementation intentions?. Behavior Therapy, 48(6), 860-869. doi: 10.1016/j.beth.2017.08.003

Evoy, K. E., Hill, L. G., & Davis, C. S. (2021). Considering the potential benefits of over-the-counter naloxone. Integrated Pharmacy Research and Practice, 13-21. doi: 10.2147/IPRP.S244709

Fadanelli, M., Cloud, D. H., Ibragimov, U., Ballard, A. M., Prood, N., Young, A. M., & Cooper, H. L. (2020). People, places, and stigma: a qualitative study exploring the overdose risk environment in rural Kentucky. International Journal of Drug Policy, 85, 102588. doi: 10.1016/j.drugpo.2019.11.001

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39(2), 175-191. doi: 10.3758/bf03193146

Faulkner-Gurstein, R. (2017). The social logic of naloxone: Peer administration, harm reduction, and the transformation of social policy. Social Science & Medicine, 180, 20-27. doi: 10.1016/j.socscimed.2017.03.013

Festinger, D. S., & Dugosh, K. L. (2012). Paying substance abusers in research studies: where does the money go?. The American journal of drug and alcohol abuse, 38(1), 43-48. doi: 10.3109/00952990.2011.563337

Filteau, M. R., Green, B., Kim, F., & McBride, K. A. (2022). 'It's the same thing as giving them CPR training': rural first responders' perspectives on naloxone. Harm Reduction Journal, 19(1), 111. doi: 10.1186/s12954-022-00688-4

Fishman, J., Lushin, V., & Mandell, D. S. (2020). Predicting implementation: comparing validated measures of intention and assessing the role of motivation when designing behavioral interventions. Implementation science communications, 1(1), 1-10. doi: 10.1186/s43058-020-00050-4

Florence, C., Luo, F., & Rice, K. (2021). The economic burden of opioid use disorder and fatal opioid overdose in the United States, 2017. Drug and alcohol dependence, 218, 108350. doi: 10.1016/j.drugalcdep.2020.108350

Food and Drug Administration. (2023). FDA approves first over-the counter Naloxone nasal spray. Available at: www.fda.gov/news-events/press-announcements/fda-approves-first-over-counter-naloxone-nasal-spray

Gardner, B., Lally, P., & Wardle, J. (2012). Making health habitual: the psychology of 'habit-formation'and general practice. British Journal of General Practice, 62(605), 664-666. doi: 10.3399/bjgp12X659466

Giglio, R. E., Li, G., & DiMaggio, C. J. (2015). Effectiveness of bystander naloxone administration and overdose education programs: a meta-analysis. Injury epidemiology, 2(1), 1-9. doi: 10.1186/s40621-015-0041-8

Gillies, K., Brehaut, J., Coffey, T., Duncan, E. M., Francis, J. J., Hey, S. P., Presseau, J., Weijer, C., & Campbell, M. K. (2021). How can behavioural science help us design better trials?. Trials, 22(1), 1-7. doi: 10.1186/s13063-021-05853-x

Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. Annual review of public health, 31, 399-418. doi: 10.1146/annurev.publhealth.012809.103604

Glasgow, R. E. (2013). What does it mean to be pragmatic? Pragmatic methods, measures, and models to facilitate research translation. Health Education & Behavior, 40(3), 257-265. doi: 10.1177/1090198113486805

Glover, R. W., & Silka, L. (2013). Choice, power and perspective: The neglected question of who initiates engaged campus-community partnerships. Gateways: International Journal of Community Research and Engagement, 6, 38-56. ISSN:1836-3393

Godbee, K., Guccione, L., Palmer, V. J., Gunn, J., Lautenschlager, N., & Francis, J. J. (2022). Dementia Risk Reduction in Primary Care: A Scoping Review of Clinical Guidelines Using a Behavioral Specificity Framework. Journal of Alzheimer's Disease, (Preprint), 1-14. doi: 10.3233/JAD-220382

Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. European review of social psychology, 4(1), 141-185. doi: 10.1080/14792779343000059

Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. Journal of personality and social psychology, 73(1), 186. doi: 10.1037/0022-3514.73.1.186

Gollwitzer, P. M. (1999). Implementation intentions: strong effects of simple plans. American psychologist, 54(7), 493. doi: 10.1037/0003-066X.54.7.493

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. Advances in experimental social psychology, 38, 69-119. doi: 10.1016/S0065-2601(06)38002-1

Gollwitzer, P. M., Parks-Stamm, E. J., Jaudas, A., & Sheeran, P. (2008). Flexible tenacity in goal pursuit. Handbook of motivation science, 325-341. ISBN: 1462515118, 9781462515110

Gollwitzer, P. M. (2014). Weakness of the will: Is a quick fix possible?. Motivation and Emotion, 38, 305-322. doi: 10.1007/s11031-014-9416-3

Gollwitzer, P. M., & Oettingen, G. (2015). From studying the determinants of action to analysing its regulation: a commentary on Sniehotta, Presseau and Araújo-Soares. Health Psychology Review, 9(2), 146-150. doi: 10.1080/17437199.2014.919511

Gollwitzer, A., Schwörer, B., Stern, C., Gollwitzer, P. M., & Bargh, J. A. (2017). Up and down regulation of a highly automatic process: Implementation intentions can both increase and decrease social projection. Journal of Experimental Social Psychology, 70, 19-26. doi: 10.1016/j.jesp.2016.12.006

Gollwitzer, P. M., & Oettingen, G. (2019). Goal attainment. In R. M. Ryan (Ed.), The Oxford handbook of human motivation (2nd ed., pp. 247–268). Oxford University Press.

Gollwitzer, P. M., Sheeran, P (2020). Implementation Intentions. National Cancer Institute. Available at: https://cancercontrol.cancer.gov/brp/research/constructs/implementation-intentions

Goode, E. (2006). “The Sociology of Drug Use”. 21st Century Sociology, edited by Clifton D. Bryant and Dennis L. Peck. Sage Publications. November 2006, 415-24. ISBN: 9781506320212

Greene, R. L. (1986). Sources of recency effects in free recall. Psychological Bulletin, 99(2), 221–228. doi: 10.1037/0033-2909.99.2.221

Greer, A. M., Luchenski, S. A., Amlani, A. A., Lacroix, K., Burmeister, C., & Buxton, J. A. (2016). Peer engagement in harm reduction strategies and services: a critical case study and evaluation framework from British Columbia, Canada. BMC public health, 16(1), 1-9. doi: 10.1186/s12889-016-3136-4

Haffajee, R. L., Cherney, S., & Smart, R. (2020). Legal requirements and recommendations to prescribe naloxone. Drug and alcohol dependence, 209, 107896. doi: 10.1016/j.drugalcdep.2020.107896

Hagan, H., McGough, J. P., Thiede, H., Hopkins, S., Duchin, J., & Alexander, E. R. (2000). Reduced injection frequency and increased entry and retention in drug treatment associated with needle-exchange participation in Seattle drug injectors. Journal of substance abuse treatment, 19(3), 247-252. doi: 10.1016/s0740-5472(00)00104-5

Hagger, M. S., & Luszczynska, A. (2014). Implementation intention and action planning interventions in health contexts: State of the research and proposals for the way forward. Applied Psychology: Health and Well-Being, 6(1), 1-47. doi: 10.1111/aphw.12017

Hamilton, A. B., & Finley, E. P. (2019). Qualitative methods in implementation research: An introduction. Psychiatry research, 280, 112516. doi: 10.1016/j.psychres.2019.112516

Han, H. R., Xu, A., Mendez, K. J., Okoye, S., Cudjoe, J., Bahouth, M., Reese, M., Bone, L., & Dennison-Himmelfarb, C. (2021). Exploring community engaged research experiences and preferences: a multi-level qualitative investigation. Research Involvement and Engagement, 7(1), 1-9. doi: 10.1186/s40900-021-00261-6

Handal, K. A., Schauben, J. L., & Salamone, F. R. (1983). Naloxone. Annals of emergency medicine, 12(7), 438-445. doi: 10.1016/S0196-0644(83)80343-6

Hanrahan, V., Biesty, L., Lawrie, L., Duncan, E., & Gillies, K. (2022). Theory-guided interviews identified behavioral barriers and enablers to healthcare professionals recruiting participants to maternity trials. Journal of Clinical Epidemiology, 145, 81-91. doi: 10.1016/j.jclinepi.2022.01.015

Hanson, B. L., Porter, R. R., Zöld, A. L., & Terhorst-Miller, H. (2020). Preventing opioid overdose with peer-administered naloxone: findings from a rural state. Harm reduction journal, 17(1), 1-9. doi: 10.1186/s12954-019-0352-0

Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). A metadata-driven methodology and workflow process for providing translational research informatics support. J. Biomed. Inform., 42(2), 377-81. doi: 10.1016/j.jbi.2008.08.010

Harris, P. A., Taylor, R., Minor, B. L., Elliott, V., Fernandez, M., O'Neal, L., McLeod, L., Delacqua, G., Delacqua, F., Kirby, J., Duda, S. N., & REDCap Consortium. (2019). The REDCap consortium: Building an international community of software platform partners. J. Biomed. Inform., 95, 103208. doi: 10.1016/j.jbi.2019.103208

Hawdon, J. E. (2001). The role of presidential rhetoric in the creation of a moral panic: Reagan, Bush, and the war on drugs. Deviant behavior, 22(5), 419-445. doi: 10.1080/01639620152472813

Heavey, S. C., Chang, Y. P., Vest, B. M., Collins, R. L., Wieczorek, W., & Homish, G. G. (2018). 'I have it just in case'—naloxone access and changes in opioid use behaviours. International Journal of Drug Policy, 51, 27-35. doi: 10.1016/j.drugpo.2017.09.015

Hennink, M. M., Kaiser, B. N., & Marconi, V. C. (2017). Code saturation versus meaning saturation: how many interviews are enough?. Qualitative health research, 27(4), 591-608. doi: 10.1177/1049732316665344

Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. Research in nursing & health, 31(2), 180-191. doi: 10.1002/nur.20247

Higginbotham, J. A., Markovic, T., Massaly, N., & Morón, J. A. (2022). Endogenous opioid systems alterations in pain and opioid use disorder. Frontiers in Systems Neuroscience, 118. doi: 10.3389/fnsys.2022.1014768

Hockey, J. (1993). Research methods--researching peers and familiar settings. Research papers in Education, 8(2), 199-225. doi: 10.1080/0267152930080205

Hughto, J. M., Gordon, L. K., Stopka, T. J., Case, P., Palacios, W. R., Tapper, A., & Green, T. C. (2022). Understanding opioid overdose risk and response preparedness among people who use cocaine and other drugs: mixed-methods findings from a large, multi-city study. Substance abuse, 43(1), 465-478. doi: 10.1080/08897077.2021.1946893

Huttlinger, K. (2013). Ch. 8 People of Appalachian Heritage. In: Purnell L, editor. Transcultural Health Care: A Culturally Competent Approach. 4th Edition. Philadelphia, PA: F.A. Davis Company. p. 137–58.

Ibragimov, U., Young, A. M., & Cooper, H. L. (2020). Understanding rural risk environments for drug-related harms: Progress, challenges, and steps forward. International Journal of Drug Policy, 85, 102926. doi: 10.1016/j.drugpo.2020.102926

Ibragimov, U., Cooper, K. E., Batty, E., Ballard, A. M., Fadanelli, M., Gross, S. B., Klein, E. M., Lockard, S., Young, A. M., & Cooper, H. L. (2021). Factors that influence enrollment in syringe services programs in rural areas: a qualitative study among program clients in Appalachian Kentucky. Harm Reduction Journal, 18(1), 68. doi: 10.1186/s12954-021-00518-z

Irvine, M. A., Buxton, J. A., Otterstatter, M., Balshaw, R., Gustafson, R., Tyndall, M., Kendall, P., Kerr, T., Gilbert, M., & Coombs, D. (2018). Distribution of take-home opioid antagonist kits during a synthetic opioid epidemic in British Columbia, Canada: a modelling study. The Lancet Public Health, 3(5), e218-e225. doi: 10.1016/S2468-2667(18)30044-6

Iyengar, S., Kravietz, A., Bartholomew, T. S., Forrest, D., & Tookes, H. E. (2019). Baseline differences in characteristics and risk behaviors among people who inject drugs by syringe exchange program modality: an analysis of the Miami IDEA syringe exchange. Harm reduction journal, 16(1), 1-8. doi: 10.1186/s12954-019-0280-z

Jarlais, D. C. D., Nugent, A., Solberg, A., Feelemyer, J., Mermin, J., & Holtzman, D. (2015). Syringe service programs for persons who inject drugs in urban, suburban, and rural areas—United States, 2013. Morbidity and mortality weekly report, 64(48), 1337-1341. doi: 10.15585/mmwr.mm6448a3

Jensen, J. D., Pokharel, M., King, A. J., John, K. K., Wu, Y. P., & Grossman, D. (2020). Obstacles to skin self-examination: are frontier adults inclined abstainers?. Psychology, health & medicine, 25(4), 470-479. doi: 10.1080/13548506.2019.1704035

Jiang, T. (2018). FDA Briefing Document Joint Meeting of the Anesthetic and Analgesic Drug Products Advisory Committee and the Drug Safety and Risk Management Advisory Committee. Available at: https://www.fda.gov/media/121182/download

Judd, C. M., Westfall, J., & Kenny, D. A. (2012). Treating stimuli as a random factor in social psychology: a new and comprehensive solution to a pervasive but largely ignored problem. Journal of personality and social psychology, 103(1), 54. doi: 10.1037/a0028347

Kahn, L. S., Wozniak, M., Vest, B. M., & Moore, C. (2022a). "Narcan encounters:" overdose and naloxone rescue experiences among people who use opioids. Substance Abuse, 43(1), 113-126. doi: 10.1080/08897077.2020.1748165

Kahn, L. S., Wozniak, M. L., Doscher, T., Moore, C., & Vest, B. M. (2022b). Treatment experiences among people who use opioids: A social ecological approach. Qualitative Health Research, 32(8-9), 1386-1398. doi: 10.1177/10497323221104315

Kano, M., Salvador, J. G., Katzman, W., Sussman, A. L., & Takeda, M. Y. (2020). "You've got to care to carry this stuff" Community implications from take-home naloxone use: A qualitative study. Journal of Substance Abuse Treatment, 115, 108030. doi: 10.1016/j.jsat.2020.108030

Keller, L., Bieleke, M., & Gollwitzer, P. M. (2019). Mindset theory of action phases and if-then planning. Social psychology in action: Evidence-based interventions from theory to practice, 23-37. doi: 10.1007/978-3-030-13788-5_2

Kelly, J. F., Fallah-Sohy, N., Cristello, J., Stout, R. L., Jason, L. A., & Hoeppner, B. B. (2021). Recovery community centers: Characteristics of new attendees and longitudinal investigation of the predictors and effects of participation. Journal of substance abuse treatment, 124, 108287. doi: 10.1016/j.jsat.2021.108287

Kerensky, T., & Walley, A. Y. (2017). Opioid overdose prevention and naloxone rescue kits: what we know and what we don't know. Addiction science & clinical practice, 12(1), 1-7. doi: 10.1186/s13722-016-0068-3

Kim, H. Y. (2017). Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test. Restorative dentistry & endodontics, 42(2), 152-155. doi: 10.5395/rde.2017.42.2.152

Kim, H. K., Connors, N. J., & Mazer-Amirshahi, M. E. (2019). The role of take-home naloxone in the epidemic of opioid overdose involving illicitly manufactured fentanyl and its analogs. Expert opinion on drug safety, 18(6), 465-475. doi: 10.1080/14740338.2019.1613372

Kinnard, E. N., Bluthenthal, R. N., Kral, A. H., Wenger, L. D., & Lambdin, B. H. (2021). The naloxone delivery cascade: identifying disparities in access to naloxone among people who inject drugs in Los Angeles and San Francisco, CA. Drug and alcohol dependence, 225, 108759. doi: 10.1016/j.drugalcdep.2021.108759

Khan, M. R., Hoff, L., Elliott, L., Scheidell, J. D., Pamplin, J. R., Townsend, T. N., Irvine, N. M., & Bennett, A. S. (2023). Racial/ethnic disparities in opioid overdose prevention: comparison of the naloxone care cascade in White, Latinx, and Black people who use opioids in New York City. Harm Reduction Journal, 20(1), 24. doi: 10.1186/s12954-023-00736-7

Klaic, M., Seng, E., & McGrath, R. (2022). Factors that influence oral hygiene care with hospitalised stroke patients: a mixed methods study. Disability and Rehabilitation, 44(25), 7926-7935. doi: 10.1080/09638288.2021.2003450

Knäuper, B., McCollam, A., Rosen-Brown, A., Lacaille, J., Kelso, E., & Roseman, M. (2011). Fruitful plans: Adding targeted mental imagery to implementation intentions increases fruit consumption. Psychology and Health, 26(5), 601-617. doi: 10.1080/08870441003703218

Koester, S., Mueller, S. R., Raville, L., Langegger, S., & Binswanger, I. A. (2017). Why are some people who have received overdose education and naloxone reticent to call Emergency Medical Services in the event of overdose?. International Journal of Drug Policy, 48, 115-124. doi: 10.1016/j.drugpo.2017.06.008

Kolb, L., & Du Mez, A. G. (1924). The prevalence and trend of drug addiction in the United States and factors influencing it. Public Health Reports (1896-1970), 1179-1204. doi: 10.2307/4577168

Kolodny, A., Courtwright, D. T., Hwang, C. S., Kreiner, P., Eadie, J. L., Clark, T. W., & Alexander, G. C. (2015). The prescription opioid and heroin crisis: a public health approach to an epidemic of addiction. Annual review of public health, 36, 559-574. doi: 10.1146/annurev-publhealth-031914-122957

Koripalli, M., Giruparajah, M., Laur, C., & Shulman, R. (2022). Selecting an intervention to prevent ketoacidosis at diabetes diagnosis in children using a behavior change framework. Pediatric Diabetes, 23(3), 406-410. doi: 10.1111/pedi.13314

Kozak, Z., Ciccarone, D., Thrul, J., Cole, T. O., Pappas, A. L., Greenblatt, A. D., Welsh, C., Yoon, M., Gann Jr., D., Artigiani, E. E., Wish, E. D., & Belcher, A. M. (2023). Harm reduction behaviors are associated with carrying naloxone among patients on methadone treatment. Harm reduction journal, 20(1), 1-6. doi: 10.1186/s12954-023-00745-6

Krieter, P., Chiang, N., Gyaw, S., Skolnick, P., Crystal, R., Keegan, F., Aker, J., Beck, M., & Harris, J. (2016). Pharmacokinetic properties and human use characteristics of an FDA-approved intranasal naloxone product for the treatment of opioid overdose. The Journal of Clinical Pharmacology, 56(10), 1243-1253. doi: 10.1002/jcph.759

Kruis, N. E., & Merlo, A. V. (2021). A preliminary assessment of stigma in law enforcement officers' responses to opioid overdoses. Journal of Drug Issues, 51(2), 301-322. doi: 10.1177/0022042620974076

Kruis, N. E., McLean, K., Perry, P., & Nackley, M. K. (2022). First responders' views of naloxone: does stigma matter?. Substance Use & Misuse, 57(10), 1534-1544. doi: 10.1080/10826084.2022.2092150

Kumle, L., Võ, M. L. H., & Draschkow, D. (2021). Estimating power in (generalized) linear mixed models: An open introduction and tutorial in R. Behavior research methods, 53(6), 2528-2543. doi: 10.3758/s13428-021-01546-0

Lagu, T., Anderson, B. J., & Stein, M. (2006). Overdoses among friends: drug users are willing to administer naloxone to others. Journal of substance abuse treatment, 30(2), 129-133. doi: 10.1016/j.jsat.2005.05.010

Lai, J. T., Goldfine, C. E., Chapman, B. P., Taylor, M. M., Rosen, R. K., Carreiro, S. P., & Babu, K. M. (2021). Nobody wants to Be Narcan'd: A pilot qualitative analysis of drug users' perspectives on naloxone. Western journal of emergency medicine, 22(2), 339. doi: 10.5811/WESTJEM.2020.10.48768

Lambdin, B. H., Davis, C. S., Wheeler, E., Tueller, S., & Kral, A. H. (2018). Naloxone laws facilitate the establishment of overdose education and naloxone distribution programs in the United States. Drug and alcohol dependence, 188, 370-376. doi: 10.1016/j.drugalcdep.2018.04.004

Lambdin, B. H., Bluthenthal, R. N., Wenger, L. D., Wheeler, E., Garner, B., Lakosky, P., & Kral, A. H. (2020). Overdose education and naloxone distribution within syringe service programs—United States, 2019. Morbidity and Mortality Weekly Report, 69(33), 1117. doi: 10.15585/mmwr.mm6933a2

Lancaster, K. E., Cooper, H. L., Browning, C. R., Malvestutto, C. D., Bridges, J. F., & Young, A. M. (2020). Syringe service program utilization, barriers, and preferences for design in rural Appalachia: differences between men and women who inject drugs. Substance use & misuse, 55(14), 2268-2277. doi: 10.1080/10826084.2020.1800741

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. Biometrics, 159-174. doi: 10.2307/2529310

Lankenau, S. E., Wagner, K. D., Silva, K., Kecojevic, A., Iverson, E., McNeely, M., & Kral, A. H. (2013). Injection drug users trained by overdose prevention programs: responses to witnessed overdoses. Journal of Community Health, 38, 133-141. doi: 10.1007/s10900-012-9591-7

Latkin, C. A., Gicquelais, R. E., Clyde, C., Dayton, L., Davey-Rothwell, M., German, D., Falade-Nwulia, S., Saleem, H., Fingerhood, M., & Tobin, K. (2019a). Stigma and drug use settings as correlates of self-reported, non-fatal overdose among people who use drugs in Baltimore, Maryland. International Journal of Drug Policy, 68, 86-92. doi: 10.1016/j.drugpo.2019.03.012

Latkin, C. A., Dayton, L., Davey-Rothwell, M. A., & Tobin, K. E. (2019b). Fentanyl and drug overdose: perceptions of fentanyl risk, overdose risk behaviors, and opportunities for intervention among people who use opioids in Baltimore, USA. Substance use & misuse, 54(6), 998-1006. doi: 10.1080/10826084.2018.1555597

Legrand, E., Bieleke, M., Gollwitzer, P. M., & Mignon, A. (2017). Nothing will stop me? Flexibly tenacious goal striving with implementation intentions. Motivation Science, 3(2), 101–118. doi: 10.1037/mot0000050

Lei, R., Swartz, M. D., Harvin, J. A., Cotton, B. A., Holcomb, J. B., Wade, C. E., & Adams, S. D. (2019). Stop the bleed training empowers learners to act to prevent unnecessary hemorrhagic death. The American Journal of Surgery, 217(2), 368-372. doi: 10.1016/j.amjsurg.2018.09.025

Leung, P. T., Macdonald, E. M., Stanbrook, M. B., Dhalla, I. A., & Juurlink, D. N. (2017). A 1980 letter on the risk of opioid addiction. New England Journal of Medicine, 376(22), 2194-2195. doi: 10.1056/NEJMc1700150

Lewin, S., Glenton, C., & Oxman, A. D. (2009). Use of qualitative methods alongside randomised controlled trials of complex healthcare interventions: methodological study. Bmj, 339. doi: 10.1136/bmj.b3496

Lewis, C. R., Vo, H. T., & Fishman, M. (2017). Intranasal naloxone and related strategies for opioid overdose intervention by nonmedical personnel: a review. Subst. Abuse Rehabil., 8, 79. doi: 10.2147/SAR.S101700

Lieberman, A. & Davis, C. (2021). Legal interventions to reduce overdose mortality: Naloxone access laws. The Network for Public Health Law. Available at: https://www.networkforphl.org/resources/legal-interventions-to-reduce-overdose-mortality-naloxone-access-and-good-samaritan-laws/

Linas, B. P., Savinkina, A., Barbosa, C., Mueller, P. P., Cerdá, M., Keyes, K., & Chhatwal, J. (2021). A clash of epidemics: impact of the COVID-19 pandemic response on opioid overdose. Journal of Substance Abuse Treatment, 120, 108158. doi: 10.1016/j.jsat.2020.108158

Lipira, L., Leichtling, G., Cook, R. R., Leahy, J. M., Orellana, E. R., Korthuis, P. T., & Menza, T. W. (2021). Predictors of having naloxone in urban and rural Oregon findings from NHBS and the OR-HOPE study. Drug and alcohol dependence, 227, 108912. doi: 10.1016/j.drugalcdep.2021.108912

Loveland, D., & Driscoll, H. (2014). Examining attrition rates at one specialty addiction treatment provider in the United States: a case study using a retrospective chart review. Substance abuse treatment, prevention, and policy, 9(1), 1-13. doi: 10.1186/1747-597X-9-41

Ludwig, R. M., Srivastava, S., & Berkman, E. T. (2019). Predicting exercise with a personality facet: Planfulness and goal achievement. Psychological Science, 30(10), 1510-1521. doi: 10.1177/0956797619868812

Madah-Amiri, D., Clausen, T., & Lobmaier, P. (2017). Rapid widespread distribution of intranasal naloxone for overdose prevention. Drug and alcohol dependence, 173, 17-23. doi: 10.1016/j.drugalcdep.2016.12.013

Madah-Amiri, D., Gjersing, L., & Clausen, T. (2019). Naloxone distribution and possession following a large-scale naloxone programme. Addiction, 114(1), 92-100. doi: 10.1111/add.14425

Malaguti, A., Ciocanel, O., Sani, F., Dillon, J. F., Eriksen, A., & Power, K. (2020). Effectiveness of the use of implementation intentions on reduction of substance use: a meta-analysis. Drug and alcohol dependence, 214, 108120. doi: 10.1016/j.drugalcdep.2020.108120

Mamdani, Z., Loyal, J. P., Xavier, J., Pauly, B., Ackermann, E., Barbic, S., Buxton, J. A., & Greer, A. (2022). 'We are the first responders': overdose response experiences and perspectives among peers in British Columbia. Drugs: Education, Prevention and Policy, 1-14. doi: 10.1080/09687637.2022.2132134

Martignetti, L., & Sun, W. (2022). Perspectives of Stakeholders of Equitable Access to Community Naloxone Programs: A Literature Review. Cureus, 14(1). doi: 10.7759/cureus.21461

Martiny-Huenger, T., Martiny, S. E., Parks-Stamm, E. J., Pfeiffer, E., & Gollwitzer, P. M. (2017). From conscious thought to automatic action: A simulation account of action planning. Journal of Experimental Psychology: General, 146(10), 1513. doi: 10.1037/xge0000344

Mathis, S. M., Hagemeier, N., Hagaman, A., Dreyzehner, J., & Pack, R. P. (2018). A dissemination and implementation science approach to the epidemic of opioid use disorder in the United States. Current HIV/AIDS Reports, 15, 359-370. doi: 10.1007/s11904-018-0409-9

McAuley, A., Aucott, L., & Matheson, C. (2015). Exploring the life-saving potential of naloxone: a systematic review and descriptive meta-analysis of take home naloxone (THN) programmes for opioid users. International Journal of Drug Policy, 26(12), 1183-1188. doi: 10.1016/j.drugpo.2015.09.011

McAuley, A., Munro, A., & Taylor, A. (2018). "Once I'd done it once it was like writing your name": lived experience of take-home naloxone administration by people who inject drugs. International Journal of Drug Policy, 58, 46-54. doi: 10.1016/j.drugpo.2018.05.002

McClellan, C., Lambdin, B. H., Ali, M. M., Mutter, R., Davis, C. S., Wheeler, E., Pemberton, M., & Kral, A. H. (2018). Opioid-overdose laws association with opioid use and overdose mortality. Addictive behaviors, 86, 90-95. doi: 10.1016/j.addbeh.2018.03.014

McDonald, R., & Strang, J. (2016). Are take-home naloxone programmes effective? Systematic review utilizing application of the Bradford Hill criteria. Addiction, 111(7), 1177-1187. doi: 10.1111/add.13326

McDonald, R., Campbell, N. D., & Strang, J. (2017). Twenty years of take-home naloxone for the prevention of overdose deaths from heroin and other opioids—conception and maturation. Drug and alcohol dependence, 178, 176-187. doi: 10.1016/j.drugalcdep.2017.05.001

McDonald, R., Parkin, S., Eide, D., Neale, J., Clausen, T., Metrebian, N., Carter, B., & Strang, J. (2021). Rethinking 'carriage' of take-home naloxone. International Journal of Drug Policy, 95, 103253. doi: 10.1016/j.drugpo.2021.103253

McHugh, M. L. (2012). Interrater reliability: the kappa statistic. Biochemia medica, 22(3), 276-282. PMCID: PMC3900052

McWilliams, L., Bellhouse, S., Yorke, J., Lloyd, K., & Armitage, C. J. (2019). Beyond "planning": A meta-analysis of implementation intentions to support smoking cessation. Health Psychology, 38(12), 1059. doi: 10.1037/hea0000768

Michie, S., & Johnston, M. (2004). Changing clinical behaviour by making guidelines specific. BMJ, 328(7435), 343-345. doi: 10.1136/bmj.328.7435.343

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implementation science, 6(1), 1-12. doi: 10.1186/1748-5908-6-42

Miller, N. M., Waterhouse-Bradley, B., Campbell, C., & Shorter, G. W. (2022). How do naloxone-based interventions work to reduce overdose deaths: a realist review. Harm reduction journal, 19(1), 1-13. doi: 10.1186/s12954-022-00599-4

Moody, L. N., Satterwhite, E., & Bickel, W. K. (2017). Substance use in rural Central Appalachia: Current status and treatment considerations. Journal of Rural Mental Health, 41(2), 123. doi: 10.1037/rmh0000064

Moody, L. N., Tegge, A. N., Poe, L. M., Koffarnus, M. N., & Bickel, W. K. (2018). To drink or to drink less? Distinguishing between effects of implementation intentions on decisions to drink and how much to drink in treatment-seeking individuals with alcohol use disorder. Addictive behaviors, 83, 64-71. doi: 10.1016/j.addbeh.2017.11.010

Morgan, J., & Atkin, L. (2016). Expelling stress for primary school teachers: Self-affirmation increases positive emotions in teaching and emotion reappraisal. International journal of environmental research and public health, 13(5), 500. PMID: 27187437

Morton, K. J., Harrand, B., Floyd, C. C., Schaefer, C., Acosta, J., Logan, B. C., & Clark, K. (2017). Pharmacy-based statewide naloxone distribution: a novel "top-down, bottom-up" approach. Journal of the American Pharmacists Association, 57(2), S99-S106. doi: 10.1016/j.japh.2017.01.017

Moustaqim-Barrette, A., Papamihali, K., Crabtree, A., Graham, B., Karamouzian, M., & Buxton, J. A. (2019). Correlates of take-home naloxone kit possession among people who use drugs in British Columbia: a cross-sectional analysis. Drug and alcohol dependence, 205, 107609. doi: 10.1016/j.drugalcdep.2019.107609

Moustaqim-Barrette, A., Dhillon, D., Ng, J., Sundvick, K., Ali, F., Elton-Marshall, T., Leece, P., Rittenbach, K., Ferguson, M., & Buxton, J. A. (2021). Take-home naloxone programs for suspected opioid overdose in community settings: a scoping umbrella review. BMC public health, 21(1), 1-16. doi: 10.1186/s12889-021-10497-2

Nahum-Shani, I., Smith, S. N., Tewari, A., Witkiewitz, K., Collins, L. M., Spring, B., & Murphy, S. A. (2014). Just-in-Time Adaptive Interventions (JITAIs): an organizing framework for ongoing health behavior support:(Technical Report No. 14-126). University Park, PA: The Methodology Center, Penn State.

