**Current and Desired Data**

Current Data: General Population to Directed Use

According to the 2010 census, the population of Worcester is 181,045, and the population of the greater Worcester area is 265,719. We know that there were 70,507 claims for opioid prescriptions from Medicare Part D data in Worcester in 2013, for a total of 1,507,326 days. For greater Worcester, there were a total of 77,862 claims for a total of 1,662,171 supply days. There are various figures for the number of Medicare enrollees, but it is approximately 16% of the US population.

As a result, we can derive the following:

68.13% of the greater Worcester population lives in Worcester.

181,045/265,719=.6813

90.68% of the prescriptions written in greater Worcester were written in Worcester.

1,507,326/1,662,171=.9068

Because many prescriptions written in Worcester were likely for residents of nearby towns in the greater Worcester area, we assume that 79.41% of prescriptions were written for Worcester residents, by averaging the 2 numbers.

(.6813+.9068)/2=.7941

This reduces the number of supply days to 1,319,915.

.7941\*1,662,171=1,319,915

This also suggests that 3,616 people in Worcester are taking prescription opioids, any given day.

1,319,915/365=3,616

If 16% of the population is enrolled in Medicare, this would be 28,967 people in Worcester.

181,045\*.16=28,967

This implies that 12.48% of the population is taking prescription opioids on any given day, assuming the Medicare ratio is consistent with the general population.

3,616/28,967=.1248

Based on the assumption that 0.7% transition from general population to misuse annually, that leaves 99.3% of the population.

1-.007=.993

We can therefore assume that 86.90% of the general population is still in the general population, after 1 year.

.993\*(1-.1248)=.8690

We can also calculate that 99.96% of the general population stays in the general population, after 1 day.

=.9996

This also implies that 0.04% of the general population does not stay in the general population, after 1 day. We can calculate the percentage that transition to directed use, rather than misuse, based on the following calculation.

.1248/(.1248+.007)\*.0004=.00038

Desired Data: General Population to Directed Use

We are currently assuming that non-Medicare patients are prescribed opioids, at the same level as Medicare patients. It would be useful to have all claims data. It would also be useful to know the city that the patient resides in, as we are assuming that many Worcester doctors are writing prescriptions for residents of nearby towns. It would also be useful to know the number of people who the claims are written for. The current model assumes that each person only has 1 claim per year, resulting in a higher turnover from general population to directed use.

Current Data: General Population to Misuse

Pain reliever incidence increased from 1990, when there were 628,000 initiates, to 2000, when there were 2.7 million. In 2001, the number was 2.4 million.

In 2013, there were 169,000 persons aged 12 or older who had used heroin for the first time within the past 12 months

2013 population ~ 315,000,000

2,000,000 + 169,000 = 2,169,000

2,169,000 / 315,000,000 = 0.00689

The above data was collected from various sources by Frank Zhang.

Desired Data: General Population to Misuse

It would be useful to have more recent data about the number of people transitioning from the general population to misuse, as the number has likely increased.

Current Data: Directed Use to General Population

See directed use to misuse.

Desired Data: Directed Use to General Population

See directed use to misuse.

Current Data: Directed Use to Misuse

We are able to calculate the average opioid prescription length based on provided Medicare Part D data. For example, we know that the average prescription in Worcester is for 21 days.

We can therefore calculate that a patient on directed use will remain on directed use the next day, 95.24% of the time.

20/21=.9524

For the remaining 4.76%, we are assuming that 80% return to the general population, 19.9% become misusers, and 0.1% overdose. As a result, we are assuming that 0.95% transition to misuse everyday.

.0476\*.199=.0095

Desired Data: Directed Use to Misuse

We do not have any data to support that assumption however. If we can get survey information from current and former opioid users that determines the percentage that started misusing as a result of directed use, this will help us better model the data.

Current Data: Directed Use to Overdose from Directed Use

See directed use to misuse.

Desired Data: Directed Use to Overdose from Directed Use

See directed use to misuse.

Current Data: Overdose from Directed Use to Death

We have the number of fatal and non-fatal opioid overdoses for each Massachusetts city in 2009.[[1]](#footnote-1) For example, we know that Lowell had 618 non-fatal overdoses and 20 fatal overdoses. With the calculation below, we can derive that 3.1% of overdoses in Lowell resulted in death.

20/(618+20)=.031

We also know that the number of deaths increased to 29 in 2014.

Desired Data: Overdose from Directed Use to Death

While we know the number of deaths increased in 2014, we do not know the number of non-fatal overdoses. We have to assume that either the number of overdoses increased proportionally or the death rate from overdoses increased. It would be helpful to have more recent non-fatal overdose information. Additionally, we are assuming that the death rate was the same from all 3 types of overdoses. It would be nice to find out what stage each of the 29 individuals were in prior to their overdoses which resulted in death.

Current Data: Misuse to General Population

We currently assume that 1.7% in misuse transition back to the general population daily.

Desired Data: Misuse to General Population

We have no data to support that assumption. It would be useful to gather survey information from the general population about individuals that have misused opioids in the past, to get an idea of how many experimented with opioids, without it becoming a habit.

