

**ACCOUNTING FOR RURAL VERSUS URBAN DIFFERENCES IN THE OPIOID
EPIDEMIC IN PENNSYLVANIA**

by

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ABSTRACT

In Pennsylvania, rural and urban communities can differ in the various factors that impact healthcare outcomes. The social ecological model was used as a lens to view underlying factors in the literature related to the opioid epidemic that affect an individual's susceptibility to opioid use disorder in rural and urban populations. The Substance Abuse and Mental Health Services Administration treatment provider search function was used to examine rates of buprenorphine, drug and alcohol and mental health, and detoxification providers across the Commonwealth of Pennsylvania. Following the literature review and provider search, several factors were viewed to affect rural populations more so than urban populations: the occupation of an individual, social networks, recovery support services, and access to buprenorphine and detoxification providers. Several factors were also found to be similar between urban and rural populations: individual risk factors, perceived norms towards substance use disorder, family, peer influence, stigma, socioeconomic status, rates of drug and alcohol and mental health treatment providers, and policies related to substance use disorder.

All these factors also have the ability to intermix and impact outcomes, such as perceived norms and stigma, which can combine to create low levels of access to treatment and recovery services. Several strategies could be used to overcome these barriers to care in rural populations. Behavioral health can be integrated into primary care offices. Telemedicine can be fully optimized

to increase access to specialty services in rural communities. Finally, Medicaid policies can be adapted to make these strategies more achievable for providers of rural healthcare clinics. By incentivizing and increasing reimbursement for medication-assisted treatment and opioid use disorder management and prevention, Medicaid beneficiaries can have increased access to treatment necessary for recovery. In the future, public health policies and interventions that take both the differences and similarities of rural and urban communities into account, can have greater success in overdose reduction and decreasing rates of opioid use disorder across Pennsylvania and the United States.

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ABBREVIATIONS

CM.....	Contingency management
MAT.....	Medication Assisted Treatment
OUD.....	Opioid Use Disorder
PDMP.....	Prescription Drug Monitoring Program
SAMHSA.....	Substance Abuse and Mental Health Services Administration
SEM.....	Social Ecological Model
SES.....	Socioeconomic Status
SUD.....	Substance Use Disorder

PREFACE

I would like to thank Dr. Terry, Hawk, and Buchanich for their valuable insight into this work and for pushing me intellectually throughout the entire process. Their expertise and serving on my committee goes greatly appreciated.

I would like to especially thank Dr. Martha Terry for bringing out my passion for public health and eliminating disparities in healthcare. Her mentorship and support throughout my studies has been invaluable to my success. I am not sure if I would have found my path in public health today without her positive influence and direction whenever necessary.

1.0 INTRODUCTION

The current opioid epidemic in the United States, defined by the rapid increase in opioid use among the population, began over 20 years ago partially as a result of the increase in prescription opioid use.¹ In the late 1990s, state medical boards reduced restrictions for prescribing opioids for chronic non-cancer pain. In 2000, the Joint Commission on the Accreditation of Healthcare Organizations introduced new pain management standards that brought increased awareness to the “right to be pain-free.” Additionally, aggressive marketing by pharmaceutical companies and the promotion of opioids over other methods of pain therapy are also associated with increased opioid use.¹

These factors have contributed to the increase in the number of prescription opioids in the United States, which contributes to the non-medical use of prescription opioids.² The nonmedical use of prescription opioids varies throughout the population from relatively infrequent use once or twice a year to daily use and corresponding addiction.³ In 2014, a total of 10.3 million people reported using opioids in a manner other than prescribed or using opioid medications that were not originally prescribed for them.⁴ One population, people who use heroin, are 3.9 times more likely to report using prescription opioids nonmedically.⁵

In addition to nonmedical prescription opioid use, heroin use has increased in the United States over the past decade, especially since 2007.⁶ Between 2002 and 2004, heroin use for nonmedical prescription opioid users increased 138.9%.⁴ Heroin users have also reported increased use of and dependence on cocaine, alcohol, and marijuana.^{3,6} The rate of use has increased in young

adults aged 18 to 25, in urban and rural areas, and among all sexes, races, and ethnic groups. Heroin use rates have increased the most among non-Hispanic whites and women.^{3,6} Heroin users entering treatment are predominantly white, middle-class, and living in non-urban areas of the country. These patterns associated with heroin use are similar to those of nonmedical prescription opioid use since 2002.^{3,4,7-9}

Misuse of prescription and non-prescription opioids has several consequences. First, increased misuse of opioids has been associated with increased drug overdose rates. Drug overdoses have become the leading cause of death for Americans younger than 50 years of age.¹⁰ Second, opioid misuse and dependence are associated with increased readmission rates following major operating room surgery.¹¹ Third, increased opioid use has been associated with increased healthcare costs. The total economic burden of prescription opioid misuse has been estimated at \$78 billion.¹² Substance use disorder (SUD) costs the United States an estimated \$442 billion a year.¹³ This includes the costs of healthcare, lost productivity, treatment, and the involvement of the criminal justice system.^{13,14} These consequences combine to have a large effect on the economy and health of the entire population of the United States.

Recently, state and federal levels of government have taken action to reduce opioid overdose deaths. The United States government has enacted policies to mitigate inappropriate opioid prescribing.² Policies include implementing prescription drug monitoring programs (PDMPs), taking legal action against physicians and pharmacists aberrantly prescribing or dispensing opioid medications, initiating drug disposal programs, and building coalitions across the country to bring key stakeholders together to share success and develop community action plans.^{3,15}

Addressing the issues behind the opioid epidemic requires a comprehensive set of initiatives related to public health policy and prevention in the medical and public health community. Improving access to, as well as methods of treatment, targeting the major risks factors, managing the availability of opioids to the public, and properly addressing differences in the populations of the United States when creating new programs and policies, will assist in the fight against fatal opioid overdose.^{3,16}

Pennsylvania ranks fourth in the country in opioid deaths at 37.9 per 100,000 (age-adjusted).¹⁷ In 2016, 4,642 drug overdose deaths occurred in Pennsylvania.¹⁸ In January of 2018, Governor Tom Wolf declared the opioid epidemic a statewide disaster emergency, the first of its kind in Pennsylvania. This declaration aims to enhance state response and increase access to treatment by promoting collaborative initiatives between all state agencies.¹⁹ This will allow more people to receive necessary treatments and increase their chances for optimal health outcomes.

1.1 PURPOSE

The purpose of this thesis is to examine variations in the use of opioid-related mortality rates, access to treatment options and providers, and risk factors for opioid use disorder (OUD) and SUD in Pennsylvania. It will examine differences and similarities in the opioid epidemic between rural and urban populations at the policy, organizational, community, interpersonal, and individual levels as outlined in the Social Ecological Model (SEM). This thesis will also discuss where access to treatment services needs to be enhanced and suggest policy changes to better address those needs.

1.2 OBJECTIVES

This thesis has five main objectives. The first is to provide a background on the opioid epidemic. The reader will review the neuroscience of opioids and how opioid use can lead to dependence. This thesis will also review epidemiological data related to the opioid epidemic and drug overdose in the Commonwealth of Pennsylvania and how the Commonwealth relates to the rest of the United States. Second, this paper will provide information on the types of treatment available for opioid use disorder (OUD) and the rates of treatment providers in rural and urban counties in Pennsylvania. Third, it will demonstrate the differences in rural and urban populations using the SEM to guide a literature review. Fourth, this paper will use the Substance Abuse and Mental Health Services (SAMHSA) provider search tool to locate SUD treatment providers in each county of Pennsylvania. Finally, policy suggestions will be provided based on the results of the literature review to better address opioid overdose and associated co-morbidities in rural and urban populations. Through these five main objectives, this thesis will provide reasonable strategies to prevent future deaths from drug-related overdose.

2.0 BACKGROUND

This section will provide a background on the neuroscience of opioids, OUD, opioid overdose, and relevant statistics and epidemiological findings. It will then review various treatment methods for OUD. Next, it will provide background on rural and urban methods of classification for populations. Finally, it will review data related to access to various types of care for OUD in rural and urban counties throughout Pennsylvania.

2.1 EXAMINING THE OPIOID EPIDEMIC

The first section will discuss how opioids impact the human body. Next, it will discuss how high quantities of opioids can lead to overdose. It will then review the definition of OUD and provide background on the epidemiological impact of the opioid epidemic on Pennsylvania compared to the rest of the United States.

2.1.1 NEUROSCIENCE OF OPIOIDS

In order to understand why treating OUD is so difficult, it is important to understand how opioids affect the brain and become addictive. The term “opioid” refers to any natural, synthetic, or semi-synthetic agent that has the functional and pharmacological properties of an opiate. “Opiate” refers to compounds that are structurally related to naturally occurring products found in the opium poppy.²⁰ The different classes of opioid ligands act on three classes of opioid receptors: mu, kappa,

and delta.^{21,22} These G-protein-coupled receptors are widely distributed throughout the central nervous system and are expressed in a variety of peripheral tissues, such as vascular, cardiac, lung, gastro-intestinal system, and resident and circulating inflammatory cells.²³ Each of the three kinds of opioid receptors is activated throughout the body when the opioid enters the blood stream and binds to the receptors of the central nervous system.

Opioids' interaction with the central nervous system is what gives them their addictive properties. Opioids weaken pain signals, and create euphoria and relaxation, which is why they are effective for treating pain.²⁴ However, opioids also change the chemical structure of the brain. Opioids cause the release of dopamine, which can motivate patients to pursue behaviors that cause dopamine to be released, such as eating, having sexual intercourse, or taking a pill.²⁵ Additionally, opioids mitigate the release of endorphins, the body's natural pain relief neurotransmitters. Thus, when the brain runs out of opioids to react to, there are no endorphins to fill the opioid's place – dopamine levels drop, and pain and uncomfortable symptoms return, often at stronger intensities. Therefore, people often experience rapid tolerance to opioids, and as a result, need to consume more opioids to relieve the pain and symptoms.^{25,26} When an individual reaches a level where the pain and withdrawal symptoms are so uncomfortable that he or she cannot function without opioids, or are at risk of death, the individual becomes dependent on the drug.²⁶

2.1.2 OPIOID OVERDOSE

A fatal or non-fatal overdose from opioids occurs when there is an over-accumulation of opioids in the body, which can lead to respiratory depression, general unconsciousness, and death. When used in combination with alcohol and sedative medications, such as benzodiazepines, the risk of respiratory depression and death increases.²⁷ In 2016, 145 Americans died each day on average

from an opioid-related drug overdose.²⁸ Fatal opioid overdose occurs in all sex, ethnic, and age, populations and geographic locations.²⁹

The ability of opioids to create euphoria and relieve pain in various patient populations has led to the creation of many different synthetic and semi-synthetic agents. Synthetic opioids, such as fentanyl, are commonly used to cut street heroin to increase its effect due to low production costs.³⁰ This increase in potency can be dangerous for unsuspecting people who use drugs.³¹ The increase in opioid overdose in the United States is largely a result of the rise and development of synthetic opioids following 2013.^{32,33} The increase in the use of fentanyl in street heroin has made it easier to overdose. People who use drugs often believe that they are administering the same quantity of drug into their body. They are not aware that when heroin is cut with fentanyl, the dose they normally administer is ten to one thousand times as powerful.³⁴ However, people who use drugs and have a tolerance to opioids, often also seek synthetic opioids, like fentanyl, due to their strength and correspondingly powerful high.³⁵

2.1.3 OPIOID USE DISORDER

OUD is defined as “a problematic pattern of opioid use leading to clinically significant impairment or distress.”³⁶ This form of SUD is characterized by a persistent desire for opioids, an inability to control or reduce the use of opioids, continued use despite inability to fulfill major life or social obligations, chronic use at high dosages over long periods of time, development of tolerance, spending a large amount of time searching for opioids to use, and appearance of withdrawal symptoms following reduction or stopping of use. Common withdrawal symptoms include depression, nausea or vomiting, muscle aching, diarrhea, fever, and insomnia.³⁶

