RIDESHARING AND ACCESS TO HEALTHCARE

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1. RESEARCH QUESTION

Ridesharing platforms have transformed transportation accessibility and usage patterns across the United States. One domain where these services could yield significant impacts is healthcare access. Anecdotally, Uber's introduction of UberHealth, a platform where providers can coordinate rides on behalf of patients, indicates that medical providers are using ridesharing services to facilitate patient transportation to and from appointments.[1]

Our proposed project will study whether ridesharing significantly improves access to care in settings where patients require ongoing or recurring treatment: substance use disorders and dialysis. For patients with substance use disorders, transportation issues are an established barrier to treatment. For example, Harwerth, Washburn, Lee, and Basham (2023) identify various transportation-related barriers to outpatient substance use treatment, including public transit availability, lack of a driver's license, and high transportation costs. Remaining in treatment is crucial for patients: dropping out of treatment is associated with a substantially elevated risk of a fatal overdose (Zanis and Woody, 1998). With a staggering 48 million people in the United States suffering from a substance use disorder (SAMHSA, 2022), even small enhancements in access to treatment could have significant beneficial effects.

Similarly, transportation barriers can affect patients who require dialysis treatment, including those with Chronic Kidney Disease (CKD) and End-Stage Renal Disease (ESRD). Latham (1998), for example, reports that "that the average number of no shows per patient per year recorded by one large dialysis service provider was 0.5 in geographic areas where transportation assistance was available to patients, compared to an average of 2.5 no shows per patient in geographic areas where only limited or no transportation assistance was available." Gray, Cohen, and Brunelli (2017) highlight that patients miss 9.9% of their hemodialysis treatments - hemodialysis is the official term for the medical procedure that filters waste products and extra fluid from the blood when a individual's kidneys are no longer functioning properly. Even when these appointments are successfully rescheduled for the next day, Cohen et al. (2020) find that emergency department visits and hospital admissions increase by between 28% and 39% over the next 30 days for those who missed their scheduled appointment. According to the National Kidney Foundation, over 500,000 people receive regular dialysis treatment each year.[2] Ridesharing could significantly improve outcomes for thousands of CKD and ESRD patients if it leads to fewer missed dialysis treatments.

Our work will make several contributions to the existing literature on the impact of ridesharing. For example, building on Moskatel and Slusky (2019), who show that ridesharing services are used as an alternative to ambulances, our findings will provide further evidence regarding how ridesharing can reduce transportation barriers and improve access to healthcare. More broadly, we will add to society's understanding of the transformative effects of ridesharing on communities, where the existing literature has also uncovered significant impacts on labor markets (Chen, Rossi, Chevalier,

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[1]See `uberhealth.com` for more information. Website last accessed 2/16/2024.

[2]See `https://www.kidney.org/news/newsroom/fsindex`. Website last accessed 3/27/2024.

and Oehlsen, 2019), public transit usage and congestion (Hall, Palsson, and Price, 2018), crime (Dills and Mulholland, 2018), and traffic fatalities and drunk driving (Anderson and Davis, 2023). We explain our empirical approach in detail in the next section.

2. Empirical Approach

2.1. **Setting 1: Substance Use Disorder Treatment.** To estimate the impact of ridesharing on substance use disorder treatment, we will use 2008 to 2018 data from the Treatment Episode Data Set (TEDS). The TEDS is a national database of approximately two million admissions to specialty substance use disorder treatment facilities each year. TEDS admissions are parsed by treatment modality (i.e., residential or hospital, detoxification, intensive outpatient, and non-intensive outpatient) which allows us to study overall admissions and admissions to modalities of treatment with different requirements for patient transportation. To estimate the effect of UberX entry on admissions to substance use disorder treatment facilities, we will use a difference-in-differences approach, exploiting variation in UberX entry across time and place. Our estimating equation is as follows:

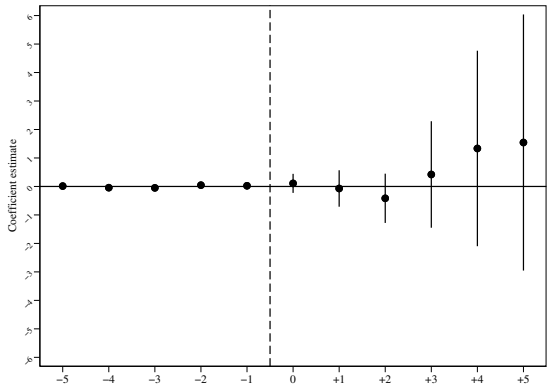
$$y_{jt} = \alpha + \beta \cdot \text{Uber}_{jt} + X_{jt}\Pi + \theta_j + \phi_t + \varepsilon_{jt}. \tag{1}$$

