Springboard—DSC Program

Capstone Project 1 Proposal

Determining the Likelihood and Type of Drug Abuse Visits to Emergency Departments in the US

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Background

According to The National Institute on Drug Abuse, “Addiction is a chronic disease characterized by drug seeking and use that is compulsive, or difficult to control, despite harmful consequences. The initial decision to take drugs is voluntary for most people, but repeated drug use can lead to brain changes that challenge an addicted person’s self-control and interfere with their ability to resist intense urges to take drugs. These brain changes can be persistent, which is why drug addiction is considered a "relapsing" disease—people in recovery from drug use disorders are at increased risk for returning to drug use even after years of not taking the drug.”[1]

Drug abuse occurs when a person takes a substance, whether illegal, prescribed or over-the-counter, for purposes other than those in which they are meant to be used, or when a person takes large quantities of the substance. Typically, the person is using the drug to alter his or her mood or feel better and not for a health reason.

Statistics for drug abuse include:

- Almost 21 million Americans have at least one addiction, yet only 10% of them receive treatment.[2]
- Drug overdose deaths have more than tripled since 1990.[2]
- From 1999 to 2017, more than 700,000 Americans died from overdosing on a drug.[2]
- More than 90% of people who have an addiction started to drink alcohol or use drugs before they were 18 years old.[2]
- Americans between the ages of 18 and 25 are most likely to use addictive drugs.[2]
- Alcohol and drug addiction cost the U.S. economy over $600 billion every year.[2]
- During 2008–2011, an average of 1.1 million emergency department (ED) visits were made each year for drug poisoning, with a visit rate of 35.4 per 10,000 persons.[3]

- About one-quarter (24.5%) of drug-poisoning ED visits resulted in hospital admission.[3]

Client and Problem Statement

Emergency Departments in hospitals nationwide must be prepared to accept patents that are suffering from drug abuse. They need to plan for enough staffing and supplies to handle the expected types and percentages of drug abuse related Emergency Department visits so that the departments' can be prepared with enough staffing, medications, procedures, etc. to properly deal with these cases and have good outcomes.

Dataset

The Drug Abuse Warning Network (DAWN) is a public health surveillance system that monitors drug abuse related visits to emergency departments in hospitals in large metro areas across the US. According to the Substance Abuse and Mental Health Services Administration (SAMHDA),

> "A DAWN case is any ED visit involving recent drug use that is implicated in the ED visit. DAWN captures both ED visits that are directly caused by drugs and those in which drugs are a contributing factor, but not the direct cause of the ED visit. Annually, DAWN produces estimates of drug-related visits to hospital EDs for the nation as a whole and for selected metropolitan areas.
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> DAWN is used to monitor trends in drug misuse and abuse, identify the emergence of new substances and drug combinations, assess health hazards associated with drug abuse, and estimate the impact of drug misuse and abuse on the Nation's health care system. DAWN relies on a longitudinal probability sample of hospitals located throughout the United States.
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> To be eligible for selection into the DAWN sample, a hospital must be a non-federal, short-stay, general surgical and medical hospital located in the United States, with at least one 24-hour ED. The dataset includes demographics, drugs involved in the ED visit (up to 16 drugs from 2004 through 2008 and up to 22 drugs from 2009 through 2011), toxicology confirmation, route of administration, type of case, and disposition of the patient following the visit.
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> Prepared DAWN Emergency Department National and Metro data tables are available on the DAWN website. The DAWN website also provides access to DAWN reports."[4]

Approach

The approach that will be used to model this problem will be to treat it as a binary classification problem. Baseline models will be built using algorithms and features to be defined. Once the

performance characteristics of these models are established other models and/or tuning approaches will also be attempted, and all models built will be compared with respect to performance metrics that align with the business problem. In general, we will implement the classical phases associated with many data science problems, namely: data acquisition and wrangling, storytelling and applications of inferential statistics, and model building and ranking.

Deliverables

As required, all Jupyter notebooks, a written final report, and a presentation slide deck will be submitted at the end of this project.

Footnotes:

1. 'Understanding Drug Use and Addiction', *National Institute on Drug Abuse,* June, 2018, https://www.drugabuse.gov/publications/drugfacts/understanding-drug-use-addiction, (accessed December 14, 2019)
2. Yerby, Nathan, 'Statistics on Addiction in America', *Addiction Center,* December 5, 2019, https://www.addictioncenter.com/addiction/addiction-statistics/, (accessed December 14, 2019)
3. Albert, Michael, M.D., M.P.H.; McCaig, Linda F, M.P.H.; Uddin, Sayeedha, M.D., M.P.H., 'Emergency Department Visits for Drug Poisoning: United States, 2008-2011', *Centers for Disease Control and Prevention,* April, 2015, https://www.cdc.gov/nchs/products/databriefs/db196.htm, (accessed December 14, 2019)
4. 'Drug Abuse Warning Network 2011 (DAWN-2011-DS0001)', *Substance Abuse & Mental Health Services Administration,* 2011, https://www.datafiles.samhsa.gov/study-dataset/drug-abuse-warning-network-2011-dawn-2011-ds0001-nid13747, (accessed December 14, 2019)