2.1.4 EPIDEMOLOGICAL FINDINGS RELATED TO OPIOID OVERDOSE

The opioid epidemic has impacted the entire United States. The rate of death due to opioid-related overdose has increased by more than 200% over the past 15 years throughout the country. Opioids were involved in 42,249 deaths in 2016. According to national health statistics data, in 2016 the five states with the highest rates of death due to drug overdose were West Virginia (52.0 per 100,000), Ohio (39.1 per 100,000), New Hampshire (39.0 per 100,000), Pennsylvania (37.9 per 100,000), and Kentucky (33.5 per 100,000).¹⁷

In Pennsylvania in 2016, out of the 4,642 drug overdose deaths, 1,074 (23%) were individuals who lived in 48 counties listed as “rural” and 3,568 (77%) were in counties listed as “urban” using the Center for Rural Pennsylvania’s definitions.¹⁸ Figures 1 and 2 below display the drug overdose death rates for urban and rural counties, respectively. The urban and rural counties with the highest overdose death rates in 2016 were Philadelphia and Beaver (urban) and Cambria and Fulton (rural). According to the 2016 Drug Enforcement Agency Report, the Pennsylvania drug-related overdose death rate in 2016 was 36.5 per 100,000 people, up from 26.7 per 100,000 people in 2015, an increase of 37%.¹⁸ This is in comparison to the national drug overdose death rate in 2015 of 16.3 per 100,000. Seventy-eight percent of Pennsylvania counties experienced overdose death rates higher than the national average.^{17,18}

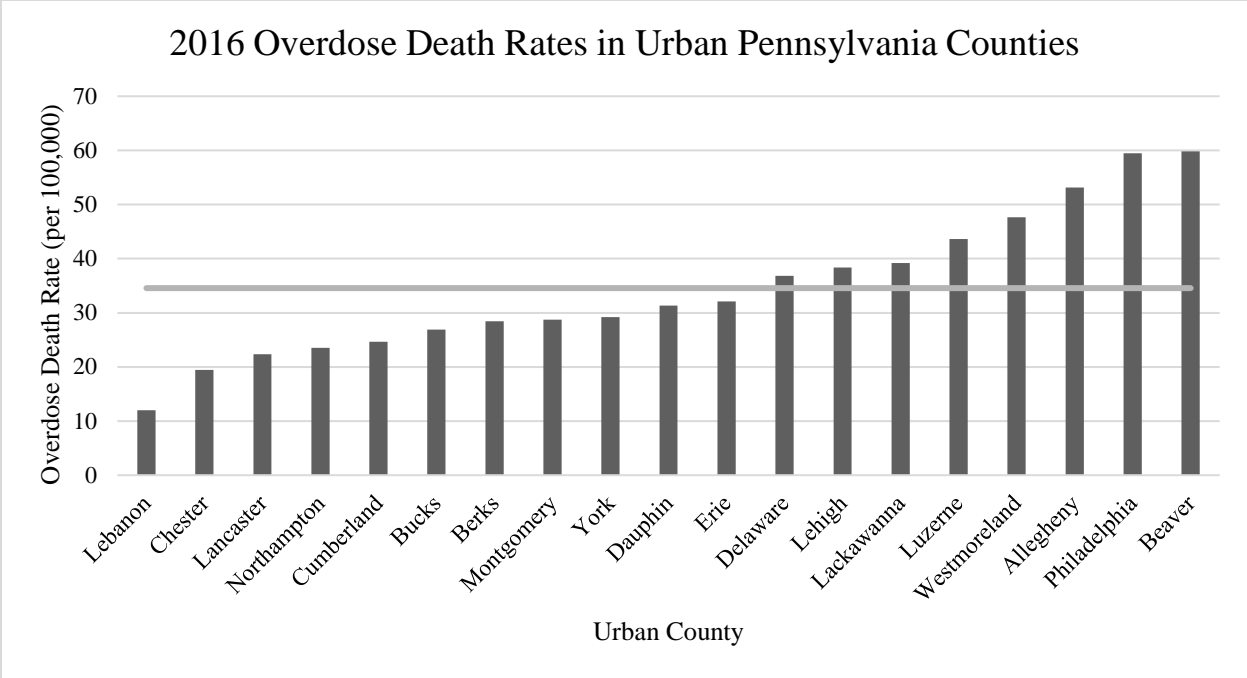


Figure 1: 2016 Overdose Death Rates for Urban Pennsylvania Counties (Gray Bar Equals Average Death Rate of Urban Pennsylvania Counties)

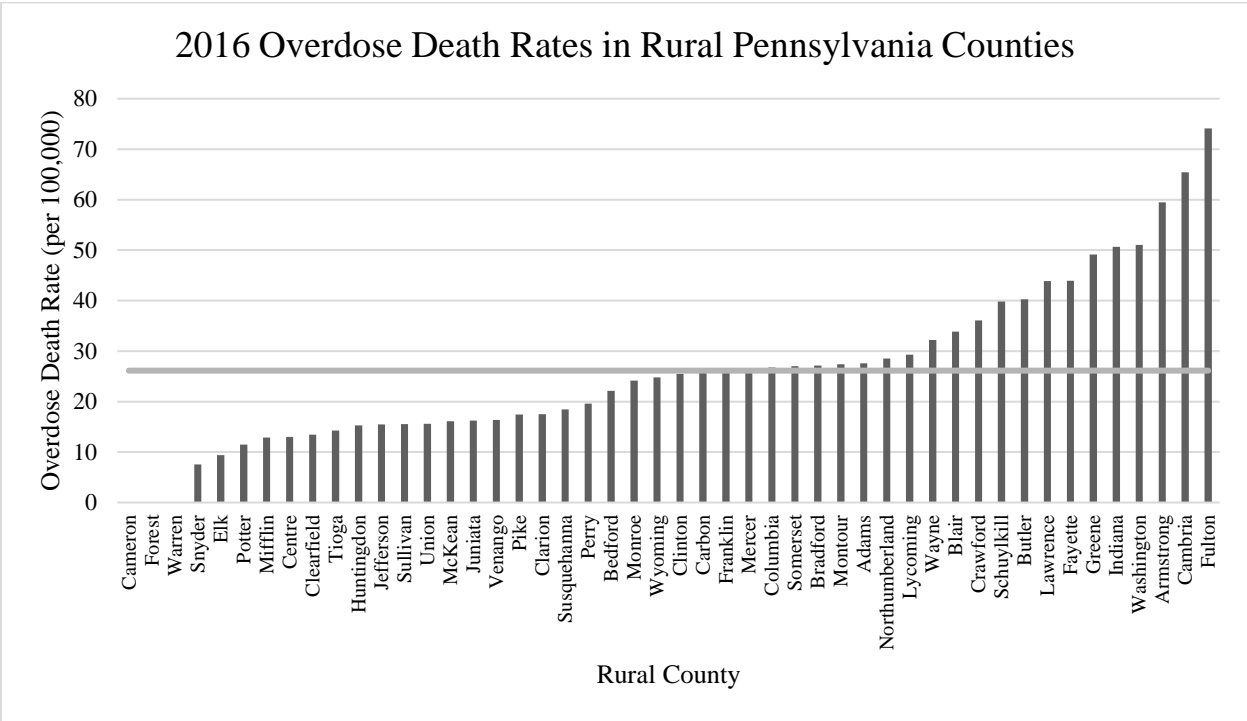


Figure 2: 2016 Overdose Death Rates for Rural Pennsylvania Counties (Gray Bar Equals Average Death Rate of Rural Pennsylvania Counties)

In Pennsylvania, the percent increase in the number of deaths was larger in rural counties (42%) than urban counties (34%) between 2015 and 2016.¹⁸ In 2016, 77% of fatal overdoses across the Commonwealth involved white individuals, 12% involved black individuals, and 7% Hispanic individuals. For the first time, fentanyl-related synthetic opioids were the leading cause of overdose-related death in both rural and urban Pennsylvania counties.¹⁸ In 2016, fentanyl-related synthetic opioids were associated with 52% of the deaths, increasing from 27% in 2015. There was a 150% increase in fentanyl-related synthetic opioid-related deaths from 2015 to 2016. Heroin was the second most common drug category, followed by prescription opioids in rural counties, and benzodiazepines in urban counties.¹⁸

2.2 METHODS OF TREATMENT AND PREVENTION

2.2.1 PRIMARY PREVENTION EFFORTS

State and national programs have focused on primary prevention efforts and improved access to effective opioid treatment in response to the increase in overdose deaths. Primary prevention efforts are centered on decreasing the number of individuals who misuse opioids and mitigating access to opioids. Most commonly, primary efforts consist of educational programs aimed at the most high-risk populations for overdose, such as those with a history of SUD or young adults.³⁷ Another example of primary prevention efforts are PDMPs. The Pennsylvania-PDMP has been attributed with an 86% decrease in “doctor shopping,” the action of visiting multiple healthcare providers and filling the same prescription for the same reported injury or illness.³⁸ Given the

recent implementation of the Pennsylvania-PDMP, begun in 2016, it is still too early to quantify the outcomes of such a program on the population in respect to reduction in drug overdose.³⁸

Another primary prevention strategy are drug take-back programs. They allow the safe disposal of prescription and over-the-counter solid medications, tablets and capsules, and pet medications.³⁹ Drug take-back programs serve multiple purposes through proper disposal of medications. These programs have been implemented throughout communities to provide a safe and secure place for people to return unused prescription medications. This provides an opportunity to reduce the amount of opioids available in a community so that they cannot be misused or accidentally consumed, by children, for example.⁴⁰ In Pennsylvania, the Department of Drug and Alcohol Programs sponsors prescription drug take-back programs throughout the Commonwealth. However, the effects of these types of strategies on the opioid epidemic have not yet been determined.⁴¹

2.2.2 DRUG AND ALCOHOL TREATMENT

To determine the level of care necessary to treat an individual with an SUD in Pennsylvania, healthcare workers assess patients using the Pennsylvania Client Placement Criteria (Figure 3).⁴²

The four levels of care in the Pennsylvania Client Placement Criteria include (1) Outpatient and Intensive Outpatient Treatment; (2) Partial Hospitalization and Recovery Residence; (3) Medically-Monitored Inpatient Treatment; and (4) Medically-Managed Inpatient Treatment.

