

Research Project 3 - Research Proposal

The impact of connecting housing-insecure patients with substance use disorder who visit the emergency department to housing and social care resources on patient health outcomes and healthcare utilization

Michael M. Litterer

Executive Masters in Public Administration, Rutgers University
20:831:562:90 Applied Research Design
Dr. Lois M. Warner
May 7, 2023

Title of Proposed Study: *The impact of connecting housing-insecure patients with substance use disorder who visit the emergency department to housing and social care resources on patient health outcomes and healthcare utilization*

Introduction: The increasing prevalence of housing insecurity (HI) and substance use disorder (SUD) has become a significant public health concern in the United States (US), and effective interventions designed to improve health outcomes and healthcare utilization are urgently needed. Research has established that HI patients with SUD often face complex and multifaceted challenges, contributing to poor health outcomes and increased healthcare utilization (Moulin, Evans, Xing, & Melnikow, 2018) (Mitchell, León, Byrne, Lin, & Bharel, 2017). Many of these patients utilize emergency departments (ED) as their primary source of healthcare, representing a significant challenge for healthcare systems (Aldridge et al., 2018). As ED visits by HI patients with SUD continue to rise (Huynh, Ferland, Blanchette-Martin, Ménard, & Fleury, 2016), exploring innovative solutions that address the root causes of these issues and effectively meet the needs of these patients is essential (Johnson & Chamberlain, 2008). Addressing the problem of HI patients with SUD visiting the ED requires a multifaceted approach that targets the underlying social determinants of health (SDOH), improves access to comprehensive care, and addresses access to care issues prevalent among this patient population (Miller-Archie, Walters, Singh, & Lim, 2019). The proposed research will examine the impact of connecting HI patients with SUD who visit EDs to housing and social care resources on their health outcomes and healthcare utilization. (Doran et al., 2018) The intervention to be studied will utilize a peer-based model of care (Liebling, Perez, Litterer, & Greene, 2021) to address the intersecting issues the target population faces that contribute to their overall vulnerability and difficulty accessing appropriate care. (Bibbins-Domingo, 2019) (Friedman & Banegas, 2018) (Preda & Voigt, 2015) (Gurewich, Garg, & Kressin, 2020) (Magnan, 2017) (Stringfellow et al., 2016) (Sacamano, Krawczyk, & Latkin, 2018)

The results of the proposed study can inform public policy and practice in several ways. Firstly, policymakers and healthcare providers can foster new care reimbursement models if the study finds causality associated with connecting the target population with housing and social care resources and improved patient health outcomes and healthcare utilization. These policy changes can include increased funding for programs that provide housing and social care resources in the ED setting, modifying current healthcare payment models to support the intervention, and increasing the capacity and prevalence of peer-based ED providers focused on connecting patients with HI and SUD resources. Secondly, the results of this study will inform the development of new interventions focused on addressing

Research Project 3 - Research Proposal - Michael Litterer

complex SDOH-related needs. For example, the study could identify subpopulations with specific barriers to accessing these resources and suggest strategies to address the target population's needs best. This could include increasing funding to social care resources to increase capacity, developing new ED-based referral processes, improving communication between healthcare providers and social service agencies, or incentivizing patients who engage with these resources. Overall, the results of this study have important implications for both policy and practice, helping to improve the health outcomes and healthcare utilization of HI patients with SUD who visit the ED (Bibbins-Domingo, 2019) (Friedman & Banegas, 2018) (Preda & Voigt, 2015) (Gurewich et al., 2020) (Magnan, 2017). The model presented by (Tabuena, 2020) has been used to create this research proposal.

Statement of the Problem: Healthcare costs in the US, which are primarily clinical in focus, outpace costs in other developed countries and are expected to increase by an annual rate of 5.4 percent (Keehan et al., 2020). However, research indicates that clinical care represents only a tiny fraction of the factors that affect health outcomes; the other factors include genetics, environment, behaviors, and social circumstances (Magnan, 2017). Commonly referred to as the SDOH, current research emphasizes that SDOH contributes to 80-90% of health outcomes compared to the 10-20% clinical care contributes (Magnan, 2017). SDOH are defined as the conditions in which people are born, live, work, play, and learn that affect health inequity, health disparities, health outcomes, and life expectancy (Foundation, 2021). Two of the most prevalent SDOHs are HI and SUD (Truong et al., 2020). With such a significant percentage of health outcomes driven by SDOH, it is critical to address SDOH by implementing social care strategies to reduce healthcare costs and improve patient outcomes.

To reduce healthcare costs and achieve improved patient health outcomes, the US government, healthcare payers, and providers have grappled with strategies to increase the current capacity of healthcare to address SDOH, such as HI and SUD, through more evidenced-based social care interventions (Mold, 2017). One strategy healthcare has explored to address SDOH is establishing peer-based interventions that enable patients to access and leverage community-based social care services through the existing healthcare system. As a country, the US must create an integrated system that seamlessly serves its patients comprehensively, addressing medical, social, and behavioral factors concurrently that are proven to lead to poor health, social, educational, and economic health outcomes. As a result, research shows that healthcare continues to lack the tools and interventions necessary to positively impact health outcomes, especially for patients with complex SDOH needs. While there is no single solution to the issue of

Research Project 3 - Research Proposal - Michael Litterer

effectively addressing SDOH, by researching effective interventions to address the most prominent and impactful SDOH, the current healthcare system can move from a 'sick-care' system to a 'health care' or preventative system. (Carey, Crammond, & Keast, 2014)

The prevalence, impact, and intersectionality of HI patients with SUD visiting the ED significantly affect patient health outcomes and healthcare utilization and represent two of the most prevalent SDOHs. According to a newly released study by (Barocas et al., 2023), "at least 500,000 people in the US experience homelessness nightly. More than 30% of people experiencing homelessness also have a substance use disorder" (Barocas et al., 2023). Research by (Doran et al., 2018) estimates that approximately 10% of ED patients had unmet housing needs, and 38% had a SUD diagnosis (Doran et al., 2018). Another study by (Salhi, White, Pitts, & Wright, 2018) found that 17.6% of ED patients in their sample had HI, and the prevalence of SUD in this population was 28.3% (Salhi et al., 2018). Additional research indicates that HI patients with SUD have been found to use ED services more frequently than other populations. A study by (Raven et al., 2017) found that HI patients with SUD were likelier to have multiple ED visits and extended hospital stays (Raven et al., 2017). This increased utilization may lead to higher healthcare costs and strain on the ED system of care. Despite higher healthcare utilization rates, HI patients with SUD are likelier to experience adverse health outcomes. Research by (Baggett et al., 2013) found that HI individuals with SUD had a higher mortality risk than those with stable housing (Baggett et al., 2013). Additionally, a study by (Kushel, Perry, Bangsberg, Clark, & Moss, 2002) reported that HI patients with SUD were likelier to experience poor mental and physical health, HIV infection, and victimization (Kushel et al., 2002). These studies indicate that HI and SUD are interconnected issues impacting patient health outcomes and healthcare utilization, subsequently increasing the overall cost of healthcare.

Review of Selected/Related Literature: To best inform the proposed study, ten peer-reviewed journal articles related to connecting HI patients with SUD who visit the ED to housing and social care resources and the impact on patient health outcomes and healthcare utilization were reviewed. Each study reviewed contained critical research that collectively informed the proposed study and represented the current body of evidence. Each article selected for this literature review has been assigned to five relevant categories broken down by their relationship to the proposed study's dependent and independent variables. The selected articles directly contribute to the design of the proposed research study by identifying bright spots in the current research, essential considerations for the research design, and

Research Project 3 - Research Proposal - Michael Litterer

current gaps in the associated body of research. Each selected article has been summarized and synthesized in the context of the proposed study. Included below is a summarized overview of the literature review conducted. The complete literature review has been included in Appendix A.

Literature Review Methods: A comprehensive search of online academic databases, including Google Scholar and the Rutgers Newark Academic Library, was conducted. The search strategy focused on articles published between 2008 and 2021 that examined the proposed study's identified dependent and independent variables. Additional articles were considered through manual searches of reference lists from relevant studies. Search terms such as "housing insecurity," "homelessness," "substance use disorder," "emergency department," "housing resources," "health outcomes," "social care resources," "peer-based models," and "healthcare utilization" were utilized. The articles were selected from multiple fields of scholarship, which helped to gain various perspectives on the subject. These fields of scholarship included medical, administrative, social care, HI, and SUD, which contained clinical, implementation, and outcome considerations.