Nahum-Shani, I., Smith, S. N., Spring, B. J., Collins, L. M., Witkiewitz, K., Tewari, A., & Murphy, S. A. (2018). Just-in-time adaptive interventions (JITAIs) in mobile health: key components and design principles for ongoing health behavior support. Annals of Behavioral Medicine, 52(6), 446-462. doi: 10.1007/s12160-016-9830-8

National Opinion Research Center (NORC). (2021). Understanding the Opioid Crisis in the United States. Drug Overdose Deaths in the United States. Available at: https://opioidmisusetool.norc.org/

Naumann, R. B., Durrance, C. P., Ranapurwala, S. I., Austin, A. E., Proescholdbell, S., Childs, R., Marshall, S. W., Kansagra, S., & Shanahan, M. E. (2019). Impact of a community-based naloxone distribution program on opioid overdose death rates. Drug and alcohol dependence, 204, 107536. doi: 10.1016/j.drugalcdep.2019.06.038

Neale, J., & Strang, J. (2015). Naloxone—does over-antagonism matter? Evidence of iatrogenic harm after emergency treatment of heroin/opioid overdose. Addiction, 110(10), 1644-1652. doi: 10.1111/add.13027

Neale, J., Brown, C., Campbell, A. N., Jones, J. D., Metz, V. E., Strang, J., & Comer, S. D. (2019). How competent are people who use opioids at responding to overdoses? Qualitative analyses of actions and decisions taken during overdose emergencies. Addiction, 114(4), 708-718. doi: 10.1111/add.14510

Neale, J., Kalk, N. J., Parkin, S., Brown, C., Brandt, L., Campbell, A. N., Castillo, F., Jones, J. D., Strang, J., & Comer, S. D. (2020). Factors associated with withdrawal symptoms and anger among people resuscitated from an opioid overdose by take-home naloxone: exploratory mixed methods analysis. Journal of substance abuse treatment, 117, 108099. doi: 10.1016/j.jsat.2020.108099

National Institute on Drug Abuse. (2021). Naloxone for Opioid Overdose: Life-Saving Science. Available at: https://nida.nih.gov/publications/naloxone-opioid-overdose-life-saving-science

Nederhof, A. J. (1985). Methods of coping with social desirability bias: A review. European journal of social psychology, 15(3), 263-280. doi: 10.1002/ejsp.2420150303

Netherland, J., & Hansen, H. (2017). White opioids: Pharmaceutical race and the war on drugs that wasn't. BioSocieties, 12, 217-238. doi: 10.1057/biosoc.2015.46

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. Implementation Science: IS, 10, 53-53. doi: 10.1186/s13012-015-0242-0

Norman, P., Cameron, D., Epton, T., Webb, T. L., Harris, P. R., Millings, A., & Sheeran, P. (2018). A randomized controlled trial of a brief online intervention to reduce alcohol consumption in new university students: Combining self-affirmation, theory of planned behaviour messages, and implementation intentions. British Journal of Health Psychology, 23(1), 108-127. doi: 10.1111/bjhp.12277

O'Carroll, R. (2014). Health psychology interventions. British Journal of Health Psychology, 19(2), 235-239. doi: 10.1111/bjhp.12082

O'Connor, C., & Joffe, H. (2020). Intercoder reliability in qualitative research: debates and practical guidelines. International journal of qualitative methods, 19, 1609406919899220. doi: 10.1177/1609406919899220

Oettingen, G., Sevincer, A. T., & Gollwitzer, P. M. (2008). Goal pursuit in the context of culture. Handbook of motivation and cognition across cultures. doi: 10.1016/B978-0-12-373694-9.00009-X

Olsen, Y., & Sharfstein, J. M. (2019). The Opioid Epidemic: What Everyone Needs to Know. Oxford University Press.

Orbell, S., Hodgkins, S., & Sheeran, P. (1997). Implementation intentions and the theory of planned behavior. Personality and social psychology bulletin, 23(9), 945-954. doi: 10.1177/0146167297239004

Parkin, S., Neale, J., Brown, C., Campbell, A. N., Castillo, F., Jones, J. D., Strang, J., & Comer, S. D. (2020). Opioid overdose reversals using naloxone in New York City by people who use opioids: Implications for public health and overdose harm reduction approaches from a qualitative study. International Journal of Drug Policy, 79, 102751. doi: 10.1016/j.drugpo.2020.102751

Patey, A. M., Fontaine, G., Francis, J. J., McCleary, N., Presseau, J., & Grimshaw, J. M. (2022). Healthcare professional behaviour: health impact, prevalence of evidence-based behaviours, correlates and interventions. Psychology & Health, 1-29. doi: 10.1080/08870446.2022.2100887

Patton, M. Q. (1990). Qualitative evaluation and research methods. SAGE Publications, inc.

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. Health services research, 34(5 Pt 2), 1189. PMID: 10591279; PMCID: PMC1089059.

Perri, M., & Strike, C. (2020). The missing link: Incorporating behaviour change theories in overdose education and naloxone distribution programs. International Journal of Drug Policy, 83, 102853. doi: 10.1016/j.drugpo.2020.102853

Pert, C. B., & Snyder, S. H. (1973). Opiate receptor: demonstration in nervous tissue. Science, 179(4077), 1011-1014. doi: 10.1126/science.179.4077.1011

Peugh, J. L., Beal, S. J., McGrady, M. E., Toland, M. D., & Mara, C. (2021). Analyzing discontinuities in longitudinal count data: A multilevel generalized linear mixed model. Psychological Methods, 26(4), 375–397. doi: 10.1037/met0000347

Phillips, J. K., Ford, M. A., & Bonnie, R. J. (2017). Pain management and the opioid epidemic: Balancing societal and individual benefits and risks of prescription opioid use. doi: 10.17226/24781

Porter, J., & Jick, H. (1980). Addiction rare in patients treated with narcotics. The New England journal of medicine, 302(2), 123. doi: 10.1056/NEJM198001103020221

Pouly, E., Coppry, M., Rogues, A. M., & Dumartin, C. (2022). Systematic review of factors promoting behaviour change towards antibiotic use in hospitals. Clinical Microbiology and Infection. doi: 10.1016/j.cmi.2022.01.005

Prescription Drug Abuse Policy System. (2021). Good Samaritan Overdose Prevention Laws. Available at: https://pdaps.org/datasets/good-samaritan-overdose-laws-1501695153

Presseau, J., McCleary, N., Lorencatto, F., Patey, A. M., Grimshaw, J. M., & Francis, J. J. (2019). Action, actor, context, target, time (AACTT): a framework for specifying behaviour. Implementation Science, 14(1), 1-13. doi: 10.1186/s13012-019-0951-x

Provine, D. M. (2011). Race and inequality in the war on drugs. Annual Review of Law and Social Science, 7, 41-60. doi: 10.1146/annurev-lawsocsci-102510-105445

Purnell, L.D., Fenkl, E.A. (2019). People of Appalachian Heritage. In: Handbook for Culturally Competent Care. Springer, Cham. doi: 10.1007/978-3-030-21946-8_7

Razaghizad, A., Windle, S. B., Filion, K. B., Gore, G., Kudrina, I., Paraskevopoulos, E., Kimmelman, J., Martel, M. O., & Eisenberg, M. J. (2021). The effect of overdose education and naloxone distribution: an umbrella review of systematic reviews. American journal of public health, 111(8), e1-e12. doi: 10.2105/AJPH.2021.306306

Reed, M., Wagner, K. D., Tran, N. K., Brady, K. A., Shinefeld, J., & Roth, A. (2019). Prevalence and correlates of carrying naloxone among a community-based sample of opioid-using people who inject drugs. International Journal of Drug Policy, 73, 32-35. doi: 10.1016/j.drugpo.2019.07.010

Rees, D. I., Sabia, J. J., Argys, L. M., Dave, D., & Latshaw, J. (2019). With a little help from my friends: the effects of Good Samaritan and naloxone access laws on opioid-related deaths. The Journal of Law and Economics, 62(1), 1-27. doi: 10.1086/700703

Rhodes, T. (2002). The 'risk environment': a framework for understanding and reducing drug-related harm. International journal of drug policy, 13(2), 85-94. doi: 10.1016/S0955-3959(02)00007-5

Rhodes, T. (2009). Risk environments and drug harms: a social science for harm reduction approach. International journal of drug policy, 20(3), 193-201. doi: 10.1016/j.drugpo.2008.10.003

Richard, J., & Reidenberg, M. M. (2005). The risk of disciplinary action by state medical boards against physicians prescribing opioids. Journal of Medical Regulation, 91(2), 14-19. doi: 10.1016/j.jpainsymman.2004.05.009

Rivera, A. V., Nolan, M. L., Paone, D., Carrillo, S. A., & Braunstein, S. L. (2022). Gaps in naloxone ownership among people who inject drugs during the fentanyl wave of the opioid

overdose epidemic in New York City, 2018. Substance abuse, 43(1), 1172-1179. doi: 10.1080/08897077.2022.2074597

Roberts, K., Dowell, A., & Nie, J. B. (2019). Attempting rigour and replicability in thematic analysis of qualitative research data; a case study of codebook development. BMC medical research methodology, 19, 1-8. doi: 10.1186/s12874-019-0707-y

Robins, L. N., Davis, D. H., & Nurco, D. N. (1974). How permanent was Vietnam drug addiction?. American Journal of Public Health, 64(12_Suppl), 38-43. doi: 10.2105/ajph.64.12_suppl.38

Robins, L. N., & Slobodyan, S. (2003). Post-Vietnam heroin use and injection by returning US veterans: clues to preventing injection today. Addiction, 98(8), 1053-1060. doi: 10.1046/j.1360-0443.2003.00436.x

Rochester, E., & Graboyes, M. (2022). Experiences of people who use drugs with naloxone administration: a qualitative study. Drugs: Education, Prevention and Policy, 29(1), 54-61. doi: 10.1080/09687637.2020.1855116

RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL http://www.rstudio.com/

Rudd, B. N., Davis, M., & Beidas, R. S. (2020). Integrating implementation science in clinical research to maximize public health impact: a call for the reporting and alignment of implementation strategy use with implementation outcomes in clinical research. Implementation Science, 15(1), 1-11. doi: 10.1186/s13012-020-01060-5

Saloner, B., McGinty, E. E., Beletsky, L., Bluthenthal, R., Beyrer, C., Botticelli, M., & Sherman, S. G. (2018). A public health strategy for the opioid crisis. Public Health Reports, 133(1_suppl), 24S-34S. doi: 10.1177/0033354918793627

Scher, C., Meador, L., Van Cleave, J. H., & Reid, M. C. (2018). Moving beyond pain as the fifth vital sign and patient satisfaction scores to improve pain care in the 21st century. Pain Management Nursing, 19(2), 125-129. doi: 10.1016/j.pmn.2017.10.010

Schiller, E. Y., Goyal, A., & Mechanic, O. J. (2017). Opioid overdose. In: StatPearls. StatPearls Publishing, Treasure Island (FL); 2022. PMID: 29262202

Schlosser, A. V., & Hoffer, L. D. (2022). “I don’t go to funerals anymore”: how people who use opioids grieve drug-related death in the US overdose epidemic. Harm Reduction Journal, 19(1), 110. doi: 10.1186/s12954-022-00693-7

Schneider, K. E., Dayton, L., Winiker, A. K., Tobin, K. E., & Latkin, C. A. (2021). The role of overdose reversal training in knowing where to get naloxone: Implications for improving naloxone access among people who use drugs. Substance Abuse, 42(4), 438-443. doi: 10.1080/08897077.2021.1875103

Schneider, K. E., Rouhani, S., Weicker, N. P., Morris, M., & Sherman, S. G. (2022). Businesses in high drug use areas as potential sources of naloxone during overdose emergencies. Drug and alcohol dependence, 233, 109357. doi: 10.1016/j.drugalcdep.2022.109357

Schulz, K. F., Altman, D. G., & Moher, D. (2010). CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. Trials, 11(1), 1-8. doi: 10.1186/1741-7015-8-18

Schwarzer, R., Sniehotta, F. F., Lippke, S., Luszczynska, A., Scholz, U., Schüz, B., Wegner, M., & Ziegelmann, J. P. (2003). On the assessment and analysis of variables in the health action process approach conducting an investigation. Available at: https://www.zora.uzh.ch/id/eprint/102499/1/hapa_web.pdf

Schwarzer, R., & Luszczynska, A. (2008). How to overcome health-compromising behaviors: The health action process approach. European Psychologist, 13(2), 141-151. doi: 10.1027/1016-9040.13.2.141

Schwarzer, R., Lippke, S., & Luszczynska, A. (2011). Mechanisms of health behavior change in persons with chronic illness or disability: The Health Action Process Approach (HAPA). Rehabilitation Psychology, 56(3), 161–170. doi: 10.1037/a0024509

Schwarzer, R. (2016). Health Action Process Approach (HAPA) as a theoretical framework to understand behavior change. Actualidades en Psicología, 30(121), 119-130. doi: 10.15517/ap.v30i121.23458

Sellen, K., Markowitz, B., Parsons, J. A., Leece, P., Handford, C., Goso, N., Hopkins, S., Klaiman, M., Shahin, R., Milos, G., Wright, A., Charles, M., Morrison, L., Strike, C., & Orkin, A. (2023). Considerations for the design of overdose education and naloxone distribution interventions: results of a multi-stakeholder workshop. BMC public health, 23(1), 1-12. doi: 10.1186/s12889-023-15554-6

Sheeran, P., & Orbell, S. (1999). Implementation intentions and repeated behaviour: Augmenting the predictive validity of the theory of planned behaviour. European journal of social psychology, 29(2-3), 349-369. doi: 10.1002/(SICI)1099-0992(199903/05)29:2/3<349::AID-EJSP931>3.0.CO;2-Y

Sheeran, P., & Orbell, S. (2000). Using implementation intentions to increase attendance for cervical cancer screening. Health Psychology, 19(3), 283. doi: 10.1037//0278-6133.19.3.283

Sheeran, P. (2002). Intention—behavior relations: a conceptual and empirical review. European review of social psychology, 12(1), 1-36. doi: 10.1080/14792772143000003

Sheeran, P., & Silverman, M. (2003). Evaluation of three interventions to promote workplace health and safety: evidence for the utility of implementation intentions. Social Science & Medicine, 56(10), 2153-2163. doi: 10.1016/s0277-9536(02)00220-4

Sheeran, P., & Webb, T. L. (2016). The intention–behavior gap. Social and personality psychology compass, 10(9), 503-518. doi: 10.1111/spc3.12265

Schur, E. M. (1962). Narcotic addiction in Britain and America: the impact of public policy (Vol. 7). Indiana University Press.

Silka, L. (1999). Paradoxes of Partnership: Reflections on University-Community Partnerships. In N. Kleniewski & G. Rabrenovic (Eds.), Research in Politics and Society: Community Politics and Policies, Volume 7, pp. 335-359. Stamford, Connecticut: JAI Press Inc.

Silka, L. (2006). Scholarship in action: Applied research and community change. U.S. Department of Housing and Urban Development, Washington, DC.

Silka, L., Cleghorn, G. D., Grullón, M., Tellez, T., & Group in collaboration with the Lawrence Research Initiative Working. (2008). Creating community-based participatory research in a diverse community: A case study. Journal of Empirical Research on Human Research Ethics, 3(2), 5-16. doi: 10.1525/jer.2008.3.2.5

Silva, M. A. V. D., Sao-Joao, T. M., Brizon, V. C., Franco, D. H., & Mialhe, F. L. (2018). Impact of implementation intentions on physical activity practice in adults: A systematic review and meta-analysis of randomized clinical trials. PLoS One, 13(11), e0206294. doi: 10.1371/journal.pone.0206294

Skolnick, P. (2018). On the front lines of the opioid epidemic: rescue by naloxone. European journal of pharmacology, 835, 147-153. doi: 10.1016/j.ejphar.2018.08.004

Smart, R., Pardo, B., & Davis, C. S. (2021). Systematic review of the emerging literature on the effectiveness of naloxone access laws in the United States. Addiction, 116(1), 6-17. doi: 10.1111/add.15163

Sondhi, A., Ryan, G., & Day, E. (2016). Stakeholder perceptions and operational barriers in the training and distribution of take-home naloxone within prisons in England. Harm reduction journal, 13, 1-8. doi: 10.1186/s12954-016-0094-1

Spadaro, A., Agarwal, A. K., Sangha, H. K., Perrone, J., Delgado, M. K., & Lowenstein, M. (2023). Motivation to Carry Naloxone: A Qualitative Analysis of Emergency Department Patients. American Journal of Health Promotion, 37(2), 200-209. doi: 10.1177/08901171221107908

Spector, A. L., Galletly, C. L., Christenson, E. A., Montaque, H., & Dickson-Gomez, J. (2022). A qualitative examination of naloxone access in three states: Connecticut, Kentucky, and Wisconsin. BMC Public Health, 22(1), 1-13. doi: 10.1186/s12889-022-13741-5

Spencer, M. R., Miniño, A. M., & Warner, M. (2022). Drug Overdose Deaths in the United States, 2001–2021. NCHS data brief, (457), 1-8. Available at: https://www.cdc.gov/nchs/products/databriefs/db457.htm

Sporer, K. A., & Kral, A. H. (2007). Prescription naloxone: a novel approach to heroin overdose prevention. Annals of emergency medicine, 49(2), 172-177. doi: 10.1016/j.annemergmed.2006.05.025

Spring, C., Croxford, S., Ward, Z., Ayres, R., Lord, C., Desai, M., Emanuel, E., Vickerman, P., & Artenie, A. (2022). Perceived availability and carriage of take-home naloxone and factors associated with carriage among people who inject drugs in England, Wales and Northern Ireland. International Journal of Drug Policy, 102, 103615. doi: 10.1016/j.drugpo.2022.103615

Stanton, M. D. (1976). Drugs, Vietnam, and the Vietnam veteran: an overview. The American journal of drug and alcohol abuse, 3(4), 557-570. doi: 10.3109/00952997609014295

Steiner, B. D., & Argothy, V. (2000). White Addiction: Racial Ineqaulity, Racial Ideology, and the War on Drugs. Temp. Pol. & Civ. Rts. L. Rev., 10, 443.

Steketee, A. M., Archibald, T. G., & Harden, S. M. (2020). Adjust your own oxygen mask before helping those around you: an autoethnography of participatory research. Implementation Science, 15, 1-20. doi: 10.1186/s13012-020-01002-1

Steketee, A., Chen, S., Nelson, R. A., Kraak, V. I., & Harden, S. M. (2022). A mixed-methods study to test a tailored coaching program for health researchers to manage stress and achieve work-life balance. Translational Behavioral Medicine, 12(3), 369-410. doi: 10.1093/tbm/ibab134

Strang, J., & Farrell, M. (1992). Harm minimisation for drug misusers. BMJ: British Medical Journal, 304(6835), 1127. doi: 10.1136/bmj.304.6835.1127

Strang, J., Powis, B., Best, D., Vingoe, L., Griffiths, P., Taylor, C., Welch, S., & Gossop, M. (1999). Preventing opiate overdose fatalities with take-home naloxone: pre-launch study of possible impact and acceptability. Addiction, 94(2), 199-204. doi: 10.1046/j.1360-0443.1999.9421993.x

Strike, C., & Miskovic, M. (2018). Scoping out the literature on mobile needle and syringe programs—review of service delivery and client characteristics, operation, utilization, referrals, and impact. Harm reduction journal, 15(1), 1-15. doi: 10.1186/s12954-018-0212-3

Strohmetz, D. B. (2008). Research artifacts and the social psychology of psychological experiments. Social and Personality Psychology Compass, 2(2), 861-877. doi: 10.1111/j.1751-9004.2007.00072.x

Suresh, K. P. (2011). An overview of randomization techniques: an unbiased assessment of outcome in clinical research. Journal of human reproductive sciences, 4(1), 8. doi: 10.4103/0974-1208.82352

Sutton, S. (2008). How does the health action process approach (HAPA) bridge the intention–behavior gap? An examination of the model's causal structure. Applied Psychology, 57(1), 66-74. doi: 10.1111/j.1464-0597.2007.00326.x

Szumilas, M. (2010). Explaining odds ratios. Journal of the Canadian academy of child and adolescent psychiatry, 19(3), 227. PMCID: PMC2938757

Tanne J H. (2023). FDA approves over the counter sale of naloxone to reverse drug overdoses. BMJ, 380, p749. doi: 10.1136/bmj.p749

Tebes, J. K. (2000). External validity and scientific psychology. American Psychologist, 55(12), 1508–1509. doi: 10.1037/0003-066X.55.12.1508

Tenny, S., Brannan, G. D., Brannan, J. M., & Sharts-Hopko, N. C. (2017). Qualitative study. PMID: 29262162

Thomas, N., Van de Ven, K., & Mulrooney, K. J. (2020). The impact of rurality on opioid-related harms: A systematic review of qualitative research. International Journal of Drug Policy, 85, 102607. doi: 10.1016/j.drugpo.2019.11.015

Tippey, K. G., Yovanoff, M., McGrath, L. S., & Sneeringer, P. (2019). Comparative human factors evaluation of two nasal naloxone administration devices: NARCAN® nasal spray and naloxone prefilled syringe with nasal atomizer. Pain and Therapy, 8, 89-98. doi: 10.1007/s40122-019-0118-0

Tobin, K. E., Sherman, S. G., Beilenson, P., Welsh, C., & Latkin, C. A. (2009). Evaluation of the Staying Alive programme: training injection drug users to properly administer naloxone and save lives. International Journal of Drug Policy, 20(2), 131-136. doi: 10.1016/j.drugpo.2008.03.002

Tobin, K., Clyde, C., Davey-Rothwell, M., & Latkin, C. (2018). Awareness and access to naloxone necessary but not sufficient: examining gaps in the naloxone cascade. International Journal of Drug Policy, 59, 94-97. doi: 10.1016/j.drugpo.2018.07.003

Toli, A., Webb, T. L., & Hardy, G. E. (2016). Does forming implementation intentions help people with mental health problems to achieve goals? A meta-analysis of experimental studies with clinical and analogue samples. British Journal of Clinical Psychology, 55(1), 69-90. doi: 10.1111/bjc.12086

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. International journal for quality in health care, 19(6), 349-357. doi: 10.1093/intqhc/mzm042

Torchiano, M., (2020). effsize: Efficient Effect Size Computation. doi:10.5281/zenodo

Townsend, T., Blostein, F., Doan, T., Madson-Olson, S., Galecki, P., & Hutton, D. W. (2020). Cost-effectiveness analysis of alternative naloxone distribution strategies: First responder and lay distribution in the United States. International Journal of Drug Policy, 75, 102536. doi: 10.1016/j.drugpo.2019.07.031

Treloar, C., Rance, J., Yates, K., & Mao, L. (2016). Trust and people who inject drugs: The perspectives of clients and staff of Needle Syringe Programs. International Journal of Drug Policy, 27, 138-145. doi: 10.1016/j.drugpo.2015.08.018

Tse, W. C., Djordjevic, F., Borja, V., Picco, L., Lam, T., Olsen, A., Larney, S., Dietze, P., & Nielsen, S. (2022). Does naloxone provision lead to increased substance use? A systematic review to assess if there is evidence of a ‘moral hazard’ associated with naloxone supply. International Journal of Drug Policy, 100, 103513. doi: 10.1016/j.drugpo.2021.103513

Valentino, R. J., & Volkow, N. D. (2018). Untangling the complexity of opioid receptor function. Neuropsychopharmacology, 43(13), 2514-2520. doi: 10.1038/s41386-018-0225-3

Vallis, M., Bacon, S., Corace, K., Joyal-Desmarais, K., Sheinfeld Gorin, S., Paduano, S., Presseau, J., Rash, J., Yohannes, A. M., & Lavoie, K. (2021). Ending the pandemic: How behavioural science can help optimize global COVID-19 vaccine uptake. Vaccines, 10(1), 7. doi: 10.3390/vaccines10010007

van Osch, L. V., Lechner, L., Reubsaet, A., & Vries, H. D. (2010). From theory to practice: An explorative study into the instrumentality and specificity of implementation intentions. Psychology and Health, 25(3), 351-364. doi: 10.1080/08870440802642155

Van Zee, A. (2009). The promotion and marketing of oxycontin: commercial triumph, public health tragedy. American journal of public health, 99(2), 221-227. doi: 10.2105/AJPH.2007.131714

Virginia Department of Health. (2021). Overdose Deaths. Available at: https://www.vdh.virginia.gov/opioid-data/overdose-deaths/

Virginia Department of Health. (2023). Comprehensive Harm Reduction. Available at: https://www.vdh.virginia.gov/disease-prevention/chr/

Wagner, K. D., Davidson, P. J., Iverson, E., Washburn, R., Burke, E., Kral, A. H., McNeely, M., Bloom, J. J., & Lankenau, S. E. (2014). “I felt like a superhero”: The experience of responding to drug overdose among individuals trained in overdose prevention. International Journal of Drug Policy, 25(1), 157-165. doi: 10.1016/j.drugpo.2013.07.003

Wagner, K. D., Marks, C., Felsher, M., Latkin, C., Pearson, J. L., & Falade-Nwulia, O. O. (2022). Individual and social network correlates of responding to multiple overdoses among a cohort of people who use drugs. Drug and Alcohol Dependence Reports, 5, 100107. doi: 10.1016/j.dadr.2022.100107

Walley, A. Y., Doe-Simkins, M., Quinn, E., Pierce, C., Xuan, Z., & Ozonoff, A. (2013a). Opioid overdose prevention with intranasal naloxone among people who take methadone. Journal of substance abuse treatment, 44(2), 241-247. doi: 10.1016/j.jsat.2012.07.004.