These four levels of drug and alcohol treatment differ in their level of monitoring, frequency, use of medications, and whether or not they require that the participant reside as an inpatient or return for treatment as an outpatient. The types of care described in Figure 3 specifically apply to individuals in recovery from drug and alcohol misuse or those diagnosed with an SUD. Recovery

is defined by the SAMHSA as “a process through which individuals improve through health and wellness, live self-directed lives and strive to reach their full potential.”⁴³

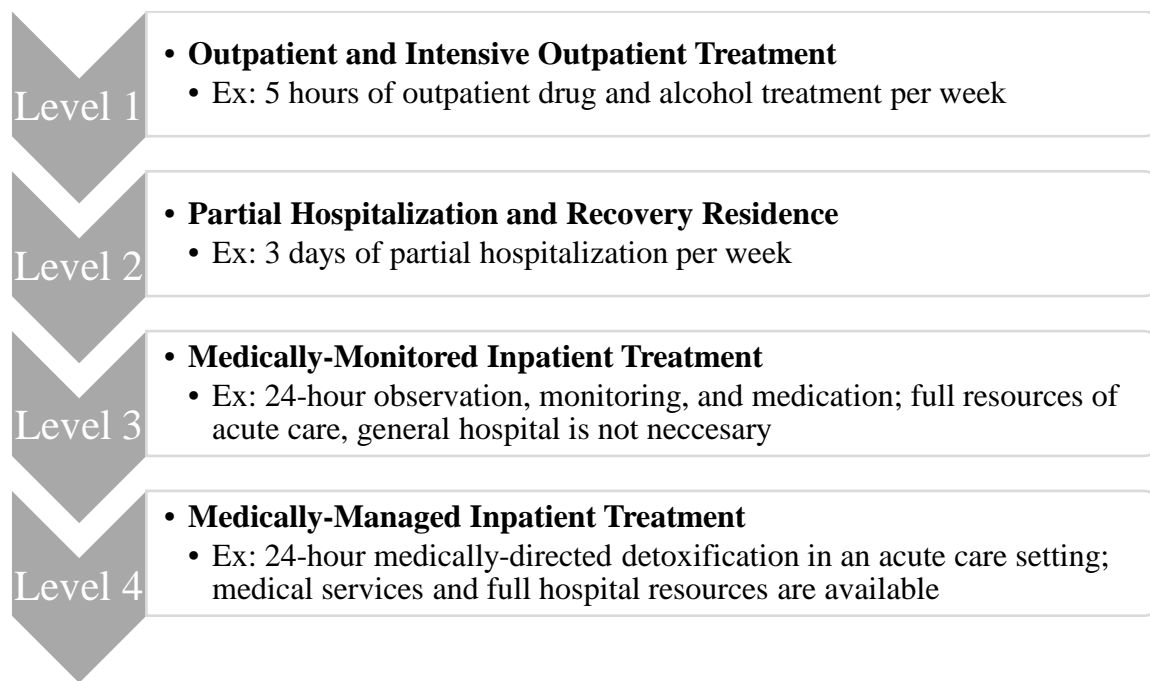


Figure 3: The Four Patient Care Levels Suggested by the Pennsylvania Client Placement Criteria

In Pennsylvania, the Department of Drug and Alcohol Programs and the Department of Human Services have established different entities to help connect patients to SUD and OUD treatment services. Each county, or groups of counties, has Single County Authorities. The Single County Authority determines a person’s eligibility for service funding, assesses his/her need for various types of treatment or other medical services, and refers the individual to programs that match his/her needs.⁴⁴ In 2017, Centers of Excellence were established throughout the Commonwealth specifically to manage the influx of OUD patients during the onset of the opioid epidemic. Centers of Excellence ensure that people with OUD engage in different forms of treatment through case management, and assist patients in overcoming barriers, such as lack of transportation and childcare services.⁴⁵

2.2.3 MEDICATION ASSISTED TREATMENT

Medication Assisted Treatment (MAT) is an effective strategy to reduce the chances of an opioid overdose.⁴⁶ MAT uses medications, such as buprenorphine, methadone, naltrexone, and naloxone, that can help prevent relapse. These medications can be used alone or in a combination as either full agonists, (e.g., methadone), partial agonists (e.g., buprenorphine), or antagonists (e.g., naltrexone and naloxone) on the mu, kappa, or delta opioid receptors.²³ Opioid agonist therapies, such as methadone and buprenorphine, work by reducing the effects of opioid withdrawal. Buprenorphine, a partial-opioid receptor agonist, partially binds to and activates the receptors but more weakly than a full agonist, such as methadone or heroin. As a result, opioid agonists can relieve symptoms of withdrawal and cravings. Opioid antagonist therapies work by reducing the risk of relapse and the urge to use drugs by fully blocking the receptor's ability to be activated by an agonist, such as heroin.⁴⁷ When a patient is actively taking an opioid antagonist and consumes an opioid, the opioid will not cause pain relief or euphoria.

It is often clinically recommended to begin MAT using opioid-agonist methods and transition the patient to opioid-antagonist methods.⁴⁸ MAT has been shown to improve patient outcomes, such as decreasing the frequency of problematic opioid use, HIV transmission, and mortality rates.³⁷ In addition, this course of treatment allows for the patient to slowly be transitioned off of an opioid in order to ease withdrawal, while eventually using the opioid-antagonist therapy to decrease potential future cravings.

A common barrier to provider participation in MAT programs is the stigma associated with the therapy and stigma associated with placing treatment clinics in communities.³⁷ Some local officials have opposed locating MAT programs in their neighborhoods by proposing legislation that is in violation of the Americans with Disabilities Act that would change zoning codes to

exclude MAT centers.⁴⁹ Health insurers have also imposed arbitrary limits on how long a provider can treat OUD using medications.^{49,50} For example, some insurers have limited OUD treatment with methadone and will not continue payment for treatment that exceeds a certain time period.⁵¹

A second barrier to physicians providing MAT using buprenorphine or methadone is the additional training mandated by the Drug Enforcement Administration, which prohibits doctors from prescribing MAT therapy if they are not certified.⁵² For example, to become a buprenorphine provider, a physician or advanced practice provider must take an additional either eight- or 24-hour continuing education course to prescribe the medication for patients.⁵³ The extra time commitment and process may seem overly burdensome to providers and they may decide to avoid becoming certified to work with the medication.^{52,54} As of January 2018, providers can prescribe buprenorphine for up to 30 patients for the first year after initially obtaining their waiver. Following the first year, providers can apply to prescribe buprenorphine for 100 and then 250 patients at a time. This will increase the access to the medication, allowing providers to treat more patients in rural and urban areas.⁵³

2.2.4 BEHAVIORAL THERAPY

Several forms of behavioral therapy are recommended by healthcare professionals for the management of OUD. Cognitive-Behavioral Therapy was first developed as a method to prevent relapse when treating alcohol use disorder patients. Cognitive-Behavioral Therapy strategies are based on teaching individuals how to identify and correct problematic behaviors, such as drug misuse and corresponding behaviors, by using a specific skillset, such as coping skills.⁵⁵ Techniques used in Cognitive-Behavioral Therapy include discussing the positive and negative consequences of continued drug use, self-monitoring by patients to recognize cravings and address

them early on, and learning how to develop strategies that remove the individual from situations where the patient might be tempted to use the substances.

A second type of behavioral therapy used to manage SUDs is contingency management (CM).⁵⁵⁻⁵⁸ CM involves administering rewards to reinforce positive behaviors, such as abstaining from using drugs and alcohol. CM has been shown to be effective at increasing treatment efficacy and retention in methadone and psychosocial counseling treatment programs.⁵⁷ Voucher-Based Reinforcement and Prize Incentives CM are two examples of CM. In Voucher-Based Reinforcement, the patient receives a voucher for each drug-free urine test they have. The value increases in monetary value as the patient progresses through treatment. Prize Incentives CM is similar to Voucher-Based Reinforcement CM; however, the patients have opportunities to win certain prizes instead of monetary vouchers. These methods of behavioral therapy can augment traditional behavioral therapies and have been shown to be effective in promoting abstinence from opioids and cocaine (co-use) in patients in methadone treatment specifically.⁵⁸

2.2.5 HARM REDUCTION STRATEGIES

There has also been a large increase in the use of harm reduction strategies to reduce overdose deaths. Harm reduction strategies and programs aim to reduce the negative consequences associated with drug use, such as contracting hepatitis from a needle used to inject heroin intravenously.⁵⁹ These programs have been implemented more frequently in recent years because of changes in policy around drug use and overdose. Many of these harm reduction programs have been based on naloxone distribution and drug take-back programs.³⁷ Naloxone is an opioid antagonist that has the ability to reverse an overdose and save an individual's life. Naloxone can be administered by first responders, lay persons, and medical providers. It is often distributed in

areas that have high rates of overdose.⁶⁰ Opioid overdose prevention programs provide training to lay persons in the community on how to identify the symptoms of an opioid overdose and how to respond by administering naloxone.⁶¹

In comparison to MAT and other treatments, less research exists on the impact of education and community naloxone distribution programs on opioid overdoses and mortality. Studies have focused on training and distributing naloxone kits to individuals on heroin through community-based programs. These programs have been successful because heroin users often use with others. If someone overdoses, an individual is present to administer naloxone and reverse the overdose.⁶² Importantly, communities where these programs were implemented saw a reduction in opioid overdose death rates. The Medical Examiner of Cook County and Chicago, Illinois reported a 20% decrease in opioid-related overdoses in 2001 and 10% decreases in 2002 and 2003, following the institution of a naloxone distribution education harm reduction campaign in January of 2001.⁶³

2.3 PENNSYLVANIA COUNTY ANALYSIS

Tables 1 and 2 display the drug-related overdose death rate in 2016 (per 100,000, crude), the number of drug-related overdose deaths in 2016, the rate (per 100,000) of waived buprenorphine providers, the rate (per 100,000) of drug and alcohol and mental health providers, and the rate (per 100,000) of inpatient and outpatient detoxification service providers currently registered in each county of Pennsylvania as of January 2018 separated by urban (Table 1) and rural (Table 2) counties.

The categories of drugs included in the 2016 Drug Enforcement Agency Death Report, include benzodiazepines, cocaine, fentanyl, fentanyl-related substances, non-prescription

synthetic opioids, heroin, other illicit drugs (e.g., methamphetamine), and prescription opioids. Beaver County had the highest overdose death rate of all urban counties in Pennsylvania in 2016 at 59.81 deaths per 100,000 (crude). Out of all the counties in Pennsylvania, Fulton and Cambria County had the highest death rates at 74.1 and 65.42 deaths per 100,000 people (crude) in 2016. Both counties are located in rural areas of the state as classified by the Center for Rural Pennsylvania.

Table 1: The Number of Overdose Deaths, Overdose Death Rates, and Rate of SUD-Related Providers in Urban Counties per 100,000 people.

Urban County Name	Population (2010 Census)	# of Overdose Deaths (2016)	Overdose Death Rate (per 100,000) (2016) (crude)	Rate of Buprenorphine Providers (2018)	Rate of D&A and MH* Providers (2018)	Rate of Detox Service Providers (2018)
Allegheny	1223348	648	52.97	16.02	8.26	0.33
Beaver	170539	102	59.81	8.80	6.45	1.17
Berks	411442	117	28.44	6.32	8.99	0.97
Bucks	625249	168	26.87	8.00	6.08	0.64
Chester	498886	97	19.44	6.21	7.62	0.60
Cumberland	235406	58	24.64	3.40	5.10	0.00
Dauphin	268100	84	31.33	4.10	10.82	0.37
Delaware	558979	206	36.85	8.94	3.40	0.36
Erie	280566	90	32.08	7.84	9.62	0.71
Lackawanna	214437	84	39.17	9.33	7.00	0.93
Lancaster	519445	116	22.33	4.62	5.97	0.58
Lebanon	133568	16	11.98	2.25	7.49	1.50
Lehigh	349497	134	38.34	6.29	7.15	0.29
Luzerne	320918	140	43.62	11.22	5.92	1.25
Montgomery	799874	230	28.75	10.50	6.25	0.63
Northampton	297735	70	23.51	4.70	5.71	0.67
Philadelphia	1526006	907	59.44	11.27	10.42	0.92
Westmoreland	365169	174	47.65	15.06	7.12	0.55
York	434972	127	29.2	4.37	6.44	0.69

Source: 2016 Drug Enforcement Administration Report Based on Pennsylvania Coroner/Medical Examiner Data
*Mental Health (MH)

Table 2: The Number of Overdose Deaths, Overdose Death Rates, and Rate of SUD-Related Providers in Rural Counties per 100,000 people.