In equation 1, y_{jt} refers to admissions to treatment per 1,000 residents in Core-Based Statistical Area (CBSA) j in time period t (where y can be total admissions or detoxification, residential/hospital, intensive outpatient, or non-intensive outpatient admissions). We focus on CBSA level effects as CBSA is the smallest geographic identifier in the TEDS. We capture UberX (Uber's taxi-like service) availability using an indicator, Uber_{jt}, that equals one if UberX is present in CBSA j at time t. Our UberX entry data come from Teltser, Lennon, and Burgdorf (2021). All specifications include CBSA fixed effects, θ_j, year fixed effects, ϕ_t, and an idiosyncratic error term, ε_{jt}, adjusted for clustering at the CBSA level. In some specifications, we will include CBSA-level characteristics that are captured by the X_{jt} term. Our main coefficient of interest is β, which represents the association between UberX entry and changes in admissions to treatment.

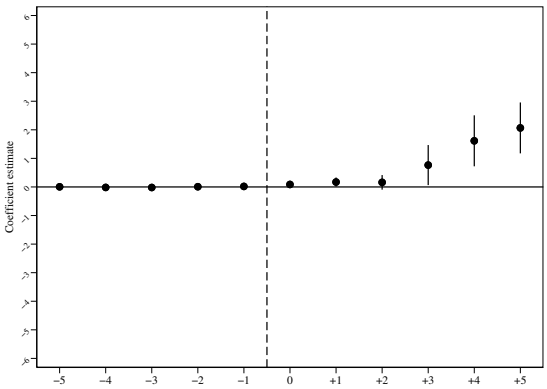
Some preliminary analyses, presented as event studies in Figure 1, suggest that UberX entry has no observable effect on the total number of substance use disorder treatment admissions. However, the overall null impact hides interesting and clinically relevant changes in patterns of treatment received by patients with a substance use disorder. In particular, we see significant changes in the *type* of care received by patients: preliminary difference-in-differences estimates show a statistically significant 0.54 drop in non-intensive outpatient admissions per 1,000 residents following UberX entry to a CBSA. That decline is fully offset by an increase of 0.68 intensive outpatient admissions per 1,000 residents. In TEDS, an intensive outpatient treatment program involves treatment of two or more hours at least three times per week. Anything less frequent is considered non-intensive treatment. Therefore, our estimates suggest substitution from less to more transportation-intensive treatment post-UberX entry, showing that UberX helps to improve access to care.

We will support a causal interpretation for our findings using event study and difference-in-differences approaches that are robust to treatment effect heterogeneity (e.g., Borusyak, Jaravel, and Spiess, 2021 and Gardner, 2022). We will also explore heterogeneity across demographic groups and geographic areas. For example, we would expect to see greater effects among young adults (who are substantially more likely to own a smartphone and use UberX during our sample period) and in areas with weaker existing public transport options. Finally, we will consider whether UberX exacerbates or minimizes inequities in access to care by race and gender.

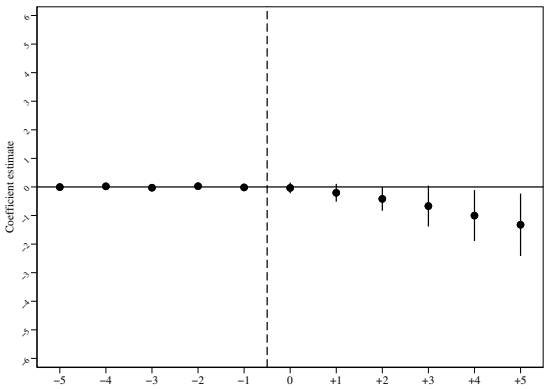
FIGURE 1. Event Studies



(A) Total Admissions



(B) Intensive Outpatient



(C) Non-intensive Outpatient

Notes: These event study figures show the effect of UberX entry on the noted outcome per 1,000 population using the two-step procedure from Gardner (2022) and TEDS data from 2008-2018. Coefficient estimates are reported with circles. 95% confidence intervals that account for within-CBSA clustering are reported with vertical lines. We control for the number of SUD treatment centers per 1,000 residents, CBSA fixed-effects, and year fixed-effects in each specification. The unit of observation is a CBSA in a year. Data are weighted by the CBSA population.