Reviewed Literature :

1. **Health outcomes:**

Article #	Date and Journal	Title	Authors
Article 1. a	The Lancet Volume 391, Issue 10117, 20-26 January 2018, Pages 241-250	Morbidity and mortality in homeless individuals, prisoners, sex workers, and individuals with substance use disorders in high-income countries: a systematic review and meta-analysis	Aldridge, R. W., Story, A., Hwang, S. W., Nordentoft, M., Luchenski, S. A., Hartwell, G., . . . Hayward, A. C. (2018)
Citation	(Aldridge et al., 2018) https://www.sciencedirect.com/science/article/pii/S014067361731869X		

Article #	Date and Journal	Title	Authors
Article 1. b	Substance Abuse Volume 37, 2016 - Issue 4 Pages 534-541 July 18, 2016	Substance use among persons with homeless experience in primary care	Stringfellow, E. J., Kim, T. W., Gordon, A. J., Pollio, D. E., Grucza, R. A., Austin, E. L., . . . Kertesz, S. G. (2016)
Citation	(Stringfellow et al., 2016) https://www.tandfonline.com/doi/abs/10.1080/08897077.2016.1145616		

The reviewed studies on the dependent variable of health outcomes demonstrate that significant health disparities exist among HI patients and those with SUDs, underscoring the need for targeted interventions and comprehensive healthcare services. (Aldridge et al., 2018) and (Stringfellow et al., 2016) investigate health outcomes among patients with HI and SUD. (Aldridge et al., 2018) conducted a systematic review and meta-analysis to examine morbidity and

Research Project 3 - Research Proposal - Michael Litterer

mortality among HI individuals, prisoners, sex workers, and individuals with SUD in high-income countries. The study by (Aldridge et al., 2018) found that these populations experienced a higher risk of all-cause mortality, with standardized mortality ratios (SMRs) ranging from 3.88 for SUD patients to 11.86 for HI patients compared to the general population (Aldridge et al., 2018). (Stringfellow et al., 2016) focused on SUD among individuals with a history of HI receiving primary care in the US. The study used a prospective cohort design and analyzed data from 801 participants over 3 years. The findings revealed a high prevalence of SUD among the participants: 66.9% had a lifetime history of SUD, and 30.8% had an active SUD. Moreover, active SUD was associated with poorer housing outcomes, lower quality of life, and worse mental health (Stringfellow et al., 2016). While the studies by (Aldridge et al., 2018) and (Stringfellow et al., 2016) effectively establish the poor health outcomes associated with patients with HI and SUD, gaps in the research specific to the interventions that most effectively improve outcomes among patients with HI and SUD remain. The proposed study will utilize the evidence of need established by the reviewed studies on health outcomes to design an intervention to address the established needs effectively.

2. Healthcare utilization:

Article #	Date and Journal	Title	Authors
Article 2. a	Western Journal of Emergency Medicine 2018 Nov; 19(6): 902-906. 2018 October 18	Substance Use, Homelessness, Mental Illness, and Medicaid Coverage: A Set-up for High Emergency Department Utilization	Moulin, A., Evans, E. J., Xing, G., & Melnikow, J. (2018)
Citation	(Moulin et al., 2018) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6225935/		

Article #	Date and Journal	Title	Authors
Article 2. b	Psychological Services, 14(2), 193-202	Cost of health care utilization among homeless frequent emergency department users	Mitchell, M. S., León, C. L., Byrne, T. H., Lin, W.-C., & Bharel, M. (2017)
Citation	(Mitchell et al., 2017) https://psycnet.apa.org/doiLanding?doi=10.1037%2Fser0000113		

The reviewed studies on the dependent variable of healthcare utilization demonstrate that patients with HI and SUD have substantially higher rates of healthcare utilization compared to the general population, suggesting the potential value of interventions that connect these patients to housing and social care resources. (Moulin et al., 2018) and (Mitchell et al., 2017) investigate healthcare utilization patterns among patients with SUD and HI. (Moulin et al., 2018) conducted a cross-sectional study to examine the factors associated with high ED utilization, including SUD, HI, mental illness, and Medicaid coverage. The study by (Moulin et al., 2018) included 62,609 adult patients visiting the

Research Project 3 - Research Proposal - Michael Litterer

ED between 2012 and 2013. (Moulin et al., 2018) found that patients with SUD, mental illness, and HI had significantly higher odds of being high ED utilizers (defined as having four or more ED visits in a year). Moreover, patients with all three conditions and Medicaid coverage were 15.9 times more likely to be high ED utilizers than those without these factors (Moulin et al., 2018). (Mitchell et al., 2017) analyzed healthcare utilization and costs among HI frequent ED users in a large metropolitan area in the US. The study by (Mitchell et al., 2017) employed a retrospective cohort design and examined data for 1,165 HI individuals with four or more ED visits within a year. The findings revealed that these patients incurred a median cost of \$8,217 per person, with mental health and SUD-related visits accounting for 43% of the total ED visits (Mitchell et al., 2017). The study also identified that HI, SUD, and psychiatric comorbidities significantly predict higher healthcare costs (Mitchell et al., 2017). While the reviewed studies by (Moulin et al., 2018) and (Mitchell et al., 2017) help to support further the high healthcare utilization among patients with HI and SUD and the resulting high overall costs of healthcare in the US, gaps in the current research specific to interventions that effectively reduce healthcare utilization and reduce costs associated with this population remain. The proposed study will utilize the need established by the reviewed studies on health utilization to design an intervention to address the established needs effectively.

3. Substance Use Disorder.

Article #	Date and Journal	Title	Authors
Article 3. a	Psychiatric Quarterly volume 87, pages 713-728 (2016) February 13, 2016	Factors Influencing the Frequency of Emergency Department Utilization by Individuals with Substance Use Disorders	Huynh, C., Ferland, F., Blanchette-Martin, N., Ménard, J.-M., & Fleury, M.-J. (2016)
Citation	(Huynh et al., 2016) https://link.springer.com/article/10.1007/s11126-016-9422-6		

Article #	Date and Journal	Title	Authors
Article 3. b	Annals of Epidemiology Volume 32, April 2019, Pages 1-6.e1	Impact of supportive housing on substance use-related health care utilization among homeless persons who are active substance users	Miller-Archie, S. A., Walters, S. C., Singh, T. P., & Lim, S. (2019)
Citation	(Miller-Archie et al., 2019) https://www.sciencedirect.com/science/article/abs/pii/S1047279718310469		

The reviewed research related to SUD further highlights the importance of addressing HI and other factors among individuals with SUDs. (Huynh et al., 2016) and (Miller-Archie et al., 2019) both investigate healthcare utilization patterns and outcomes among individuals with SUD, specifically focusing on the impact of HI. (Huynh et al., 2016) conducted a retrospective cohort study to identify factors influencing the frequency of ED utilization by individuals with

Research Project 3 - Research Proposal - Michael Litterer

SUDs. The study by (Huynh et al., 2016) included 6,871 patients with SUD admitted to EDs in Quebec, Canada, from 2004 to 2006. The findings revealed that frequent ED users (also defined as having four or more visits within a year) were more likely to have a concurrent mental health disorder, be HI, and have a higher severity of SUD. (Huynh et al., 2016) suggested that interventions addressing these factors could help reduce ED utilization among individuals with SUDs. (Miller-Archie et al., 2019) examined the impact of supportive housing on SUD-related health care utilization among HI individuals who were active substance users. The study by (Miller-Archie et al., 2019) employed a retrospective cohort design, analyzing data for 2,609 HI adults with active SUD in New York City. Participants were provided with supportive housing, which included housing subsidies and case management services. (Miller-Archie et al., 2019) found that supportive housing was associated with significant reductions in SUD-related ED visits and hospitalizations and decreased overall healthcare costs. While the reviewed studies by (Huynh et al., 2016) and (Miller-Archie et al., 2019) help to support further the impact HI and SUD on health outcomes and utilization, along with the potential effectiveness focused interventions might have, gaps in the current research specific to the design and implementation of evidence-based interventions remain. The proposed study will utilize the research presented by the reviewed studies on SUD to design an intervention to address the established needs.

4. Housing insecurity:

Article #	Date and Journal	Title	Authors
Article 4. a	Australian Social Work Volume 61, 2008 - Issue 4 Pages 342-356 November 20, 2008	Homelessness and Substance Abuse: Which Comes First?	Johnson, G., & Chamberlain, C. (2008)
Citation	(Johnson & Chamberlain, 2008) https://www.tandfonline.com/doi/abs/10.1080/03124070802428191		

Article #	Date and Journal	Title	Authors
Article 4. b	Drug and Alcohol Dependence Volume 188, July 1, 2018, Pages 328-333	Substance use and homelessness among emergency department patients	Doran, K. M., Rahai, N., McCormack, R. P., Milian, J., Shelley, D., Rotrosen, J., & Gelberg, L. (2018)
Citation	(Doran et al., 2018) https://www.sciencedirect.com/science/article/abs/pii/S0376871618302849		

The research related to HI highlights the complex relationship between HI and SUD, emphasizing the need for targeted interventions to address both issues. (Johnson & Chamberlain, 2008) and (Doran et al., 2018) investigate the relationship between HI and SUD among vulnerable populations. (Johnson & Chamberlain, 2008) conducted a longitudinal study to examine the relationship between HI and SUD, addressing the question of which comes first. The

Research Project 3 - Research Proposal - Michael Litterer

study by (Johnson & Chamberlain, 2008) included 4,291 participants experiencing HI in Australia, with data collected from 2001 to 2006. (Johnson & Chamberlain, 2008) found that for most participants, SUD began before the onset of HI. However, HI exacerbated SUD issues and complicated the process of recovery (Johnson & Chamberlain, 2008). (Doran et al., 2018) assessed the prevalence of SUD and HI among ED patients, examining the association between these factors and healthcare utilization. The cross-sectional study by (Doran et al., 2018) involved 5,947 adult ED patients in New York City, with data collected from 2014 to 2015. The findings revealed that 10% of the patients reported current HI, and 38% reported SUD (Doran et al., 2018). HI and SUD were independently associated with frequent ED use, with HI patients having higher odds of frequent ED use. The studies by (Johnson & Chamberlain, 2008) and (Doran et al., 2018) are critically important to the proposed research. Understanding the interconnection of HI and SUD and the increased severity caused by the interconnection is vitally important in designing the proposed intervention. Based on these critical findings, the proposed study will build upon the research presented by the reviewed studies on the interconnection of HI and SUD to design an intervention that factors in this evidence.