Rural County Name	Population (2010 Census)	# of Overdose Deaths (2016)	Overdose Death Rate (per 100,000) (2016) (crude)	Rate of Buprenorphine Providers (2018)	Rate of D&A and MH* Providers (2018)	Rate of Detox Service Providers (2018)
Adams	101407	28	27.61	6.90	4.93	0.00
Armstrong	68941	41	59.47	2.90	8.70	0.00
Bedford	49762	11	22.11	0.00	6.03	0.00
Blair	127089	43	33.83	11.80	9.44	2.36
Bradford	62622	17	27.15	1.60	9.58	0.00
Butler	183862	74	40.25	30.46	7.61	0.54
Cambria	143679	94	65.42	4.87	5.57	0.00
Cameron	5085	0	0	19.67	19.67	0.00
Carbon	65249	17	26.05	10.73	10.73	0.00
Centre	153990	20	12.99	9.09	9.09	0.65
Clarion	39988	7	17.51	2.50	7.50	0.00
Clearfield	81642	11	13.47	7.35	11.02	0.00
Clinton	39238	10	25.49	10.19	5.10	0.00
Columbia	67295	18	26.75	2.97	13.37	0.00
Crawford	88765	32	36.05	5.63	10.14	1.13
Elk	31946	3	9.39	3.13	15.65	0.00
Fayette	136606	60	43.92	10.98	10.98	0.73
Forest	7716	0	0	0.00	25.92	0.00
Franklin	149618	39	26.07	4.68	6.02	0.00
Fulton	14845	11	74.1	6.74	6.74	0.00
Greene	38686	19	49.11	7.75	15.51	0.00
Huntingdon	45913	7	15.25	0.00	6.53	0.00
Indiana	88880	45	50.63	10.13	5.63	1.13
Jefferson	45200	7	15.49	11.06	8.85	0.00
Juniata	24636	4	16.24	8.12	4.06	0.00
Lawrence	91108	40	43.9	9.88	7.68	0.00
Lycoming	116111	34	29.28	14.64	8.61	0.00
McKean	43450	7	16.11	4.60	23.01	2.30
Mercer	116638	31	26.58	10.29	11.15	0.00
Mifflin	46682	6	12.85	12.85	6.43	0.00
Monroe	169842	41	24.14	8.24	8.24	1.18
Montour	18267	5	27.37	27.37	10.95	0.00
Northumberland	94528	27	28.56	5.29	8.46	0.00
Perry	45969	9	19.58	0.00	2.18	0.00
Pike	57369	10	17.43	8.72	5.23	0.00
Potter	17457	2	11.46	0.00	17.19	0.00
Schuylkill	148289	59	39.79	1.35	6.74	0.67
Snyder	39702	3	7.56	0.00	5.04	0.00
Somerset	77742	21	27.01	1.29	6.43	1.29
Sullivan	6428	1	15.56	0.00	0.00	0.00
Susquehanna	43356	8	18.45	0.00	4.61	0.00
Tioga	41981	6	14.29	4.76	16.67	4.76
Union	44947	7	15.57	0.00	11.12	2.22
Venango	54984	9	16.37	7.27	16.37	1.82
Warren	41815	0	0	2.39	26.31	2.39

Rural County Name	Population (2010 Census)	# of Overdose Deaths (2016)	Overdose Death Rate (per 100,000) (2016) (crude)	Rate of Buprenorphine Providers (2018)	Rate of D&A and MH* Providers (2018)	Rate of Detox Service Providers (2018)
Table 2 Continued						
Washington	207820	106	51.01	16.84	8.66	0.48
Wayne	52822	17	32.18	5.68	7.57	0.00
Wyoming	28276	7	24.76	3.54	10.61	0.00
Source: 2016 Drug Enforcement Administration Report Based on Pennsylvania Coroner/Medical Examiner Data *Mental Health (MH)						

2.4 RURAL VERSUS URBAN CLASSIFICATION

Rural and urban regions of Pennsylvania differ demographically and by population density. The Center for Rural Pennsylvania’s definitions of “rural” and “urban” counties are based on population density statistics.⁶⁴ Population density is calculated by dividing the total population of a specific area by the total number of square land miles of that area. According to the 2010 Census, Pennsylvania’s overall population density is 284 persons per square mile. If a county has 284 persons or more per square mile, it is considered urban. Following this definition, Pennsylvania has 48 rural counties and 19 urban counties (Figure 4).

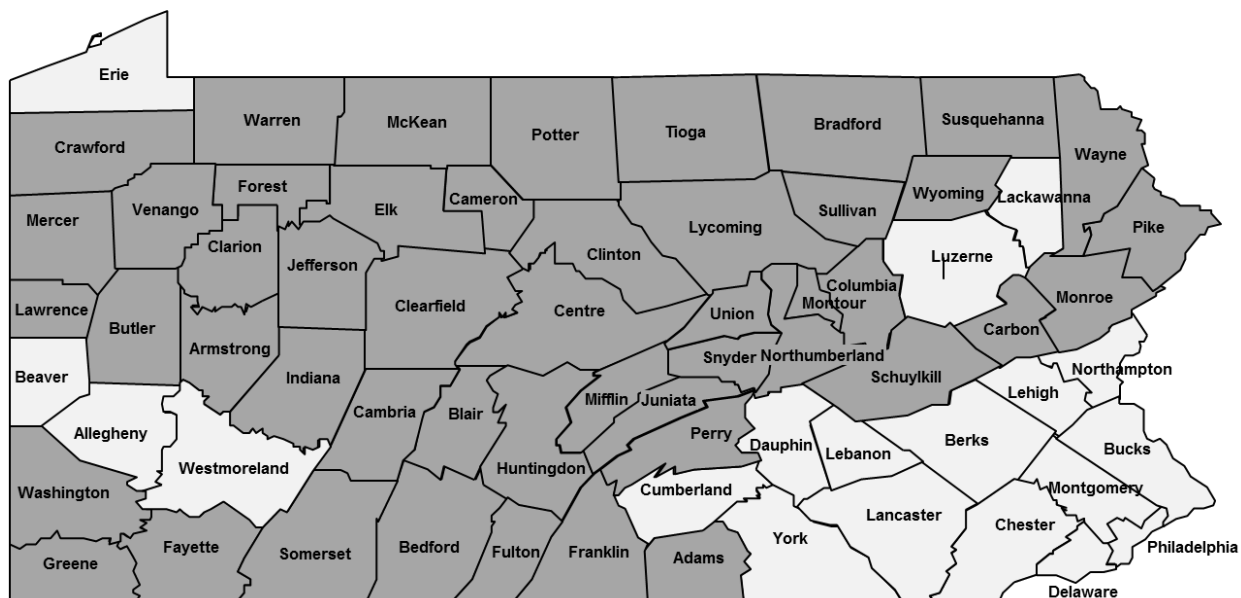


Figure 4: Rural (in gray) and Urban Counties in Pennsylvania

In 2016, Pennsylvania had an estimated population of 12,784,227 people and 1,470,338 lived in rural Pennsylvania.⁶⁵ While much of Pennsylvania is rural, the majority of the population lives in metropolitan or urban areas. Seven of Pennsylvania’s 67 counties have total populations that exceeded 500,000 in 2016. The four most populous counties are Philadelphia, Allegheny, Montgomery, and Bucks.⁶⁵ This makes Pennsylvania a unique state in that there are both large urban and rural populations separated by large geographical distances.

2.5 SOCIAL ECOLOGICAL MODEL

One way to identify key differences and similarities in how OUD manifests and is addressed in rural and urban communities is to use a framework to identify key factors that affect a public health event. The SEM is a theory-based framework for understanding the interacting and multilayered effects of environmental and personal factors that ultimately impact behavior. It can be used to

identify areas of interest from an organizational or behavioral perspective that may impact the overall health of a population.⁶⁶ The SEM is made up of five nested and hierarchical levels: Individual, Interpersonal, Community, Organizational, and Policy.⁶⁷

The individual level is defined as the characteristics of an individual that influence behavior change, like risk factors and perceived norms. The interpersonal level of the SEM is made up of the formal and informal social networks and support systems that can influence the individual's behavior, such as family and the influence of one's peers on their behavior. Community level factors consist of the environments or settings in which relationships occur. Organizational factors are the organizations and social institutions available or not available to the individual. Finally, the policy level impacts all of these nested levels by regulating and supporting actions and practices that influence an individual's susceptibility to a health outcome.^{66,67}

In public health, the most effective programs will simultaneously address various levels or work to be designed so components are complementary.⁶⁷ In this manner, the SEM can be used to explore a range of underlying factors that contribute to OUD in rural versus urban populations. The results section of this thesis is organized using this framework to differentiate between rural and urban populations as they relate to OUD. The SEM can be used to demonstrate that the opioid epidemic has deep roots in socio-economic factors both upstream and downstream of an event, such as an opioid overdose.

3.0 METHODOLOGY

A literature search was conducted using PubMed, Google Scholar, and MedlinePlus for articles published from 1998 to 2018 related to opioids and the management of OUD following the factors classified using the SEM. A separate search was also conducted on providers of SUD related care, including buprenorphine prescribers and drug and alcohol and mental health treatment providers. The primary objective of the provider search was to determine the number of providers located in each county in order to calculate a rate of providers for rural and urban counties. During the literature review, addiction to prescription opioids, synthetic opioids, and heroin were all considered. Articles, studies, and information included in this thesis pertain only to the United States.

3.1 LITERATURE SEARCH

The primary objective of the literature search was to determine differences in rural and urban populations as they pertain to various factors affecting OUD and related behaviors. The SEM guided the literature search process. Key words related to the SEM were combined with SUD-related terms during the search as they pertain to both rural and urban communities. Keywords related to the levels of the SEM were “skills,” “perceived norms,” “genetics,” “risk factor,” “peer influence,” “social network,” “family,” “socioeconomic,” “recovery support services,” “stigma,” “treatment access,” “healthcare insurance,” “healthcare access,” “standing order,” “federal legislature,” and “state legislature.” Keywords related to opioids were “opioid use disorder,”

“substance use disorder,” “opioid,” “opiate,” “heroin,” “prescription,” “medication assisted treatment,” “behavioral therapy,” “mental health,” and “policy.” Other MeSH terms including “rural,” “urban,” and “treatment,” were combined with the terms used for opioids and the management of OUD as well as the terms related to the SEM. The word “difference” was also used as a MeSH term to search for differences between urban and rural populations. The keywords related to opioids follow the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition criteria for the classification of mental disorders used by mental health professionals in the United States.

A total of 4,325 articles were identified through database searching for analysis in the results section of this paper. These articles include the keywords outlined above that relate to OUD, SUD, and the SEM. Thirty-two articles were identified through other sources, such as Google Scholar manual searches. A total of 2,361 articles were removed due to duplicate citations that occurred following the database searches. Two-thousand three-hundred and sixty-one articles were screened and 2,177 were removed from the resource database. Articles were briefly screened for publishing dates (after 1998) and titles and subjects that related to the purpose of this thesis. If articles were published before 1998 they were excluded. This time frame was chosen so that more recently published literature was included in this thesis. Any articles that appeared useful to addressing the objectives of the thesis were kept in the resource database. One-hundred and eighty-four full-text articles were assessed for eligibility by review of their abstract. Abstracts were reviewed for pertinent subject matter, such as rural and urban differences in levels of access to treatment options for OUD. A total of 107 full-text articles were excluded due to irrelevant subject matter or weak contextual results. These results were determined too weak or strong based on the level of statistical significance of the results, if available. If statistical analysis was not available,

the literature available that supported each claim was reviewed and analyzed for its significance and relevance. Irrelevant subject matter included topics not outlined in the SEM. If the full-text of the article was not available, the article was excluded. Seventy-seven articles were included in the qualitative synthesis of the results section of this thesis (see Appendix for PRISMA Flow Diagram). Information obtained from research studies and other sources included study outcomes, background information related to opioids, and evidence-based treatment methods for OUD and related SUDs, such as alcohol use disorder.

