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Increased distance was associated with lower daily attendance to an opioid treatment program in Spokane County Washington

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ABSTRACT

Objective: Adherence to opioid agonist therapy with methadone is associated with improved clinical and community outcomes such as reductions in drug use, criminal behavior, high-risk sexual behavior, and mortality. However, the need for daily attendance for witnessed ingestion may comprise adherence.

Methods: Data for this study were obtained from the Spokane Regional Health District's Treatment Services database. Generalized linear models with negative binomial log link function were used to assess the association between distance to the only state-funded opioid treatment program (OTP) in Spokane County, Washington and the number of missed methadone doses in the first month of treatment.

Results: In total, 892 individuals received methadone treatment at this OTP between February 2015 and December 2017. In the adjusted multivariable model, clients who lived more than 10 miles from the OTP were more likely to miss doses compared to individuals who lived within 5 miles of the clinic (IRR = 1.29, 95%CI = 1.03–1.61, $p = 0.03$). Clients who lived less than 5 miles and between 5 and 10 miles from the OTP were equally likely to miss treatment doses (IRR = 1.02, 95%CI = 0.84–1.23, $p = 0.86$).

Conclusions: This study found significant positive associations between distance to an OTP and the number of missed doses in the first month of treatment. Findings suggest the need to improve the spatial availability of OTPs to optimize opioid use disorder treatment outcomes.

1. Introduction

Drug overdose has become the leading cause of accidental death in the United States with opioids driving this crisis (Hedegaard, Warner, & Minino, 2017). Emergency department visits and deaths from opioid overdose increased by nearly 30% from 2015 to 2016 (Vivolo-Kantor et al., 2018). Approximately 2.1 million Americans aged 12 or older had an opioid use disorder attributable to pain relievers or heroin in 2016 (SAMHSA, 2017). Opioid agonist therapy (OAT) with methadone is widely used for opioid use disorder treatment.

Adherence to OAT with methadone is associated with improved clinical and community outcomes such as reductions in drug use, criminal behavior, and high-risk sexual behavior (Corsi, Lehman, & Booth, 2009; Deck et al., 2009; Nosyk et al., 2013). There are 1308 opioid treatment programs (OTPs) across the United States, most situated in metropolitan areas (SAMHSA, 2016). The United States federal laws require newly enrolled clients to attend treatment on a daily basis for dosing. After three months, individuals who adhere and do not show unauthorized drug use may be eligible for home self-administered privileges (SAMHSA, 2015). The need for daily attendance for witnessed ingestion has comprised adherence, with 20% to 50% of clients reporting partial or poor adherence during the first month of treatment (Haskew, Wolff, Dunn, & Bearn, 2008; Nguyen, Nguyen, Nguyen, Tran, & Latkin, 2017; Tran, Nguyen, Tran, & Latkin, 2018). Concomitantly, findings of a systematic review and meta-analysis showed that the risk of mortality during treatment was highest during the initial four weeks of methadone treatment (Sordo et al., 2017). Co-use of other licit or illicit drugs and opioids has also shown to adversely impact general

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health and increase the risk of overdose morbidity and mortality (Backmund, Meyer, Soyka, Reimer, & Schütz, 2006; Jones, Mogali, & Comer, 2012). These evidence suggest that the first month is a key period for retaining clients in treatment, preventing drug related deaths, and managing overdose events.

Transportation coupled with other logistical barriers (e.g. physical or mental health condition, drug or alcohol abuse patterns, among others) have been documented to compromise adherence (Palmer, Murphy, Piselli, & Ball, 2009; Tran et al., 2018). A limited number of studies have explored commuting patterns of individuals to OTPs (Rosenblum et al., 2011), or the effect of distance on treatment completion (Beardsley, Wish, Fitzelle, O'Grady, & Arria, 2003), seeking aftercare after treatment (Schmitt, Phibbs, & Piette, 2003), and abstinence after treatment (Klinger, Karriker-Jaffe, Witbrodt, & Kaskutas, 2018). These studies, however, have some key limitations. For instance, distance was calculated as a straight-line from the center or population centroid of clients' five-digit zip codes to the exact location or zip code of treatment facilities. Zip-code cannot be considered a perfect geographic marker for place of residence. A straight-line distance does not account for the actual travel distance and would lead to an underestimation of the actual distances involved, specifically when individuals commute distances on a daily basis.

The aim of this study was to examine the association between spatial access to the only state-funded OTP in Spokane County, Washington and treatment adherence during the initial month of treatment. Utilizing residential location and clinical data, we also explored the geographic clustering of adherence. Our hypothesis was that those living farther from the OTP would have lower levels of treatment adherence.