5. **Social care interventions:**

Article #	Date and Journal	Title	Authors
Article 5. a	Substance Use & Misuse Volume 53, 2018 - Issue 13 April 19, 2018	Emergency Department Visits in a Cohort of Persons with Substance Use: Incorporating the Role of Social Networks	Sacamano, P., Krawczyk, N., & Latkin, C. (2018)
Citation	(Sacamano et al., 2018) https://www.tandfonline.com/doi/abs/10.1080/10826084.2018.1461225		

Article #	Date and Journal	Title	Authors
Article 5. b	The American Journal of Drug and Alcohol Abuse Encompassing All Addictive Disorders Volume 47, 2021 - Issue November 20, 2020	Implementing hospital-based peer recovery support services for substance use disorder	Liebling, E. J., Perez, J. J. S., Litterer, M. M., & Greene, C. (2021)
Citation	(Liebling et al., 2021) https://www.tandfonline.com/doi/abs/10.1080/00952990.2020.1841218		

The research on social care interventions highlights the importance of social care interventions, such as social network support and peer-based services, in addressing health outcomes and healthcare utilization among patients with HI and SUD. (Sacamano et al., 2018) and (Liebling et al., 2021) investigate social care interventions' role in addressing SUD among HI patients. (Sacamano et al., 2018) conducted a study to examine the role of social networks in ED visits among a cohort of patients with SUD. The study by (Sacamano et al., 2018) included 503

Research Project 3 - Research Proposal - Michael Litterer

participants with SUD, and data were collected using audio computer-assisted self-interviewing (ACASI) and a social network inventory. The findings revealed that patients with more extensive social networks had significantly fewer ED visits, suggesting that social support may be critical in reducing healthcare utilization among those with HI and SUD (Sacamano et al., 2018). (Liebling et al., 2021) evaluated the implementation of hospital-based peer-based recovery support services for patients with SUD. The study by (Liebling et al., 2021) employed a pre-post design, including 171 participants who received peer-based recovery support services and 17,401 who did not. The findings demonstrated that patients who received peer-based recovery support services had significantly lower ED visit rates and hospital admissions, indicating the potential effectiveness of peer-based interventions in reducing healthcare utilization for patients with SUD (Liebling et al., 2021). The studies by (Sacamano et al., 2018) and (Liebling et al., 2021) are critically important to the proposed research. Understanding the impact of peer-based services is vitally important to the proposed study. These findings support the use of peer-based services and provide a bright spot in the existing body of research that the proposed study will contribute to.

Overall Summary of Literature Review Findings: All studies reviewed in this literature review provide evidence of the need for interventions focused on connecting HI patients with SUD who visit the ED to housing and social care resources and the positive impact these interventions can have on patient health outcomes and healthcare utilization. While the reviewed studies were categorized by their primary topics in relation to the dependent and independent variables of the proposed study, each study included additional related variables and critical considerations for the proposed intervention. Therefore, to provide a concise overview of the current body of research, below is a summary of the key findings found in the proposed study's literature review:

- Health outcomes are poorer among patients with SUD and/or HI.
- Interventions focused on comprehensively addressing SUD and HI-related issues among patients show promise of positively impacting health outcomes.
- Patients with SUD and HI demonstrate higher-than-average healthcare utilization.
- Research supports that interventions focused on comprehensively addressing SUD and HI-related issues will reduce high-cost healthcare utilization.
- Patients with SUD frequently use the ED as a primary source of healthcare.
- Patients with SUD have low utilization rates of primary care.

Research Project 3 - Research Proposal - Michael Litterer

- Interventions focused on addressing SUD-related issues early are more effective.
- SUD is directly associated with HI; more specifically, SUD often increases the risk and acuity of HI.
- ED-based interventions addressing low, mid, and high-risk HI are effective.
- Peer-based interventions, such as those provided by CHWs or peer recovery specialists, effectively address SUD.
- Peer-based models have an associated outcome of increasing a patient's social network, thereby increasing the likelihood of long-term recovery for patients with SUD.

Literature Review Limitations and Future Research: Based on the reviewed studies, the current body of research needs more evidence on interventions specific to the target population in the ED setting. Additionally, there is a limited number of longitudinal randomized control trial (RCT) studies. As supported by (Remler & Van Ryzin, 2021), RCTs offer some of the most validated and generalizable results. The lack of RCTs and evidenced-based interventions creates a substantial gap in the current body of generalizable research on the most effective strategies for connecting HI patients with SUD to housing and social care resources and their long-term impact. The proposed study will help to determine the most effective strategies, at the right point in the continuum of care and by the most equipped and trained staff, for connecting patients to HI and SUD social care resources.

Research Question and Hypotheses: The proposed study will examine the impact of connecting HI patients with SUD who visit the ED to housing and social care resources on patient health outcomes and healthcare utilization by answering the following question.

“How does connecting housing-insecure (HI) patients with substance use disorder (SUD) who visit the emergency department (ED) to housing and social care resources impact patient health outcomes and healthcare utilization?”

The null and alternative hypotheses for the proposed study are as follows:

- Null Hypothesis (H0): There is no significant difference in health outcomes and healthcare utilization between HI patients with SUD who are connected to housing and social care resources and those not connected to these resources after visiting the ED.
- Alternative Hypothesis (H1): There is a significant difference in health outcomes and healthcare utilization between HI patients with SUD who are connected to housing and social care resources and those who are not connected to these resources after visiting the ED.

Definition of Terms:

Housing insecurity: HI is a complex and multifaceted issue encompassing various dimensions of a person's living situation. Definitions in the literature vary, but most include inadequate housing, high housing costs, and temporary living arrangements as part of the definition of HI. (Leifheit et al., 2020) describe housing insecurity as a spectrum that includes unaffordable housing, unsafe living conditions, overcrowding, and unstable housing arrangements, such as living in motels or temporarily staying with friends or family (Leifheit et al., 2020). According to a study by (Maqbool, Ault, & Viveiros, 2015), housing insecurity includes a range of issues such as high housing cost burden, overcrowding, frequent moves, or doubling up with other households due to economic constraints (Maqbool et al., 2015). Factoring in many of the researched definitions of HI, the proposed study will use the definition of HI presented by the US Department of Housing and Urban Development (HUD). HUD defines HI as households that spend more than 30% of their income on housing costs or live in inadequate or overcrowded conditions. (Housing, 2005) HUD's definition of HI will also be applied to all screening and assessment tools used in the proposed study, specifically the American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) (O'Gurek & Henke, 2018) described in detail below.

Substance use disorder: SUD is a complex condition characterized by the recurrent and harmful use of substances, including alcohol, illicit drugs, and prescription medications. According to the American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), SUD is diagnosed when an individual exhibits a cluster of cognitive, behavioral, and physiological symptoms, indicating that they continue to use substances despite significant substance-related problems (Association, 2013). Therefore, the definition of SUD presented by the DSM-5 will be utilized in the proposed study. In addition, this definition will be applied to the Tobacco, Alcohol, Prescription medications, and other Substance (TAPS) Tool (McNeely et al., 2016) described in detail below.

Health outcomes: Health outcomes are defined as the changes in health status or health-related quality of life attributable to an intervention or a series of interventions, including healthcare services, public health initiatives, or policies. (DeSalvo, Bloser, Reynolds, He, & Muntner, 2006)

Healthcare utilization: Healthcare utilization, also known as health services utilization or health services use, refers to the use of healthcare services by individuals, including the frequency, type, and purpose of those services. (Andersen,

Research Project 3 - Research Proposal - Michael Litterer

1995) defines healthcare utilization as the "consumption of medical services such as visits to physicians, hospital stays, and the use of medical procedures" (Andersen, 1995).

