Graduate Research Plan Statement

Motivation: More than 130 people die every day in the U.S. from opioid-related drug overdoses **[1]**. Declared a national public health emergency in 2017, the opioid epidemic is devastating communities across the United States. In 2019 alone, an estimated 10.1 million people misused opioids, more than the entire population of Michigan **[2]**. During this same time period, the U.S. has also witnessed a steady increase in the number of single-parent and non-parent households. Nearly a quarter of children in the U.S. live with one parent, more than three times the worldwide average **[3]**. Household drug use destabilizes family life and may lead to separation between parent and children through divorce, incarceration, the involvement of the child welfare system, or even parental mortality. Given that the epidemic has primarily affected individuals ages 25 to 54, many of whom are parents, these two trends may be related. Using public data and a difference-in-differences framework, I will test the hypothesis that counties disproportionately affected by the opioid epidemic have also witnessed differential increases in the number of single-parent and non-parent households. I will also explore whether changes in these outcomes are larger for groups that saw heavier exposure to the opioid epidemic.

Intellectual Merit: While the health and economic consequences of opioid abuse have been widely studied, the intergenerational effects of the epidemic are still not well-understood nor documented. My project will add to the literature on the costs of substance abuse and the opioid epidemic by investigating the far-reaching impacts of the recent growth in the illicit drug market. These results will also deepen our understanding of the multifaceted determinants of household formation, as well as whether the current policies in place to combat the consequences of the epidemic are overlooking potentially large, negative spillovers onto child and individual welfare.

Empirical Methodology: The causal effects of the opioid crisis are difficult to understand because the quantity of prescription opioids in a given place is endogenous to local socioeconomic factors. Areas of the country that have experienced declining labor market conditions and demographic changes are also the regions that have seen the most pronounced increases in opioid overdoses and deaths. Given the potential simultaneous nature of these two variables, I will estimate an event study with a difference-in-differences framework that exploits two different supply shocks that both occurred in 2010. First, to combat the problem of widespread misuse, Purdue Pharma reformulated OxyContin so that it could no longer be easily snorted or injected when crushed. Contemporaneously, the Drug Enforcement Agency (DEA) and local law enforcement began to crack down on Florida "Pill Mills," or areas with loose prescribing practices where individuals from all over the U.S. could go and readily receive multiple opioid prescriptions. Both events led to a decrease in the national supply of prescription opioids but a large increase in the demand for a close and inexpensive substitute – heroin. Social science research has established a well-documented link between the misuse of oxycodone (the active ingredient in many prescription painkillers including OxyContin) and heroin. Indeed, studies have reported that counties with higher pre-2010 milligram morphine equivalent (MME) shipments of oxycodone experienced relatively greater increases in their heroin and synthetic opioid overdose death rates post-2010 **[4,5]**. The opioid epidemic can therefore be seen as two waves: the prescription drug crisis, which started with the introduction of OxyContin in 1996; and the modern-day illicit opioid epidemic, which began in 2010 with the transition to heroin and other synthetic opioid use like fentanyl.

In accordance with the literature **[6]**, I will use the amount of oxycodone (in MME) shipped to a county pre-2010 as a proxy for the severity of the present-day heroin and synthetic opioid epidemic in that county. My study will include all U.S. counties from 2005 through 2019. My empirical specification is of the form:

$$HHCharacteristics_{ct} = X_{ct}\beta + (Pre2010\ OxyRate)\gamma_c + \theta_c + \mu_t + \varepsilon_{ct}$$

where c denotes the county and t denotes the year of observation. The main dependent variable, *HHCharacteristics,* includes both (1) the ratio of single-parent and (2) non-parent households to the total number of households with children in a given county. I will regress this on county-fixed effects (θ); year fixed effects (μ); and the interaction of the average oxycodone rate in a county from 2005 – 2009 and year effects (*Pre2010 OxyRate)*. I will construct this rate from the ratio of oxycodone grams shipped to a county's pharmacies to the county's working-age population. As a robustness check, I will include a vector of controls (*X*) which includes characteristics of automation and international trade, the housing boom and the Great Recession, and the white, male, college graduate, and foreign-born population shares to account for differences in demographics.

To find the number of single and non-parent households, I will use data from the Census Bureau's American Community Survey (ACS). The ACS provides detailed data on the social, economic, and demographic characteristics of families throughout the U.S., including the relationship of household members and the living arrangements of children under 18 years old. I will supplement this with data on a county's MME shipments of oxycodone from the Automated Reports and Consolidated Ordering System (ARCOS), a dataset from the DEA in which manufacturers and distributors report all transactions of controlled substances.

Finally, I will estimate the model separately on subgroups defined by education, race, and income in order to start to understand which groups appear to be contributing to the observed aggregate relationship. Regardless of the outcome of this analysis – whether the effects are equally felt across demographics or a certain subset of the population is most affected – the results are meaningful. However, they have distinct policy implications. Currently, the bulk of the public's attention and media coverage has focused primarily on white, suburban communities. If the opioid crisis impacted family formation differentially across demographics and time, careful considerations of the necessary programs and avenues are needed to ensure those most affected receive the proper attention and resources.

Broader Impacts: Policymakers have invested a tremendous amount of time and resources to combat the opioid epidemic and alleviate its effects within their populace; however, more research is needed into whether we are combatting the crisis in the right way. My results will shed light on whether the recent growth in the illicit drug market has affected family dynamics in local communities and whether resources are helping the most affected people. Additionally, this research will illuminate whether some of the measures employed to fight the epidemic — such as the forced reformulation of OxyContin or the sudden closing of large opioid suppliers — have had adverse or differential effects. If these government actions lead to unintentional consequences, such as changes in household formation, then future policy should focus on preventative measures as opposed to strict enforcement.

References: [1] HRSA report "Opioid Crisis" **[2]** HHS report "Opioid Crisis Statistics" **[3]** Pew Research Center report "U.S. Has World's Highest Rate of Children Living in Single-Parent Households" **[4]** Evans, W.N., Lieber, E.M.J., & Power, P. (2019) The Review of Economics and Statistics **[5]** Powell, D. & Pacula, R.L. (2021) American Journal of Health Economics **[6]** Cho, D., Garcia, D.I., Montes, J., & Weingarden, A. (2021) Finance and Economics Discussion Series