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Public Health Data Challenge Technical Document

Opioids are at the center of an unprecedented crisis sweeping our nation, with overdoses claiming the lives of more than 700,000 Americans since the late 1990s. However, we see some indication that the increase in opioid overdoses can be curbed through opioid agonist therapy (OAT) and the de-stigmatization of opioid addiction treatment. OAT effectively treats drug addiction through the use of agonists such as methadone and buprenorphine, which help reduce withdrawal symptoms. Our strategy aimed at combating the opioid crisis is to overcome social stigma regarding OAT, allocate federal funding towards OAT services in crucial areas, spread the usage of Narcan, and expend leftover federal funding to expand opioid treatment throughout the U.S. To demonstrate the efficacy of OAT as a definitive solution to the opioid crisis, we will conduct a variety of statistical tests to provide statistically significant evidence.

There are three separate periods to deal with opioid addiction: before drug introduction, during addiction, and during life-threatening situations. Our primary source was the CDC WONDER dataset on drug overdose death rates. While this data helped address the problem of overdose *deaths*, it did not account for opioid *addiction rates*, as addiction rates are much more difficult to monitor and are not necessarily strongly correlated with death rates. As a result, we had a somewhat incomplete picture of the epidemic. Therefore, we chose to focus our research on preventing opioid deaths rather than preventing addictions.

It did not take long for our team to realize that the opioid epidemic could not be rectified by a “one-size-fits-all” solution. The states and counties most affected by the opioid epidemic span across America in unique and diverse communities. We ran individual correlation tests

between drug-related death rates and factors such as opioid prescriptions, poverty rate, education level, and population density and found very weak correlations with each. We attempted a multivariate analysis combining several of the factors and found a moderate correlation ($r = 0.3426$). Although this correlation is not strong enough to compel immediate action, we would like to analyze additional factors such as addiction rates, number of homeless/displaced persons in the area, age, and race/ethnicity. However, due to time constraints and limited access to databases, we were unable to do so.

Naloxone (known as Narcan), a drug commonly used by first responders to instantly counteract the effects of opioid overdose, was one possible intervention that we investigated. After running a two-sample t-test, we found statistically significant evidence ($p\text{-value} = 0.0049$) that states with over-the-counter Narcan access have lower overdose rate than states with prescription-only access. However, since correlation does not imply causation, we believe a closer case-by-case study on the effectiveness of Narcan would help supplement our conclusion.

Our solution to the opioid crisis personalizes and expedites treatment by primarily focusing on areas that are most at risk. This not only saves money through the redistribution of funds to aid more addicts, but also provides better care and treatment to patients.

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