The literature was thematically analyzed using a three-step process to determine the factors outlined in this paper. First, the literature was coded using the five levels of the SEM as codes. From here, grounded theory methodology was used to identify key factors that relate to each level of the SEM. This step consisted of reviewing each piece of literature's abstract and results section for its themes for relevance to the opioid epidemic. Common themes related to healthcare access, common misconceptions about people with SUD and OUD, stigma, and differences in rural and urban populations. Factors were generated from the themes or the themes themselves were used as factors and then organized using the SEM. Finally, the information was coded as relating to either urban or rural communities.

3.2 PROVIDER SEARCH

In order to determine the availability of treatment resources in each county, a search for the number of providers in each county was conducted. The SAMHSA provider locator search function was used to search for buprenorphine providers, detoxification service providers, and drug and alcohol and mental health service providers registered in the Commonwealth of Pennsylvania. The

SAMHSA provider locator tool (<https://findtreatment.samhsa.gov/>) can be used to find various recovery and treatment centers by their location anywhere in the United States. A buprenorphine provider was included if registered with SAMHSA by January 2018. Drug and Alcohol or Mental Health providers were included if registered with SAMHSA as of January 2018.

The provider searches started at the level of the entire United States. Pennsylvania was then selected as the state of interest to the search. Next, each county in Pennsylvania was selected and the three relevant provider types were searched using the locator tool. Following each search, a Microsoft Excel spreadsheet was downloaded and analyzed for the presence of each provider type in each Pennsylvania County. Provider rates by county were calculated by dividing the population of each county in 2010 by the number of providers and multiplying the figure by 100,000. Information extracted about access to different types of treatment and providers throughout Pennsylvania included information on the number of registered buprenorphine providers, providers of any type of detoxification related services, and providers of any type of drug and alcohol and/or behavioral healthcare.

4.0 RESULTS

The factors relevant to each level in the SEM were determined based on the review of the literature conducted in the background section of this paper as well as those cited as pertinent to the various levels by the Centers for Disease Control and Prevention.^{67,68} At the individual level, risk factors, and perceived norms were identified as playing a part in increasing an individual's susceptibility to OUD. Family, social networks, and the influence of one's peers were identified as being an integral part of the interpersonal level of the SEM. The community level included the recovery support services available to individuals with OUD, socioeconomic status, occupation, the stigma against SUD individuals, and the treatment of SUD in communities. Healthcare access, treatment options, and insurance were included as factors at the organizational level. In the policy level of the SEM, state and federal policies were considered.

Common factors not included in any of the levels for this analysis include the media and educational and workplace-related policies and procedures.⁶⁸ This is because the effect of the media on SUD and OUD is too difficult to interpret, and the literature is lacking on educational and workplace related policies to outcomes related to SUD or OUD. The media can be included in the SEM at various levels, such as the Community and Organizational level. The following will define and detail the evidence behind each of these factors and how they relate to urban versus rural communities. Figure 5 shows the SEM level and the factors identified following a review of the literature.

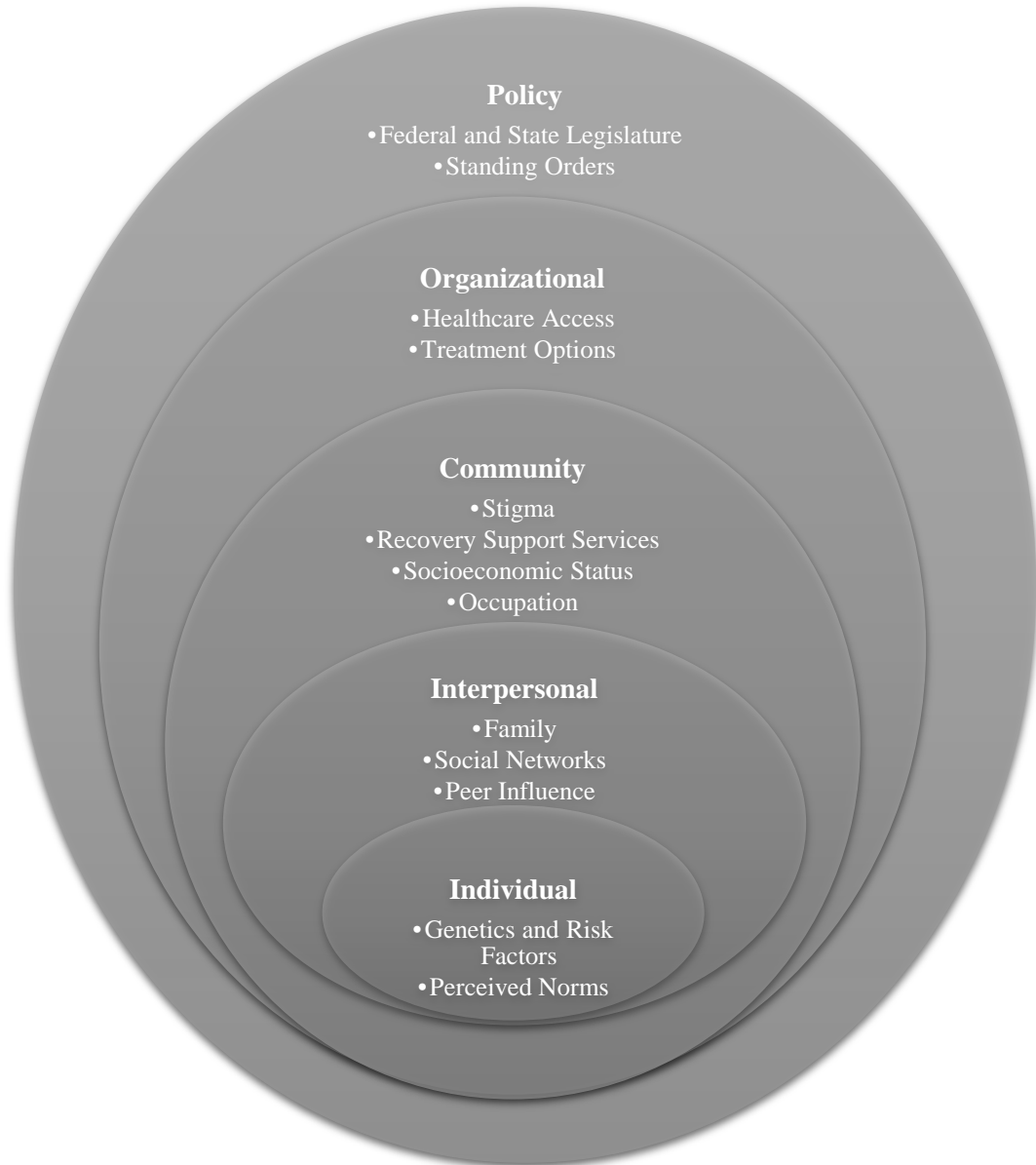


Figure 5: Social Ecological Model, Factors that Contribute to Opioid Overdose

4.1 INDIVIDUAL LEVEL

4.1.1 OPIOID USE DISORDER RISK FACTORS

Several risk factors and comorbidities increase an individual's risk of OUD. These include past or current substance misuse, mental health disorders, and family history.⁶⁹ Opioid-related fatal overdose is highest in adults aged 25-54 who are white and have co-occurring SUDs and mental health disorders.²⁸ Family, twin, and adoption studies have shown that genetic factors contribute to OUD-related behavior(s) and increase the chances of relapse after treatment through interactions with environmental factors. These include a history of substance misuse, depression and other psychiatric disorders, childhood abuse, and certain personality traits, such as impulsivity and sensation seeking.⁷⁰ These risk factors do not vary between rural and urban populations based on a review of the literature.

4.1.2 PERCEIVED NORMS

An individual's health-related behavior is often guided by how they perceive others' beliefs and behaviors. A norm is the perceived social pressure to enact or not to enact a behavior in a situation.⁷¹ College students often perceive social pressure to drink alcohol illegally or use drugs, due to the prevalence and pressure to be a part of the collegiate social system. This can lead to negative impacts, such as arrest, or alcoholism or drug addiction after repeated use. Drug and alcohol users often share a group identity that affects their behavior and risk for SUD.⁷² They perceive that drug and alcohol use is normal and that they should take part in the activity. Research has shown that there is a relationship between actual behavior and perceived peer norms.⁷³ These

perceived norms do not vary between rural and urban populations based on a review of the literature.

4.2 INTERPERSONAL LEVEL

4.2.1 FAMILY

Family environment can play a large role in an individual's decision to use and misuse drugs and alcohol. At a young age, people are greatly influenced by their parents. Evidence has shown that family processes play a vital role in social and behavioral outcomes among youth and/or in protecting them from negative results.⁷⁴ Adolescents who have conflicts in their home life are more likely to consume alcohol at a young age. The attitudes and beliefs that family members have towards SUDs also greatly impact an individual's fight to get sober or seek treatment. For example, if a family member sees SUD as a moral failing and that the person should "just quit," the individual with SUD may struggle to find and stay in an SUD treatment program.⁷⁵ If a family is well-educated on the subject and provides a good attitude for the family member, research shows that the individual has a greater opportunity to be successful in treatment.⁷⁶ Consequential to the development of OUD, people often divert their opioid prescription medication to family members.⁷⁷⁻⁸² Therefore, family environment can play multiple roles in the potential development of OUD. However, the effect of family on OUD does not vary between rural and urban populations based on a review of the literature.

4.2.2 SOCIAL NETWORKS

An individual's social network greatly impacts their risk for misusing drugs and alcohol as well as developing an SUD. A social network is a network of individuals, such as friends and coworkers, that are connected through interpersonal relationships.⁸³ In a study examining the effect of social relationships and social assimilation in adult Latinos on SUDs, it was found that SUD is associated with more frequent interactions with friends in females but not males.⁸⁴ Other research has shown positive associations between increased substance use with friend and family encouragement of use and having close members in their social network who used substances. Importantly, peer discouragement was associated with reduced risk for SUD.⁸⁵

The population of rural areas is often more dispersed and spread out geographically than in urban areas. However, rural communities are often strong from a social perspective. People often know each other by name and the community is "tight-knit" in nature.⁸⁶ These strong community ties in rural areas reflect the emphasis the community puts on strength and social capital.⁸⁷ Individuals in rural areas report knowing the members of their social networks for a longer period of time than those in urban areas.⁸⁸ Research on rural populations has also shown that these individuals trust their neighbors more and are more likely to reach out to them compared to those in more urban geographical places.^{89,90} Therefore rural individuals may be more able to intervene in the case of an opioid overdose because they may be more available to help in an emergency situation. Social networks have the potential to impact rural communities in a more positive way than urban communities.

4.2.3 PEER INFLUENCE

Individuals with SUD often associate with people with SUDs. The influence of friends and peers is often a large aspect of an individual's substance use and misuse. Research shows that adolescents with fewer than four friends who require alcohol or drug treatment have a greater likelihood of remaining abstinent.⁹¹ The most important contributors to adolescents using tobacco and consuming alcohol are having friends who smoke or drink and being invited to drink or smoke.⁹² Peer influence and its effects on SUD occurs in adolescents and adults in both rural and urban areas.⁹³

4.3 COMMUNITY LEVEL

4.3.1 STIGMA

Stigma plays an important role in the opioid epidemic. Several factors contribute to the stigma associated with OUD and its treatment.⁴⁹ First, individuals may feel as though OUD is a moral weakness or choice and not a mental illness.⁵⁰ This creates a stigma against both the SUD patient population as well as the treatment methods. Second, the language around SUDs and OUD is often very stigmatizing. Words like “addict” and “drug abuser” often implicate the person and create a negative connotation that can be difficult to overlook. For example, people who have OUD are often referred to as “junkies.” Urine drug tests are called “clean” or “dirty,” rather than “positive” or “expected.” This type of stigmatizing language propagates throughout society and leads to

detrimental effects on the SUD patient population.⁴⁹ Stigma can make it more difficult for an individual to obtain treatment for their disease as well as find or keep a job.⁹⁴

Stigma against opioid users, prevention efforts, and treatment methods is present in both rural and urban populations. A major barrier to the implementation of MAT programs in both populations is preexisting provider attitudes about patients with addiction and about treatment strategies. To overcome this barrier, extensive training with office staff and providers is required to reduce the negative perceptions towards this patient population.⁹⁵ For example, methadone treatment, has been shown to be stigmatized by clinical staff.⁹⁶⁻⁹⁸ Stigma is present in both rural and urban populations based on a review of the literature.