2.2. **Setting 2: Dialysis Treatment.** We will use a similar difference-in-differences approach when studying UberX's impact on dialysis treatment. Our estimating equation is as follows:

$$y_{ijt} = \gamma + \kappa \cdot \text{Uber}_{jt} + X_{ijt}\Omega + \Theta_j + \Phi_t + \varepsilon_{ijt}. \tag{2}$$

In equation 2, y_{ijt} refers to counts of dialysis treatment for individual i in county j in time period t. The Uber_{jt} indicator is as described in Section 3.1. We again include area (county) fixed effects, time period fixed effects, time-varying area and individual controls, and cluster our standard errors at the CBSA level, as the advent of UberX occurs at the CBSA level. Our main coefficient of interest in this exercise is κ, which represents the association between UberX entry and changes in the quantity of dialysis treatment received by patients. Again, we will support a causal interpretation for our findings using event studies, methods that are robust to treatment timing bias (e.g., Borusyak et al., 2021; Gardner, 2022), and a range of robustness and heterogeneity analyses that provide support for a causal interpretation for our findings.

For this work, we will use USRDS (United States Renal Data System) data, provided by the National Institutes of Health (NIH). The USRDS Standard Analysis Files provide patient- and facility-specific data from the USRDS database to support research on patients suffering from Chronic Kidney Disease and End-Stage Renal Disease in the U.S. We are in the process of implementing a data use agreement with NIH to use this data.

3. Summary of Potential Relevance to U.S. Department of Transportation

The findings of our research will inform the United States Department of Transportation about the causal impact of ridesharing on access to health care. It will also provide insights into the economic and societal implications of ridesharing, offering data-driven evidence to help policymakers formulate appropriate regulation. We will also contribute by informing a range of stakeholders who are interested in the cumulative impact of ridesharing on public health and well-being. For example, several states and localities are experimenting with using UberX or other ridesharing services as a means to support patients receiving substance use disorder treatment.[3] These interventions include full or partial funding to patients for ridesharing. We consider it important to assess whether these interventions are likely to have substantial benefits for patients and their communities. Finally, our findings will inform policymakers about whether extending similar transportation services to dialysis patients could improve the effectiveness of public spending given that dialysis treatment accounts for 7.2% ($36bn) of the Medicare budget.[4]

4. Research Team

The principal investigators for this project are Conor Lennon, an associate professor at Rensselaer Polytechnic Institute, Johanna Catherine Maclean, an NBER and IZA affiliate and associate professor at George Mason University, and Keith Teltser, an assistant professor at Georgia State University. The graduate research assistant for this project is Christian Saenz, a PhD student in economics at Georgia State University.

Lennon, Maclean, and Teltser all have excellent training and publication records. Lennon earned his PhD in Economics at the University of Pittsburgh in 2016 and has 14 publications including articles in the *Journal of Health Economics* and the *Journal of Law and Economics*. Maclean earned her PhD in Economics from Cornell University in 2012. She has over 80 peer-reviewed publications, is co-editor at the *Journal of Policy Analysis and Management* and an associate editor at the *Journal of Health Economics*. Maclean is currently the Principal Investigator on an NIH R01 research grant that explores the impact of social insurance on use of mental healthcare and is a Co-Investigator on an NIH R01 examining the impact of cost-sharing on mental healthcare use. Teltser earned his PhD in Economics from Michigan State University in 2016 and has eight publications, including articles in the *Review of Economics and Statistics*, *American Economic Journal: Applied Economics*, and *American Economic Journal: Economic Policy*.

The authors have several prior publications that are relevant to issues in transportation and health especially in the context of substance use and kidney disease, including Maclean and Saloner (2019); Dickert-Conlin, Elder, and Teltser (2019); and Teltser, Lennon, and Burgdorf (2021). Maclean and Saloner (2019) study the extent to which the Affordable Care Act's Medicaid expansion affected

[3] See `https://www.ideastream.org/health-science/2018-04-30/hospital-using-uber-and-lyft-to-transport-patients-to-drug-treatment` or `https://www.narconon-suncoast.org/blog/uber-pilot-program-offers-free-rides-to-rehab.html`. All websites last accessed 2/16/2024.

[4] See, `https://usrds-adr.niddk.nih.gov/2020/end-stage-renal-disease/9-healthcare-expenditures-for-persons-with-esrd`. Website last accessed 3/27/2024.

substance use disorder treatment utilization and financing. Dickert-Conlin et al. (2019) study how variation in transportation regulations (motorcycle helmet laws) affect a critical health outcome: the quantity and quality of transplantable organs. Finally, Teltser et al. (2021) find that the advent of ridesharing increases alcohol consumption.

5. Conflict of Interest Statement

Lennon, Maclean, and Teltser each declare that they have no financial or other ties to the transportation industry and have no financial or other interests related to this proposed project.

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