Walley, A. Y., Xuan, Z., Hackman, H. H., Quinn, E., Doe-Simkins, M., Sorensen-Alawad, A., Ruiz, S., & Ozonoff, A. (2013b). Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: interrupted time series analysis. Bmj, 346. doi: 10.1136/bmj.f174

Wang, G., Wang, Y., & Gai, X. (2021). A Meta-Analysis of the Effects of Mental Contrasting With Implementation Intentions on Goal Attainment. Frontiers in Psychology, 12, 1299. doi: 10.3389/fpsyg.2021.565202

Webb, T. L., & Sheeran, P. (2004). Identifying good opportunities to act: Implementation intentions and cue discrimination. European Journal of Social Psychology, 34(4), 407-419. doi: 10.1002/ejsp.205

Webb, T. L., & Sheeran, P. (2007). How do implementation intentions promote goal attainment? A test of component processes. Journal of Experimental Social Psychology, 43(2), 295-302. doi: 10.1016/j.jesp.2006.02.001

Webb, T. L., Christian, J., & Armitage, C. J. (2007). Helping students turn up for class: Does personality moderate the effectiveness of an implementation intention intervention?. Learning and individual differences, 17(4), 316-327. doi: 10.1016/j.lindif.2007.03.001

Webb, N. (2017). Survey: Leading Questions. In M. Allen The SAGE Encyclopedia of Communication Research Methods. (Vols. 1-4). SAGE Publications, Inc. doi: 10.4135/9781483381411

Weiner, J., Murphy, S. M., & Behrends, C. (2019). Expanding access to naloxone: a review of distribution strategies. Issue Brief, 23, 132. Available at: http://resource.nlm.nih.gov/101750194

Wheeler, E., Jones, T. S., Gilbert, M. K., & Davidson, P. J. (2015). Opioid overdose prevention programs providing naloxone to laypersons—United States, 2014. Morbidity and Mortality Weekly Report, 64(23), 631. PMCID: PMC4584734

Wickham, H. (2016). ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York. ISBN 978-3-319-24277-4, https://ggplot2.tidyverse.org

Winiker, A. K., Tobin, K. E., Gicquelais, R. E., Owczarzak, J., & Latkin, C. (2020). "When You're Getting High… You Just Don't Want to Be around Anybody." A Qualitative Exploration of Reasons for Injecting Alone: Perspectives from Young People Who Inject Drugs. Substance use & misuse, 55(13), 2079-2086. doi: 10.1080/10826084.2020.1790008

Wojcicki, J. M. (2019). Dying alone: the sad irrelevance of naloxone in the context of solitary opiate use. Addiction, 114(3), 574-575. doi: 10.1111/add.14508

Woolf, S. H. (2008). The meaning of translational research and why it matters. Jama, 299(2), 211-213. doi: 10.1001/jama.2007.26

World Health Organization. (2007). Task shifting: rational redistribution of tasks among health workforce teams: global recommendations and guidelines. Available at: https://apps.who.int/iris/bitstream/handle/10665/43821/9789?sequence=1

Wygonik, Q., Glassman, T., & Tucker-Gail, K. (2021). The role of the social network in fatal opioid overdose prevention: the former opioid user's perspective. Journal of Drug Issues, 51(3), 576-589. doi: 10.1177/00220426211006365

Xie, Q. (2013). Agree or disagree? A demonstration of an alternative statistic to Cohen's Kappa for measuring the extent and reliability of agreement between observers. In Proceedings of the Federal Committee on Statistical Methodology Research Conference (Vol. 4).

Yudko, E., Lozhkina, O., & Fouts, A. (2007). A comprehensive review of the psychometric properties of the Drug Abuse Screening Test. Journal of substance abuse treatment, 32(2), 189-198. doi: 10.1016/j.jsat.2006.08.002

Zahle, J. (2021). Objective data sets in qualitative research. Synthese, 199(1-2), 101-117. doi: 10.1007/s11229-020-02630-2

Zhang, C.-Q., Zhang, R., Schwarzer, R., & Hagger, M. S. (2019). A meta-analysis of the health action process approach. Health Psychology, 38(7), 623–637. doi: 10.1037/hea0000728

Appendix A. Recruitment flyer

Do you use opioids? If so, you may encounter opioid overdoses. Your experience is important for our research!

Seeking participants for a behavioral research study of opioid overdose prevention.

In this study, you will develop plans to obtain and use naloxone, apply basic life support skills in a simulated opioid overdose scenarios, and complete electronic follow-up surveys at 3- and 6-months. We are recruiting people who have used opioids (e.g., heroin, fentanyl, etc.) in the last 12-months including people in treatment and syringe service programs.

We have taken steps to reduce risk related to COVID-19 and will provide you with the appropriate personal protective equipment.

Participants will receive:

- $25.00
- An additional $25.00 for completing electronic follow-up surveys.

Location

- Comprehensive Harm Reduction program in Virginia
- *Carilion Clinic Center for Simulation, Research and Patient Safety in Roanoke, VA
- Online through Virginia Tech's secure Zoom cloud recording system
- There will be one study visit lasting 1.5 hours.

*Carilion Clinic is in no way sponsoring or responsible for this study.

Are you eligible?

- 18 years of age or older.
- Active symptoms of opioid use disorder (used opioids in the last 12-months) including people in treatment and syringe service programs.

If you are unsure if you meet the requirements or are interested in participating, call or email a member of the study team:

Franklin Edwards, study coordinator
Email: gfedward@vt.edu
Phone: 540-526-2550
The IRB protocol number is 21-037

Or complete a screening survey:

SCAN ME

Appendix B. Recruitment email

Subject line: Behavioral research study of opioid overdose prevention

We are recruiting for an overdose prevention study. In this study, you will develop plans to obtain and use naloxone, apply basic life support skills in simulated opioid overdose scenarios, and complete electronic follow-up surveys at 3- and 6-months. We are recruiting people who have used opioids (e.g., heroin, fentanyl, etc.) in the last 12-months including people in treatment and syringe service programs.

WHO: We are looking for people who have used opioids (e.g., heroin, fentanyl, etc.) in the last 12-months including people in treatment and syringe service programs.

WHY: Opioid overdose is a public health epidemic, particularly in southwestern Virginia. This study will help us understand how people who are likely to witness and be the first on scene to assist persons who overdose implement overdose prevention behaviors in their day-to-day lives.

WHAT IS THE STUDY: We are interested in**:**

1. Collecting participants plans to implement overdose prevention behaviors in their day-to-day lives.
2. Administering electronic follow-up surveys at 3- and 6-months to gather information on overdose prevention behaviors.

WHAT WILL HAPPEN TO ME IF I PARTICIPATE: You can expect to spend 1.5 hours in this study and complete an electronic follow-up survey at 3- and 6-months. In this study, you will develop plans to obtain and use naloxone, apply basic life support skills in a simulated opioid overdose scenario, and complete electronic follow-up surveys at 3- and 6-months. This research study will take place online through Virginia Tech's secure Zoom cloud recording system, in-person at a Comprehensive Harm Reduction program in Virginia, or the *Carilion Clinic Center for Simulation, Research and Patient Safety in Roanoke, VA. Your participation in this research is voluntary. You will be compensated $25 for your time, and an additional $25 if you complete both electronic follow-up surveys.
*Carilion Clinic is in no way sponsoring or responsible for this study

We have taken steps to reduce risk related to COVID-19 and will provide you with the appropriate personal protective equipment.

Please complete the screening questions by using this link:
https://sslvpn.export.vt.edu/redcap/surveys/?s=WMJK4878MT

Please e-mail Franklin Edwards at gfedward@vt.edu or call 540-526-2550 if you have any questions. The IRB protocol number is 21-037.

Appendix C. Screening survey

Name:
Phone number:
Email address:

Are you 18 years of age or older?
a. Yes
b. No

Are you currently in a treatment recovery program?
a. Yes
b. No

Do you currently use syringe service programs?
a. Yes
b. No

General Instructions
"Opioid use" refers to (1) the use of prescribed or over-the-counter opioids in excess of the directions, and (2) any nonmedical use of opioids. The questions do not include alcoholic beverages.

Please answer every question. If you have difficulty with a statement, then choose the response that is mostly right.

These questions refer to opioid use in the past 12-months. Please answer Yes or No.

Have you used opioids other than those required for medical reasons?
a. Yes
b. No
Do you use more than one opioid at a time?
a. Yes
b. No
Are you always able to stop using opioids when you want to?
a. Yes
b. No
Have you had “blackouts or “flashbacks” as a result of opioid use?
a. Yes
b. No
Do you ever feel bad or guilty about your opioid use?
a. Yes
b. No
Does your spouse (or parents) ever complain about your involvement with opioids?
a. Yes

b. No

Have you neglected your family because of your use of opioids?

a. Yes
b. No

Have you engaged in illegal activities in order to obtain opioids?

a. Yes
b. No

Have you ever experienced withdrawal symptoms (felt sick) when you stopped taking opioids?

a. Yes
b. No

Have you had medical problems as a result of your opioid use (e.g., memory loss, hepatitis, convulsions, bleeding, etc.)?

a. Yes
b. No

Appendix D. Consent form

Title of research study: People with active opioid use disorder as first responders to overdoses: Improving implementation intentions to administer naloxone

Principal Investigator: Franklin Edwards 540-526-2550 or gfedward@vt.edu

Other study contact(s):

- Sarah Parker, PhD 540-526-2550 or separker@vtc.vt.edu
- Whitney DeLong 540-526-2550 or whit7243@vtc.vt.edu

Key Information: The following is a short summary of this study to help you decide whether or not to be a part of this study. More detailed information is listed later on in this form.

Why am I being invited to take part in a research study?

You may prevent overdoses. We want to know where you get naloxone, where you carry it, who you discuss naloxone with, and when you administer naloxone. You will be in a safe and non-judgmental space. You can talk about naloxone and practice using naloxone.
To participate, you must be ≥18 years of age.

What should I know about being in a research study?

- Someone will explain this research study to you
- Whether or not you take part is up to you
- You can choose not to take part
- You can agree to take part and later change your mind
- Your decision will not be held against you
- You can ask all the questions you want before you decide

What should I know about this research study?

- We want to learn about your use of naloxone, and electronically (e.g., on your personal device, research personnel's' electronic mobile device or tablet, or over the phone) or use an in-person hardcopy assessment at follow-up with you at 3- and 6-months.
- We expect you to participate in-person or virtually for 1.5 hours and complete electronic or in-person hardcopy follow-up surveys at 3- and 6-months.
- (Optional) With your consent (written or verbal), we will collect your Comprehensive Harm Reduction data including participant ID code or first and last name when a participant ID code cannot be recalled. We will use your participant ID code or first and last name to collect data completed by the staff of Comprehensive Harm Reduction programs including housing status, available overdose prevention kit, and overdoses experienced or treated with naloxone (at sign-up to Comprehensive Harm Reduction program). Furthermore, with your consent (written or verbal) we will collect data from previous and proceeding exchange visit forms completed by staff of Comprehensive Harm Reduction programs including housing status, overdoses experienced or treated

with naloxone, and naloxone (also referred to as Narcan) referrals and linkages. This data will support your 3- and 6-month follow-up data.

- Study group replacement:
  - If you are randomized to the experimental group or control group, your 1st study procedure will take place online through Virginia Tech's secure Zoom cloud recording system or at the Carilion Clinic Center for Simulation, Research and Patient Safety or a Comprehensive Harm Reduction program in Virginia.
  - If you are randomized to a subset of the experimental group, your 1st and 2nd study procedure will take place at the Carilion Clinic Center for Simulation, Research and Patient Safety or Comprehensive Harm Reduction program in Virginia.

- Study procedures:
  - During the 1st study procedure, you will complete a demographic questionnaire, and baseline measures of your intentions and actual use of naloxone. You will either create plans for obtaining, carrying, discussing with peers, and administering naloxone or you will set goals for performing those actions.
  - During the 2nd study procedure (second experiment), you will practice naloxone administration in simulation.
  - For the 3rd and 4th study procedures, you will complete an electronic or in-person hardcopy follow-up survey at 3- and 6-months. More detailed information about the study procedures can be found under "What happens if I say yes, I want to be in this research?"

- This is a minimal risk study. However, you may find the subject matter of simulations (opioid overdose) disturbing or upsetting. More detailed information about the risks of this study can be found under "Is there any way being in this study could be bad for me? (Detailed Risks)"
- There are no benefits for taking part in this research study. We cannot promise any benefits to others from your taking part in this research. However, possible benefits to others include the development of a low-cost intervention for increasing naloxone use.
- Taking part in research is completely up to you. You can decide to participate or not to participate.

Detailed Information: The following is more detailed information about this study in addition to the information listed above.

Who can I talk to?
If you have questions, concerns, or complaints, or think the research has hurt you, talk to the research team at: 540-526-2550 or gfedward@vt.edu

This research has been reviewed and approved by the Virginia Tech Institutional Review Board (IRB). You may communicate with them at 540-231-3732 or irb@vt.edu if:

- You have questions about your rights as a research subject
- Your questions, concerns, or complaints are not being answered by the research team
- You cannot reach the research team

- You want to talk to someone besides the research team to provide feedback about this research

How many people will be studied?
We will include no more than 100 people in this research study.

What happens if I say yes, I want to be in this research?
- We will contact you to schedule an in-person or Zoom interview at your earliest convenience.
- You will participate in three study procedures if you are randomized to the experimental group or control group.
- You will participate in four study procedures if you are randomized to a subset of the experimental group. *See table below.*

Study Procedures				
Procedure	**1st procedure**	**2nd procedure (**subset of the experimental group only)	**3rd procedure**	**4th procedure**
What	Baseline assessment and Interview (1 hour)	Simulated opioid overdose scenario (30 minutes)	3-month follow-up (*10 minutes*)	6-month follow-up (*10 minutes*)
Where	Center for Simulation, Research and Patient Safety, a Comprehensive Harm Reduction program, or Zoom	Center for Simulation, Research and Patient Safety and a Comprehensive Harm Reduction program	Electronic or in-person hardcopy survey	Electronic or in-person hardcopy survey

- During the 1st study procedure, you will complete a demographic questionnaire and a baseline assessment.
- During the same study procedure, we will help you create plans or set goals for naloxone use. We will audio and/or video record the in-person or Zoom interview. The completion of the 1st study procedure will take one hour.
- During the 2nd study procedure (subset of the experimental group only), you will respond to a simulated opioid overdose scenario. We will audio and/or video record the simulation scenario. Afterwards, we will ask you questions about this experience and answer any questions you have. The completion of the 2nd study procedure will take one hour.
- During the 3rd and 4th study procedures, you will complete an electronic or in-person hardcopy follow-up survey at 3- and 6-months. Both electronic or in-person hardcopy follow-up surveys will take 10 minutes.

What happens if I say yes, but I change my mind later?
You can leave the research at any time, for any reason, and it will not be held against you.

If you decide to leave the research, contact the investigator so that the investigator can remove you from our participant contact list and schedule.

We will delete your contact information if you withdraw from the study. We will store any data that we have collected from you for six years before deletion. We will collect your Comprehensive Harm Reduction data (described above) up to your date of drop-out or removal from the study. We will use any deidentified data we have collected from you in our analysis, publications, or presentations.

Is there any way being in this study could be bad for me? (Detailed Risks)
Overall, there is minimal risk in participating in this research study. The main risks to the participants across all study procedures include:

- Physical Risk: There is very limited physical risk, as much of the physical work will take place in a simulated opioid overdose response procedure (subset of the experimental group only). We will conduct pre-briefs and debriefs as checkpoints to ensure you are able and want to continue. We will prevent you from doing anything in the simulated scenarios that could harm you, study personnel, or the simulation equipment (ex: manikins). Given the pandemic, additional protections are being added to ensure your safety. Please see the additional document from the research team describing our COVID-19 protections. We will provide all necessary personal protective equipment.

    - Face masks are required in the Center for Simulation, Research and Patient Safety and Comprehensive Harm Reduction programs.
    - Gloves and gowns are required when working with the manikins.
    - Gowns and face shields will be worn when social distancing of at least 6FT cannot be maintained.

- Psychological Risk: Part of the focus of this research study is to help you develop plans for naloxone use. Thus, the discussion and process of writing down these plans may pose psychological risk if you are uncomfortable providing such information and trigger a negative reaction in a person who has post-traumatic stress disorder (PTSD) related to opioid overdose. However, the likelihood of this occurrence is very low. If you have symptoms of PTSD or experiences related to seeing an overdose, experiencing an overdose yourself or learning about the overdose of a loved one, please let the research personnel know. If you do experience any adverse reactions from the discussion or process of writing down information about overdose prevention, then we will stop and direct you to a peer recovery specialist or a peer recovery support line. You can take as much time as you need with the resources provided until you are ready to continue participating. You can leave the study at any time, for any reason.

- Privacy Risk: The largest risk within this project is breech of privacy. If this were to occur, we would notify all research subjects that are impacted. We will save all audio and/or video recordings to a project management server and protected behind a Virginia Tech SharePoint drive. One of the risks is breech of privacy. We are not accessing or

exposing research subjects' medical records. Another risk is that the data integrity is compromised. We will de-identify participants study materials and store them on a protected server, within the OESRC REDCap storage database, or in a locked filing cabinet behind a locked door.

- Social Risk: There is risk of social risk. It is possible that you might feel embarrassed by the information you provide in your plans. We will de-identify your study materials and store them on a protected server, within the OESRC REDCap storage database, Virginia Tech SharePoint drive, and in a locked filing cabinet behind a locked door.
- Legal Risk: Any information that you share will be kept confidential and not shared outside of the research team. We will protect and deidentify your data.

- Economic Risk: There is no economic risk associated with participation in this research.

Taking part in this research study might lead to added costs to you such as: transportation costs and time away from work, but we will work with you on figuring out a schedule that does not take away from your work hours.

What happens to the information collected for the research?
We will make every effort to limit the disclosure of your personal information, including research study materials, only to people who have a need to review this information. We cannot promise complete confidentiality. Organizations that may inspect and copy your information include the:

- Institutional Review Board of Virginia Tech
- Human Research Protection Program and other authorized representatives of Virginia Tech.
- The Food and Drug Administration or other government agencies that oversee research with humans.
- The following company (known as a contract research organization) that manages the research at Carilion and other sites: REDCap

Sensitive data may be collected in some cases. We will de-identify your study materials and store them on a secure OESRC REDCap database, Virginia Tech SharePoint drive, or in a locked filing cabinet behind a locked door.

You will complete questionnaires, the planning activity, and simulated overdose scenario in a private and confidential room. We will keep hardcopy versions of your completed questionnaires, plans or goals in a locked filing cabinet behind a locked door. We will code the questionnaires, plans, and goals with a unique number. We will link your name to the code number on a master list of those who take part in the study. We will keep this codebook/master list in the Virginia Tech SharePoint drive. This master list will only be used by the researchers or organizations that govern research quality and safety oversight. Your identity will not be used in any sort of published report.

We will audio and/or video record your planning activity and response to a simulated opioid overdose. You can choose to not be audio and/or video recorded. We will store audio and/or video recordings in a protected Virginia Tech SharePoint drive. Only research personnel will have access to this drive.

(Optional) With your consent (written or verbal), we will collect your Comprehensive Harm Reduction data including participant ID code or first and last name when a participant ID code cannot be recalled, housing status, available overdose prevention kit, and overdoses experienced or treated with naloxone (collected at sign-up to Comprehensive Harm Reduction program). Additionally, we will collect data from previous and proceeding exchange visit forms completed by staff of Comprehensive Harm Reduction programs including housing status, overdoses experienced or treated with naloxone, and naloxone (also referred to as Narcan) referrals and linkages. Your participant ID code or first and last name will be given to the Comprehensive Harm Reduction program manager to collect and release your data (described above) to the designated research personnel via email. Your Comprehensive Harm Reduction program data will be stored securely.

All identified data will be kept for a minimum of 6 years and disposed of according to the Virginia Tech IRB guidelines for human subjects' research.

If identifiers are removed from your private information or samples that are collected during this research, that information or those samples could be used for future research studies or distributed to another investigator for future research studies without your additional informed consent.

The results of this research study may be presented in summary form at conferences, in presentations, reports to the sponsor, academic papers, and as part of a thesis/dissertation.

Can I be removed from the research without my OK?
You can be removed from this research study without your approval. Possible reasons for removal include not showing up to your scheduled study procedure and unwillingness to follow the Center for Simulation, Research and Patient Safety or Comprehensive Harm Reduction programs COVID-19 risk mitigation guidelines. The reason for exclusion will be explained to you.

We will tell you about any new information that might affect your health, welfare, or choice to stay in the research.

What else do I need to know?
If needed, we will provide you with a list of local resources that provide training in opioid overdose response, naloxone, counseling or medical treatment.

Any expenses accrued for seeking or receiving medical or mental health treatment will be your responsibility and not that of the research project, research team, or Virginia Tech.

If you disclose any suicidal thoughts or plans to harm others we are required to report and follow our safety protocol. This includes contacting the PIs of this study and the IRB.

If you complete your assigned study procedures, you will receive $50 for your time and effort. You will receive the first $25 if you complete the 1st (experimental and control group only) or the 1st and 2nd procedure (subset of the experimental group only). You will receive the additional $25 if you complete the 3rd and 4th procedure. Your payment will be in the form of a ClinCard.

You will not receive the additional $25 payment if you do not complete the 3rd and 4th procedures. Your data will be kept for analysis even if you do not participate in the 3rd and 4th procedures and you will not receive any additional compensation.

Your information and samples (both identifiable and de-identified) might be used to create products or to deliver services, including some that may be sold and/or make money for others. If this happens, there are no plans to tell you, or to pay you, or to give any compensation to you or your family.

In general, we will not give you any individual results, however, results from this study will be shared through publication.

You could be contacted for future research studies but are not required to participate.

Signature Block for Capable Adult

Your signature documents your permission to take part in this research. With your consent (written or verbal), you release your participant ID code or first and last name to the designated research personnel. We will give your participant ID code or first and last name to the Comprehensive Harm Reduction program manager to collect your de-identified data (described above). Your de-identified data (described above) will be given to the designated research personnel. You can still participant if you choose not to consent to the release of your Comprehensive Harm Reduction data. We will provide you with a signed copy of this form for your records.

Signature of subject (or date of verbal consent)	Date

Printed name of subject

Do you consent (written or verbal) to the release of your Comprehensive Harm Reduction data (described above)?

Yes ☐ No ☐

Signature of subject (or date of verbal consent)

Comprehensive Harm Reduction Participant ID Code (Optional)

If you consent (verbal or written), your first and last name will be used to collect your Comprehensive Harm Reduction data (described above) in cases a Participant ID Code cannot be recalled.

Signature of person obtaining consent	Date
Printed name of person obtaining consent	

Appendix E. Demographic survey

2 first letters of mother's name		2 first letters of father's name		Day of birth of mother	Day of birth of father

Welcome to the study titled: *People with active opioid use disorder as first responders to overdoses: Improving implementation intentions to administer naloxone*

This questionnaire will collect your demographic information and experience with opioid/IV substance use. It will be kept confidential and stored securely.

The questionnaire should take you around 5-10 minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice.

Demographic Information

1. What is you gender?
    a. Male
    b. Female
    c. Non-binary/third gender
    d. Prefer to self-describe _____

2. Please specify your ethnicity.
    a. Hispanic or Latino or Spanish Origin
    b. Not Hispanic or Latino or Spanish Origin
    c. Prefer not to answer

3. Please specify your race.
    a. American Indian or Alaska Native
    b. Asian
    c. Black or African American
    d. Native Hawaiian or Other Pacific Islander
    e. White
    f. Prefer not to answer

4. What is your age? (open ended)

5. What is your employment status?
    a. Employed full time (40 or more hours per week)
    b. Employed part time (up to 39 hours per week)
    c. Unemployed and currently looking for work
    d. Unemployed and not currently looking for work
    e. Student
    f. Retired
    g. Stay-at-home parent
    h. Self-employed
    i. Unable to work

6. Highest educational level completed?
    a. Did not complete high school
    b. High school diploma
    c. Trade/technical/vocational training
    d. Associate Degree
    e. Bachelor's Degree
    f. Master's Degree
    g. Doctorate Degree or Medical Degree

Experience with Opioid/IV Substance Use

7. Are you trained in administering naloxone?
    a. Yes
    b. No

8. If yes, where did you receive your training?
    a. Hospital or other medically supervised training program
    b. Community-based training program
    c. Peer provided training
    d. Other (please specify):_____

9. Have you ever been among the first people to rescue an overdose victim?
    a. Yes
    b. No

10. Have you administered naloxone to a person experiencing an overdose at least once?
    a. Yes
    b. No

11. Please estimate how many overdose victims you have ever provided treatment for.

12. How many overdoses have you ever witnessed in the community (prior to arrival at Emergency Department or never went to Emergency Department)?

13. Which preparation(s) of naloxone have you used (circle all that apply)?
    a. Narcan® (single-step spray)
    b. Multi-step naloxone (atomizer attachment)
    c. Intramuscular naloxone (vial/syringe)
    d. Evzio® (auto-injector)
    e. Intravenous naloxone (established IV line)
    f. None of the above

Appendix F. Implementation intentions worksheet

Imagine that in the next 1-, 3-, and 6-months that you will obtain, carry, discuss the use of naloxone with your peers, and administer naloxone.

To administer naloxone in the moment of need, one would need to obtain, carry, and discuss the use of naloxone with your peers. You are more likely to be successful in your intentions to perform overdose prevention behaviors if you decide when, where, and how you will obtain, carry, discuss the use of naloxone with your peers, and administer naloxone.

Instructions

Identify each of the following elements (Action, Actor, Context, Target, Time) for the following behaviors: obtain naloxone, carry naloxone, discuss the use of naloxone with your peers, and administer naloxone. Then, **create** your **implementation intentions** for obtain naloxone, carry naloxone, discuss the use of naloxone with your peers, and administer naloxone. Develop them in the form of "if-then" statements. This activity will take you approximately 30-45 minutes.

Example: Brush teeth

1) Action: s*pecify the behavior that needs to change, in terms that can be observed or measured*

Brush teeth

2) Actor: *specify the person/people that do(es) or could do the action targeted*

Me

3) Context: *specify the physical location, emotional context, or social setting in which the action is performed*

At the bathroom sink

4) Target: *specify the person/people with/for whom the action is performed*

My teeth

5) Time: *specify when the action is performed (the time/date/frequency)*

When I'm getting ready for bed

Implementation intention: *use an "if-then" format that combines the elements you identified*

If I am at the bathroom sink when I'm getting ready for bed, then I will brush my teeth.

Behavior of interest: Obtain naloxone

1) Action: s*pecify the behavior that needs to change, in terms that can be observed or measured*

2) Actor: *specify the person/people that do(es) or could do the action targeted*

3) Context: *specify the physical location, emotional context, or social setting in which the action is performed*

4) Target: *specify the person/people with/for whom the action is performed*

5) Time: *specify when the action is performed (the time/date/frequency)*

Implementation intention: *use an "if-then" format that combines the elements you identified*

Behavior of interest: Carry naloxone

1) Action: s*pecify the behavior that needs to change, in terms that can be observed or measured*

2) Actor: *specify the person/people that do(es) or could do the action targeted*

3) Context: *specify the physical location, emotional context, or social setting in which the action is performed*

4) Target: *specify the person/people with/for whom the action is performed*

5) Time: *specify when the action is performed (the time/date/frequency)*

Implementation intention: *use an "if-then" format that combines the elements you identified*

Behavior of interest: Discuss the use of naloxone with your peers

1) Action: s*pecify the behavior that needs to change, in terms that can be observed or measured*

2) Actor: *specify the person/people that do(es) or could do the action targeted*

3) Context: *specify the physical location, emotional context, or social setting in which the action is performed*

4) Target: *specify the person/people with/for whom the action is performed*

5) Time: *specify when the action is performed (the time/date/frequency)*

Implementation intention: *use an "if-then" format that combines the elements you identified*

Behavior of interest: Administer naloxone

1) Action: s*pecify the behavior that needs to change, in terms that can be observed or measured*

2) Actor: *specify the person/people that do(es) or could do the action targeted*

3) Context: *specify the physical location, emotional context, or social setting in which the action is performed*

4) Target: *specify the person/people with/for whom the action is performed*

5) Time: *specify when the action is performed (the time/date/frequency)*

Implementation intention: *use an "if-then" format that combines the elements you identified*

Appendix G. Goal intentions worksheet

Please **create** your **goals** for the following behaviors: obtain naloxone, carry naloxone, discuss the use of naloxone with your peers, and administer naloxone. Please include details about how you plan to accomplish the following behaviors. This activity will take you approximately 30-45 minutes.