4.3.2 RECOVERY SUPPORT SERVICES

Recovery support services are non-clinical services that increase the efficacy of treatment and support individuals to reach their goals. These commonly consist of transportation to and from treatment, patient education to navigate barriers of health literacy, peer-to-peer mentoring, and support groups.⁹⁹ While there are Centers for Community Resources available in all Pennsylvania counties, rural areas have fewer recovery support services than urban areas in general, thus magnifying the barriers in these communities for receiving treatment.¹⁰⁰ Community resources and support services can be essential to an individual's successful recovery from an SUD.¹⁰¹

4.3.3 OCCUPATION

The nature of the work that someone performs for a living wage is often based on the skills that they possess from a young age. In the workforce in Pennsylvania and United States, people skilled

in manual labor have increased odds of acute and chronic injury. Injury can lead to opioid prescriptions to treat the pain associated with the injury and chronic prescriptions for opioids are associated with OUD.¹⁰² Common examples of these jobs include, farming, mining, and manufacturing. In comparison, someone who works at a desk job on a regular basis is at less risk of personal injury.¹⁰³

In rural areas, the population is more often skilled in manual labor-type skills than non-manual labor type skills.¹⁰⁴ The long-term action of manual labor wears on the body physically, and it often leads to chronic pain.¹⁰⁵ The chronic pain that develops can lead to opioid use and potentially OUD in the long term.¹⁰² Adults in manual labor have also been shown to have higher rates of prescription opioid misuse. These adults should be monitored more closely for chronic pain opioid use.¹⁰⁶

Geographic variation in the prevalence of opioid prescriptions is large, and the counties with the highest prescribing rates for opioids were disproportionately located in Appalachia, southern, and western states.¹⁰⁷ It has been suggested that this is due to several factors. Rural populations tend to be older than urban populations on average.¹⁰⁸ These populations experience an increase in chronic pain, which can lead to an increase in opioid prescriptions. Research also shows that chronic pain and injury are higher in rural than urban areas.¹⁰⁹ Other research in rural areas has shown that prescription drug use is a part of the culture due to the high number of prescriptions prescribed to coal mine workers and other labor intensive jobs for decades.¹¹⁰ This large amount of opioids in rural areas creates the opportunity for diversion and other illegal trading of prescription medications for nonmedical use.⁷⁷ Nationally, representative surveys have also indicated that nonmedical use of prescription opioids is higher in rural communities than urban.¹¹¹⁻

4.3.4 SOCIOECONOMIC STATUS

Socioeconomic status (SES) is defined as the social standing or class of an individual or group of people. It can be measured as a combination of income, education, and occupation.¹¹⁶ Low SES is associated with increased drug and alcohol use among other risk factors.^{117,118} In Pennsylvania, the rural poverty rate is 13.8% compared with 12.8% in urban parts of the Commonwealth.⁶⁵ The decrease in wages for low-skilled jobs and demand for manufacturing jobs and the corresponding increase in need for higher skilled workers are affecting rural areas more negatively than urban areas, given the present population workforce and its skillbase¹¹⁹⁻¹²¹ The combination of these stressors can cause an individual to have a low SES and increases the opportunity for drug and alcohol use to occur.^{120,122} The effect of low SES on OUD is the same on rural and urban populations because there are populations of low SES in both rural and urban communities.¹²³

4.4 ORGANIZATIONAL LEVEL

4.4.1 HEALTHCARE ACCESS

Primary, emergency, and specialist healthcare access is vital for any population. Low access to healthcare services is often associated with an increase in disease rates.¹²⁴ In rural areas, there is less access to healthcare services than in urban areas, including primary medical care, emergency care, and other specialty medical service providers like behavioral healthcare workers. Around 20% of the population of the United States lives in a rural area. However, only about 9% of the nation's physicians work in rural communities.¹²⁵ Medical schools often do not have as strong a

relationship with rural areas as they do with urban environments. Once they graduate, few students are willing to work in rural areas.¹²⁵⁻¹²⁷ Also, 26 states have seen at least one rural hospital close since 2010. As of January 2018, two rural hospitals have closed in Pennsylvania since 2010.¹²⁸

Transportation is often seen as a major barrier to healthcare access. Barriers to transportation can lead to rescheduled or missed appointments, prolonged care, and misuse of prescribed medication. These can all lead to the mismanagement of illness and harm to patients.¹²⁴ Research on SUD patients found that transportation was a major barrier to individuals receiving effective treatment and recovering from illness.¹²⁹ In addition to transportation, structural barriers limit an individual's ability to access care. These consist of social, political, legal, and government-run service systems.¹³⁰ Rural areas have fewer mass transit systems funded by governmental agencies, such as bus systems and rail systems that further limit transportation.¹³¹

4.4.2 TREATMENT OPTIONS

In order to effectively manage SUDs and OUD, various methods of treatment need to be available for a person to be successful. Methods that benefit individuals in their recovery from a SUD include various types of drug and alcohol treatments, behavioral health treatment, and MAT. Research on SUD treatment utilization between 2005 and 2013 found that of persons with OUD, 26% used some type of alcohol or drug use treatment, and 19% used opioid-specific treatment, such as MAT. The same study found that out of all alcohol and drug use treatments, self-help groups and outpatient rehabilitation treatment were the most commonly used services.¹³²

Figure 6 shows the rate (per 100,000) of drug and alcohol and/or behavioral health providers in each county throughout Pennsylvania as of January 2018. The rates of drug and alcohol and mental health service providers are similar in rural counties and urban counties. Two

major urban Pennsylvania counties, Allegheny and Philadelphia, have over one hundred times the drug and alcohol and/or behavioral health providers than in many rural counties. This poses a barrier to individuals in recovery for OUD who live in both rural and urban counties.

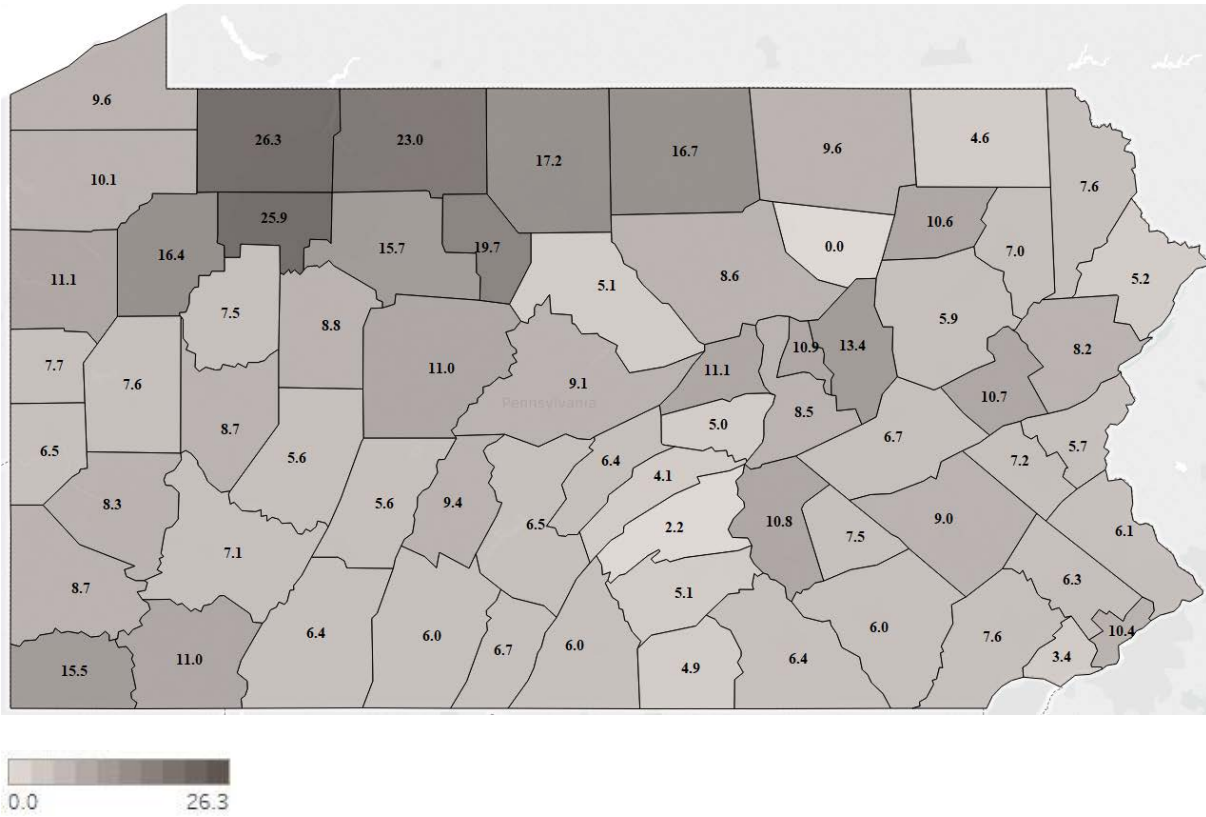


Figure 6: Rates of Drug and Alcohol and/or Behavioral Health Providers in Each County of Pennsylvania in January 2018

There are also lower rates of MAT providers who can prescribe buprenorphine for OUD in rural populations. Figure 7 shows the rate (per 100,000) of buprenorphine providers in each county of Pennsylvania as of January 2018. Susquehanna, Forest, Sullivan, Huntingdon, Perry, Bedford, Snyder, and Union Counties do not have any buprenorphine providers as of January 2018, while Allegheny and Westmoreland counties have 16 and 15 registered buprenorphine providers per 100,000 people, respectively. This means that individuals who live in these rural counties may need to travel a longer distance to receive care.