Current Data: Misuse to Directed Use

We currently assume that 1% of misusers return to directed use everyday, by receiving another prescription from a doctor.

Desired Data: Misuse to Directed Use

We have no data to support that assumption. It would be useful to know how often doctors are writing prescriptions to patients who are already using opioids or have done so recently. This would give us a better idea of how common “doctor shopping” is.

Current Data: Misuse to Overdose from Misuse

We currently assume that 0.075% overdose from misuse daily.

Desired Data: Misuse to Overdose from Misuse

We have no data to support that assumption. It would be helpful to have more recent non-fatal overdose information. Additionally, we are assuming that the death rate was the same from all 3 types of overdoses. It would be nice to find out what stage each of the 29 individuals were in prior to their overdoses which resulted in death.

Current Data: Misuse to Active Use Addiction

We currently assume that 2% of people who misuse transition to active use addiction everyday.

Desired Data: Misuse to Active Use Addiction

It would be useful to know how quickly addicts became addicted. That would give us a better idea of how quickly the transition takes place and how many are transitioning daily.

Current Data: Overdose from Misuse to Death

See overdose from directed use to death.

Desired Data: Overdose from Misuse to Death

See overdose from directed use to death.

Current Data: Active Use Addiction to Detoxification

We currently assume that 0.6% of those in active use addiction transition to detox daily.

Desired Data: Active Use Addiction to Detoxification

We have no data to support that assumption. It would be nice if people in detoxification can provide personal information about how many of their peers are still addicted, after they go through detoxification. This would give us a better idea of how common the transition is.

Current Data: Active Use Addiction to Overdose from Addiction

We currently assume that 1.5% overdose from active use addiction daily. This is twice the percentage who overdose from misuse, as we assume that those in active use addiction are about twice as likely to overdose than those in the misuse stage.

Desired Data: Active Use Addiction to Overdose from Addiction

See misuse to overdose from misuse.

Current Data: Overdose from Addiction to Death

See overdose from directed use to death.

Desired Data: Overdose from Addiction to Death

See overdose from directed use to death.

Current Data: Detoxification to Active Use Addiction

We currently assume that 75% of those in detoxification stay in detoxification the next day, as the process takes an average of 4 days.

3/4=.75

We also know that only 17% of discharged post-acute treatment services (ATS) patients can be sent to clinical stabilization services (CSS), where they transition into the addiction treatment stage. The other 83% are forced to attempt recovery management on their own or return to the active use addiction stage.[[2]](#footnote-2) We can therefore calculate that about 4.25% transition from detoxification to addiction treatment daily.

(1-.75)\*.17=.0425

We assume the remainder are split between effectively transitioning to recovery management or returning to active use addiction.

(1-.75-.0425)/2=.10375

We assume that 10.4% transition from detoxification to active use addiction, and 10.4% also transition from detoxification to recovery management everyday.

Desired Data: Detoxification to Active Use Addiction

A clearer definition for detoxification is necessary to determine how long the stage takes place. Different sources have provided different estimates, based on their definitions. It would also be useful to know what happens to the 83% who are declined by CSS. It would be nice to know if CSS collects their information and what stage they are in, if and when they are contacted.

Current Data: Detoxification to Addiction Treatment, Recovery Planning

See detoxification to active use addiction.

Desired Data: Detoxification to Addiction Treatment, Recovery Planning

See detoxification to active use addiction.

Current Data: Addiction Treatment, Recovery Planning to Active Use Addiction

We currently assume that 2% of those in addiction treatment relapse and return to active use addiction daily.

Desired Data: Addiction Treatment, Recovery Planning to Active Use Addiction

It would be nice to know completion rates of patients in addiction treatment and to track how many are able to go into recovery management. We would then assume the others return to active use addiction.

Current Data: Addiction Treatment, Recovery Planning to Recovery Management

We know that there are currently 2 types of addiction treatment support in Masssachusetts; CSS and transitional support services (TSS).[[3]](#footnote-3) There are a 297 beds in CSS and 331 in TSS. Treatment in TSS lasts for 14 days, while CSS treatments lasts for 30 days. This allows us to calculate that 94.865% in addiction treatment remain there each day.

297/(297+331)\*(13/14)+331/(297+331)\*(29/30)=.94865

Because we assume that 2% relapse into active use addiction daily, that leaves us 3.135% who transition to recovery management.

Desired Data: Addiction Treatment, Recovery Planning to Recovery Management

See addiction treatment, recovery planning to active use addiction.

Current Data: Recovery Management to Active Use Addiction

We currently assume that 99% in recovery management remain there each day, while 1% relapse into active use addiction.

Desired Data: Recovery Management to Active Use Addiction

It would be useful to know how often people seeking treatment have been through recovery management before. This would give us a better idea of how effective it is.

1. <http://www.mass.gov/eohhs/gov/departments/dph/programs/admin/dmoa/injury-suveillance/reports/drug-overdoses-and-poisonings.html> [↑](#footnote-ref-1)
2. <http://www.lifeskillstraining.com> [↑](#footnote-ref-2)
3. http://www.chiamass.gov/assets/Uploads/SUD-REPORT.pdf [↑](#footnote-ref-3)