Example: I will brush my teeth at night before going to bed.

1) Obtain naloxone

2) Carry naloxone

3) Discuss the use of naloxone with your peers

4) Administer naloxone

Appendix H. COREQ Checklist

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Franklin
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	Bachelor's
Occupation	3	What was their occupation at the time of the study?	GRA
Gender	4	Was the researcher male or female?	Male
Experience and training	5	What experience or training did the researcher have?	4 years
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	43-44
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	43-44
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	23-25
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	50
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	44-46
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	44-45
Sample size	12	How many participants were in the study?	54
Non-participation	13	How many people refused to participate or dropped out? Reasons?	54
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	45
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	45
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	55-57
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	47-49
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	No
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	44
Field notes	20	Were field notes made during and/or after the inter view or focus group?	46-49
Duration	21	What was the duration of the inter views or focus group?	55
Data saturation	22	Was data saturation discussed?	86
Transcripts returned	23	Were transcripts returned to participants for comment and/or	No

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	50-53
Description of the coding tree	25	Did authors provide a description of the coding tree?	50-53
Derivation of themes	26	Were themes identified in advance or derived from the data?	50-53
Software	27	What software, if applicable, was used to manage the data?	50
Participant checking	28	Did participants provide feedback on the findings?	No
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	58-85
Data and findings consistent	30	Was there consistency between the data presented and the findings?	58-85
Clarity of major themes	31	Were major themes clearly presented in the findings?	75-82
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	82-85

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Appendix I. Implementation intentions

ID #	Location	Implementation intention: Obtaining naloxone	Prominent feature
P4	Mobile outreach	*If it's Tuesday or Friday, then I would go to the coalition off Campbell Avenue to get Narcan for myself and friends.*	Days/hours of operation
P8	Mobile outreach	*If I go on Friday between 2:00 and 4:00 PM to the mobile van, then I will obtain Naloxone in case of overdose.*	Days/hours of operation
P12	Mobile outreach	*If I am able to come to the drop-in center…then I will obtain Narcan on Wednesday, Thursday, Friday between 9:00 AM to 11:00 AM to keep myself from OD-ing.*	Days/hours of operation
P20	Mobile outreach	*If I am near the exchange or drop in center on a Friday in the AM, then I would obtained Naloxone.*	Days/hours of operation
P23	Mobile outreach	*If I get to drop-in or the Virginia Harm Reduction Coalition, I obtain Naloxone. I pass it out amongst my peers, and I hold some for myself, and we all administer as necessary.*	Days/hours of operation
P28	Mobile outreach	*If I am at the Coalition or drop-in center at 4:00 PM, then I will obtain Naloxone for me and others.*	Days/hours of operation
P33	Mobile outreach	*If it's Tuesday or Friday between 1:00 and 4:00 PM, then I will go to the mobile unit through Drop-in Center to pick up Naloxone for my friends.*	Days/hours of operation
P35	Mobile outreach	*If I am near the YMCA parking lot around 1:30, then I would obtain Naloxone for myself, wife, and other users that I think should have it.*	Days/hours of operation
P40	Mobile outreach	*If it's Monday and I'm at the coalition, then I would obtain naloxone for my peers.*	Days/hours of operation
P42	Mobile outreach	*If I am going to locations of the mobile units, I can then obtain Narcan that I would potentially use for my friends or anyone who I encounter overdosing.*	Days/hours of operation
P44	Mobile outreach	*If I am picking up substances from a dealer, then I would ask for Narcan for myself and other peers.*	Dealer
P46	Mobile outreach	*If it is Tuesday or Friday between 1:00 and 4:00 PM, then myself and girlfriend will go to the drop-in center mobile unit to obtain Naloxone for ourselves and friends.*	Days/hours of operation
P47	Mobile outreach	*If it's mid-afternoon or towards the end of the day on Tuesday or Friday, then I would go to the mobile unit to get Naloxone for myself, girlfriend, and peers.*	Days/hours of operation
P48	Mobile outreach	*If it's between 3:00 PM and 6:00 PM on either Monday, Wednesday or Friday, then I would go to the Coalition behind The Embassy to obtain Naloxone.*	Days/hours of operation
P58	Mobile outreach	*If I go to the drop in center between 1:00 and 4:00 PM, then I will obtain Naloxone for myself and others.*	Days/hours of operation
P65	Mobile outreach	*If I am at the Days Inn on Wednesdays around 1:00 PM, then I would obtain Narcan.*	Days/hours of operation

P69	Mobile outreach	*If I'm at the YMCA parking lot at 2:00 PM on Tuesdays and Fridays I will get Narcan.*	Days/hours of operation
P70	Mobile outreach	*If I go to the drop-in center mobile unit on Tuesdays and Fridays, then I would get Narcan for myself and others.*	Days/hours of operation
P72	Mobile outreach	*I go once a month to drop-in center to obtain naloxone for my peers.*	Days/hours of operation
P80	Mobile outreach	*If I go to the drop-in van after work at 4:00 PM on Fridays, then I will get Narcan for myself, friends, and girlfriend.*	Days/hours of operation
P81	Mobile outreach	*When I go to the Drop-In Center Tuesday, Friday afternoons, I obtain naloxone for my friends.*	Days/hours of operation
P95	Mobile outreach	*If it's Tuesday or Friday between 1:00 and 4:00 PM or Monday or Wednesday between 3:00 and 6:00 PM, then I will go to the mobile unit or coalition to get naloxone for myself and peers.*	Days/hours of operation
P96	Mobile outreach	*If I'm going to the coalition mid-morning or afternoon during the week, I'm getting Naloxone for myself and friends.*	Days/hours of operation
P99	Mobile outreach	*If I go to the coalition on Monday or Wednesday, or I go to the drop in center Tuesday or Friday between 1:00 PM to 4:00 PM, then I would obtain Naloxone for myself and others.*	Days/hours of operation
P102	Mobile outreach	*When I visit the mobile vans at the Community Service Building, or the Embassy Inn, or Days Inn on Tuesdays and Fridays between 1:00 and 4:00 PM, I will obtain Naloxone for myself and others.*	Days/hours of operation
P118	Mobile outreach	*I obtain Naloxone for me and others at the coalition on Friday afternoons in between 4:30 and 6:00 PM in case we overdose.*	Days/hours of operation
P120	Mobile outreach	*If I need to obtain Narcan, I can go the coalition van when I'm able to, to provide Narcan to my peers.*	Days/hours of operation
P125	Mobile outreach	*Wednesday or Friday I will find the location of the coalition, then drive to get Narcan for me and peers.*	Days/hours of operation
P126	Mobile outreach	*If it's Monday between 4:00 and 6:00 PM, then I will go to the Coalition at a hotel to get naloxone for my peers.*	Days/hours of operation
P132	Mobile outreach	*If I need to obtain Naloxone for myself or others, then I can get it from a physician or others anytime.*	Prescription
P144	Fixed site	*When I am out of supplies I go to the Wise Health Department for more. Usually every other week.*	Days/hours of operation
P149	Fixed site	*We obtain naloxone for ourselves from the exchange program and the suboxone clinic for ourselves and friends between Monday to Wednesday every two weeks.*	Days/hours of operation
P150	Fixed site	*We obtain naloxone for ourselves from the exchange program and the suboxone clinic for ourselves and friends between Monday to Wednesday every two weeks.*	Days/hours of operation
P154	Fixed site	*I'll come here Monday, Tuesday or Wednesday to this program to get naloxone for myself or others.*	Days/hours of operation
P161	Fixed site	*If I ever have to use it or if something happens, I'll make a special trip and come out here and get it.*	Days/hours of operation

P162	Fixed site	*If I ever have to use it or if something happens, I'll make a special trip and come out here and get it.*	Days/hours of operation
P165	Fixed site	*Did not make an implementation intention.*	NA
P166	Fixed site	*Did not make an implementation intention.*	NA
P167	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P168	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P169	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
ID #	**Location**	**Implementation intention: Carrying naloxone**	**Prominent feature**
P4	Mobile outreach	*If I go out everywhere and anywhere, then I'm carrying Naloxone for my friends.*	Regularly carry
P8	Mobile outreach	*If I leave the house, I carry Naloxone in my purse in case I overdose, or someone else does.*	Products available/in use/overdose
P12	Mobile outreach	*If I am certified to carry Narcan, then I will carry Narcan in my right pocket everywhere for myself.*	Regularly carry
P20	Mobile outreach	*If I am going to be around people using, and I know there is no Naloxone available, I then would carry Naloxone with me.*	Products available/in use/overdose
P23	Mobile outreach	*I carry it all the time in a harm reduction bag, then I can save my peers.*	Regularly carry
P28	Mobile outreach	*If I'm going to get more dope for me and others, then I will carry Naloxone all the time.*	Products available/in use/overdose
P33	Mobile outreach	*If a friend calls to tell me someone has overdosed, then I will either carry or bring them some more.*	Products available/in use/overdose
P35	Mobile outreach	*Any day of the week, I have Naloxone in my backpack for myself and wife.*	Regularly carry
P40	Mobile outreach	*If going to the hotel in the mornings, then I need to carry naloxone for my peers.*	Specific location
P42	Mobile outreach	*If I am in my home, I would carry Narcan on my persons to use on friends that are gathering on the weekends, late nights.*	Products available/in use/overdose
P44	Mobile outreach	*If myself or peers overdosed, then I would carry Narcan in the glove box of my car or in my pocket or bag.*	Products available/in use/overdose

P46	Mobile outreach	*If it's the evening time when I am using more opioids, then I will carry Naloxone in the car for myself and girlfriend.*	Products available/in use/overdose
P47	Mobile outreach	*If I'm going to a location to use, then I would need to place Naloxone in a backpack and carry it with me for my girlfriend and others.*	Products available/in use/overdose
P48	Mobile outreach	*If I'm going to my friend's house where I know myself or others will be using, then I will carry Naloxone in my car.*	Products available/in use/overdose
P58	Mobile outreach	*If I'm going to purchase product every other evening, then I will carry Naloxone in my car for myself and others.*	Products available/in use/overdose
P65	Mobile outreach	*If I go to hang out, I carry Narcan to prepare for the inevitability of having to use Narcan.*	Products available/in use/overdose
P69	Mobile outreach	*If I'm at the Days Inn on the weekends at night, I will carry Narcan for myself and associates.*	Specific location
P70	Mobile outreach	*If I'm going to the Days Inn at any time during the week, then I will carry Narcan in my car console for friends and associates.*	Specific location
P72	Mobile outreach	*If I have it in my trunk when I see my peers I'll ask if they need it, if they do I'll give it to them.*	Regularly carry
P80	Mobile outreach	*If I am going home or any time I am home, then I would carry Narcan 24/7 for myself, girlfriend, sister, and cousin.*	Regularly carry
P81	Mobile outreach	*When I go to my friends houses, I carry naloxone for them.*	Specific location
P95	Mobile outreach	*If I am going to my peer's house, then I will carry naloxone in my car's console for my peers.*	Specific location
P96	Mobile outreach	*If I'm going anywhere or at any time, I will carry Naloxone with me for me and my friends.*	Regularly carry
P99	Mobile outreach	*If I am going out of my house to locations I know product will be available, then I will carry at least four doses of Naloxone in my pocketbook for myself and others.*	Products available/in use/overdose
P102	Mobile outreach	*When visiting friends in the evenings between 4:00 and 9:00 PM, I will carry Naloxone in my purse, the console, and glove box of my car, in case it's needed for friends, myself or others.*	Products available/in use/overdose
P118	Mobile outreach	*I have naloxone in my car in case me or someone else is overdosing.*	Products available/in use/overdose
P120	Mobile outreach	*If I'm going anywhere, I will always have Narcan in my bag, car, etc.*	Regularly carry
P125	Mobile outreach	*I will keep supply in my truck, backpack, and house all the time.*	Regularly carry

P126	Mobile outreach	*If it's at night, on the weekend, I will put naloxone in my backpack for my peers.*	Regularly carry
P132	Mobile outreach	*If I'm in my car then I am always carrying naloxone.*	Regularly carry
P144	Fixed site	*Anytime I leave home, I'll carry naloxone in my backpack for my peers or myself.*	Regularly carry
P149	Fixed site	*We carry it ourselves in the car or on our person for ourselves and friends all the time.*	Regularly carry
P150	Fixed site	*We carry it ourselves in the car or on our person for ourselves and friends all the time.*	Regularly carry
P154	Fixed site	*I will keep Narcan at the place I reside.*	Regularly carry
P161	Fixed site	*I just put it in the car and leave it, then it's good.*	Regularly carry
P162	Fixed site	*I just put it in the car and leave it, then it's good.*	Regularly carry
P165	Fixed site	*Did not make an implementation intention.*	NA
P166	Fixed site	*Did not make an implementation intention.*	NA
P167	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P168	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P169	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
ID #	**Location**	**Implementation intention: Discussing naloxone**	**Prominent feature**
P4	Mobile outreach	*If my friends were to obtain opiates at their home, then I would discuss Naloxone.*	Products available/in use/overdose
P8	Mobile outreach	*If I am out with my friends [and they] are using heroin, I would discuss the use of Naloxone.*	Products available/in use/overdose
P12	Mobile outreach	*If I am at my house or at the park with my peers in the morning between 10:00 AM and 4:00 PM then I will present on Narcan to my peers.*	Specific location
P20	Mobile outreach	*If I'm around people that use opioids nasally, then I would discuss the importance of Naloxone*	Products available/in use/overdose
P23	Mobile outreach	*If I'm on Facebook, then I will reach out to everyone about this Narcan and use.*	Specific location

P28	Mobile outreach	*If I'm in the motel room and somebody says someone OD'd, then I need to talk about Naloxone.*	Overdose experience
P33	Mobile outreach	*If I'm in a location where opioids are present and someone asks me about Narcan, then I will discuss the use of Narcan with whoever is asking about Narcan.*	Products available/in use/overdose
P35	Mobile outreach	*When we're at someone's apartment, myself and wife can discuss this with other users, i.e., Naloxone, Narcan.*	Specific location
P40	Mobile outreach	*If I'm in the car on the way to see the dope man, then I will discuss naloxone with friends.*	Products available/in use/overdose
P42	Mobile outreach	*If substances are present and being used, I would then talk to my friends to discuss location of Narcan.*	Products available/in use/overdose
P44	Mobile outreach	*If I am in someone's home or in a car before injecting, then I would discuss using Narcan with whoever I am partying with.*	Products available/in use/overdose
P46	Mobile outreach	*If I am in a location with peers where substances will be used and someone brings up an overdose experience they had experienced or witnessed, then I would discuss the use of Naloxone with them and others.*	Products available/in use/overdose
P47	Mobile outreach	*If I am at a friend's house prior to them using substances, then I would ask if they had Naloxone to use if needed.*	Products available/in use/overdose
P48	Mobile outreach	*If I'm either at my place or anywhere that people are using, then I would discuss the use of Naloxone.*	Products available/in use/overdose
P58	Mobile outreach	*If I am at home before using opioids, then I will discuss the use of Naloxone with family and friends.*	Products available/in use/overdose
P65	Mobile outreach	*Anywhere, anytime people share experiences of using Narcan, then we will discuss using Narcan.*	Overdose experience
P69	Mobile outreach	*If I'm in a bedroom getting ready to get high, I will discuss the use of Narcan with others.*	Products available/in use/overdose
P70	Mobile outreach	*If I am picking up friends and associates who might have used or are talking about people overdosing or dying, then I would talk about Narcan and the laws about using.*	Products available/in use/overdose
P72	Mobile outreach	*If I'm at my peers home, I'll ask or they'll ask if I have it and if I do I give.*	Specific location
P80	Mobile outreach	*If I am at the dealer's house and my peers and I are going to get high, then I would discuss the use of Naloxone with other users.*	Products available/in use/overdose

P81	Mobile outreach	*I talk to friends and family at my house about Naloxone all the time.*	Specific location
P95	Mobile outreach	*If I am at my peer's house and someone's overdosed, then I will talk about using naloxone to my peers.*	Overdose experience
P96	Mobile outreach	*When discussing someone overdosing at my house or a friend's house, my friends and I talk about using Naloxone.*	Overdose experience
P99	Mobile outreach	*If I am with a group of people at my house or peer's house, and product is available or someone who has just taken a shot of product, and look like they may overdose, then I will talk about using Narcan.*	Products available/in use/overdose
P102	Mobile outreach	*When I'm at my friend's house on the porch and in the living room, I try to talk to them about having Naloxone or Narcan, before and after they decide to use.*	Products available/in use/overdose
P118	Mobile outreach	*I talk with people about using Narcan before using drugs in my house.*	Products available/in use/overdose
P120	Mobile outreach	*If I'm at my dealer's house and people are using drugs, I bring up Narcan and make it available.*	Products available/in use/overdose
P125	Mobile outreach	*Will try and supply Narcan specifically if I see in that situation (drug use) its needed.*	Products available/in use/overdose
P126	Mobile outreach	*If I'm in a car or home and we're about to use this when it's talked about.*	Products available/in use/overdose
P132	Mobile outreach	*If anyone needs Narcan, then I will tell them how to get it or give them mine.*	Overdose experience
P144	Fixed site	*If someone overdoses peers would ask when to give Naloxone and how to know when Naloxone is needed.*	Overdose experience
P149	Fixed site	*We discuss naloxone with peers anywhere to friends, family and people in the community before and after product use at all times.*	Products available/in use/overdose
P150	Fixed site	*We discuss naloxone with peers anywhere to friends, family and people in the community before and after product use at all times.*	Products available/in use/overdose
P154	Fixed site	*Talking about Narcan generally just comes up after someone's maybe had a recent overdose experience or a friend of theirs.*	Overdose experience
P161	Fixed site	*If somebody asks me, I would get it for them.*	Overdose experience
P162	Fixed site	*If somebody asks me, I would get it for them.*	Overdose experience
P165	Fixed site	*Did not make an implementation intention.*	NA

P166	Fixed site	*Did not make an implementation intention.*	NA
P167	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P168	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P169	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
ID #	**Location**	**Implementation intention: Administering naloxone**	**Prominent feature**
P4	Mobile outreach	*If my friends OD at my house, then I would administer Naloxone.*	Overdose
P8	Mobile outreach	*If I'm out using heroin and someone overdoses, then I would administer Naloxone.*	Overdose
P12	Mobile outreach	*If I see someone with the signs of an overdose, then I would use Narcan on the person overdosing.*	Signs and symptoms
P20	Mobile outreach	*If I am anywhere where someone has overdosed and they are pale, blue lips, not breathing, incoherent, I then would administer Naloxone.*	Signs and symptoms
P23	Mobile outreach	*If I realize an OD is happening, then I administer Naloxone to my peers immediately.*	Overdose
P28	Mobile outreach	*If I am anywhere where people are using and someone quits breathing, then I would administer Naloxone to the person OD'ing.*	Signs and symptoms
P33	Mobile outreach	*If I'm in my bedroom and someone is breathing two to three times a minute or knocks over things while falling, then I will administer Narcan to the overdose victim.*	Signs and symptoms
P35	Mobile outreach	*When I'm with peers and using, when I'm with peers and using, and physical stimulus has not worked, I will administer Naloxone.*	Signs and symptoms
P40	Mobile outreach	*If I'm in a location where opioids get dispersed and I notice someone not breathing, then I will administer naloxone.*	Signs and symptoms
P42	Mobile outreach	*If I am in my home in my room with my friends who then become unresponsive or stop breathing, I will then administer Narcan.*	Signs and symptoms
P44	Mobile outreach	*If I'm in the home and someone is not breathing and not responsive because of opiates, then I would administer Narcan.*	Signs and symptoms
P46	Mobile outreach	*If I am in a car or bedroom and someone's lips and fingernails starts turning blue, then I will administer Naloxone to the person overdosing.*	Signs and symptoms
P47	Mobile outreach	*If I'm in the backseat of a car and my girlfriend or another person overdosing has blue lips and is unresponsive, then I will administer Naloxone to them.*	Signs and symptoms
P48	Mobile outreach	*If I'm in my bedroom and I notice someone's not breathing, then I'll administer Naloxone to the person experiencing the overdose.*	Signs and symptoms
P58	Mobile outreach	*If I am in a friend's bedroom or bathroom and I notice they are unresponsive, then I will administer naloxone.*	Signs and symptoms

P65	Mobile outreach	*If and when all avenues are exhausted and no response is given, then I would administer Narcan.*	Signs and symptoms
P69	Mobile outreach	*If I'm at someone's house and their breathing is off, and they are showing signs of overdosing, I will grab the Narcan and use it.*	Signs and symptoms
P70	Mobile outreach	*If I'm at the Days Inn and I see my friend's lip start to turn blue, then I will administer Narcan to them.*	Signs and symptoms
P72	Mobile outreach	*If I'm at my peer's and I see them stop breathing, and I know they're overdosing, that's when I'll administer naloxone.*	Signs and symptoms
P80	Mobile outreach	*If I'm in a bedroom and someone is unresponsive, then I will administer Narcan to the overdose victim.*	Signs and symptoms
P81	Mobile outreach	*When I find friends unresponsive after trying to get them awake, if I wasn't able to I would give naloxone.*	Signs and symptoms
P95	Mobile outreach	*If I am at my peer's house, and I notice someone's unresponsive for two to three minutes, then I will administer naloxone to the overdose victim.*	Signs and symptoms
P96	Mobile outreach	*When people are completely unresponsive in my apartment or my friend's living room or kitchen, my friends and I administer Naloxone.*	Signs and symptoms
P99	Mobile outreach	*If I am in my bedroom and my peer has stopped breathing, and I can't feel a pulse, then I will administer Naloxone to the person overdosing.*	Signs and symptoms
P102	Mobile outreach	*While your husband's friend comes to visit at your house for dinner and plans to stay over, if you notice his skin tone or breathing change or become non-existent, you would administer the Narcan.*	Signs and symptoms
P118	Mobile outreach	*I administer Narcan to anyone at the hotel rooms or in my house who happens to be overdosing.*	Overdose
P120	Mobile outreach	*If my husband turns blue and isn't breathing, then I will administer Narcan to save his life.*	Signs and symptoms
P125	Mobile outreach	*Walked in with spouse on the bed. She had blue lips and wasn't responding, so I checked breathing and pulse. Got nothing, so I administered Narcan.*	Signs and symptoms
P126	Mobile outreach	*If you are in the bedroom and someone appears blue and foaming out the mouth, then I'd administer naloxone.*	Signs and symptoms
P132	Mobile outreach	*If I were to administer Narcan then it would be to someone who is unresponsive.*	Signs and symptoms
P144	Fixed site	*If at a peer's place that I know had used and starts to become unresponsive and in and out of consciousness I would administer naloxone.*	Signs and symptoms
P149	Fixed site	*We administer naloxone ourselves in the streets or homes of friends and strangers when they are unconscious from overdosing.*	Signs and symptoms
P150	Fixed site	*We administer naloxone ourselves in the streets or homes of friends and strangers when they are unconscious from overdosing.*	Signs and symptoms
P154	Fixed site	*If I saw a bluish-colored tint to their lips and the unconsciousness, then I would administer Naloxone.*	Signs and symptoms

P161	Fixed site	*If I see somebody ODing, I would absolutely Narcan them.*	Overdose
P162	Fixed site	*If I see somebody ODing, I would absolutely Narcan them.*	Overdose
P165	Fixed site	*Did not make an implementation intention.*	NA
P166	Fixed site	*Did not make an implementation intention.*	NA
P167	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P168	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA
P169	Fixed site	*Did not make an implementation intention but identified the contextual elements.*	NA

Appendix J. Goal intentions

ID #	Location	Goal intention: Obtaining naloxone	Prominent feature
P5	Mobile outreach	*I will try to obtain naloxone at least once a week when I go to the Coalition Van.*	Higher quantity/frequency
P6	Mobile outreach	*Maintain getting Naloxone at least one time a month.*	Maintain current behavior
P13	Mobile outreach	*Once per month to take to my house. Continue as is.*	Maintain current behavior
P16	Mobile outreach	*I would hope to be able to find more rides to my typical place where I did it in Roanoke, the drop-in center. And I hope to just be able to keep it with me more, or to keep more on me just in case of any scenario.*	Higher quantity/frequency
P17	Mobile outreach	*I will try to obtain at least two boxes a week of naloxone.*	Higher quantity/frequency
P22	Mobile outreach	*I would like to start getting Naloxone each time I go to drop in. So twice a week, at least one box or two doses with each visit.*	Higher quantity/frequency
P30	Mobile outreach	*Doctor prescribed monthly, would like to obtain constant supply if necessary to save any and everyone around.*	Higher quantity/frequency
P34	Mobile outreach	*Pick up extra to distribute to friends.*	Higher quantity/frequency
P38	Mobile outreach	*Good supply. To have about 24 on hand.*	Higher quantity/frequency
P39	Mobile outreach	*Continue to get my six boxes a week.*	Maintain current behavior
P49	Mobile outreach	*Learn how to keep it on hand more.*	Higher quantity/frequency
P52	Mobile outreach	*Attending or just coming here to the drop-in center or to mobile unit.*	Maintain current behavior
P57	Mobile outreach	*Get more naloxone to have available for others.*	Higher quantity/frequency
P59	Mobile outreach	*I will check my expiration dates on Naloxone currently at home. I will replace it when it has less than one month remaining and dispose of the expired Naloxone accordingly.*	Maintain current behavior
P64	Mobile outreach	*Just an in case situation.*	Maintain current behavior
P71	Mobile outreach	*Making sure to obtain in its most pristine state.*	Higher quantity/frequency
P75	Mobile outreach	*I will get Narcan to give to anyone who asks for it.*	Maintain current behavior
P77	Mobile outreach	*I will get Naloxone once a year from the drop-in center.*	Reduce quantity/frequency

P84	Mobile outreach	*Try to get narcan to more people.*	Higher quantity/frequency
P89	Mobile outreach	*As much as people get syringes, they should get Narcan.*	Higher quantity/frequency
P97	Mobile outreach	*Continue making it easy to get Narcan from the Drop-in Center and Coalition.*	Maintain current behavior
P104	Mobile outreach	*Keep getting three to four boxes from Drop-in Center.*	Maintain current behavior
P108	Mobile outreach	*I attend weekly excursions to VHRC to obtain IM naloxone specifically.*	Maintain current behavior
P111	Mobile outreach	*Continue getting and distributing the nasal naloxone as we have been.*	Maintain current behavior
P122	Mobile outreach	*Figure out where to get it.*	Higher quantity/frequency
P138	Mobile outreach	*Did not make a goal intention.*	NA
P141	Mobile outreach	*Continue getting at least two boxes a week.*	Maintain current behavior
P155	Mobile outreach	*Continue to get at least one to two boxes when I go to the syringe exchange program.*	Maintain current behavior
P170	Mobile outreach	*I plan on always having that.*	Maintain current behavior
P145	Fixed site	*If there is a way to obtain more sooner if needed without any questions.*	Higher quantity/frequency
P146	Fixed site	*Continue to get as needed to give to other people that needed*	Maintain current behavior
P147	Fixed site	*Continue to get as needed to give to other people that needed*	Maintain current behavior
P148	Fixed site	*Continue to get as needed to give to other people that needed*	Maintain current behavior
P151	Fixed site	*My doctor gives me a prescription every week when I get my medicine filled every week at CVS. Also when I come to the needle exchange.*	Maintain current behavior
P152	Fixed site	*I get mine from the Health Department quite frequently.*	Maintain current behavior
P153	Fixed site	*Health department and doctor's office.*	Maintain current behavior
P156	Fixed site	*I will always have one somewhere around.*	Maintain current behavior
P157	Fixed site	*Did not make a goal intention.*	NA
P158	Fixed site	*Did not make a goal intention.*	NA