2. Methods

2.1. Data source and subjects

Data for this study were obtained from the Spokane Regional Health District's Treatment Services database. The data includes records of individuals who treatment at this facility between February 2015 and December 2017. This OTP helps individuals recover from illegal and prescription drug use disorders. Methadone is the only treatment offered at this OTP, and this treatment is offered in combination with cognitive and behavioral therapy sessions. Clients are required to complete 12 therapy sessions during the first three months of treatment and continue completing therapy sessions once a month afterwards. OAT services are offered Monday through Saturday and take home doses are provided to clients for Sundays. As the only state-funded local public health agency, this setting allowed the study of treatment outcomes where financial barriers to treatment are eliminated, an important factor when investigating access to care.

This OTP is located in the City of Spokane, in Spokane County, Washington. Spokane is the second-most populous city in Washington State with approximately 220,000 residents. Spokane County stays the most populous county in Eastern Washington with an area of 1780 $mile^2$ and a density of 270 persons per square mile (U.S. Census Bureau, 2017). The neighboring rural population of Eastern Washington and Northern Idaho commute to Spokane for medical, educational, and other services.

This study was approved by the Institutional Review Board of Washington State University.

2.2. Measures

2.2.1. Missed doses in the first month

The outcome variable for this study was the number of missed doses of methadone (continuous). The Spokane Regional Health District's database retain information on dates that clients received a dose. A count data variable was created that showed the number of days clients missed a dose in the first month of treatment. We excluded Sunday doses from our analysis because clients did not require to commute to the OTP for a daily dose appointment.

2.2.2. Distance to treatment

The explanatory variable, distance, was a measurement of the number of miles traveled between client's self-reported home address and the OTP. To protect the clients' identity and privacy, address points were geocoded to the nearest street intersection point utilizing the ESRI ArcGIS Business Analyst. Distance measures were calculated using the ESRI ArcGIS Network Analyst between the latitude and longitude coordinates of the street intersection points and the OTP. Distance was categorized as: (a) 5 miles or less, (b) between 5 and 10 miles, and (c) 10 miles or more according to research conducted in the planning, public health, and transportation fields. Access to destinations, such as healthcare and food outlets, has been categorized by grouping the distance from individual's residence to those destinations using increments of 5-miles (Elnicki, Morris, & Shockcor, 1995; Koopman et al., 2001; Schneider & Francis, 2005).

2.2.3. Control variables

Additional covariates, hypothesized to confound the relationship between travel distance and the number of missed doses of methadone, were included in the multivariable model. Covariates included age (continuous), gender (female versus male), and race/ethnicity (non-Hispanic white versus other).

2.3. Statistical and geographic analysis

Univariate analyses included descriptive statistics with measures of central tendency and variability for continuous variables and frequency distributions and percentages for categorical variables. Bivariate statistics included chi-square statistics and generalized linear models (GLMs) to test for differences in client characteristics in the three distance groups. Multivariate analyses included employing GLMs with negative binomial log link function to explore the association between distance and the number of missed doses of treatment controlling for age, sex, and race. Poisson regression models were not considered because of over dispersion in the frequency of missed doses. The data were analyzed using SPSS, version 25. The significance level was set at 0.05 (two-tailed).

Geographic information systems (GIS) was used to assess the relationship between distance to the OTP and adherence to treatment. The local Getis G function on ESRI ArcGIS 10.3 enabled identification of geographic clusters of poor adherence to treatment. Getis G is a function commonly used to quantify and assess links between spatially distributed variables (Getis & Ord, 1992; Ord & Getis, 1995). For geographic analysis and mapping, the number of missed doses of methadone per client and their residential location were taken into consideration.

3. Results

The study sample included 892 clients who received OAT with methadone between February 2015 and December 2017. Characteristics of clients stratified by travel distance are presented in Table 1. The participants' median age was 34 years (IQR = 29–46), 463 (52%) were female, 693 (81%) were non-Hispanic white, and 838 (94%) were insured by Medicaid. The median travel distance to the OTP was 4 miles (Min = 0.21, Max = 30). Most patients (546, 62%) commuted less than 5 miles, 210 (24%) traveled between five and 10 miles, and 136 (15%) traveled more than 10 miles to receive treatment. On average three doses were missed during the first month of treatment, with a trend of increasing number of missed doses with increasing distances between residence and the OTP. Clients tended to miss Sunday and Saturday doses the most.