Peer-based services: Peer-based services are a type of support mechanism where individuals with shared experiences, such as SDOH or SUD challenges, provide assistance and guidance to one another. These services can encompass various activities, such as advocacy, mentoring, coaching, and skill-building. The study by (Davidson et al., 1999) found that individuals who participated in peer-based services reported improved relationships, increased self-esteem, increased social networks, and reduced symptoms compared to those who did not participate. (Davidson et al., 1999) Another study by (Chinman et al., 2014) found that peer-based support services reduced hospitalizations and psychiatric symptoms among individuals with severe mental illnesses and SUD. (Chinman et al., 2014)

Community Health Worker: A community health worker (CHW) is a frontline public health worker who serves as a liaison between healthcare services and the community to facilitate access to services and improve the quality and cultural competence of service delivery. CHWs are typically members of the communities they serve, which enables them to establish trust, share cultural and linguistic characteristics, and address the unique needs of their communities (St. John, Mayfield-Johnson, & Hernández-Gordon, 2021). CHWs are critical in reducing health disparities by providing culturally appropriate health education, social support, and assistance to patients navigating the healthcare system. In addition, they often focus on addressing the SDOH, such as HI, SUD, food insecurity, and employment, to promote overall health and well-being within their communities (Ajuebor, Cometto, Boniol, & Akl, 2019).

Study Limitations: The proposed study will utilize a longitudinal RCT to research the impact of connecting HI patients with SUD who visit the ED to housing and social care resources, using a peer-based model, on patient health outcomes and healthcare utilization design. While a study of this design aims to mitigate many known limitations, some still may exist. Therefore, chapter 14 of (Remler & Van Ryzin, 2021) has been utilized to outline the limitations associated with the proposed study.

1. **Attrition:** Longitudinal RCTs often face the challenge of participant attrition over time. Participants may drop out of the study for various reasons, including relocation, death, loss of contact, or disinterest in continuing. (Remler & Van Ryzin, 2021) This can reduce statistical power and introduce potential bias in the results if the attrition is not random. (Remler & Van Ryzin, 2021) While the proposed study will attempt to address attrition in the sampling design, associated limitations may still exist.

Research Project 3 - Research Proposal - Michael Litterer

2. **Generalizability/External validity:** While using a RCT attempts to address limitations associated with generalizability/external validity, the proposed study's findings may not be generalizable to all HI patients with SUDs who visit the ED. Factors such as the specific population under study, the settings, the common geographic region shared by the proposed EDs utilized, and the type of ED services provided as part of standard care can limit the applicability of the results to other settings and populations. (Remler & Van Ryzin, 2021)
3. **Contamination/Human Artifacts:** In a study implementing a peer-based model, there is a risk of contamination/human artifacts, where participants in the control group may be exposed to the intervention indirectly through their interactions with individuals in the intervention group. This can lead to an underestimation of the intervention's actual effects. (Remler & Van Ryzin, 2021) While the reviewed research demonstrates peer-based services' beneficial impact, limitations associated with contamination/human artifacts may occur.
4. **Hawthorne effect:** Study participants may alter their behavior due to their awareness of being observed or participating in a study. This can influence the outcomes and make it difficult to determine the true impact of the intervention. (Remler & Van Ryzin, 2021) The Hawthorne effect might also be more prevalent due to peer-delivered services and the created social networks.
5. **Measurement issues:** Accurately measuring self-reported HI, SUD, health outcomes, and healthcare utilization can be challenging. The qualitative, self-reported HI, SUD, and health outcomes measures utilizing the proposed validated tools are prone to recall and social desirability biases. The quantitative electronic health record (EHR)-based administrative data may also have limitations in capturing the full extent of healthcare utilization or variations in the quality of care received, specifically care delivered by non-affiliated providers. (Remler & Van Ryzin, 2021)
6. **Implementation fidelity:** The intervention's success may depend on its implementation's quality. Variability in the training, skills, and motivation of the CHW can influence the intervention's effectiveness, making it difficult to isolate the effects of the intervention itself from those related to its implementation. (Remler & Van Ryzin, 2021) In addition, the proposed intervention relies heavily on the capacity of external community-based social

Research Project 3 - Research Proposal - Michael Litterer

care resources. Therefore, variations in the accessibility and effectiveness of social care resources could also impact fidelity.

7. **Covariates, Control variables, and Confounding variables:** While the proposed study has identified multiple covariates, control variables, and potential confounders, the presence of unknown and not considered confounding variables may exist. Using a large sample RCT will help minimize confounding, but there may still be unmeasured or unknown factors that can influence both the intervention and the outcomes. These confounding variables can bias the proposed study's results. (Remler & Van Ryzin, 2021)
8. **Ethical considerations:** The proposed study may raise ethical concerns about allocating scarce social care resources, mainly if the control group receives lower support than necessary for their well-being. While the proposed study's intervention will be considered an enhanced service, there is established evidence that the standard care available to the control group is ineffective. Additionally, evidence shows that social care resources often lack the capacity to meet the current need. The proposed intervention aims to connect the intervention group more effectively to already limited resources, potentially limiting access to the same social care resources for the control group. (Remler & Van Ryzin, 2021)

Significance of the Study: A study investigating the impact of connecting HI patients with SUD who visit the ED to housing and social care resources is significant for the following reasons:

1. **Improved Health Outcomes:** The proposed study aims to provide evidence of the effectiveness of connecting HI patients with SUD to housing and social care resources to improve their overall health outcomes. By addressing the root causes of their HI and providing adequate support for SUD, these interventions could lead to better health outcomes and decreased mortality rates.
2. **Reduced Healthcare Utilization:** The proposed study aims to demonstrate that connecting HI patients with SUD to appropriate resources can decrease ED visits and hospital admissions. Providing stable housing and social support could help patients better manage their health and reduce the need for ED care, thereby alleviating the burden on healthcare systems.
3. **Cost Savings:** Reducing healthcare utilization could lead to significant savings for public healthcare systems, insurance providers, and government agencies. The proposed study could prove the cost-effectiveness of investing in the studied intervention to prevent unnecessary healthcare expenditures.

Research Project 3 - Research Proposal - Michael Litterer

4. **Informing Policy and Practice:** The results of the proposed study aim to inform policy and practice by providing evidence-based recommendations for addressing the complex needs of HI patients with SUD. Policymakers and healthcare providers could use the study's findings to develop and implement targeted interventions similar to the intervention proposed in this study, to improve the health and well-being of this vulnerable population.
5. **Promoting Health Equity:** By examining the impact of connecting HI patients with SUD to housing and social care resources, the study could promote health equity and reduce health disparities among marginalized populations. The findings of the proposed study will help identify best practices for addressing the SDOH and fostering greater access to care for all individuals, regardless of their HI or SUD.

Research Methods

Study Design: The proposed study will utilize an Institutional Review Board (IRB) approved, National Institutes of Health (NIH) registered, longitudinal RCT (Remler & Van Ryzin, 2021) design to provide comparative data from two parallel groups, the intervention group (receiving the peer-based intervention) and the control group (receiving the standard care), that can be used to demonstrate the impact of connecting HI patients with SUD who visit the ED to housing and social care resources on patient health outcomes and healthcare utilization. HI patients with SUD will be recruited from the ED of multiple hospitals, and randomization will be conducted using Epic's computer-generated random allocation sequence. (Kieras & Meyer, 1997) In addition, the proposed study seeks to collect dependent and independent variable data to assess a causal relationship between the intervention and patient outcomes through implementing a customized intake survey, existing EHR-based validated tools, and patient-level healthcare utilization data. The author of this proposal, Michael Litterer, will serve as the Principal Investigator (PI) for the proposed study. All other research staff associated with the proposed study will be hired, including a Research Coordinator, Project Manager, Research Assistant, and Data Analyst. The proposed study's budget will support all research staff and associated costs. The proposed study's intervention will be implemented by existing RWJBarnabas Health (RWJBH) staff, including all medical ED staff and the existing team of 23 state-funded peer-based CHWs.

Variables: The proposed study seeks to collect dependent and independent variable data to assess a causal relationship between the intervention and patient outcomes through implementing a customized intake survey, existing EHR-based validated tools, and patient-level healthcare utilization data. The dependent variables for this

Research Project 3 - Research Proposal - Michael Litterer

study are patient health outcomes and healthcare utilization. In contrast, the independent variable for this study is the connection of HI patients with SUD to housing and social care resources using a peer-based model.

1. Dependent Variables:

a) Health outcomes:

1. Measurement tool: Short Form Health Survey (SF-12): Utilizing the Federal Short Form Health Survey (SF-12) will determine the patient's overall self-reported health status. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (Larson, 2002) (Andrews, 2002)

b) Healthcare utilization:

1. Measurement tool: Patient-level data from Epic's EHR will be used to measure the frequency of ED visits, inpatient hospital stays, and outpatient visits in a 6-month period pre and post-patient enrollment. (Hong, Haimovich, & Taylor, 2018)

2. Independent Variables:

- a) Intervention: Connecting HI patients with SUD who visit the ED to housing and social care resources.
- b) Control group: HI patients with SUD who visit the ED and do not receive the intervention.