P160	Fixed site	*Continue to get what they give me here.*	Maintain current behavior
P163	Fixed site	*Continue to get about one box from this program*	Maintain current behavior
P164	Fixed site	*Did not make a goal intention.*	NA
ID #	**Location**	**Goal intention: Carrying naloxone**	**Prominent feature**
P5	Mobile outreach	*I will try to carry more naloxone than I already do. Will carry it in bigger quantity.*	Higher quantity
P6	Mobile outreach	*I will always carry at least one dose of Naloxone, and take extras if I'm going to peer's houses, especially for giving instructions on use.*	Maintain current behavior
P13	Mobile outreach	*Start carrying it in my bag or on my person, being more responsible with carrying it.*	Start carrying
P16	Mobile outreach	*For when I have Narcan or Naloxone of any way, shape or form, I would like to keep it in a book bag with me, with my stuff, wherever I go. To make sure that it's always with me, and to be able to easily access it whenever it's needed.*	Start carrying
P17	Mobile outreach	*I will try to keep at least one box on me or easily accessible to me at all times.*	Start carrying
P22	Mobile outreach	*I would or will be putting Naloxone in the car so that it is readily available wherever I am.*	Start carrying
P30	Mobile outreach	*Figure out the most helpful amount without overkill to hand out to friends.*	Higher quantity
P34	Mobile outreach	*I would like to have a smaller bag that is on my persons at all times to keep Narcan in.*	Start carrying
P38	Mobile outreach	*Keep it close. In a car golve box and in trunk.*	Start carrying
P39	Mobile outreach	*I'll continue to carry six doses a week.*	Maintain current behavior
P49	Mobile outreach	*Keep some in the book bag I carry or in the car.*	Start carrying
P52	Mobile outreach	*Continue to carry it in my purse, car, and keep at home in my kitchen.*	Maintain current behavior
P57	Mobile outreach	*Continue to carry with myself like I currently am.*	Maintain current behavior
P59	Mobile outreach	*I will continue to keep it in stock at home, and I will put a few in my car.*	Maintain current behavior
P64	Mobile outreach	*Start carrying it in my purse.*	Start carrying
P71	Mobile outreach	*Try carrying more bluntly.*	Start carrying

P75	Mobile outreach	*Continue to keep narcan in my van, house, and my grill (for neighbors to get it if I am not home).*	Maintain current behavior
P77	Mobile outreach	*I will carry multiple types of Naloxone and a lot of each type.*	Start carrying
P84	Mobile outreach	*Take Narcan out of packaging to carry it more easily.*	Start carrying
P89	Mobile outreach	*I would definitely carry more with me.*	Higher quantity
P97	Mobile outreach	*Continue carrying narcan in my purse.*	Maintain current behavior
P104	Mobile outreach	*Continue to keep Narcan in room and carry to other places.*	Maintain current behavior
P108	Mobile outreach	*I will carry Naloxone in my backpack.*	Start carrying
P111	Mobile outreach	*I should try to keep more naloxone on person more often in certain place than leaving it in car.*	Higher quantity
P122	Mobile outreach	*If I had it, either in my purse or in my house.*	Start carrying
P138	Mobile outreach	*Usually four to six.*	Maintain current behavior
P141	Mobile outreach	*Continue carrying it in my purse.*	Maintain current behavior
P155	Mobile outreach	*Continue to carry it in the trunk of car and purse and keep it at home.*	Maintain current behavior
P170	Mobile outreach	*I'll try to always carry it.*	Maintain current behavior
P145	Fixed site	*I always make sure where ever we go to party there is a Narcan at that home or I make sure to bring it so we have it in case.*	Maintain current behavior
P146	Fixed site	*Did not make a goal intention.*	NA
P147	Fixed site	*Did not make a goal intention.*	NA
P148	Fixed site	*Did not make a goal intention.*	NA
P151	Fixed site	*We don't really use outside of the home I always have a couple canisters at house.*	Maintain current behavior
P152	Fixed site	*It's always on me and my fiance.*	Maintain current behavior
P153	Fixed site	*I keep it in the car (two boxes) also in the home (two boxes).*	Maintain current behavior
P156	Fixed site	*I'll always try to have at least one in my car and a few in my home.*	Maintain current behavior

P157	Fixed site	*Did not make a goal intention.*	NA
P158	Fixed site	*Did not make a goal intention.*	NA
P160	Fixed site	*I'll try to start carrying it more often with me.*	Start carrying
P163	Fixed site	*Start carrying it again.*	Start carrying
P164	Fixed site	*Did not make a goal intention.*	NA
ID #	**Location**	**Goal intention: Discussing naloxone**	**Prominent feature**
P5	Mobile outreach	*I will try to tell my peers of my own personal experiences in the hopes that they will listen and take the advice/knowledge with them.*	Overdose experience
P6	Mobile outreach	*Keep spreading the word, and giving instructions on how to save as many lives as possible.*	Maintain current behavior
P13	Mobile outreach	*Very open with most people. Keep out in the open.*	Maintain current behavior
P16	Mobile outreach	*My goal is whenever I know one of them will be using any form of opiates that would, just really any opiates in general, I will just make sure to let them know, just to keep someone with them at all times that does know how to use it. Or at least just someone with them, and always keep it on them because anything could have extra stuff in it. And just so they stay safe as well. And at least have that conversation with them at least once.*	Educate
P17	Mobile outreach	*Maintain my efforts to educate as many people as I can about the proper use and benefits of naloxone.*	Maintain current behavior
P22	Mobile outreach	*I would like to learn more about Naloxone so that I will feel more comfortable speaking with my peers and sharing information.*	Educate
P30	Mobile outreach	*We discuss often, always more to explain and learn. Keep an open mind about new treatments.*	Educate
P34	Mobile outreach	*Bring up the use of Narcan more frequently when with friends and using drugs will probably happen.*	Frequently discuss
P38	Mobile outreach	*Bring the use up more in conversation.*	Frequently discuss
P39	Mobile outreach	*Make sure people were comfortable with discussing [and] being educated on all narcan/naloxone.*	Educate
P49	Mobile outreach	*Help people that may not know how to use it.*	Educate
P52	Mobile outreach	*I let it be known that I have it in my house and how it is used.*	Frequently discuss
P57	Mobile outreach	*Continue to discuss naloxone use with peers as I currently am.*	Maintain current behavior

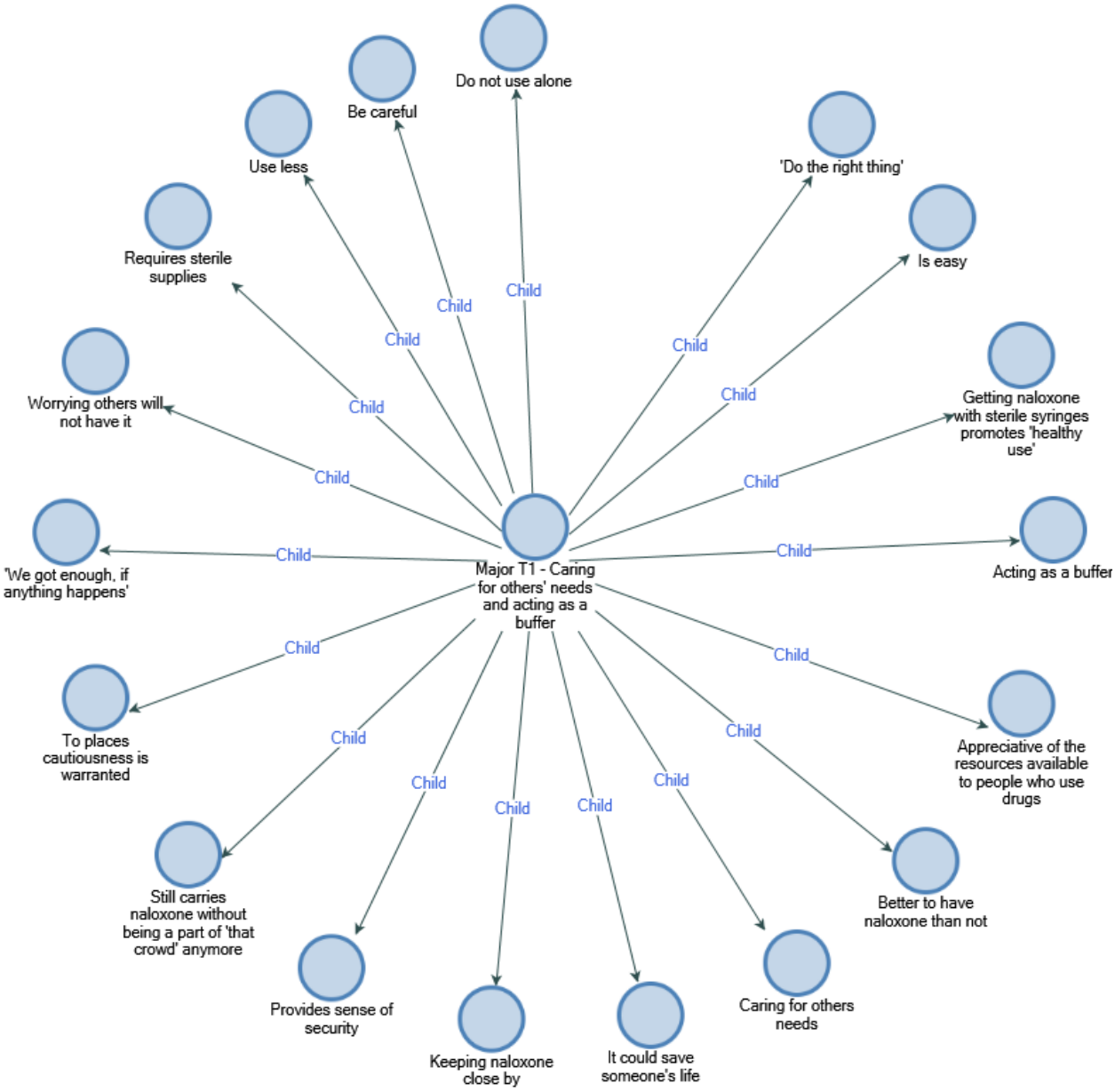
P59	Mobile outreach	*I'll make sure all peers have a basic understanding of Naloxone and how to use it and a small supply.*	Educate
P64	Mobile outreach	*Make sure to disclose where it is kept.*	Frequently discuss
P71	Mobile outreach	*Get educated to educate.*	Educate
P75	Mobile outreach	*Tell people how to use Narcan and where to get it.*	Educate
P77	Mobile outreach	*I will talk to peers about Naloxone when they bring it up in conversation.*	Frequently discuss
P84	Mobile outreach	*Make an effort to see if someone has Narcan or encourage peers to use Narcan.*	Frequently discuss
P89	Mobile outreach	*I would like to show people how to use it if they don't know. Just educate them.*	Educate
P97	Mobile outreach	*Talk about Narcan after someone's had to administer it and how long it took to revive the person.*	Overdose experience
P104	Mobile outreach	*Continue to tell people about Narcan and how to use it, and not to panic.*	Maintain current behavior
P108	Mobile outreach	*I constantly discuss opioid OD reversals through shared experience.*	Maintain current behavior
P111	Mobile outreach	*Push naloxone more than when product demands of it.*	Frequently discuss
P122	Mobile outreach	*If you're using this stuff, make sure people know, "Hey man, I got it. If I go down."*	Frequently discuss
P138	Mobile outreach	*Did not make a goal intention.*	NA
P141	Mobile outreach	*Will continue to say to others they will administer it if needed.*	Maintain current behavior
P155	Mobile outreach	*Did not make a goal intention.*	NA
P170	Mobile outreach	*Continue talking about it with peers.*	Maintain current behavior
P145	Fixed site	*Continue to tell people to make sure they have it on hand they never know it could save someone's life.*	Maintain current behavior
P146	Fixed site	*Continue to give it to people and educate people that it could still happen.*	Maintain current behavior
P147	Fixed site	*Continue to give it to people and educate people that it could still happen.*	Maintain current behavior
P148	Fixed site	*Continue to give it to people and educate people that it could still happen.*	Maintain current behavior
P151	Fixed site	*I have discussed Naloxone a few times with a few different people.*	Maintain current behavior

P152	Fixed site	*I've never personally have talked to my peers about Narcan.*	Maintain current behavior
P153	Fixed site	*Usually after experiencing someone OD-ing, then we talk about ways and experiences with Narcan.*	Overdose experience
P156	Fixed site	*I'll talk freely about it.*	Maintain current behavior
P157	Fixed site	*Continue to try and talk about it with peers and stuff.*	Maintain current behavior
P158	Fixed site	*Continue to try and talk about it with peers and stuff.*	Maintain current behavior
P160	Fixed site	*Continue to talk to them about it.*	Maintain current behavior
P163	Fixed site	*Continue to talk about it when peers bring it up.*	Maintain current behavior
P164	Fixed site	*Did not make a goal intention.*	NA
ID #	**Location**	**Goal intention: Administering naloxone**	**Prominent feature**
P5	Mobile outreach	*I will try to start using the syringe naloxone as well as the nasal spray, because if the nasal spray is not available, then I would like to still be able to bring someone back with the syringe naloxone compared to not being able to do anything at all.*	Seeking education
P6	Mobile outreach	*Only administer to persons not breathing, or not having one breath every three seconds for five minutes.*	Signs and symptoms
P13	Mobile outreach	*If I see someone in need of help, I will administer and then call for help.*	Signs and symptoms
P16	Mobile outreach	*I guess a better goal would be just to keep myself under, I guess, a more calmer state. For others around me, just to make sure that a clear mind is just better to be under while dealing with certain situations where it would be needed. And I feel over the few years, I've been better at it, but still, there's always room for improvement.*	Remain calm
P17	Mobile outreach	*Make sure I stay current on the proper ways to administer naloxone, just to make sure if I was put in that situation, I'd know what to do or how to instruct someone else to do so.*	Seeking education
P22	Mobile outreach	*I'll learn to better identify signs of an overdose so that there was no question or delay when it comes to administering Naloxone.*	Seeking education
P30	Mobile outreach	*Making myself more comfortable with using it and administering it.*	Remain calm
P34	Mobile outreach	*Having more confidence in my decision in administering the Narcan.*	Seeking education
P38	Mobile outreach	*Try to make it less stressful.*	Remain calm

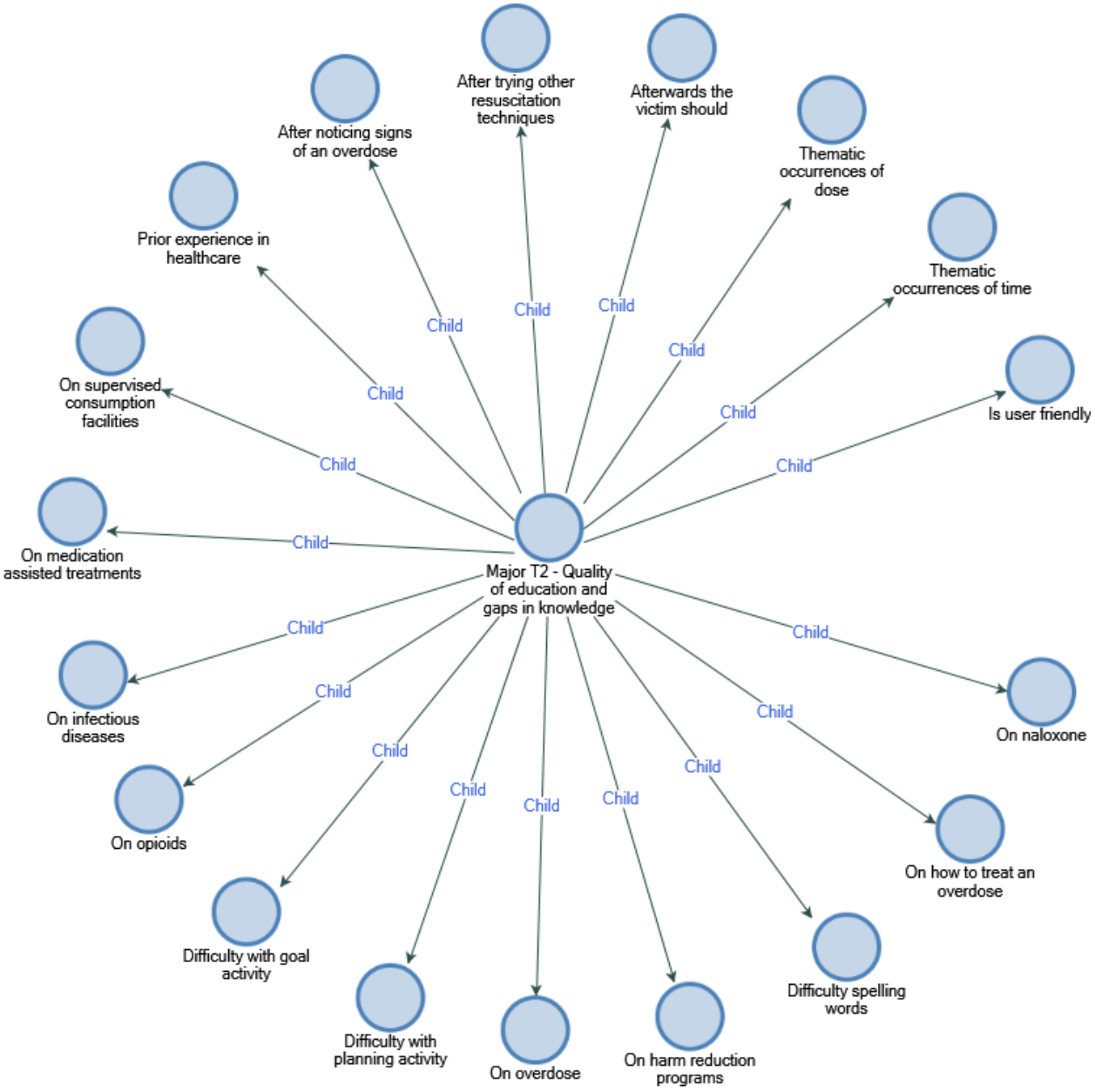
P39	Mobile outreach	*Educate people on when and how much to give.*	Seeking education
P49	Mobile outreach	*Pay closer attention and be calmer.*	Remain calm
P52	Mobile outreach	*Start to time between doses administered.*	Seeking education
P57	Mobile outreach	*Study more on it, get more knowledge on it and think more clearly.*	Seeking education
P59	Mobile outreach	*I will routinely watch refresher videos to maintain knowledge.*	Seeking education
P64	Mobile outreach	*To learn all I can about how and what to do.*	Seeking education
P71	Mobile outreach	*To get educated on administering and when.*	Seeking education
P75	Mobile outreach	*Recognize unresponsive and skin color of victim, and loss of breathing.*	Signs and symptoms
P77	Mobile outreach	*I will administer narcan to people I happen to come across, but will try to avoid situations I would need to administer.*	Signs and symptoms
P84	Mobile outreach	*Make sure that anyone who will use product are prepared to administer Narcan.*	Seeking education
P89	Mobile outreach	*I would like people to learn about the amount of Narcan and when to give it.*	Seeking education
P97	Mobile outreach	*Look for unresponsiveness, blue lips, rolled back eyes, and stiffness before administering narcan.*	Signs and symptoms
P104	Mobile outreach	*Continue to administer if someone is unresponsive and turning blue.*	Maintain current behavior
P108	Mobile outreach	*I immediately administered naloxone upon visual inspection of blue lips.*	Signs and symptoms
P111	Mobile outreach	*Learning other techniques to possibly use other than Naloxone in an overdose.*	Seeking education
P122	Mobile outreach	*Did not make a goal intention.*	NA
P138	Mobile outreach	*Did not make a goal intention.*	NA
P141	Mobile outreach	*Continue to administer naloxone when someone turns blue.*	Maintain current behavior
P155	Mobile outreach	*Encounter blue or purplish coloration and lack of breathing, most definitely going to administer Naloxone.*	Signs and symptoms
P170	Mobile outreach	*Did not make a goal intention.*	NA
P145	Fixed site	*Maybe I could be more calmer more effective and clear headed if I encounter someone I need to give Narcan to.*	Remain calm

P146	Fixed site	*Did not make a goal intention.*	NA
P147	Fixed site	*Did not make a goal intention.*	NA
P148	Fixed site	*Did not make a goal intention.*	NA
P151	Fixed site	*I have had to administer naloxone one time. It was very easy to use, the people from Health Department explained it to us very clearly and easily.*	Signs and symptoms
P152	Fixed site	*I've never been around someone personally.*	Seeking education
P153	Fixed site	*When I notice a gray clamy look to the skin and unresponsive then I administer Narcan.*	Signs and symptoms
P156	Fixed site	*At the signs of overdose.*	Signs and symptoms
P157	Fixed site	*Did not make a goal intention.*	NA
P158	Fixed site	*Did not make a goal intention.*	NA
P160	Fixed site	*I just squirt it, then if it don't work, I squirt some more. But just keeps squirting it, if he got it.*	Signs and symptoms
P163	Fixed site	*If that situation were to arise, I would be quick to provide somebody naloxone.*	Signs and symptoms
P164	Fixed site	*Did not make a goal intention.*	NA

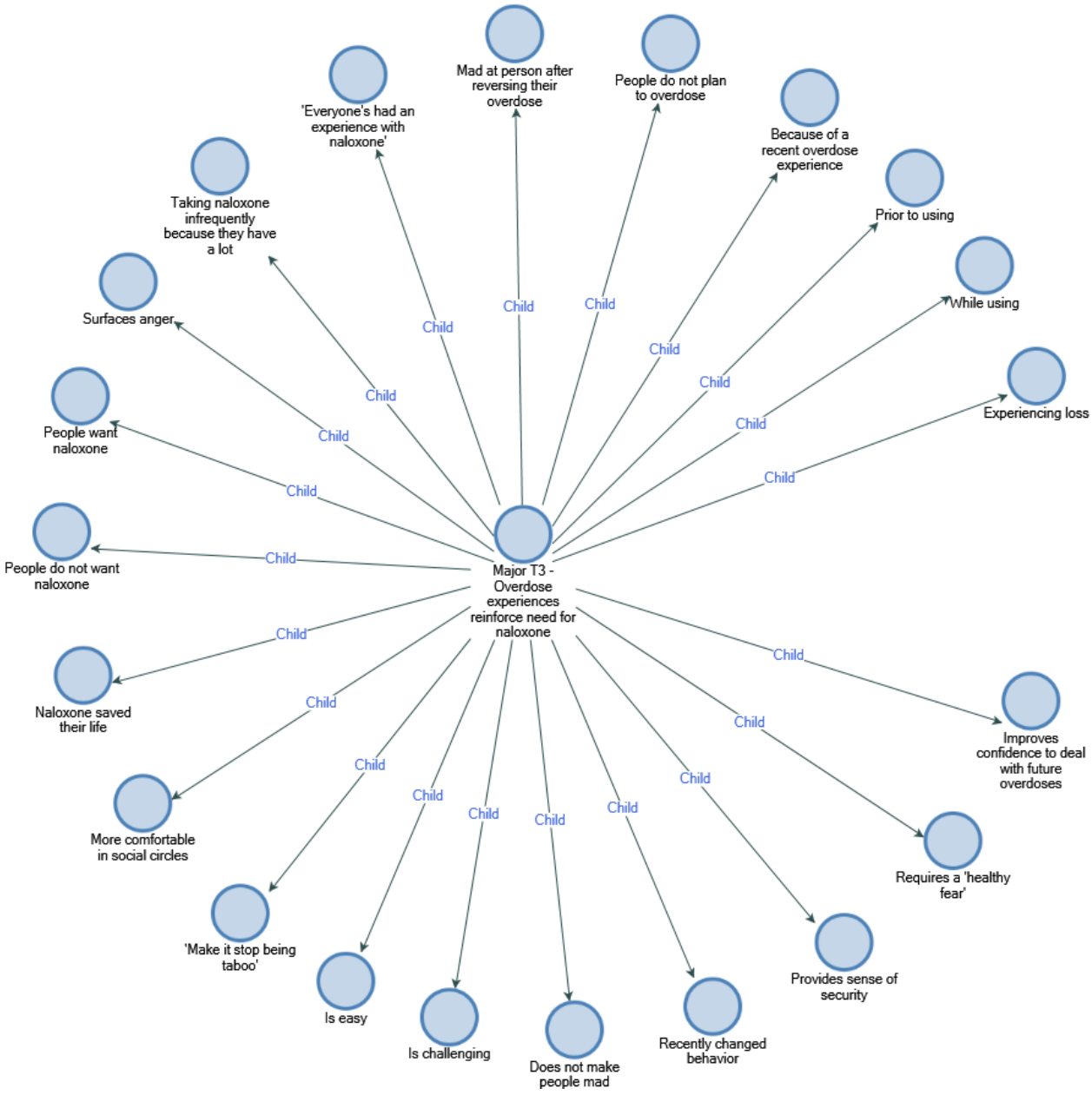
Appendix K. Thematic map: Caring for others' needs and acting as a buffer



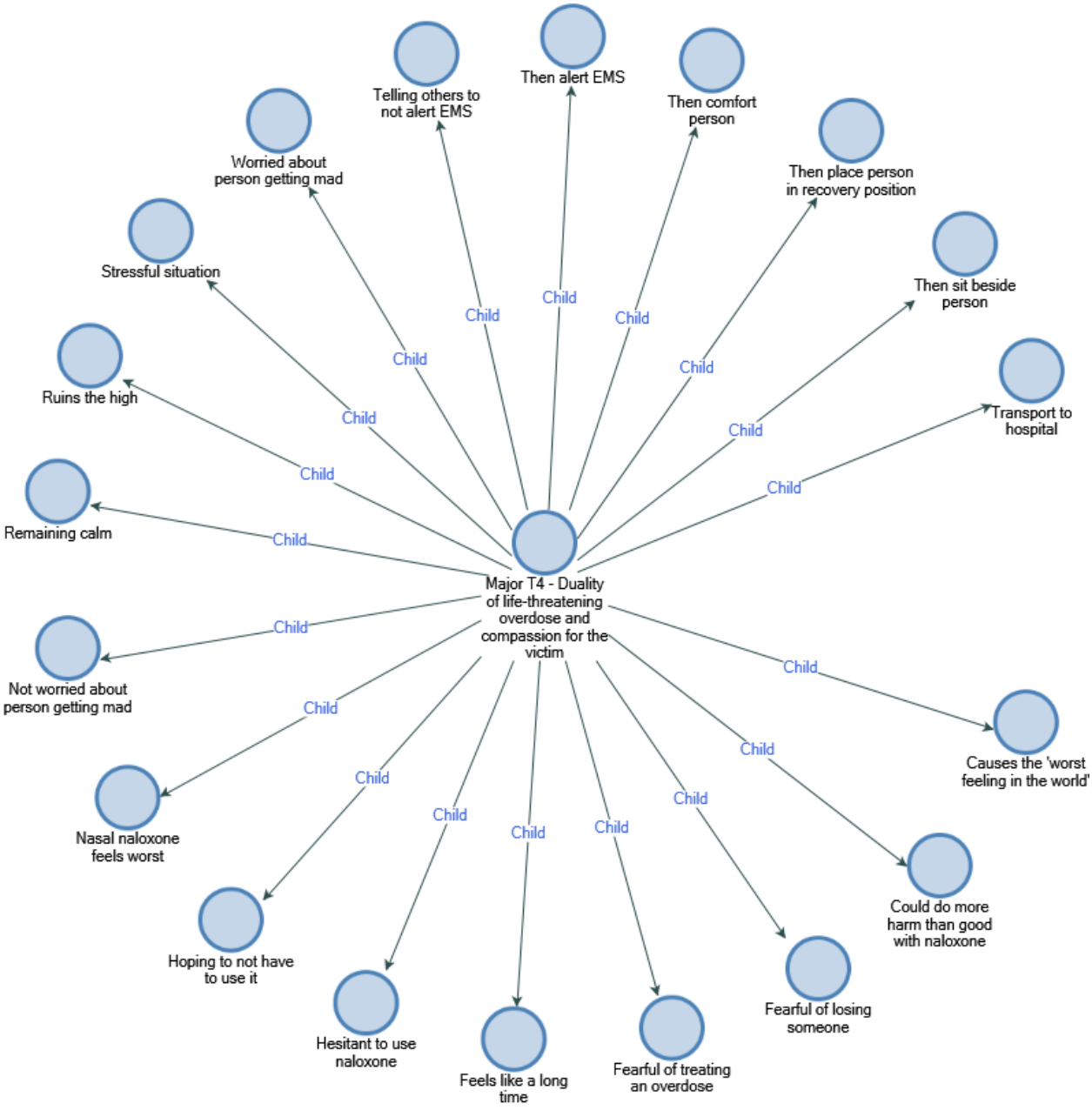
Appendix L. Thematic map: Quality of education and gaps in knowledge