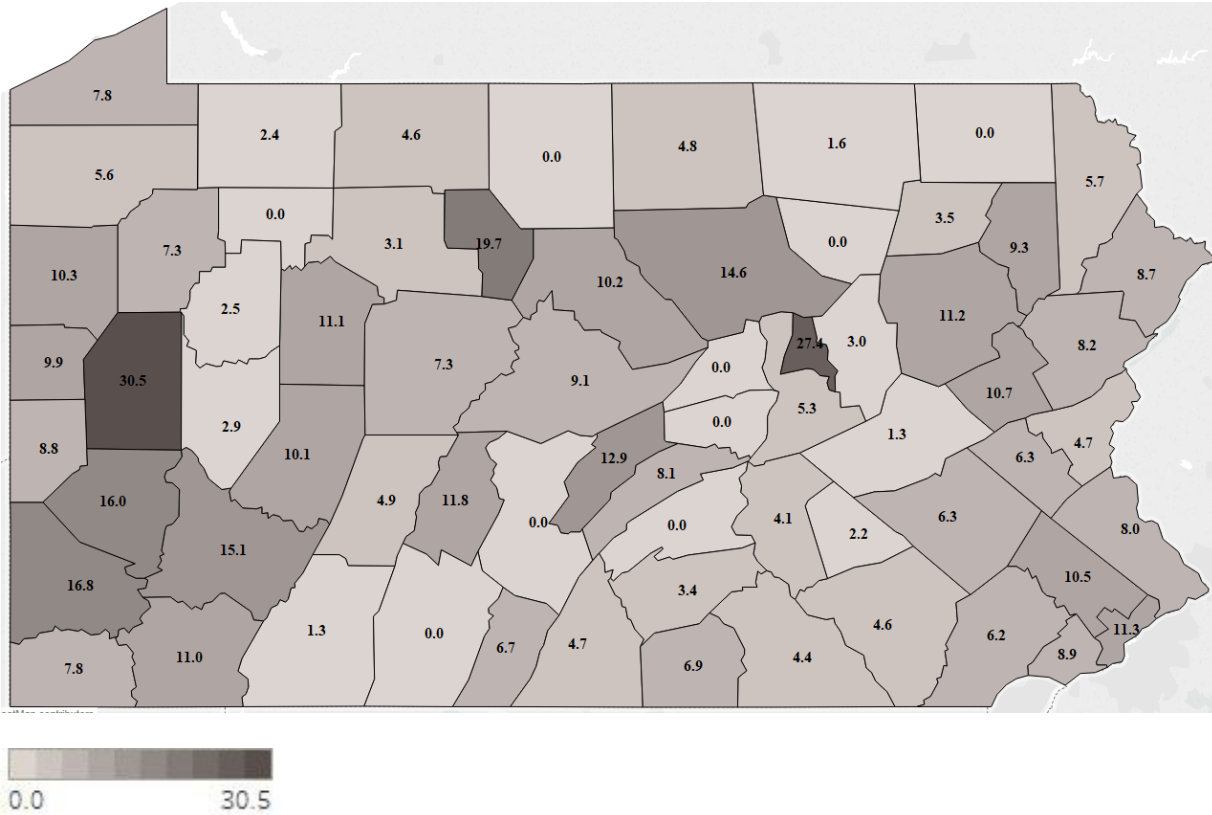


Figure 7: Rates of Registered Buprenorphine Providers in Each County of Pennsylvania in January 2018

Nationwide, 82% of the rural population lives in a county without a detoxification center.¹³³ In Pennsylvania, there are fewer inpatient and outpatient detoxification providers and treatment providers in rural areas than urban areas. Figure 8 shows that 34 rural counties do not have any detoxification providers for someone to recover from opioid withdrawal. There is one urban county (Cumberland County) that does not have a single detoxification provider. In the most populated urban counties of the Commonwealth, Allegheny and Philadelphia, the rate of detoxification providers are 0.33 and 0.92, respectively. If an individual cannot be seen at a detoxification center they are often sent to an emergency rooms for detox.¹³⁴ The lack of treatment centers and providers means that people are left on long wait-lists for treatment.¹³⁵

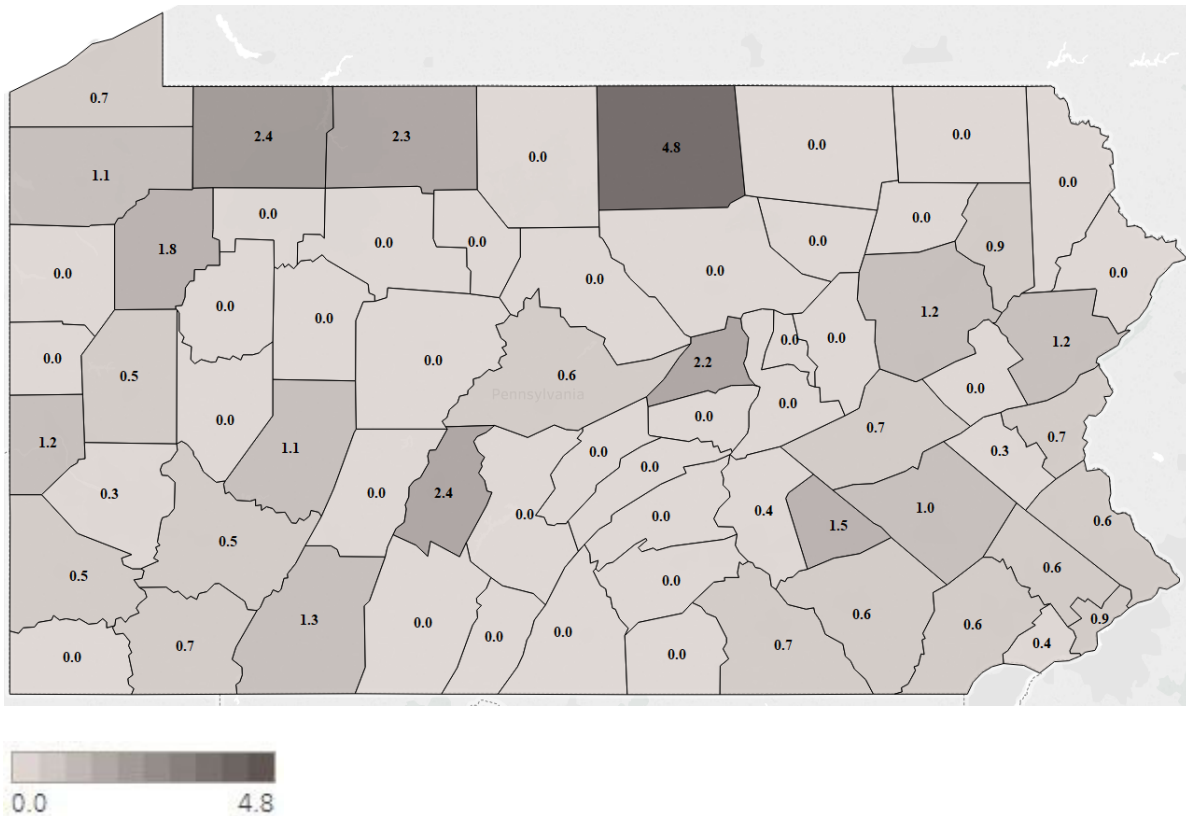


Figure 8: Rates of Drug-Related Detoxification Service Providers in Each County of Pennsylvania in January 2018

The availability of a detoxification provider or a hospital to medically manage withdrawal can vary depending on the type of insurance that someone has. For example, in Pennsylvania, if an overdose survivor is in a hospital and has private insurance, he/she can usually receive a bed in one day. If the same individual has county funding or Medicaid, they may have to wait five or six days to receive inpatient treatment.¹³⁶ While these individuals are waiting for treatment, they have a higher potential of overdose due to the increased likelihood of continued drug use. If that overdose does occur, there may not be an opportunity to reverse the overdose because of the lack of trained people to administer naloxone and general decreased access to naloxone in rural communities.¹³⁷ These wait times for treatment due to availability issues are an additional barrier to accessing treatment in a timely manner.¹³⁸

4.5 POLICY LEVEL

4.5.1 FEDERAL LEGISLATIVE POLICY

The Comprehensive Addiction and Recovery Act (P.L. 114-198) was signed into law by President Barack Obama in 2016.¹³⁹ It was enacted in response to the opioid epidemic and encompasses prevention, treatment, recovery, law enforcement, criminal justice reform, and harm reduction overdose reversal strategies. It established a coordinated approach for a combination of methods to aid in the treatment and recovery of OUD.¹⁴⁰ The funds were equitably distributed to urban and rural geographical populations.

4.5.2 STATE LEGISLATIVE POLICY

In Pennsylvania, David's Law (Opioid Overdose Reversal Act 139) allows first responders to act as if they are a healthcare professional authorized to prescribe and administer naloxone to an overdosing individual whom they encounter. A provision of Act 139, known as the "Good Samaritan" law, provides individuals immunity from prosecution if they respond to and report the overdose of another person. The individual can provide his or her name and remain on the scene of the incident and not be arrested. However, it does not protect individuals from being prosecuted if they are in possession of illegal substances or drug-related paraphernalia when authorities arrive. The law does increase the availability of naloxone in the community by allowing individuals who have a friend or family member who may overdose in the future to obtain naloxone.

Research has shown that many overdoses are witnessed by others who would be willing to intervene.³⁷ Good Samaritan laws have been created to protect those who report overdose events from prosecution, even if they were using drugs themselves.¹⁴¹ However, research has shown that individuals are concerned that law enforcement will still arrest them for drug paraphernalia or being in the possession of illegal substances, such as heroin or other drugs. This leads people to be hesitant to contact law enforcement in the event they witness someone overdosing.^{142,143} Therefore, these laws do not always have the desired effect on the community or on those in the social circles of people who use drugs.

4.5.3 STANDING ORDERS

Across the country, standing orders have been enacted by state and local officials to aid in overdose prevention efforts.¹⁴⁴ A standing order allows a pharmacist or physician to write a prescription for certain medications to assist with opioid overdose prevention efforts. The recent standing order (PA DOH-002-2016) by Governor Tom Wolf also increases access to naloxone by allowing anyone to obtain it from a pharmacy.¹⁴⁵ In both rural and urban areas, these life-saving policies are being implemented in a timelier manner than if the Commonwealth or federal legislature were to enact the law through the traditional process.¹⁴⁴

5.0 DISCUSSION

This review of the literature using the SEM identified several factors that are unique for rural and urban populations. Individual risk factors and perceived norms affect both populations in a similar manner. Family and peer influence were determined to equally affect both rural and urban populations at an interpersonal level. Stigma and SES affect both rural and urban communities. Policies affect both rural and urban populations equally but do not take the differences of rural populations into account.

Several factors affect rural populations more strongly than urban ones. The most significant factors are located at the organizational level. Rural populations have less access to OUD treatment providers than urban populations, like buprenorphine providers. Rural populations have fewer options for detoxification providers. Rural and urban areas have a similar rates of access to drug and alcohol and mental health providers. Transportation is a major barrier to obtaining care and many individuals must travel long distances to be treated for OUD and related comorbidities. There are also fewer recovery support services available to rural populations, which makes the recovery process for OUD even more difficult. At the community level, the occupation of an individual and employers in rural communities can increase rural populations' chances of OUD more so than urban populations. The social networks of an individual (interpersonal level) can be a positive on rural communities since social networks can be stronger than those in urban communities. Table 3 summarizes the factors that affect rural and urban populations' chances of OUD and potential overdose that were analyzed in this paper.

Table 3: Summary of Factors that Can Affect Rural and Urban Populations for OUD

Level of SEM	Similar Effect in Rural and Urban Populations	Greater Effect in Rural Population	Direction of Effect on Rural Communities
Individual	Risk Factors and Perceived Norms	None	N/A
Interpersonal	Family and Peer Influence	Social Networks	Positive
Community	Stigma and SES	Occupation and Recovery Support Services	Negative
Organizational	Drug and Alcohol and Behavioral Health Providers	Healthcare Access, Buprenorphine Providers, and Detoxification Providers	Negative
Policy	Federal, State, and Stranding Orders	None	N/A

Social networks were found to impact rural populations more strongly than urban populations. It was unexpected to find that social networks can have a positive outcome on overdose and OUD on rural populations. The “tight knit” nature of rural communities can be optimized in future interventions by focusing on the social networks of individuals who use drugs. For example, naloxone distribution campaigns can focus on recruiting and educating individuals who are in the same social circles of people who misuse drugs. At the conclusion of the intervention, naloxone kits could be distributed to the individuals. The participants will therefore be equipped with the knowledge and materials to save a life in their social circle and/or community. Accounting for and acknowledging positive differences in rural and urban populations can also assist in directing future interventions and policy.