To best study the impact of connecting HI patients with SUD who visit the ED to housing and social care resources, it is crucial to consider various factors that may influence patient health outcomes and healthcare utilization. Therefore, it is essential to carefully consider these factors when designing and analyzing the proposed study to minimize biases and better understand the actual effects of the intervention. These factors include the covariates, control variables, and potential confounders outlined below:

3. Covariates:

- a) Housing stability: Utilize the housing stability-related questions in the American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) tool to determine the self-reported stability and quality of the patient's current housing resource. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (O'Gurek & Henke, 2018)

Research Project 3 - Research Proposal - Michael Litterer

- b) Substance use: Utilize the Tobacco, Alcohol, Prescription medications, and other Substance (TAPS) Tool to determine the self-reported presence of SUD. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (McNeely et al., 2016) (Wu et al., 2016)

2. Control variables:

- a) Demographic factors: Age, gender, race, ethnicity, education, insurance status, and employment status.
- b) Social care needs: Utilize the American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) tool to determine the patient's self-reported social care needs, including food, housing, transportation, utilities, child care, employment, education, finances, and personal safety. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (O'Gurek & Henke, 2018)

3. Potential confounders:

- a) Resource Utilization: Patient-level data from Epic's EHR will be used to measure the number of successful connections to referred housing-specific social care resources in a 6-month period pre and post-patient enrollment.
- b) Intake Survey: Utilize the study-specific intake survey to determine the patient's self-perceived impact of their housing instability on their SUD and measure their readiness to utilize housing-specific resources.

Unit of Analysis: The unit of analysis for the proposed study is the individual patient. Using the individual patient as the unit of analysis, the proposed study will focus on the individual patient's health outcomes and healthcare utilization specific to the interventions provided. Therefore, this study must collect and analyze patient-level data to understand the proposed intervention's effects on the target population. Research staff will also perform subgroup analyses based on demographic variables to explore whether the intervention's effect differs across specific subpopulations (e.g., demographic factors: age, gender, race, ethnicity, education, insurance status, and employment status). This will help identify if specific groups of the individuals studied may benefit more from the intervention than others.

Secondary Data: Possible secondary data sources to be used by the proposed study include the existing datasets and data sources listed below. All identified sources of secondary data are de-identified and publicly available.

Research Project 3 - Research Proposal - Michael Litterer

Additional comparative data will be obtained from the research articles and reports included in the proposed study's literature review.

1. National Survey on Drug Use and Health (NSDUH) (Johnston et al., 2022)
 - a) <https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health>
2. Healthcare Cost and Utilization Project (HCUP) (Cost, 2022)
 - a) <https://www.ahrq.gov/data/hcup/index.html>
3. National Health and Nutrition Examination Survey (NHANES) (Akinbami et al., 2022)
 - a) <https://www.cdc.gov/nchs/nhanes/index.htm>
4. National Homeless Data Exchange System (HDX) (Moya, Joyce-Ponder, Garcia, & Flores, 2023)
 - a) <https://hudhdx2.info/>
5. Annual Homeless Assessment Report (AHAR) (Henry et al., 2022)
 - a) <https://www.huduser.gov/portal/sites/default/files/pdf/2022-AHAR-Part-1.pdf>

Measures: To best capture the data required to assess the primary outcome measures of patient health outcomes among patients with HI and SUD and who visit the ED, validated instruments already embedded in RWJBH's Epic ED-EHR workflow will be most effective. The validated instruments are described in detail below and include the American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) (O'Gurek & Henke, 2018), the Tobacco, Alcohol, Prescription medications, and other Substance (TAPS) Tool (Wu et al., 2016), and the Short Form Health Survey (SF-12) (Ware Jr, Kosinski, & Keller, 1996) (Larson, 2002) (Andrews, 2002). A customized intake survey will also be implemented to determine the patient's self-perceived impact of their HI on their SUD and measure their readiness to utilize housing-specific resources. Additional data sources will include patient-level data from RWJBH's Epic EHR. The validated AAFP, TAPS, and SF-12 tools will also be implemented at 6-month post-patient enrollment as part of the follow-up survey to assess the impact of the intervention.

Substantive Measure/Variable	Tool/Source	Construct	Level of Measurement
Intake Survey Appendix C: Table 1	Created for Study Appendix B	Utilizing the study-specific intake survey, determine the patient's self-perceived impact of their housing instability on their SUD and measure their readiness to utilize housing-specific resources. Question 1: Do you feel that not having a stable home impacts your ability to address your SUD? Yes/No	Question 1: Nominal categorical (Yes/No) Question 2: Ordinal categorical (1-10 Likert Scale)

Research Project 3 - Research Proposal - Michael Litterer

		Question 2: On a scale of 1-10 (10 being the readiest), How ready are you to utilize services to help address your housing instability?	
Housing stability Appendix C: Table 2	American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) Appendix B	Utilizing the housing stability-related questions in the AAFP tool, determine the self-reported stability and quality of the patient's current housing resource. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact.	Question 1: Nominal categorical (Yes/No) Question 2: Ordinal categorical
Substance use Appendix C: Table 3	The Tobacco, Alcohol, Prescription medications, and other Substance (TAPS) Tool Appendix B	Utilizing the TAPS Tool, determine the self-reported presence of SUD. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact.	Ordinal categorical (Daily or Almost Daily, Weekly, Monthly, Less Than Monthly, Never)
Social care needs Appendix C: Table 2	American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) Appendix B	Utilizing the AAFP tool, determine the patient's self-reported social care needs, including food, transportation, utilities, child care, employment, education, finances, and personal safety. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact.	Nominal (Yes/No) and Ordinal categorical
Patient health Appendix C: Table 4	Short Form Health Survey (SF-12) Appendix B	Utilizing the Federal Short Form Health Survey (SF-12), determine the overall self-reported health status of the patient. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact.	Ordinal categorical
Healthcare utilization Appendix C: Table 5	EHR Patient-level data	Patient-level data from Epic's EHR will be used to measure the frequency of ED visits, inpatient hospital stays, and outpatient visits in a 12-month period pre and post-patient enrollment.	Quantitative
Resource Utilization Appendix C: Table 5	EHR Patient-level data	Patient-level data from Epic's EHR will be used to measure the number of successful connections to referred housing-specific social care resources in a 12-month period pre and post-patient enrollment.	Quantitative
Demographic measures Appendix C: Table 6	EHR Patient-level data	Patient-level data from Epic's EHR will be used to measure the patient's age, gender, race, ethnicity, education level, and insurance status in the control and intervention groups.	Age: Quantitative Gender, Race, Ethnicity, Education level, and Insurance status: Nominal categorical

Research Project 3 - Research Proposal - Michael Litterer

Study Population: The target population for the proposed study will be adults (age 18 years and older) who are HI patients with SUD who visit the ED using the study's definitions outlined above. The inclusion criteria for the target population for this study will include patients who visit the RWJBH's Newark Beth Israel (NBI) and the Clara Maas (CMMC) Medical Centers EDs and meet specific SUD and HI criteria, based on the AAFP and TAPS screening tools and the definitions included in this proposal, during the time frame of September 23, 2023, to April 12, 2024. The study will exclude patients unwilling or unable to participate in the program, patients already receiving structured social care supportive services, patients with severe cognitive impairment, acute medical or psychiatric emergencies that prevent participation, and those already enrolled in a similar intervention program. Patients identified as eligible for this study will be recruited from the NBI and CMMC's EDs and randomized into two groups: an intervention group (patients connected to social care resources) and a control group (patients receiving standard care).

Study Sampling Plan: To identify patients that meet the criteria for the proposed study, all patients with an ED visit to NBI or CMMC during the indicated timeframe will be screened for HI and SUD. Utilizing Epic's EHR-based Research RCT functionality (Kieras & Meyer, 1997), all patients that meet the criteria of this study will be randomly placed in either the intervention or control group. All patients randomly assigned to the intervention group will be recruited for the study. On average, the NBI and CMMC ED provide care to approximately 200,000 patients annually. According to a study by (Zhang et al., 2021), approximately 11% of all patients that visit the ED have SUD. Therefore, the expected number of patients screening positive for SUD will be $n = 22,000$. According to a study by (Murray, Roosevelt, & Vogel, 2022), it can be expected that approximately 15.6% of patients visiting the ED screen positive for HI. Therefore, the expected number of patients screening positive for HI will be $n = 31,200$. This data demonstrates that an adequate patient population will be available for recruitment into the study. This study will aim to recruit 600 patients (300 control and 300 intervention participants). The target of 300 intervention group patients will help account for program attrition and lack of compliance while ensuring a large enough sample to substantiate the study's expected findings. For a patient to be included in the intervention group, the patient will need to provide informed consent. The control group will receive standard care provided by medical staff, and de-identified data will be collected. Patients assigned to the intervention group will be automatically referred to the ED-based CHW team via Epic automated triggers, Rover alerts, and patient lists similar to the RWJBH's Peer Recovery Program. (Liebling et al., 2021) The CHW team will visit all intervention group patients to obtain informed consent. Consenting patients will then be enrolled in the study in Epic,

Research Project 3 - Research Proposal - Michael Litterer

which will then prompt the CHW to complete the study-specific intake survey, the AAFP, the TAPS, and the SF-12.

EHR-based patient-level data will also be collected from all consenting patients in the intervention and control groups.