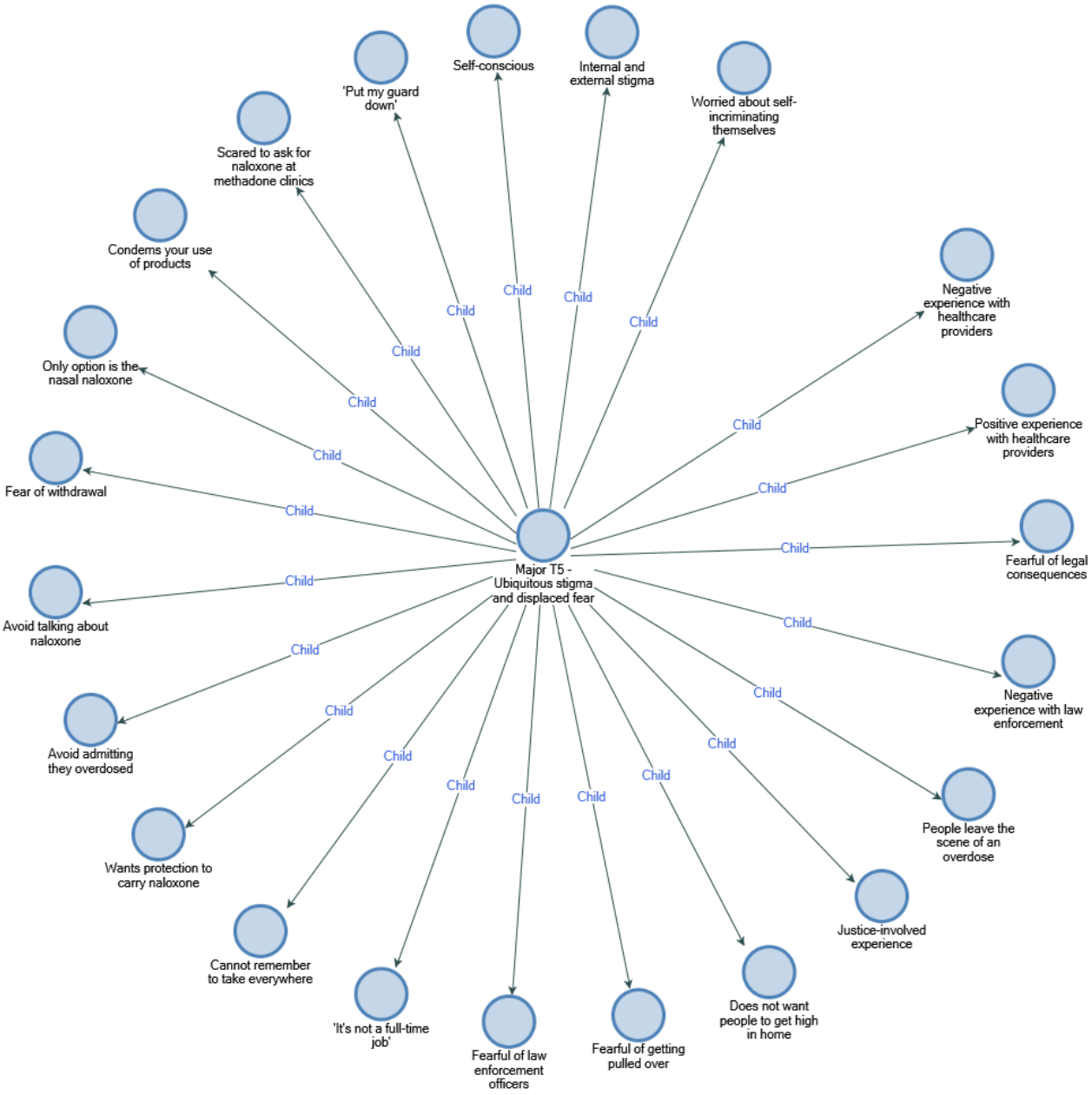
Appendix M. Thematic map: Overdose experiences reinforce need for naloxone



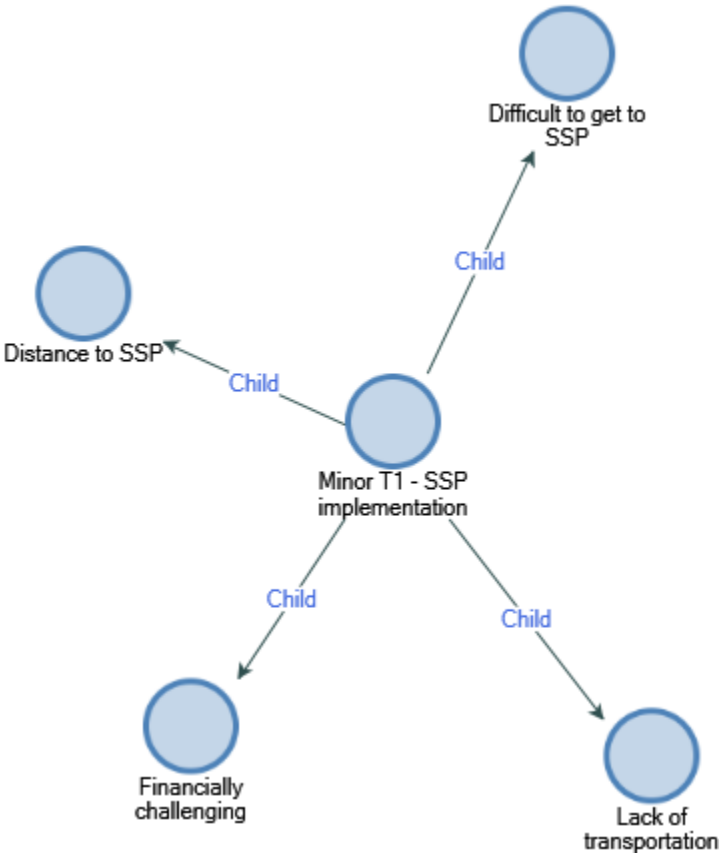
Appendix N. Thematic map: Duality of life-threatening overdose and compassion for the victim



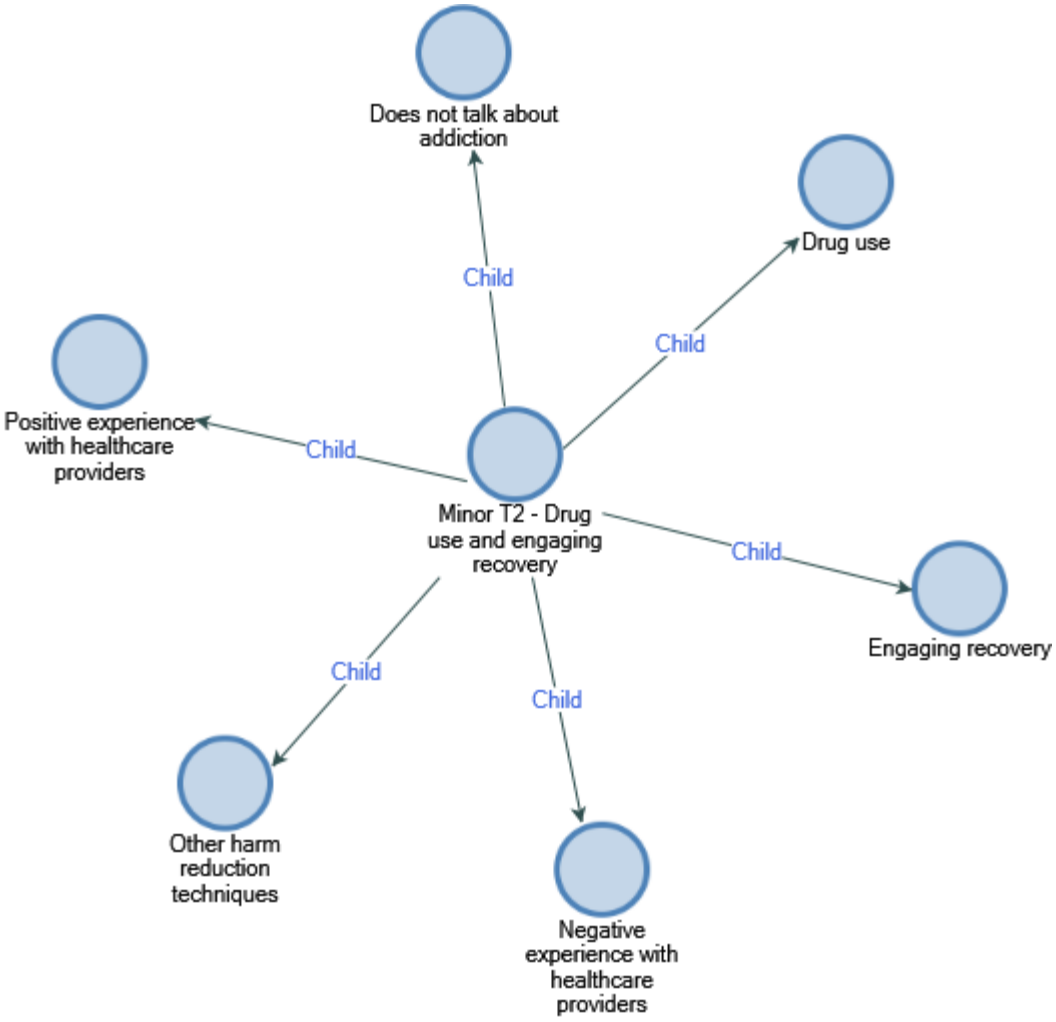
Appendix O. Thematic map: Ubiquitous stigma and displaced fear



Appendix P. Thematic map: SSP implementation



Appendix Q. Thematic map: Drug use and engaging recovery



Appendix R. Baseline data collection instrument

Welcome to the study titled: *People with active opioid use disorder as first responders to overdoses: Improving implementation intentions to administer naloxone*

This assessment should take you 10-15 minutes to complete. This survey contains 36 questions about your attitude towards overdose prevention behaviors including obtaining naloxone, carrying naloxone, discussing the use of naloxone with your peers, and administering naloxone. Additionally, there are 4 questions about your intentions to obtain naloxone, carry naloxone, discuss the use of naloxone with your peers, and administer naloxone. Lastly, there are 12 questions about your use of naloxone in the past 1-month, 3-months, and 6-months.

Definitions

- Obtain naloxone – pick up naloxone at a drop-in center, harm reduction coalition, local pharmacy, from a friend, etc.
- Carry naloxone – have naloxone in a bag or in your pocket.
- Discuss the use of naloxone with your peers – talk with your peers about using naloxone if someone were to overdose.
- Administer naloxone – use naloxone to save someone's life or attempt to save someone's life by using naloxone.

Instructions

For the following questions, please pick the choices that reflect your attitude towards the following overdose prevention behaviors (obtaining naloxone, carrying naloxone, discussing the use of naloxone with your peers and administering naloxone).

Attitudes

Obtaining naloxone

1. For me, obtaining naloxone is:
    a. Extremely unimportant
    b. Unimportant
    c. Somewhat unimportant
    d. Neutral/No opinion
    e. Somewhat important
    f. Important
    g. Extremely important

2. For me, obtaining naloxone is:
    a. Extremely pointless
    b. Pointless
    c. Somewhat pointless
    d. Neutral/No opinion
    e. Somewhat worthwhile

f. Worthwhile
g. Extremely worthwhile

3. For me, obtaining naloxone is:
    a. Extremely useless
    b. Useless
    c. Somewhat useless
    d. Neutral/No opinion
    e. Somewhat useful
    f. Useful
    g. Extremely useful

4. For me, obtaining naloxone is:
    a. Extremely foolish
    b. Foolish
    c. Somewhat foolish
    d. Neutral/No opinion
    e. Somewhat wise
    f. Wise
    g. Extremely wise

5. For me, obtaining naloxone is:
    a. Extremely harmful
    b. Harmful
    c. Somewhat harmful
    d. Neutral/No opinion
    e. Somewhat beneficial
    f. Beneficial
    g. Extremely beneficial

Carrying naloxone

6. For me, carrying naloxone is:
    a. Extremely unimportant
    b. Unimportant
    c. Somewhat unimportant
    d. Neutral/No opinion
    e. Somewhat important
    f. Important
    g. Extremely important

7. For me, carrying naloxone is:
    a. Extremely pointless
    b. Pointless

c. Somewhat pointless
d. Neutral/No opinion
e. Somewhat worthwhile
f. Worthwhile
g. Extremely worthwhile

8. For me, carrying naloxone is:
    a. Extremely useless
    b. Useless
    c. Somewhat useless
    d. Neutral/No opinion
    e. Somewhat useful
    f. Useful
    g. Extremely useful

9. For me, carrying naloxone is:
    a. Extremely foolish
    b. Foolish
    c. Somewhat foolish
    d. Neutral/No opinion
    e. Somewhat wise
    f. Wise
    g. Extremely wise

10. For me, carrying naloxone is:
    a. Extremely harmful
    b. Harmful
    c. Somewhat harmful
    d. Neutral/No opinion
    e. Somewhat beneficial
    f. Beneficial
    g. Extremely beneficial

Discussing the use of naloxone with your peers

11. For me, discussing the use of naloxone with my peers is:
    a. Extremely unimportant
    b. Unimportant
    c. Somewhat unimportant
    d. Neutral/No opinion
    e. Somewhat important
    f. Important
    g. Extremely important

12. For me, discussing the use of naloxone with my peers is:
    a. Extremely pointless
    b. Pointless
    c. Somewhat pointless
    d. Neutral/No opinion
    e. Somewhat worthwhile
    f. Worthwhile
    g. Extremely worthwhile

13. For me, discussing the use of naloxone with my peers is:
    a. Extremely useless
    b. Useless
    c. Somewhat useless
    d. Neutral/No opinion
    e. Somewhat useful
    f. Useful
    g. Extremely useful

14. For me, discussing the use of naloxone with my peers is:
    a. Extremely foolish
    b. Foolish
    c. Somewhat foolish
    d. Neutral/No opinion
    e. Somewhat wise
    f. Wise
    g. Extremely wise

15. For me, discussing the use of naloxone with my peers is:
    a. Extremely harmful
    b. Harmful
    c. Somewhat harmful
    d. Neutral/No opinion
    e. Somewhat beneficial
    f. Beneficial
    g. Extremely beneficial

Administering naloxone

16. For me, administering naloxone is:
    a. Extremely unimportant
    b. Unimportant
    c. Somewhat unimportant
    d. Neutral/No opinion
    e. Somewhat important

f. Important
g. Extremely important

17. For me, administering naloxone is:
    a. Extremely pointless
    b. Pointless
    c. Somewhat pointless
    d. Neutral/No opinion
    e. Somewhat worthwhile
    f. Worthwhile
    g. Extremely worthwhile

18. For me, administering naloxone is:
    a. Extremely useless
    b. Useless
    c. Somewhat useless
    d. Neutral/No opinion
    e. Somewhat useful
    f. Useful
    g. Extremely useful

19. For me, administering naloxone is:
    a. Extremely foolish
    b. Foolish
    c. Somewhat foolish
    d. Neutral/No opinion
    e. Somewhat wise
    f. Wise
    g. Extremely wise

20. For me, administering naloxone is:
    a. Extremely harmful
    b. Harmful
    c. Somewhat harmful
    d. Neutral/No opinion
    e. Somewhat beneficial
    f. Beneficial
    g. Extremely beneficial

Subjective norms

21. Most people who are important to me think that I should obtain naloxone.
    a. Strongly disagree
    b. Disagree

c. Somewhat disagree
d. Neutral/No opinion
e. Somewhat agree
f. Agree
g. Strongly agree

22. Most people who are important to me think that I should carry naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

23. Most people who are important to me think that I should discuss the use of naloxone with my peers.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

24. Most people who are important to me think that I should administer naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

Perceived behavioral control

25. How easy or difficult is it for you to obtain naloxone?
    a. Very difficult
    b. Difficult
    c. Somewhat difficult
    d. Neutral/No opinion
    e. Somewhat easy
    f. Easy
    g. Very easy

26. How easy or difficult is it for you to carry naloxone?
    a. Very difficult
    b. Difficult
    c. Somewhat difficult
    d. Neutral/No opinion
    e. Somewhat easy
    f. Easy
    g. Very easy

27. How easy or difficult is it for you to discuss the use of naloxone with your peers?
    a. Very difficult
    b. Difficult
    c. Somewhat difficult
    d. Neutral/No opinion
    e. Somewhat easy
    f. Easy
    g. Very easy

28. How easy or difficult is it for you to administer naloxone?
    a. Very difficult
    b. Difficult
    c. Somewhat difficult
    d. Neutral/No opinion
    e. Somewhat easy
    f. Easy
    g. Very easy

29. I am confident that I can obtain naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

30. I am confident that I can carry naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree

f. Agree
g. Strongly agree

31. I am confident that I can discuss the use of naloxone with my peers.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

32. I am confident that I can administer naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

33. If I wanted to, I could easily obtain naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

34. If I wanted to, I could easily carry naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

35. If I wanted to, I could easily discuss the use of naloxone with my peers.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree

d. Neutral/No opinion
e. Somewhat agree
f. Agree
g. Strongly agree

36. If I wanted to, I could easily administer naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

Instructions

For the following questions, please pick the choices that reflect your intentions to perform the following overdose prevention behaviors (obtaining naloxone, carrying naloxone, discussing the use of naloxone with your peers, and administering naloxone).

Intentions

37. I intend to obtain naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

38. I intend to carry naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

39. I intend to discuss the use of naloxone with my peers.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion

e. Somewhat agree
f. Agree
g. Strongly agree

40. I intend to administer naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

Instructions

Please provide an approximation for the number of times (*rounded to the nearest whole number*) you have performed the following behaviors: obtained naloxone, carried naloxone, discussed the use of naloxone with your peers, and administered naloxone.

Example:

1. **How many times have you administered naloxone?**
    a. **In the past month?**

       3

    b. **In the past 3-months?**

       8

    c. **In the past 6-months?**

       12

Please provide your best approximation. Round your answers to the nearest whole number.

1. How many times have you **obtained** naloxone?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

2. How many times have you **carried** naloxone with you?
    a. In the past month?

b. In the past 3-months?

c. In the past 6-months?

3. How many times have you **discussed the use of naloxone with your peers**?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

4. How many times have you **administered** naloxone?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

Appendix S. Comprehensive harm reduction program data

	Mobile outreach SSP	Fixed site SSP
Gender (%)		
Male	57.2%	52.3%
Female	42.0%	47.7%
Other	0.9%	0.0%
Race (%)		
White	71.5%	97.0%
Black	5.3%	1.0%
Other	4.2%	2.0%
No answer	19.0%	0.0%
Housing status (%)		
Own a home	7.2%	21.1%
Rent a home	34.0%	37.5%
Homeless	24.3%	2.6%
Stays w/others	33.5%	38.5%
Other	0.9%	0.2%
Health insurance (%)		
Medicaid	70.4%	72.6%
Medicare	5.3%	11.5%
Private	5.4%	0.7%
Other	0.9%	0.0%
None	17.9%	15.2%
Drug of choice to inject (%)		
Rx opioids	13.5%	14.3%
Heroin	37.9%	10.6%
Fentanyl	1.0%	1.4%
Meth	32.8%	33.9%
Cocaine	7.6%	6.3%
Suboxone/Subutex	3.8%	31.1%
Hormones	0.6%	0.0%
Insulin	1.4%	1.7%
Steroids	0.1%	0.3%
Other	1.2%	0.4%
How many times per day does the client inject drugs, mean (SD)	5.46 (3.76)	3.77 (1.66)

How else does the participant use drugs (%)		
Oral	16.0%	13.4%
Snort	33.7%	22.5%
Smoke	33.8%	19.2%
Other	1.2%	0.0%
None of these	15.3%	44.9%
Syringes distributed, mean (SD)	57.84 (32.09)	62.22 (32.15)
Syringes collected, mean (SD)	49.52 (41.16)	60.2 (31.93)
Does the participant have an overdose prevention kit containing naloxone (%)		
Yes	99.6%	99.9%
No	0.4%	0.1%
Has the participant experienced an overdose reversal since their last visit (%)		
Yes	9.2%	0.8%
No	90.5%	99.2%
No answer	0.3%	0.0%
Has the participant reversed somebody's else's overdose since their last visit (%)		
Yes	19.6%	12.5%
No	80.2%	87.5%
No answer	0.2%	0.0%
Changes in drug use (%)		
Increased	0.2%	9.3%
Decreased	2.1%	11.2%
None	97.6%	79.5%
Condoms distributed, mean (SD)	2.03 (7.77)	12.91 (13.53)
Tested for HIV (%)		
Yes	35.5%	28.4%
No	37.8%	57.4%
Unknown	0.4%	13.7%
No answer	26.4%	0.5%
HCV test result (%)		

Positive - first infection	35.2%	32.8%
Positive - reinfected	1.4%	0.0%
Negative	60.6%	60.3%
Unknown	2.8%	6.9%
Was the participant previously treated & cured, and become reinfected with HCV (%)		
Yes	0.0%	0.0%
No	100.0%	89.5%
Unknown	0.0%	10.5%

This data was collected from the SSP recruitment sites and represents estimates of the program's population of PWUO. The 'Other' category for Race represents American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, or Other.
HCV; hepatitis C, HIV; human immunodeficiency virus, SD; standard deviation

Appendix T. 3-month follow-up survey

Welcome to the study titled: *People with active opioid use disorder as first responders to overdoses: Improving implementation intentions to administer naloxone* study!

This assessment should take you 10 minutes or less to complete. This survey contains 4 questions about your intentions to obtain naloxone, carry naloxone, discuss the use of naloxone with your peers, and administer naloxone. Lastly, there are 12 questions about your use of naloxone in the past 1-month, 3-months, and 6-months.

After you complete this assessment, we will reach out to you again in another 3-months to complete the 6-month follow-up assessment. Once you complete the 6-month follow-up, we will load an additional $25 onto your ClinCard.

Definitions

- Obtain naloxone – pick up naloxone at a drop-in center, harm reduction coalition, local pharmacy, from a friend, etc.
- Carry naloxone – have naloxone in a bag or in your pocket.
- Discuss the use of naloxone with your peers – talk with your peers about using naloxone if someone were to overdose.
- Administer naloxone – use naloxone to save someone's life or attempt to save someone's life by using naloxone.

Instructions

For the following questions, please pick the choices that reflect your intentions to perform the following overdose prevention behaviors (obtaining naloxone, carrying naloxone, discussing the use of naloxone with your peers, and administering naloxone).

1. I intend to obtain naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

2. I intend to carry naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

3. I intend to discuss the use of naloxone with my peers.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

4. I intend to administer naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

Instructions

Please provide an approximation for the number of times (*rounded to the nearest whole number*) you have performed the following behaviors: obtained naloxone, carried naloxone, discussed the use of naloxone with your peers and administered naloxone.

Example:

1. **How many times have you administered naloxone?**
    a. **In the past month?**

        3

    b. **In the past 3-months?**

        8

    c. **In the past 6-months?**

        12

Please provide your best approximation. Round your answers to the nearest whole number.

1. How many times have you **obtained** naloxone?
    d. In the past month?

    e. In the past 3-months?

    f. In the past 6-months?

2. How many times have you **carried** naloxone with you?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

3. How many times have you **discussed the use of naloxone with your peers**?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

4. How many times have you **administered** naloxone?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

Appendix U. 6-month follow-up survey

Welcome to the study titled: *People with active opioid use disorder as first responders to overdoses: Improving implementation intentions to administer naloxone* study!

This assessment should take you 10 minutes or less to complete. This survey contains 4 questions about your intentions to obtain naloxone, carry naloxone, discuss the use of naloxone with your peers and administer naloxone. Lastly, there are 12 questions about your use of naloxone in the past 1-month, 3-months, and 6-months.

After you complete this assessment, we will load $25 on the ClinCard provided to you at the start of this study. Thank you for your participation.

Definitions

- Obtain naloxone – pick up naloxone at a drop-in center, harm reduction coalition, local pharmacy, from a friend, etc.
- Carry naloxone – have naloxone in a bag or in your pocket.
- Discuss the use of naloxone with your peers – talk with your peers about using naloxone if someone were to overdose.
- Administer naloxone – use naloxone to save someone's life or attempt to save someone's life by using naloxone.

Instructions

For the following questions, please pick the choices that reflect your intentions to perform the following overdose prevention behaviors (obtaining naloxone, carrying naloxone, discussing the use of naloxone with your peers, and administering naloxone).

1. I intend to obtain naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

2. I intend to carry naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

3. I intend to discuss the use of naloxone with my peers.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

4. I intend to administer naloxone.
    a. Strongly disagree
    b. Disagree
    c. Somewhat disagree
    d. Neutral/No opinion
    e. Somewhat agree
    f. Agree
    g. Strongly agree

Instructions

Please provide an approximation for the number of times (*rounded to the nearest whole number*) you have performed the following behaviors: obtained naloxone, carried naloxone, discussed the use of naloxone with your peers and administered naloxone.

Example:

1. **How many times have you administered naloxone?**
    a. **In the past month?**

        3

    b. **In the past 3-months?**

        8

    c. **In the past 6-months?**

        12

Please provide your best approximation. Round your answers to the nearest whole number.

1. How many times have you **obtained** naloxone?
    d. In the past month?

    e. In the past 3-months?

    f. In the past 6-months?

2. How many times have you **carried** naloxone with you?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

3. How many times have you **discussed the use of naloxone with your peers**?
    a. In the past month?

    b. In the past 3-months?

    c. In the past 6-months?

4. How many times have you **administered** naloxone?
    a. In the past month?

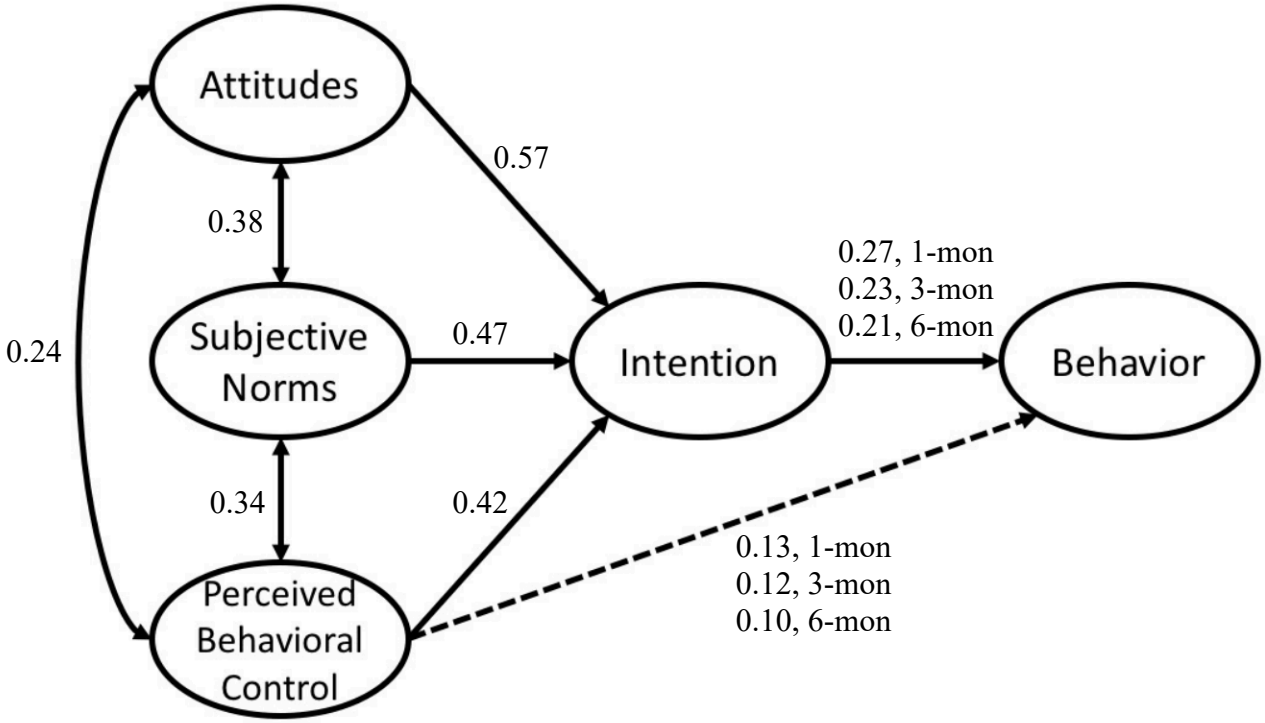
    b. In the past 3-months?

    c. In the past 6-months?