Epic patient outreach targets will indicate when all 6-month follow-ups will be completed and documented.

Data Collection: The mode of data collection for the proposed study will utilize a mixed methods approach, including qualitative self-reported patient surveys/validated assessment tools and quantitative EHR records abstraction.

Baseline data on the intervention and control groups will be collected during enrollment in the study and at the 6-month follow-up using the validated tools listed below. All collected data will be documented in the Epic EHR. All patients assigned to the control group will consent based on the standard ED registration, including patient-level de-identified research approval. Control patients will be assigned a randomized serial number to maintain confidentiality. All patients randomly assigned to the intervention group will provide study-specific informed consent and be assessed in person during the patient's ED visit. Patients will also be provided the full intervention during the patient's current ED visit. All follow-up data collection will be completed by phone, text, or Epic's MyChart (Chagin et al., 2021), including the 6-month post-program follow-up. Alternative follow-up patient contact could include in-person visits and care coordination with program-provided social care resources. If the patient does not respond to the 6-month follow-up, the team will attempt to contact them four more times within ten days. If there is no response, the patient will be considered non-respondent based on attrition. The proposed study's data collection methods are summarized below.

1. Patient health outcomes using the Short Form Health Survey (SF-12): Utilizing the Federal Short Form Health Survey (SF-12) will determine the patient's overall self-reported health status. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (Larson, 2002) (Andrews, 2002)
2. Healthcare utilization: Patient-level data from Epic's EHR will be used to measure the frequency of ED visits, inpatient hospital stays, and outpatient visits in a 6-month period pre and post-patient enrollment. (Hong et al., 2018)
3. Housing stability: Utilize the housing stability-related questions in the American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) tool to determine the self-reported stability and quality of the patient's current housing resource. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (O'Gurek & Henke, 2018)

Research Project 3 - Research Proposal - Michael Litterer

4. Substance use: Utilize the Tobacco, Alcohol, Prescription medications, and other Substance (TAPS) Tool to determine the self-reported presence of SUD. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (McNeely et al., 2016) (Wu et al., 2016)
5. Demographic factors: Age, gender, race, ethnicity, education, insurance status, and employment status.
6. Social care needs: Utilize the American Academy of Family Physicians (AAFP) Social Needs Screening Tool (SNST) tool to determine the patient's self-reported social care needs, including food, transportation, utilities, child care, employment, education, finances, and personal safety. This measurement will be included in the 6-month follow-up survey to assess the intervention's impact. (O'Gurek & Henke, 2018)
7. Resource Utilization: Patient-level data from Epic's EHR will be used to measure the number of successful connections to referred housing-specific social care resources in a 6-month period pre and post-patient enrollment.
8. Intake Survey: Utilize the study-specific intake survey to determine the patient's self-perceived impact of their housing instability on their SUD and measure their readiness to utilize housing-specific resources.

Data Analysis: The data collected will be analyzed using appropriate statistical methods to assess the impact of connecting HI patients with SUD to housing and social care resources on patient health outcomes and healthcare utilization. The following data analysis steps will be employed to demonstrate the effectiveness of the intervention on patient health outcomes and healthcare utilization.

1. Data Pre-processing: Custom data reports will be generated using Epic's Slicer Dicer report-building feature and the Rutgers Clinical and Research Data Warehouse (CRDW). The raw data generated by the Epic and CRDW reports will be cleaned and pre-processed to address missing values, outliers, and inconsistencies. In addition, research staff will ensure the accuracy and reliability of the data sets. Sample data templates with mock data sets are included in Appendix C.
2. Comparative Analysis at study enrollment: The collected data will compare the intervention and control groups' outcomes specific to the dependent and independent variables. Differences in the variables of both groups will be used to determine all baseline factors.

Research Project 3 - Research Proposal - Michael Litterer

3. **Comparative Analysis at 6-month follow-up:** The processed data collected will be used to compare the intervention and control groups' outcomes specific to the dependent and independent variables. Differences in the variables of both groups will be used to determine the effectiveness of the intervention.
4. **Subgroup Analysis:** Research staff will perform subgroup analyses to explore whether the intervention's effect differs across specific subpopulations (e.g., demographic factors: age, gender, race, ethnicity, education, insurance status, and employment status). This will help identify which groups may benefit the most from the intervention.
5. **Sensitivity Analysis:** Research staff will conduct probability, sensitivity, and regression analyses to assess the robustness of the findings to alternative assumptions and methods using the null and alternative hypotheses.
6. **Reporting Results:** Research staff will present the results, including confidence intervals and p-values, to assess the statistical significance of the intervention's effect on patient health outcomes and healthcare utilization. These results will be used to discuss the findings in the context of the study's limitations and implications for practice and policy.

Timeframe: The proposed study will take 23.5 months (approximately 2 years) to complete. Patients will be enrolled in the control and intervention groups from September 23, 2023, to April 12, 2024. Patient-level data will be collected 6 months following the end of the enrollment period. In addition, patient-level EHR data will also be analyzed for 6 months prior to and 6 months post-study enrollment. A detailed study timeline can be found in Appendix D.

Intervention: Patients in the intervention group will be assigned a peer-based CHW responsible for connecting them to housing and social care resources. The CHWs, individuals with lived experience of HI and/or SUD, will be trained to provide tailored support, guidance, and warm handoff to community-based social care services. The CHWs will help patients navigate the healthcare system, access appropriate care, and connect with transitional or permanent housing resources, financial assistance, and other SDOH-related services. The CHWs will utilize Epic's Healthy Planet Community Resource Directory (CRD) to identify and link patients to the most appropriate resources. (Thomas-Henkel & Schulman, 2017) In addition, CHWs will provide peer support for patients to encourage engagement in SUD treatment. Patients in the control group will receive standard care, which may include referrals to available housing and social care resources, but without the personalized support from a CHW.

Research Project 3 - Research Proposal - Michael Litterer

Budget: The budget for the proposed study will be \$1,188,649.00 (\$599,924.50 annually) for the entire 2-year study period. By utilizing existing resources, all patient screening, enrollment, and interventions will be provided by existing RWJBH peer-based CHW staff. Leveraging existing resources will allow the proposed budget to be used on research staff and all associated costs. In addition, all client-related assistance will leverage existing hospital and community-based resources. The proposed budget will support the following staff/roles: the study's PI (0.5 FTE), a Research Coordinator (1.0 FTE), a Project Manager (1.0 FTE), a Research Assistant (1.0 FTE), and a Data Analyst (1.0 FTE). The staff compensation supported by the proposed budget will be based on fair market value and include all fringe benefits (28% of base salary) and expenses. An indirect cost rate of 12% of the total budget will also be included. The proposed study's budget of \$1,188,649.00 will be supported by a research grant provided by the Rutgers Addiction Research Center (<https://www.addiction.rutgers.edu/>). See the proposed study's budget in Appendix E.

Ethical Considerations: When designing a study to research the impact of connecting HI patients with SUD who visit the ED to housing and social care resources on patient health outcomes and healthcare utilization, there are several ethical issues to consider. (Rognli et al., 2021) The proposed study's IRB application and approval will include and consider these ethical considerations.

1. **Informed consent:** Patients must be adequately informed about the study's purpose, procedures, potential risks, benefits, and alternatives before they agree to participate. Obtaining informed consent can be challenging when working with vulnerable populations like HI patients with SUD, as they may have impaired decision-making capacity, low literacy, or be in crises. Therefore, the proposed study will ensure that consent is voluntary and ongoing throughout the study. Patient consent will be documented and maintained in the Epic Research Portal.
2. **Confidentiality and privacy:** The proposed study must protect patients' privacy by collecting and storing data securely and anonymizing identifiable information. The proposed study must also prevent sharing sensitive information with third parties, especially regarding HI status and SUD, as this information is protected under the Health Insurance Portability and Accountability Act of 1996 (HIPAA) (Shen et al., 2006) and 42 CFR Part 2 (Regulation, 2018). All data collected on the patients assigned to the control group will provide consent based on the standard ED registration consent, which includes patient-level de-identified research approval.

Research Project 3 - Research Proposal - Michael Litterer

In addition, control patient data will be assigned a randomized serial number to maintain confidentiality.

Utilizing RWJBH's Epic EHR will help ensure that all confidentiality and privacy measures are maintained.

3. Risk-benefit analysis: The potential benefits of the proposed study must outweigh any potential risks or harm to the patients. The proposed study must carefully consider the potential physical, psychological, social, and financial risks and take measures to minimize them. Due to the proposed study's intervention being an enhanced service, patient risk will be limited as the control group will still receive all existing care standards.
4. Equitable selection of patients: The proposed study will use an RCT to recruit patients fairly, without exploiting or excluding particular groups. By screening all patients visiting the two designated EDs during the proposed study's designated timeframe, all patients will have barrier-free, randomized access to participation, and the benefits of the study will be distributed equitably among the target population. Epic's technology-based tool will assign patients using a standard, unbiased algorithm to ensure the equitable selection of randomized patients.
5. Cultural sensitivity: The proposed study will consider all cultural differences and potential biases that may influence patient interactions, interpretation of results, and implementation of interventions. Using a peer-based model, the proposed study will create a culturally sensitive study design that respects the values and beliefs of the target population.
6. Monitoring and evaluation: The proposed study's research staff will utilize Epic EHR functionality to monitor and evaluate the study's progress to ensure its ethical conduct and effectiveness. The ongoing monitoring and evaluation efforts will be conducted through random chart audits and Epic productivity dashboards. In addition, staff will be prepared to modify or terminate the study if it poses undue risks or no longer benefits the patients.
7. Dissemination of results: The proposed study has an ethical obligation to disseminate the study's findings in a manner that is accessible and understandable to patients, healthcare staff, community stakeholders, and policymakers. The proposed study will be transparent about any conflicts of interest or funding sources that may influence the interpretation or reporting of results.

Research Project 3 - Research Proposal - Michael Litterer

Considering these ethical issues, the proposed study can address the critical issue of connecting HI patients with SUD to housing and social care resources while protecting the rights and well-being of the patients involved ethically (Rognli et al., 2021).

Expected Results: The expected results of the proposed study on the impact of connecting HI patients with SUD to housing and social care resources using a peer-based CHW model in the ED will provide evidence that the study's alternative hypothesis is true and establish causation related to the dependent and independent variables. The proposed study has the potential to demonstrate significant improvements in patient health outcomes, reduced healthcare utilization, and inform public policy and practice for the target population in several areas, as outlined below:

1. Improved patient health outcomes (independent variable): The proposed study is expected to demonstrate that connecting HI patients with SUD to housing and social care resources can lead to better overall health outcomes. This could include reduced HI, enhanced SUD recovery, increased utilization of social care resources, and enhanced quality of life. In addition, patients in the intervention group are likely to show more significant improvements in health outcomes compared to the control group, who receive standard care.
2. Reduced healthcare utilization (independent variable): By providing housing and social care resources using an ED-based peer CHW model, the study is expected to reduce healthcare utilization for the intervention group. This could include fewer emergency department (ED) visits, reduced hospitalizations, and decreased reliance on acute care services, leading to significant cost savings for the public healthcare system.
3. Informing public policy and practice: The proposed study's results could demonstrate the importance of integrating social care services within the ED setting, highlighting the potential benefits of a peer-based CHW model connecting HI patients with SUD to appropriate housing and social care resources. This could prompt policy changes and encourage the development of more comprehensive, patient-centered, peer-based care models in the ED.
4. Peer-based interventions to address SDOH: The proposed study could provide evidence supporting the use of peer-based interventions in addressing SDOH for HI patients with SUD. The results may show that these interventions can effectively connect patients to housing and social care resources, enhance patient engagement, and improve health outcomes.

Research Project 3 - Research Proposal - Michael Litterer

5. Improving health equity and reducing health disparities: The proposed study could provide much-needed evidence on the most effective tools and interventions necessary to positively impact health outcomes, especially for patients with complex SDOH needs. By providing evidence on effective interventions to address the most prominent and impactful SDOH, the current healthcare system can move from a 'sick-care' system to a 'health care' or preventative system. (Carey et al., 2014)

Overall, the expected results of the proposed study could play a crucial role in informing public policy and practice related to social care, peer-based interventions, health equity, and the reduction of health disparities. Ultimately, the proposed study seeks to promote a more integrated, patient-centered approach to care that addresses the complex needs of HI patients with SUD and fosters long-term reductions in healthcare utilization and improved health outcomes.

List of Appendixes

- Appendix A: Full Literature Review
- Appendix B: Study Tools and Surveys
- Appendix C: Sample Data Tables (Word and Excel)
- Appendix D: Full Study Timeline
- Appendix E: Budget

References:

- Ajuebor, O., Cometto, G., Boniol, M., & Akl, E. A. (2019). Stakeholders' perceptions of policy options to support the integration of community health workers in health systems. *Human resources for health, 17*(1), 1-13.
- Akinbami, L. J., Chen, T.-C., Davy, O., Ogden, C. L., Fink, S., Clark, J., . . . Mohadjer, L. K. (2022). National Health and Nutrition Examination Survey, 2017-March 2020 Prepandemic File: Sample Design, Estimation, and Analytic Guidelines.
- Aldridge, R. W., Story, A., Hwang, S. W., Nordentoft, M., Luchenski, S. A., Hartwell, G., . . . Hayward, A. C. (2018). Morbidity and mortality in homeless individuals, prisoners, sex workers, and individuals with substance use disorders in high-income countries: a systematic review and meta-analysis. *The Lancet, 391*(10117), 241-250. doi:[https://doi.org/10.1016/S0140-6736\(17\)31869-X](https://doi.org/10.1016/S0140-6736(17)31869-X)
- Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: does it matter? *Journal of health and social behavior, 1*-10.
- Andrews, G. (2002). A brief integer scorer for the SF-12: validity of the brief scorer in Australian community and clinic settings. *Australian and New Zealand Journal of Public Health, 26*(6), 508-510. doi:<https://doi.org/10.1111/j.1467-842X.2002.tb00357.x>
- Association, A. P. (2013). Diagnostic and Statistical Manual of Mental Disorders, 5th edn (Arlington, VA, American Psychiatric Publishing). *What is Dementia, 13*.
- Baggett, T. P., Hwang, S. W., O'Connell, J. J., Porneala, B. C., Stringfellow, E. J., Orav, E. J., . . . Rigotti, N. A. (2013). Mortality among homeless adults in Boston: shifts in causes of death over a 15-year period. *JAMA Internal Medicine, 173*(3), 189-195.
- Barocas, J. A., Nall, S. K., Axelrath, S., Pladsen, C., Boyer, A., Kral, A. H., . . . Bien, M. (2023). Population-level health effects of involuntary displacement of people experiencing unsheltered homelessness who inject drugs in US cities. *JAMA*.
- Bibbins-Domingo, K. (2019). Integrating social care into the delivery of health care. *JAMA, 322*(18), 1763-1764. Retrieved from https://jamanetwork.com/journals/jama/articlepdf/2752359/jama_bibbinsdomingo_2019_vp_190_135.pdf
- Carey, G., Crammond, B., & Keast, R. (2014). Creating change in government to address the social determinants of health: how can efforts be improved? *BMC Public Health, 14*(1), 1087. doi:10.1186/1471-2458-14-1087
- Chagin, K., Choate, F., Cook, K., Fuehrer, S., Misak, J. E., & Sehgal, A. R. (2021). A framework for evaluating social determinants of health screening and referrals for assistance. *Journal of Primary Care & Community Health, 12*, 21501327211052204.
- Chinman, M., George, P., Dougherty, R. H., Daniels, A. S., Ghose, S. S., Swift, A., & Delphin-Rittmon, M. E. (2014). Peer support services for individuals with serious mental illnesses: assessing the evidence. *Psychiatric Services, 65*(4), 429-441.
- Cost, H. (2022). Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) Rockville, MD: Agency for Healthcare Research and Quality; 2008. In.
- Davidson, L., Chinman, M., Kloos, B., Weingarten, R., Stayner, D., & Tebes, J. K. (1999). Peer support among individuals with severe mental illness: A review of the evidence. *Clinical psychology: Science and practice, 6*(2), 165.
- DeSalvo, K. B., Bloser, N., Reynolds, K., He, J., & Muntner, P. (2006). Mortality prediction with a single general self-rated health question: a meta-analysis. *Journal of general internal medicine, 21*, 267-275.
- Doran, K. M., Rahai, N., McCormack, R. P., Milian, J., Shelley, D., Rotrosen, J., & Gelberg, L. (2018). Substance use and homelessness among emergency department patients. *Drug and Alcohol Dependence, 188*, 328-333. doi:<https://doi.org/10.1016/j.drugalcdep.2018.04.021>
- Foundation, C. (2021). What is Public Health? Retrieved from <https://www.cdcfoundation.org/what-public-health>
- Friedman, N. L., & Banegas, M. P. (2018). Toward Addressing Social Determinants of Health: A Health Care System Strategy. *The Permanente Journal, 22*, 18-095. doi:10.7812/tpp/18-095