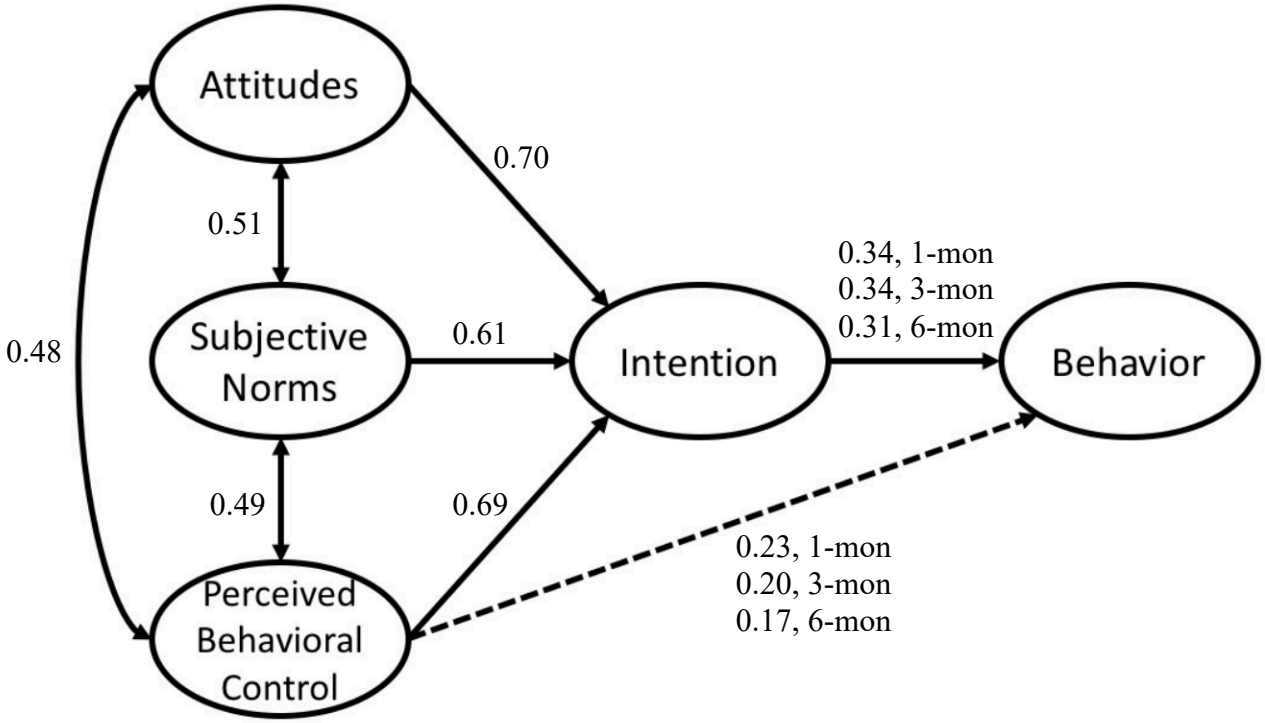
Appendix V. Survey response errors at each timepoint

	Baseline	3-month follow-up	6-month follow-up
Numerical qualitative response, n (participants)	4	4	4
Quantity qualitative response, n (participants)	2	2	0
Input error, n (participants)	1	2	2
Logical sequence, n (participants)	12	5	7

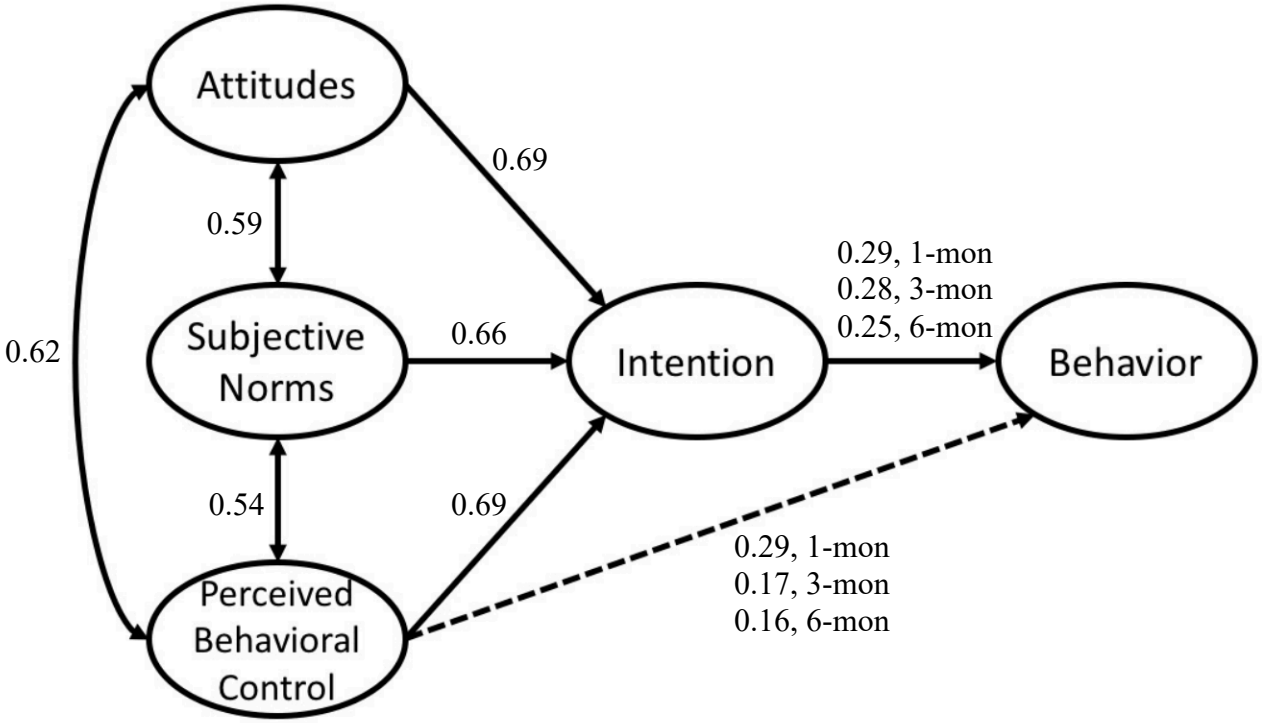
Appendix W. Theory of planned behavior construct correlations: Obtaining naloxone



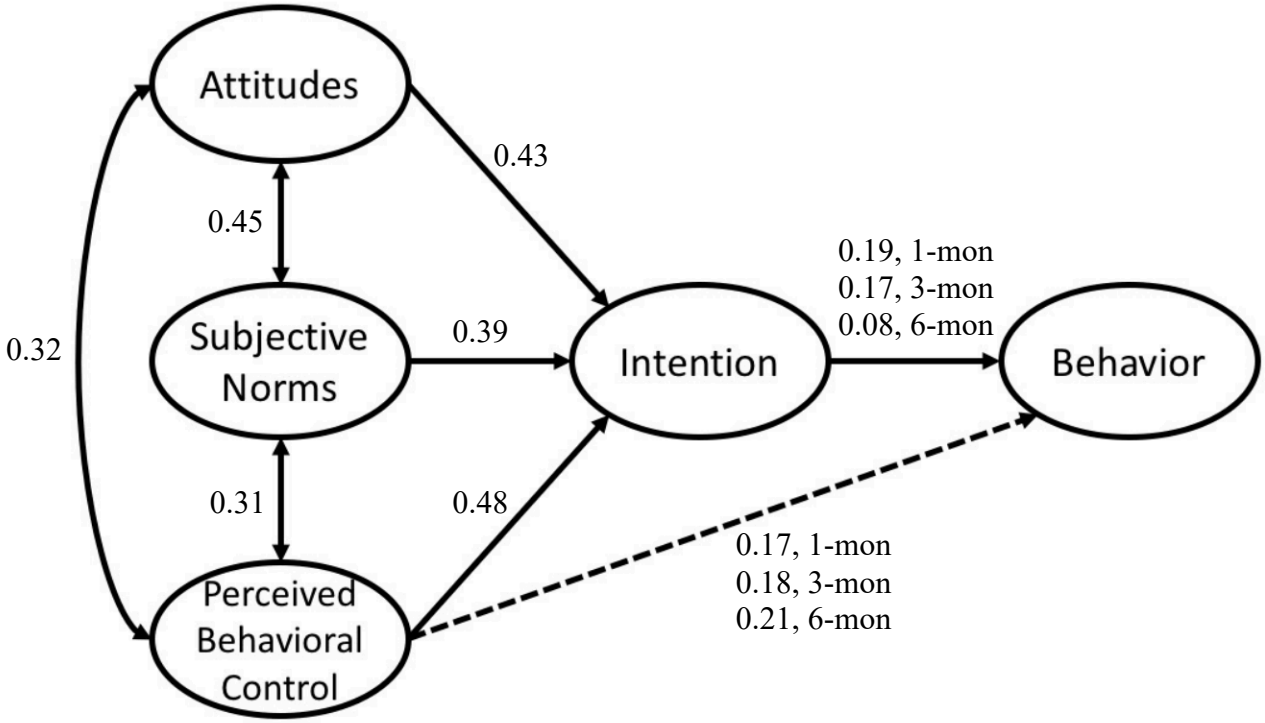
Appendix X. Theory of planned behavior construct correlations: Carrying naloxone



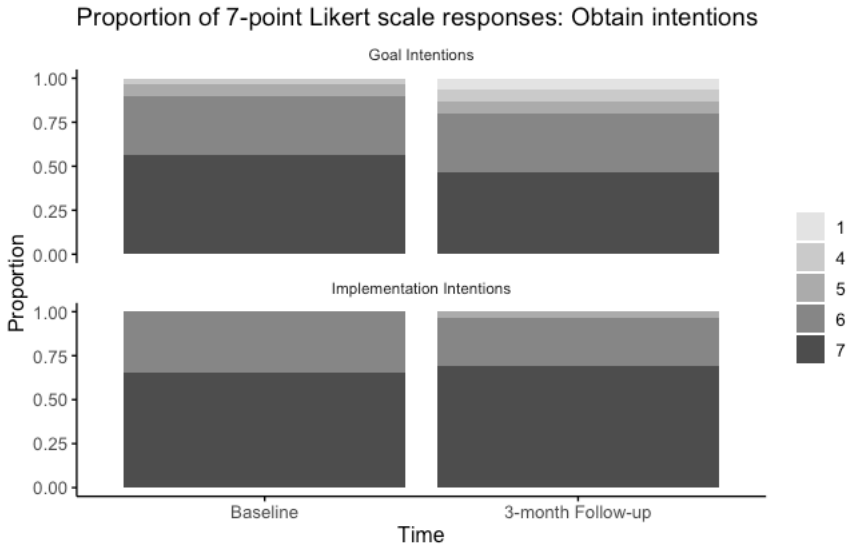
Appendix Y. Theory of planned behavior construct correlations: Discussing naloxone

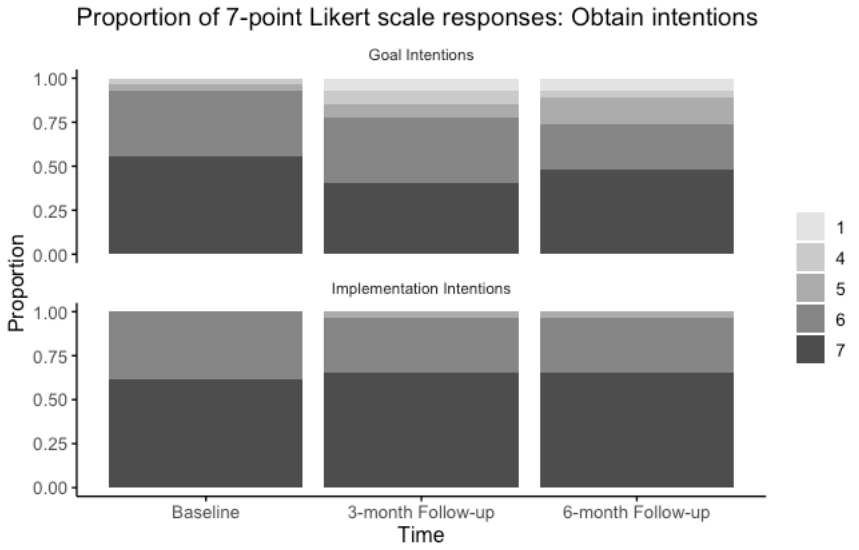


Appendix Z. Theory of planned behavior construct correlations: Administering naloxone

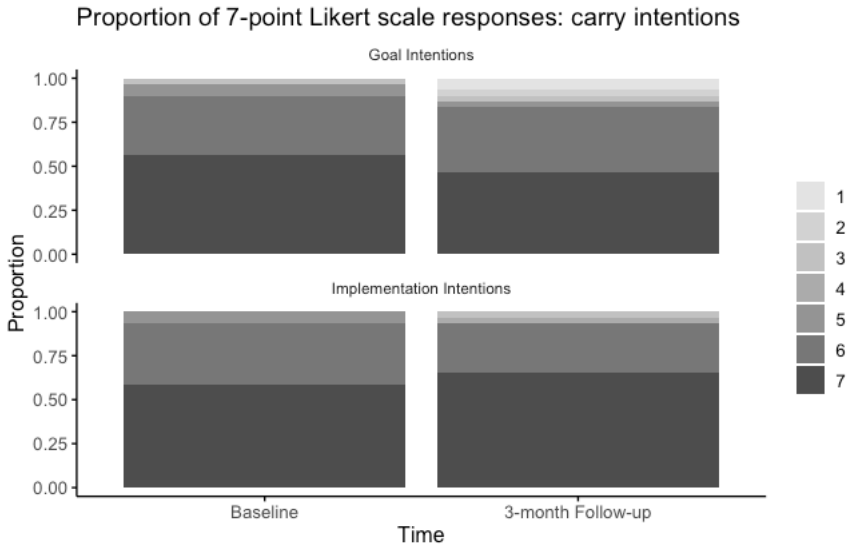


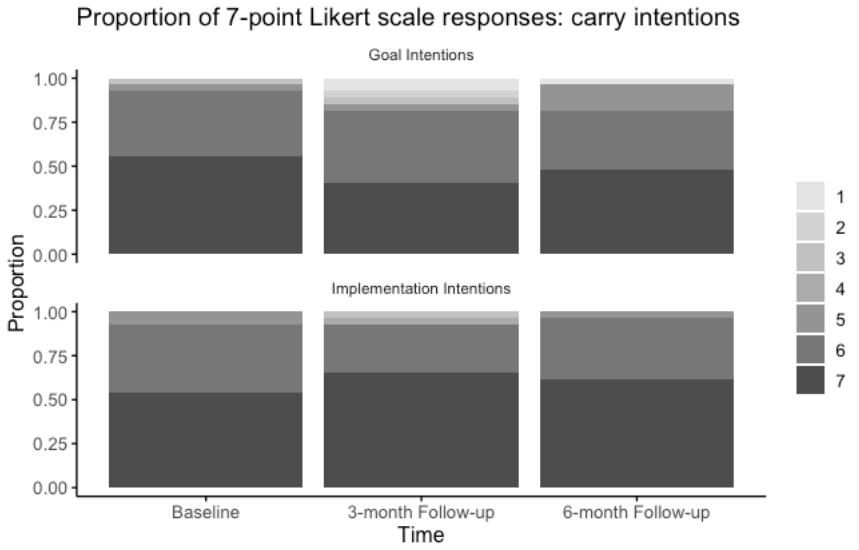
Appendix AA. Proportion of Likert scale responses: Intention to obtain naloxone



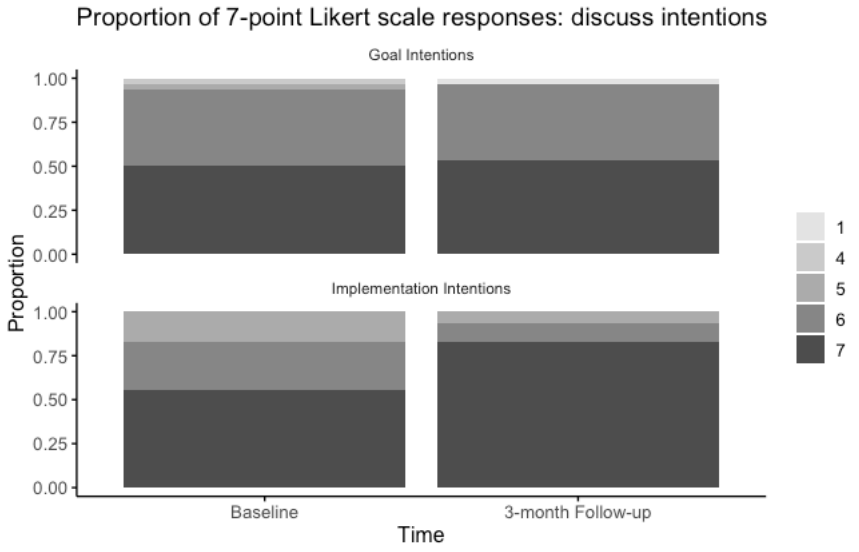


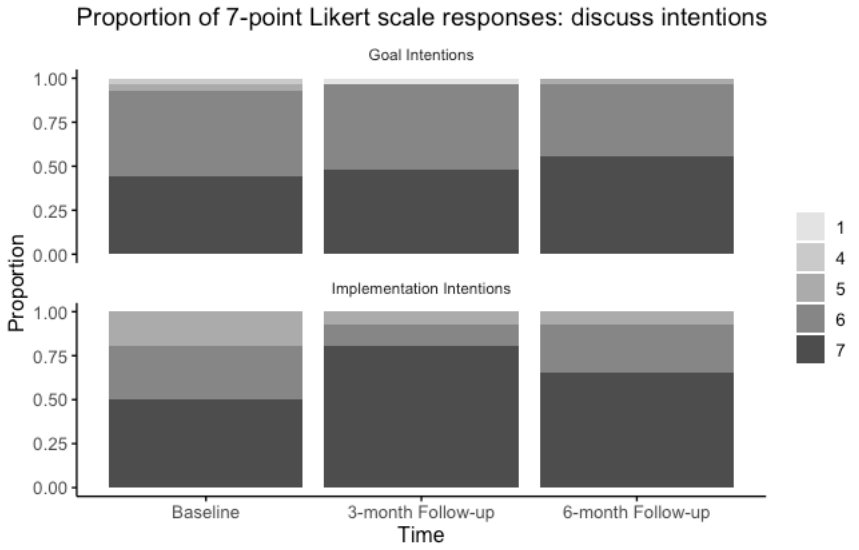
Appendix AB. Proportion of Likert scale responses: Intention to carry naloxone



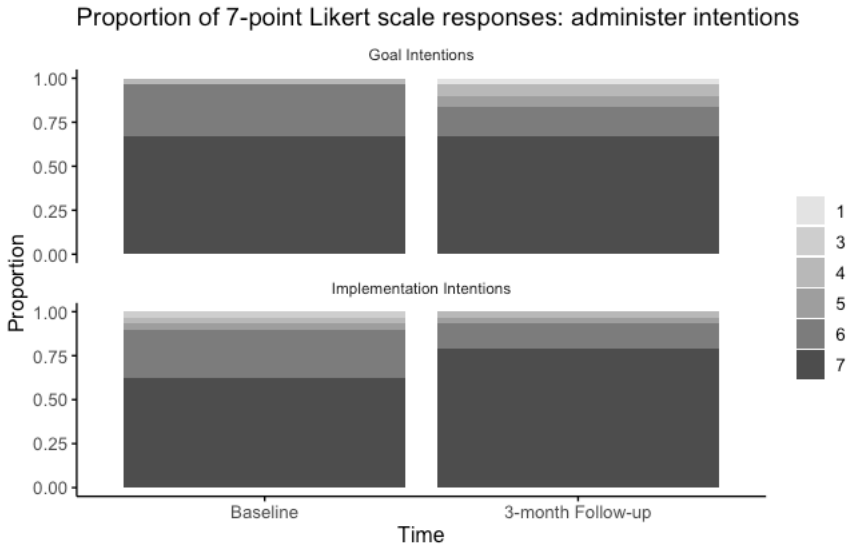


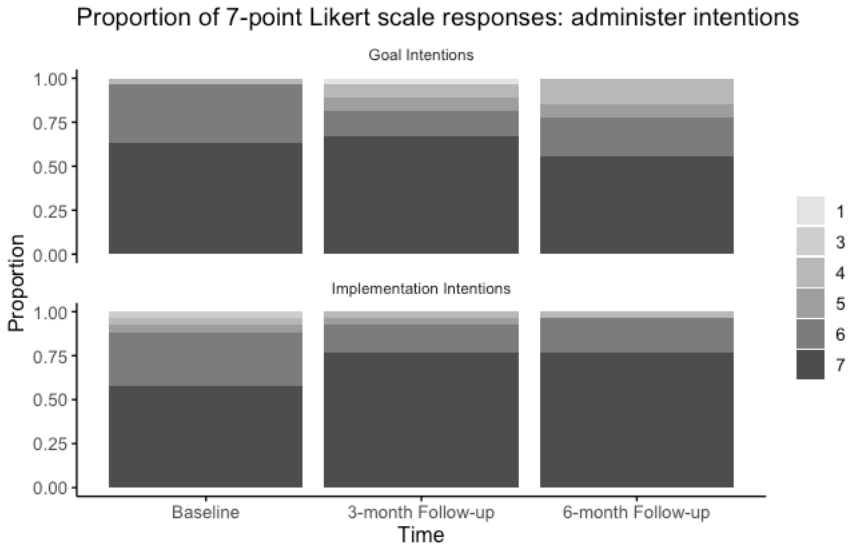
Appendix AC. Proportion of Likert scale responses: Intention to discuss naloxone





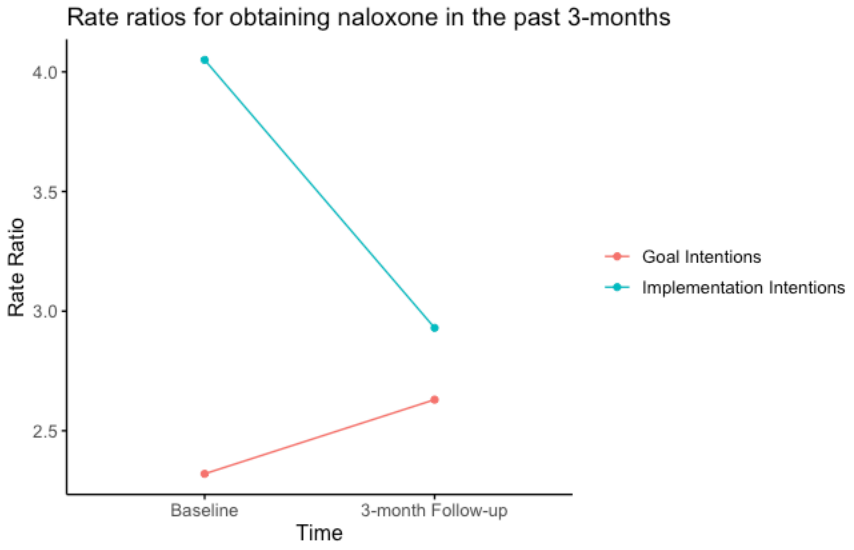
Appendix AD. Proportion of Likert scale responses: Intention to administer naloxone

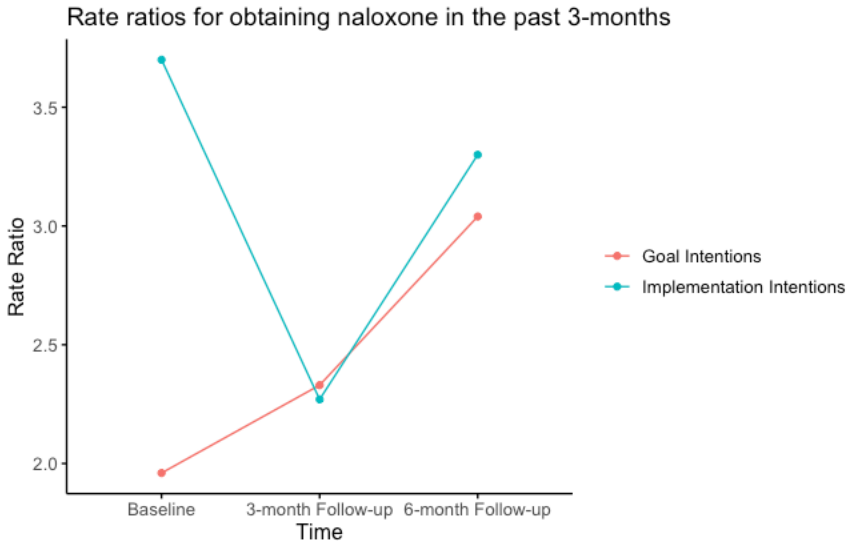




Appendix AE. Obtaining naloxone in the past 3-months

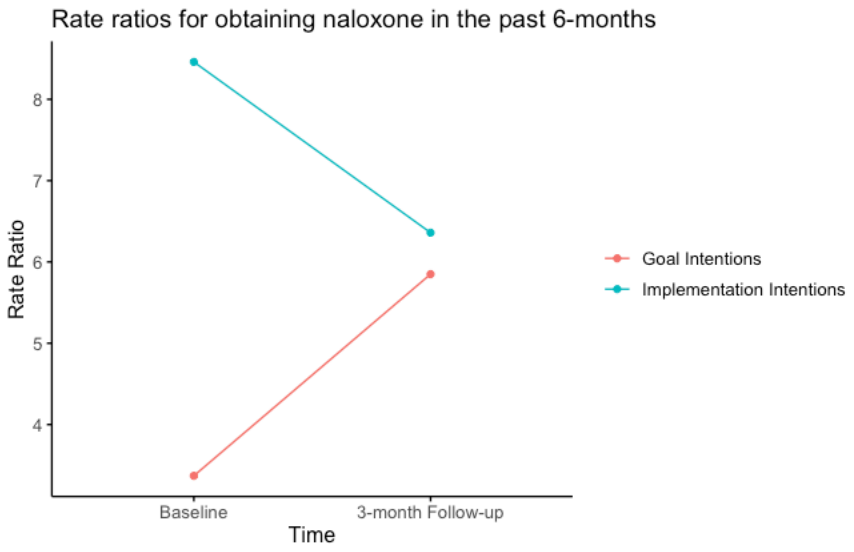
	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=58)							
Intercept	2.23	1.00	4.99	0.80	0.41	1.95	0.051
Condition	1.82	1.00	3.30	0.60	0.30	1.97	0.049
Timepoint	1.18	0.69	2.03	0.16	0.28	0.60	0.551
Condition x Timepoint	0.61	0.29	1.31	-0.49	0.39	-1.27	0.206
Baseline to 6-months (n=52)							
Intercept	1.96	0.74	5.18	0.67	0.50	1.35	0.178
Condition	1.89	0.90	3.97	0.64	0.38	1.68	0.092
Timepoint 1	1.19	0.64	2.23	0.17	0.32	0.54	0.587
Timepoint 2	1.55	0.83	2.90	0.44	0.32	1.38	0.168
Condition x Timepoint 1	0.52	0.21	1.26	-0.66	0.46	-1.45	0.147
Condition x Timepoint 2	0.57	0.24	1.40	-0.55	0.46	-1.22	0.224