Research Project 3 - Research Proposal - Michael Litterer

- Gurewich, D., Garg, A., & Kressin, N. R. (2020). Addressing Social Determinants of Health Within Healthcare Delivery Systems: a Framework to Ground and Inform Health Outcomes. *Journal of general internal medicine*, *35*(5), 1571-1575. doi:10.1007/s11606-020-05720-6
- Henry, M., de Sousa, T., Tano, C., Dick, N., Hull, R., Shea, M., . . . Morris, S. (2022). 2021 Annual Homeless Assessment Report (AHAR) to Congress: Part 1 Point in Time Estimates of Sheltered Homelessness. In: Washington, DC: The US Department of Housing and Urban Development, Office
- Hong, W. S., Haimovich, A. D., & Taylor, R. A. (2018). Predicting hospital admission at emergency department triage using machine learning. *PLOS ONE*, *13*(7), e0201016. Retrieved from <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0201016&type=printable>
- Housing, H. (2005). Department of Housing and Urban Development. *Government Printing Office*.
- Huynh, C., Ferland, F., Blanchette-Martin, N., Ménard, J.-M., & Fleury, M.-J. (2016). Factors Influencing the Frequency of Emergency Department Utilization by Individuals with Substance Use Disorders. *Psychiatric Quarterly*, *87*(4), 713-728. doi:10.1007/s1126-016-9422-6
- Johnson, G., & Chamberlain, C. (2008). Homelessness and Substance Abuse: Which Comes First? *Australian Social Work*, *61*(4), 342-356. doi:10.1080/03124070802428191
- Johnston, L. D., Miech, R. A., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Patrick, M. E. (2022). Monitoring the Future national survey results on drug use, 1975-2021: Overview, key findings on adolescent drug use.
- Keehan, S. P., Cuckler, G. A., Poisal, J. A., Sisko, A. M., Smith, S. D., Madison, A. J., . . . Hardesty, J. C. (2020). National Health Expenditure Projections, 2019-28: Expected Rebound In Prices Drives Rising Spending Growth: National health expenditure projections for the period 2019-2028. *Health Affairs*, *39*(4), 704-714.
- Kieras, D. E., & Meyer, D. E. (1997). An overview of the EPIC architecture for cognition and performance with application to human-computer interaction. *Human-Computer Interaction*, *12*(4), 391-438.
- Kushel, M. B., Perry, S., Bangsberg, D., Clark, R., & Moss, A. R. (2002). Emergency department use among the homeless and marginally housed: results from a community-based study. *American Journal of Public Health*, *92*(5), 778-784.
- Larson, C. O. (2002). Use of the SF-12 instrument for measuring the health of homeless persons. *Health Serv Res*, *37*(3), 733-750. doi:10.1111/1475-6773.00046
- Leifheit, K. M., Schwartz, G. L., Pollack, C. E., Black, M. M., Edin, K. J., Althoff, K. N., & Jennings, J. M. (2020). Eviction in early childhood and neighborhood poverty, food security, and obesity in later childhood and adolescence: Evidence from a longitudinal birth cohort. *SSM-population health*, *11*, 100575.
- Liebling, E. J., Perez, J. J. S., Litterer, M. M., & Greene, C. (2021). Implementing hospital-based peer recovery support services for substance use disorder. *Am J Drug Alcohol Abuse*, *47*(2), 229-237. doi:10.1080/00952990.2020.1841218
- Magnan, S. (2017). Social Determinants of Health 101 for Health Care: Five Plus Five. *National Academy of Medicine*. Retrieved from <https://nam.edu/social-determinants-of-health-101-for-health-care-five-plus-five/>
- Maqbool, N., Ault, M., & Viveiros, J. (2015). *The impacts of affordable housing on health: A research summary*. Center for Housing Policy.
- McNeely, J., Wu, L. T., Subramaniam, G., Sharma, G., Cathers, L. A., Svikis, D., . . . Schwartz, R. P. (2016). Performance of the Tobacco, Alcohol, Prescription Medication, and Other Substance Use (TAPS) Tool for Substance Use Screening in Primary Care Patients. *Ann Intern Med*, *165*(10), 690-699. doi:10.7326/m16-0317
- Miller-Archie, S. A., Walters, S. C., Singh, T. P., & Lim, S. (2019). Impact of supportive housing on substance use-related health care utilization among homeless persons who are active substance users. *Annals of Epidemiology*, *32*, 1-6.e1. doi:<https://doi.org/10.1016/j.annepidem.2019.02.002>
- Mitchell, M. S., León, C. L., Byrne, T. H., Lin, W.-C., & Bharel, M. (2017). Cost of health care utilization among homeless frequent emergency department users. *Psychological Services*, *14*(2), 193.

- Mold, J. (2017). Goal-directed health care: redefining health and health care in the era of value-based care. *Cureus*, *9*(2).
- Moulin, A., Evans, E. J., Xing, G., & Melnikow, J. (2018). Substance Use, Homelessness, Mental Illness and Medicaid Coverage: A Set-up for High Emergency Department Utilization. *West J Emerg Med*, *19*(6), 902-906. doi:10.5811/westjem.2018.9.38954
- Moya, E. M., Joyce-Ponder, A., Garcia, A., & Flores, J. (2023). Chronic health risks and healthcare access for adults experiencing homelessness in [BLINDED] during COVID-19 times. *EHQUIDAD. Revista Internacional de Políticas de Bienestar y Trabajo Social*(19), 121-144.
- Murray, E., Roosevelt, G. E., & Vogel, J. A. (2022). Screening for health-related social needs in the emergency department: Adaptability and fidelity during the COVID-19 pandemic. *The American Journal of Emergency Medicine*, *54*, 323.e321-323.e324. doi:<https://doi.org/10.1016/j.ajem.2021.09.071>
- O'Gurek, D. T., & Henke, C. (2018). A practical approach to screening for social determinants of health. *Family Practice Management*, *25*(3), 7-12. Retrieved from <https://www.aafp.org/dam/brand/aafp/pubs/fpm/issues/2018/0500/p7.pdf>
- Preda, A., & Voigt, K. (2015). The Social Determinants of Health: Why Should We Care? *The American Journal of Bioethics*, *15*(3), 25-36. doi:10.1080/15265161.2014.998374
- Raven, M. C., Tieu, L., Lee, C. T., Ponath, C., Guzman, D., & Kushel, M. (2017). Emergency department use in a cohort of older homeless adults: results from the HOPE HOME study. *Academic Emergency Medicine*, *24*(1), 63-74.
- Regulation, P. (2018). 42 CFR Part 10.
- Remler, D. K., & Van Ryzin, G. G. (2021). *Research methods in practice: Strategies for description and causation*. Sage Publications.
- Rognli, E. B., Aas, E. M., Drake, R. E., Marsden, J., Anders, P., Bond, G. R., . . . Arnevik, E. A. (2021). The effect evaluation of Individual Placement and Support (IPS) for patients with substance use disorders: study protocol for a randomized controlled trial of IPS versus enhanced self-help. *Trials*, *22*(1), 705. doi:10.1186/s13063-021-05673-z
- Sacamano, P., Krawczyk, N., & Latkin, C. (2018). Emergency Department Visits in a Cohort of Persons with Substance Use: Incorporating the Role of Social Networks. *Substance Use & Misuse*, *53*(13), 2265-2269. doi:10.1080/10826084.2018.1461225
- Salhi, B. A., White, M. H., Pitts, S. R., & Wright, D. W. (2018). Homelessness and Emergency Medicine: A Review of the Literature. *Academic Emergency Medicine*, *25*(5), 577-593. doi:<https://doi.org/10.1111/acem.13358>
- Shen, J. J., Samson, L. F., Washington, E. L., Johnson, P., Edwards, C., & Malone, A. (2006). Barriers of HIPAA regulation to implementation of health services research. *Journal of Medical Systems*, *30*, 65-69.
- St. John, J. A., Mayfield-Johnson, S. L., & Hernández-Gordon, W. D. (2021). Introduction: Why Community Health Workers (CHWs)? *Promoting the Health of the Community: Community Health Workers Describing Their Roles, Competencies, and Practice*, 3-10.
- Stringfellow, E. J., Kim, T. W., Gordon, A. J., Pollio, D. E., Grucza, R. A., Austin, E. L., . . . Kertesz, S. G. (2016). Substance use among persons with homeless experience in primary care. *Substance Abuse*, *37*(4), 534-541. doi:10.1080/08897077.2016.1145616
- Tabuena, A. C. (2020). Identifying and stating the problem through the use of a research outline proposal in the research writing process. *International Journal for Innovative Research in Multidisciplinary Field*, *6*(12), 60-64.
- Thomas-Henkel, C., & Schulman, M. (2017). Screening for social determinants of health in populations with complex needs: implementation considerations. *Center for Health Care Strategies*, *10*.
- Truong, H. P., Luke, A. A., Hammond, G., Wadhwa, R. K., Reidhead, M., & Maddox, K. E. J. (2020). Utilization of social determinants of health ICD-10 Z-codes among hospitalized patients in the United States, 2016-2017. *Medical care*, *58*(12), 1037.
- Ware Jr, J. E., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical care*, 220-233.
- Wu, L.-T., McNeely, J., Subramaniam, G. A., Sharma, G., VanVeldhuisen, P., & Schwartz, R. P. (2016). Design of the NIDA clinical trials network validation study of tobacco, alcohol, prescription

Research Project 3 - Research Proposal - Michael Litterer

medications, and substance use/misuse (TAPS) tool. *Contemporary clinical trials*, 50, 90-97.
Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5035619/pdf/nihms807635.pdf>

Zhang, X., Wang, N., Hou, F., Ali, Y., Dora-Laskey, A., Dahlem, C. H., & McCabe, S. E. (2021).
Emergency Department Visits by Patients with Substance Use Disorder in the United States.
West J Emerg Med, 22(5), 1076-1085. doi:10.5811/westjem.2021.3.50839