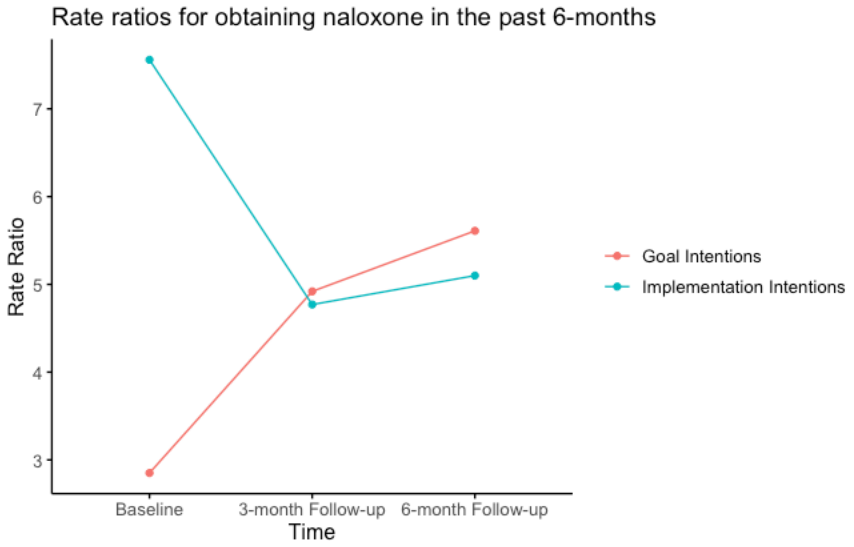

Rate ratios for obtaining naloxone in the past 3-months
Rate Ratio
4.0
3.5
3.0
2.5
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions


Rate ratios for obtaining naloxone in the past 3-months
Rate Ratio
3.5
3.0
2.5
2.0
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions

Appendix AF. Obtaining naloxone in the past 6-months

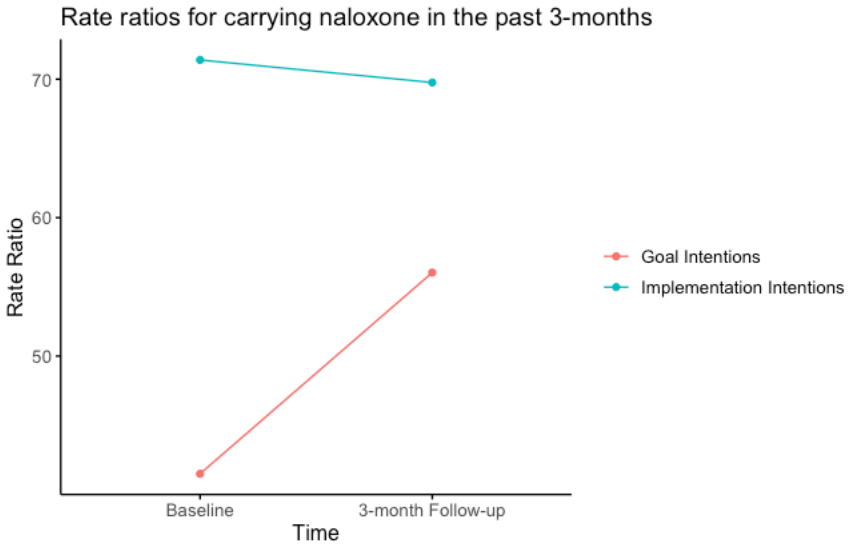
	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=58)							
Intercept	3.37	1.41	8.03	1.21	0.44	2.74	0.006
Condition	2.51	1.33	4.74	0.92	0.32	2.85	0.004
Timepoint	1.74	0.99	3.06	0.55	0.29	1.92	0.055
Condition x Timepoint	0.43	0.19	0.96	-0.84	0.41	-2.05	0.041
Baseline to 6-months (n=52)							
Intercept	2.85	0.99	8.23	1.05	0.54	1.94	0.053
Condition	2.65	1.24	5.67	0.98	0.39	2.52	0.012
Timepoint 1	1.72	0.95	3.13	0.54	0.31	1.78	0.074
Timepoint 2	1.97	1.07	3.60	0.68	0.31	2.19	0.029
Condition x Timepoint 1	0.37	0.16	0.86	-1.01	0.44	-2.30	0.021
Condition x Timepoint 2	0.34	0.14	0.81	-1.07	0.44	-2.43	0.015

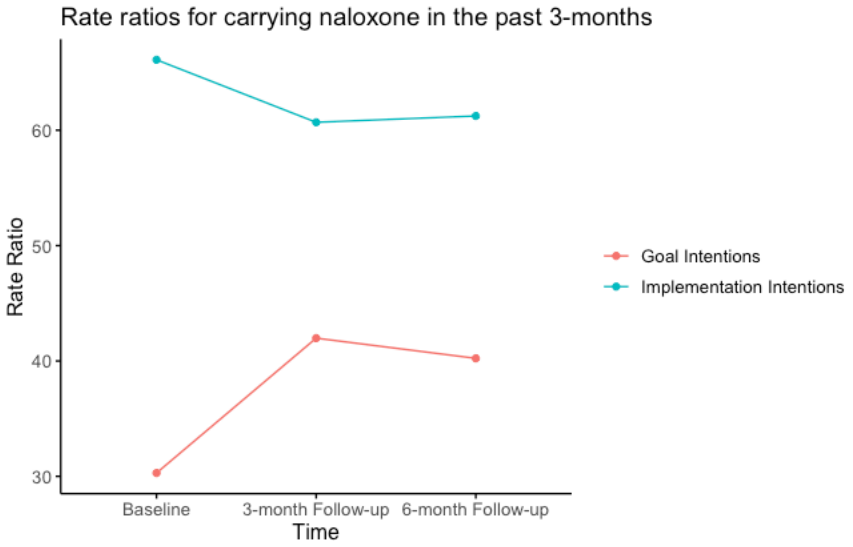

Rate ratios for obtaining naloxone in the past 6-months
Rate Ratio
8
7
6
5
4
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions


Rate ratios for obtaining naloxone in the past 6-months
Rate Ratio
7
6
5
4
3
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions

Appendix AG. Carrying naloxone in the past 3-months

	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=57)							
Intercept	41.49	24.16	71.27	3.73	0.28	13.50	<2e-16
Condition	1.72	0.88	3.35	0.54	0.34	1.59	0.111
Timepoint	1.35	0.71	2.58	0.30	0.33	0.91	0.362
Condition x Timepoint	0.72	0.28	1.85	-0.32	0.48	-0.68	0.498
Baseline to 6-months (n=52)							
Intercept	30.29	14.24	64.42	3.41	0.39	8.86	<2e-16
Condition	2.18	1.15	4.16	0.78	0.33	2.38	0.018
Timepoint 1	1.39	0.75	2.57	0.33	0.32	1.04	0.300
Timepoint 2	1.33	0.72	2.46	0.28	0.32	0.90	0.368
Condition x Timepoint 1	0.66	0.27	1.61	-0.41	0.45	-0.91	0.364
Condition x Timepoint 2	0.70	0.29	1.70	-0.36	0.45	-0.79	0.428

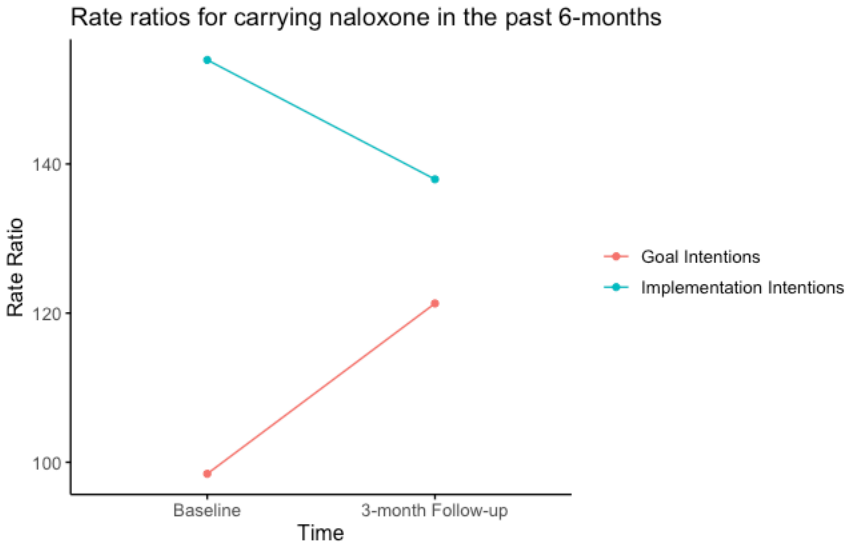

Rate ratios for carrying naloxone in the past 3-months
70
60
50
Rate Ratio
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions

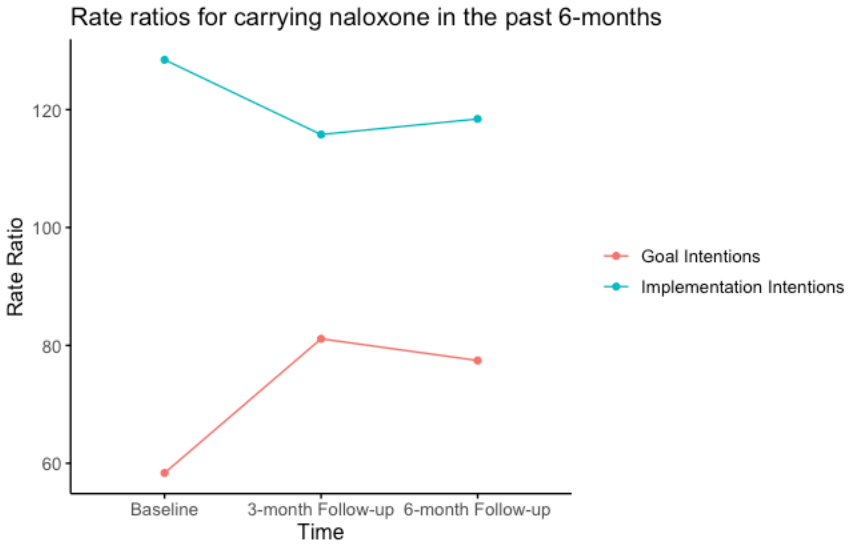

Rate ratios for carrying naloxone in the past 3-months
60
50
40
30
Rate Ratio
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions

Appendix AH. Carrying naloxone in the past 6-months

	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=57)							
Intercept	98.45	62.22	155.78	4.59	0.23	19.60	<2e-16
Condition	1.56	0.82	2.97	0.45	0.33	1.37	0.171
Timepoint	1.23	0.66	2.31	0.21	0.32	0.65	0.514
Condition x Timepoint	0.73	0.30	1.76	-0.32	0.45	-0.71	0.480
Baseline to 6-months (n=52)							
Intercept	58.35	26.50	128.48	4.07	0.40	10.10	<2e-16
Condition	2.20	1.10	4.39	0.79	0.35	2.24	0.025
Timepoint 1	1.39	0.71	2.71	0.33	0.34	0.97	0.333
Timepoint 2	1.33	0.68	2.59	0.28	0.34	0.83	0.407
Condition x Timepoint 1	0.65	0.25	1.69	-0.43	0.49	-0.88	0.377
Condition x Timepoint 2	0.69	0.27	1.82	-0.36	0.49	-0.74	0.458

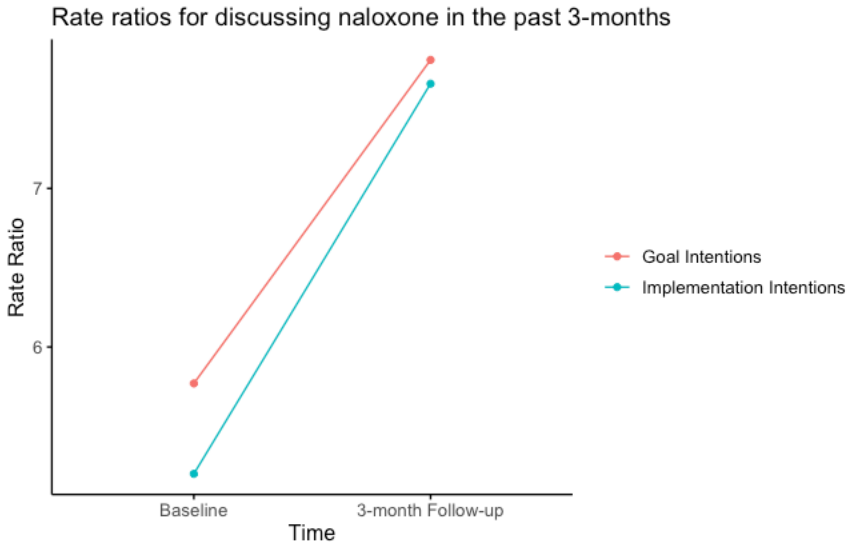
Baseline to 3-months is a zero-inflation negative binomial.

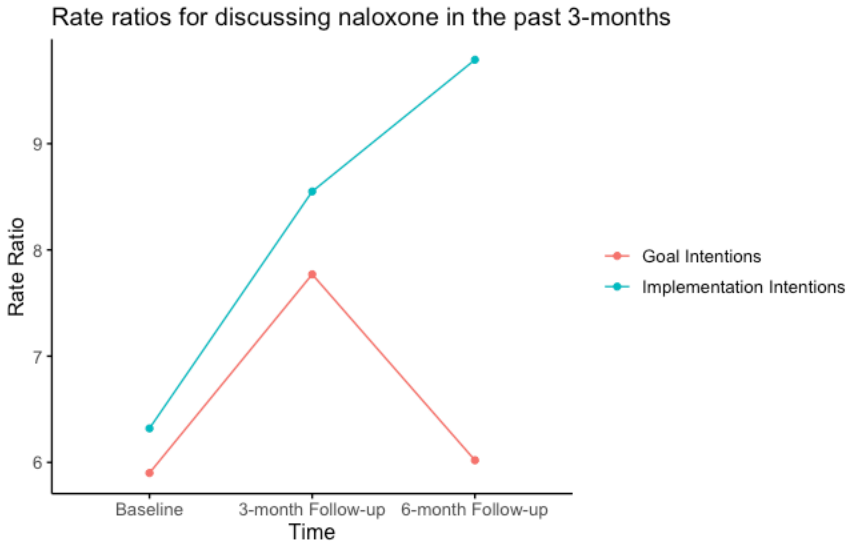

Rate ratios for carrying naloxone in the past 6-months
Rate Ratio
140
120
100
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions


Rate ratios for carrying naloxone in the past 6-months
Rate Ratio
120
100
80
60
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions

Appendix AI. Discussing naloxone in the past 3-months

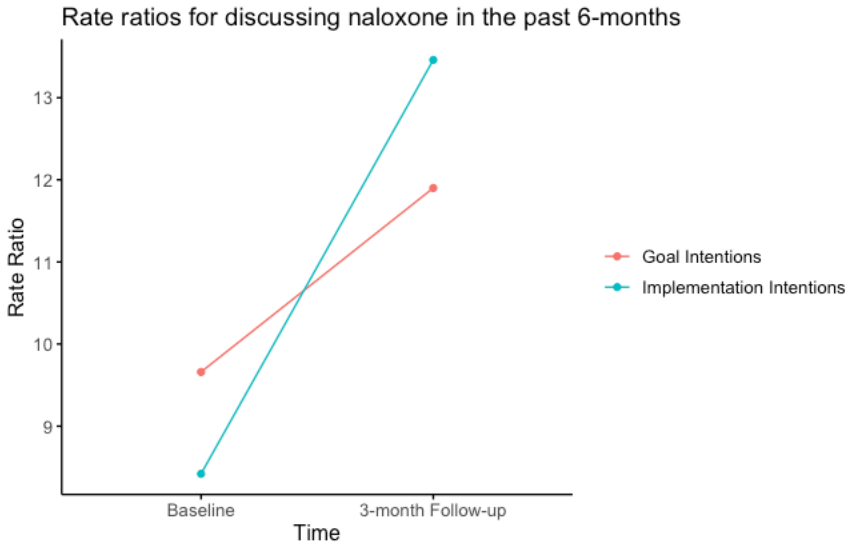
	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=57)							
Intercept	5.77	2.90	11.47	1.75	0.35	4.99	5.9e-07
Condition	0.90	0.46	1.78	-0.10	0.35	-0.30	0.768
Timepoint	1.35	0.81	2.26	0.30	0.26	1.16	0.246
Condition x Timepoint	1.09	0.52	2.28	0.08	0.38	0.22	0.825
Baseline to 6-months (n=52)							
Intercept	5.90	3.17	11.00	1.78	0.32	5.59	2.27e-08
Condition	1.07	0.54	2.13	0.07	0.35	0.20	0.843
Timepoint 1	1.32	0.77	2.24	0.27	0.27	1.01	0.311
Timepoint 2	1.02	0.60	1.72	0.02	0.27	0.07	0.943
Condition x Timepoint 1	1.03	0.48	2.18	0.03	0.38	0.07	0.944
Condition x Timepoint 2	1.52	0.72	3.22	0.42	0.38	1.09	0.275

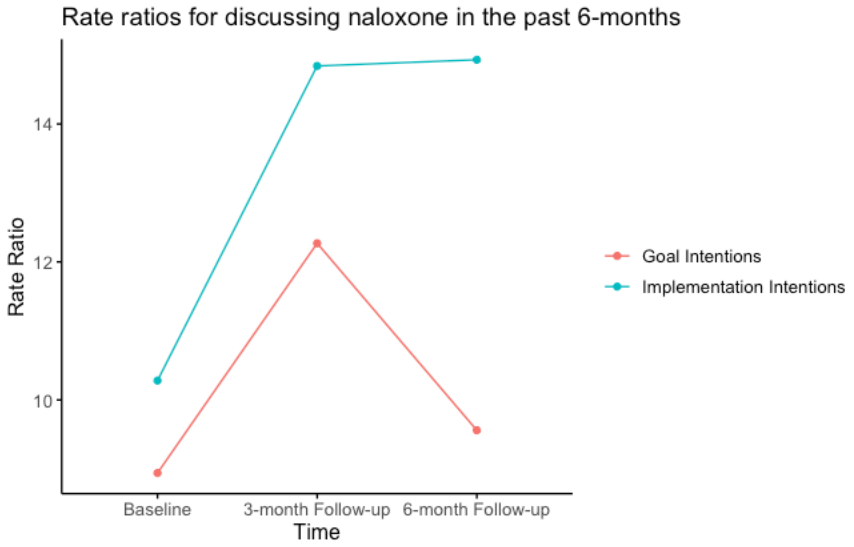

Rate ratios for discussing naloxone in the past 3-months
Rate Ratio
7
6
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions


Rate ratios for discussing naloxone in the past 3-months
Rate Ratio
9
8
7
6
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions

Appendix AJ. Discussing naloxone in the past 6-months

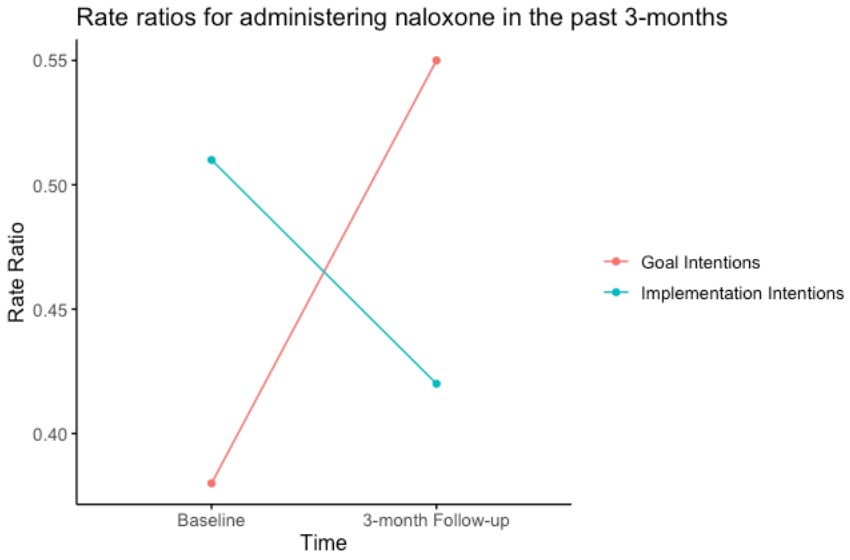
	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=57)							
Intercept	9.66	4.25	21.95	2.27	0.42	5.41	6.23e-08
Condition	0.87	0.42	1.83	-0.14	0.38	-0.36	0.717
Timepoint	1.23	0.71	2.14	0.21	0.28	0.74	0.460
Condition x Timepoint	1.30	0.58	2.91	0.26	0.41	0.63	0.527
Baseline to 6-months (n=52)							
Intercept	8.94	4.14	19.31	2.19	0.39	5.57	2.53e-08
Condition	1.15	0.55	2.41	0.14	0.38	0.37	0.710
Timepoint 1	1.37	0.77	2.46	0.32	0.30	1.07	0.286
Timepoint 2	1.07	0.60	1.92	0.07	0.30	0.23	0.821
Condition x Timepoint 1	1.05	0.46	2.42	0.05	0.43	0.12	0.908
Condition x Timepoint 2	1.36	0.59	3.13	0.31	0.43	0.72	0.473

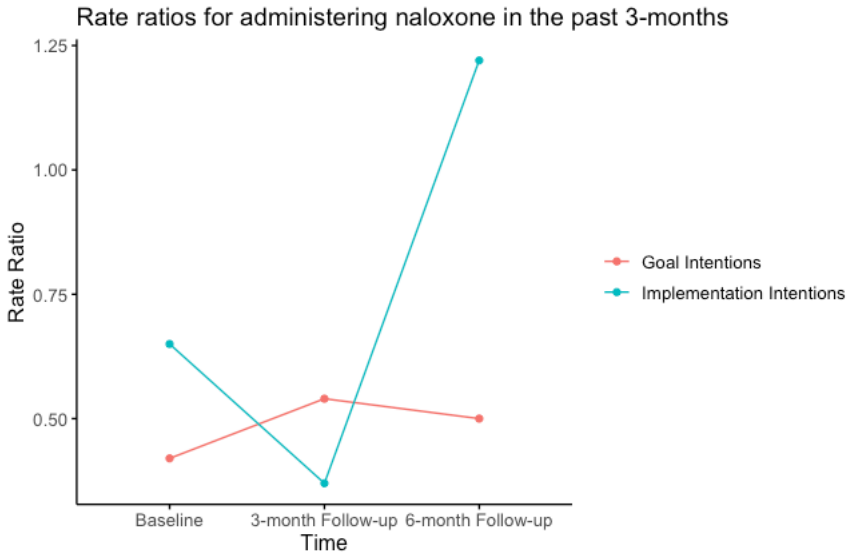

Rate ratios for discussing naloxone in the past 6-months
Rate Ratio
13
12
11
10
9
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions


Rate ratios for discussing naloxone in the past 6-months
Rate Ratio
14
12
10
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions

Appendix AK. Administering naloxone in the past 3-months

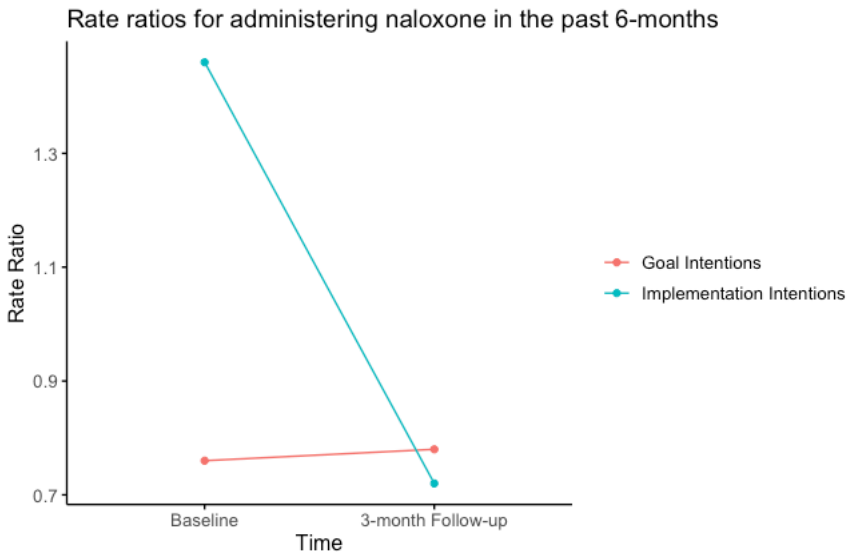
	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=57)							
Intercept	0.38	0.14	1.04	-0.96	0.51	-1.88	0.060
Condition	1.32	0.52	3.35	0.28	0.47	0.59	0.556
Timepoint	1.44	0.73	2.83	0.36	0.35	1.05	0.294
Condition x Timepoint	0.58	0.22	1.56	-0.54	0.50	-1.07	0.284
Baseline to 6-months (n=52)							
Intercept	0.42	0.16	1.12	-0.86	0.50	-1.73	0.083
Condition	1.54	0.57	4.21	0.43	0.51	0.85	0.396
Timepoint 1	1.27	0.62	2.60	0.24	0.37	0.65	0.518
Timepoint 2	1.18	0.57	2.43	0.16	0.37	0.43	0.664
Condition x Timepoint 1	0.44	0.16	1.26	-0.81	0.53	-1.52	0.128
Condition x Timepoint 2	1.58	0.59	4.24	0.46	0.50	0.91	0.360

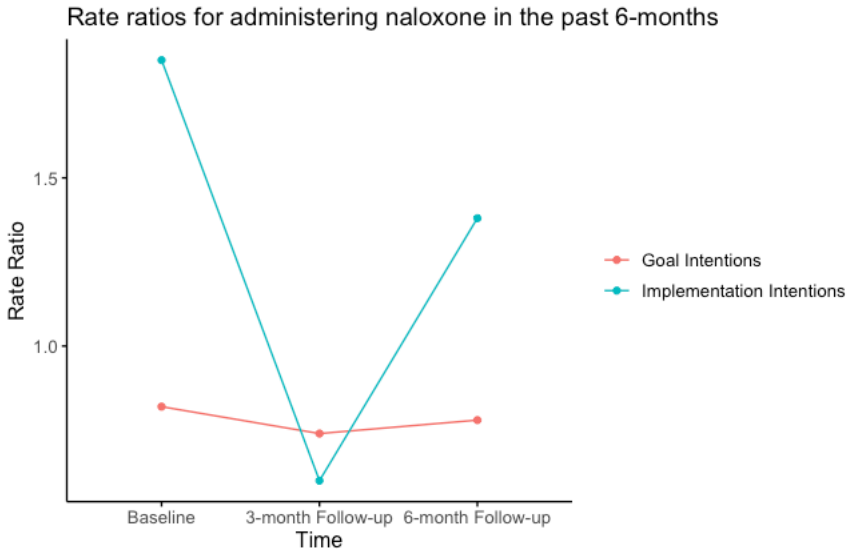

Rate ratios for administering naloxone in the past 3-months
0.55
0.50
0.45
0.40
Rate Ratio
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions


Rate ratios for administering naloxone in the past 3-months
1.25
1.00
0.75
0.50
Rate Ratio
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions

Appendix AL. Administering naloxone in the past 6-months

	RR	*2.5 %*	*97.5 %*	*b*	*SE*	*z*	*p*
Baseline to 3-months (n=57)							
Intercept	0.76	0.21	2.69	-0.28	0.65	-0.43	0.668
Condition	1.92	0.72	5.11	0.65	0.50	1.31	0.190
Timepoint	1.03	0.51	2.09	0.03	0.36	0.09	0.931
Condition x Timepoint	0.48	0.16	1.40	-0.73	0.55	-1.34	0.180
Baseline to 6-months (n=52)							
Intercept	0.82	0.29	2.36	-0.20	0.54	-0.37	0.714
Condition	2.25	0.81	6.26	0.81	0.52	1.56	0.119
Timepoint 1	0.91	0.45	1.83	-0.10	0.36	-0.27	0.787
Timepoint 2	0.95	0.47	1.94	-0.05	0.36	-0.13	0.898
Condition x Timepoint 1	0.36	0.13	1.02	-1.02	0.53	-1.93	0.054
Condition x Timepoint 2	0.78	0.29	2.14	-0.25	0.51	-0.48	0.631


Rate ratios for administering naloxone in the past 6-months
Rate Ratio
1.3
1.1
0.9
0.7
Baseline
3-month Follow-up
Time
Goal Intentions
Implementation Intentions


Rate ratios for administering naloxone in the past 6-months
Rate Ratio
1.5
1.0
Baseline
3-month Follow-up
6-month Follow-up
Time
Goal Intentions
Implementation Intentions