The factors outlined in this paper also interact to increase or decrease the risk of OUD and overdose in rural and urban populations. Risk factors at an individual level, such as family history of substance misuse and depression, intermix with factors at the interpersonal level, such as someone’s social network. Together these factors can combine to increase someone’s potential for

having an OUD.^{70,85} Low access to healthcare and treatment can also be magnified when combined with the lack of access to recovery support services and skills that support a primary profession of manual labor. Future policy can take all these factors into account to help overcome barriers in these different populations. On the other hand, ignoring these differences and not improving access to care ultimately increases the cost of healthcare and puts further burden on providers and health systems.¹³⁶

5.1 OVERCOMING STIGMA

Stigma against OUD and its treatment methods affects many of the factors that ultimately determine behavior in both rural and urban populations. One factor that can contribute to stigma is the perceived norms an individual has towards drugs and OUD. Perceived norms can be both detrimental and helpful when planning interventions to decrease overdose and OUD. The perceived norm that drugs are bad and harmful to a person's body can prevent people from originally misusing drugs. This could be a benefit of perceived norms towards OUD and prevention efforts. However, the perceived norm that people who use drugs are bad or worse people than those who do not misuse drugs can make recovery more difficult for a person. It can also make it more difficult when planning interventions in communities and overcoming the barrier of stigma against people with OUD. In order to account for the impact of perceived norms, researchers can anticipate both impacts and plan accordingly by designing messages to influence perceived social norms to help reduce stigmatization.

When considering strategies and interventions to overcome stigma to enhance access to care for OUD, researchers and practitioners should consider the affect that stigma has at both

personal and community levels on the desired outcome of the intervention. Stigma against MAT has contributed to low levels of access in rural areas. The stigmatization of people with SUD and OUD has created barriers to more OUD clinics opening their doors. Today, stigma has the ability to spread more quickly and cause more damage through technology, like social media.¹⁴⁶ In order to overcome stigma when planning interventions and strategies to increase sustainable treatment for OUD, practitioners should consider conducting a stigma reduction training with participants that is facilitated by a person in recovery. These types of trainings have been shown to assist with overcoming the barrier of stigma against SUD.¹⁴⁷

5.2 STRATEGIES TO INCREASE ACCESS TO CARE

Several different strategies can be used to increase access to OUD-related care in rural Pennsylvania. In order to address the lack of behavioral health providers in rural Pennsylvania, a collaborative care model can be adopted by providers. In general, a collaborative model of care combines behavioral with primary health care to better address the needs of the community. The collaborative care model or the integration of behavioral health into primary health care will allow individuals to gain access to essential services in rural areas that are plagued by barriers to care, such as transportation.¹⁴⁸ Including all services in one place mitigates the transportation barrier, which can improve compliance to behavioral health treatment. Since behavioral health is also a need for effective MAT, this would also assist with increasing access for treatment for OUD.

In rural Pennsylvania, a primary care provider could obtain their buprenorphine waiver and open a collaborative care clinic. A psychologist could join the office as well as a licensed clinical social worker. Therefore, counseling services, primary medical care, and OUD treatment could be

available in one place. This would decrease the potential barrier of transportation and increase access to treatment in rural areas. The integration of behavioral health also helps individuals coordinate their medical care. Mental health disorders are a common co-morbidity to SUD, so this can also increase the ability to receive the necessary counseling for both forms of disease.

Telemedicine can be optimized in rural areas to assist with the low access to medical care.¹⁰² It can supplement current in-person care in the underserved regions of the Commonwealth by using technology to disseminate medical recommendations to patients as well as other providers.¹⁴⁹ For example, a specialist located in a major city can meet with a patient while they are with their family medical doctor five hours away in a rural community. Telemedicine can assist in the diagnosis and treatment of OUD. Using telemedicine, specialists in addiction and OUD can provide patient screening, assessments, manage medications, provide counseling, and offer on-demand treatment consultation services, such as questions related to side effects of withdrawal from opioids.¹⁵⁰ Finally, increasing the use of telemedicine can also reduce health care costs. It can reduce the time and space necessary in a brick and mortar office space for providers as well as travel expenses for patients.¹⁵¹ A multitude of barriers can be overcome by sharing medical advice through the use of technology.

5.3 MEDICAID POLICY CHANGE PROPOSAL

The services provided under Medicaid and the levels of reimbursement that providers receive can be adapted in a number of ways to better treat OUD in rural and urban patient populations. First, Medicaid can increase the availability of telemedicine services for the management of OUD. This will increase access to services for OUD in rural populations. The increase in use of telemedicine

can also benefit the payers in each county of the Commonwealth by decreasing healthcare costs in both rural and urban populations.¹⁵²

Second, medical care can be provided in a comprehensive manner and be expanded to include therapies, like MAT with buprenorphine. Medicaid can also change policies to make it easier to integrate behavioral health by eliminating billing restrictions that discourage integration efforts.^{153,154} This can provide more opportunities for rural citizens to receive primary medical care and behavioral health care in the same place, by decreasing barriers like transportation.

Third, Medicaid can ease the administrative burden it puts on MAT providers by eliminating prior-authorizations for buprenorphine and naltrexone. This can increase the number of buprenorphine providers in both rural and urban counties by allowing them to treat OUD like other illnesses.¹⁵⁵ Fourth, policy should be created that increases funding and access to detoxification providers throughout the Commonwealth. The lack of detoxification providers ultimately increases the cost of healthcare for all payers because of the increase in emergency room visits and hospital stays for detoxification-related services.^{156,157} Finally, Medicaid can incentivize and increase reimbursement for MAT and proper management of OUD. Increased funding for services that specifically address the needs of rural populations, such as funding for recovery support services, will also create a better opportunity for successful recovery from OUD in rural communities.

6.0 CONCLUSION

One hundred-forty five Americans die each day from an opioid-related drug overdose. In 2016, 4,642 drug overdose deaths occurred in Pennsylvania. The opioid epidemic affects all groups of people, and the death toll continues to take more lives each year. The outcome of OUD in an individual can be affected by a number of upstream and downstream factors. This paper used the SEM to organize those factors into multiple levels to show their effect on both rural and urban populations. A literature review was conducted to determine variations in rural and urban populations and the results were thematically analyzed and organized into the individual, interpersonal, community, organizational, and policy levels of the SEM. The SAMHSA provider search tool was also used to determine the number of providers in each Pennsylvania County and then corresponding provider rates by each counties total population.

Following analysis, several factors were shown to impact rural communities more strongly than urban communities. The occupation an individual possesses, social networks, recovery support services, and access to healthcare and treatment options for OUD were all found to impact rural communities more strongly than urban. Rates of detoxification and MAT were found to be lower in rural than urban counties. Individual risk factors and perceived norms as well as family, the influence of one's peers, stigma, SES, and policy were all found to affect both rural and urban populations. Rates of SUD and mental health treatment providers were found to be similar across rural and urban counties. All of these factors intermix to impact outcomes like OUD in various ways in the rural and urban populations in Pennsylvania.

Several strategies can be used to overcome stigma against OUD and increase access to buprenorphine, detoxification, and drug and alcohol and mental health providers. The integration

and coordination of behavioral health into primary care can increase access to treatment to common mental health comorbidities with OUD. Telemedicine can be optimized to increase access to specialty providers, access to SUD screening, medication management, and counseling. In order to make these both possible, Medicaid policy can be adapted to increase the number of services that are reimbursed as well as increase the incentives for performing MAT. Medicaid can also ease the administrative burden it puts on providers by eliminating prior authorizations for providers to prescribe buprenorphine and streamlining behavioral health integration into primary medical care. Importantly, these methods also have the potential to decrease downstream healthcare costs due to fewer emergency room and hospital visits for OUD-related care.

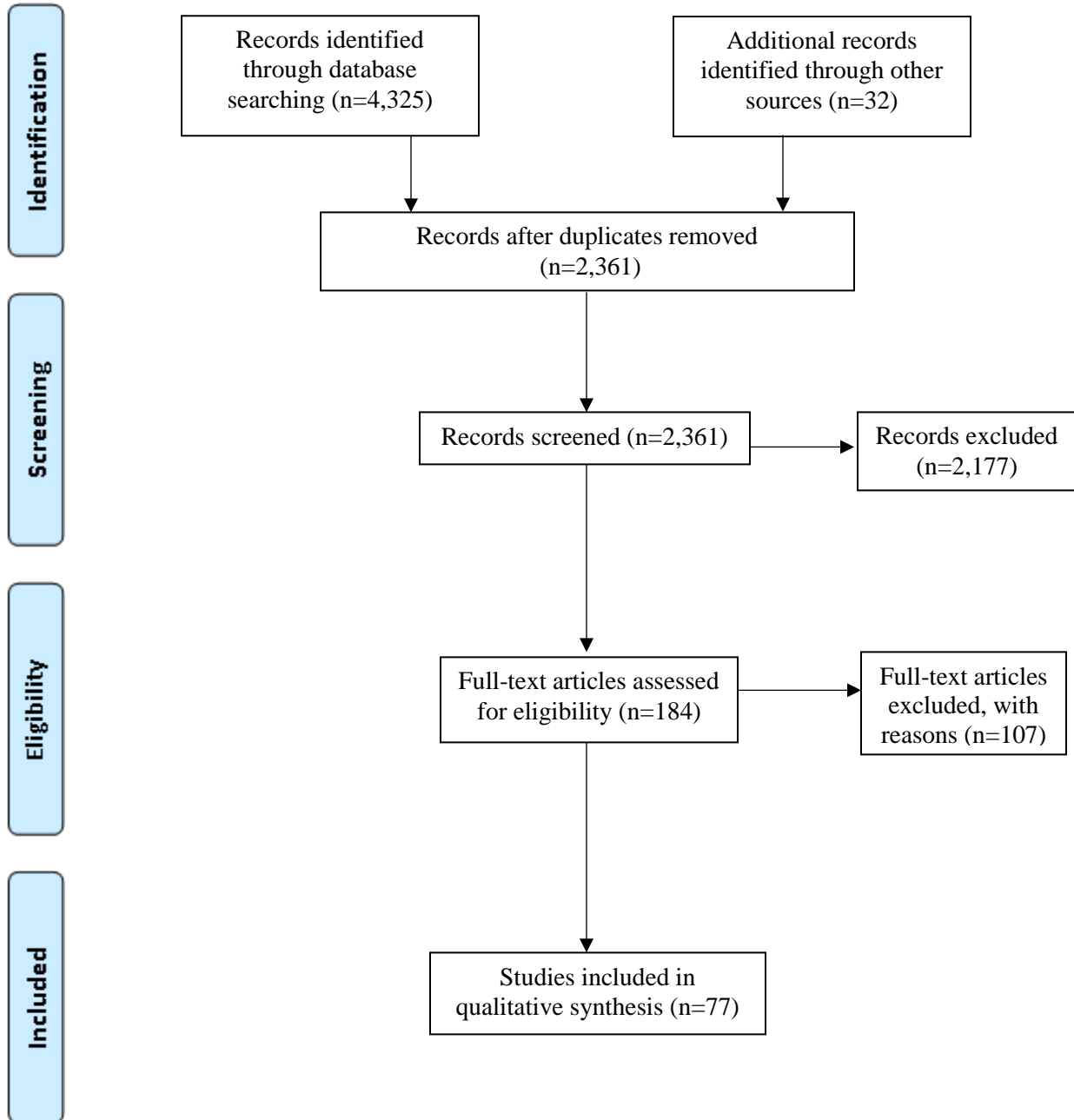
There are several limitations to this thesis. The search strategy eliminated the use of Diagnostic and Statistical Manual of Mental Disorders-IV classifications for mental disorders. For example, substance abuse and substance dependence were not searched for; therefore, this strategy may have eliminated some sources of information. A second limitation of the methodology used in this thesis was the use of the SAMHSA locator search tool to determine the number of providers in each county. Providers may not have registered with SAMHSA, resulting in an inaccurate count of providers when extracting information for the figures from the database. The SAMHSA search tool also did not allow for the number of patients treated by each provider to be calculated. Methadone providers were also not counted during treatment provider analysis. Therefore, access to one of the treatment providers for OUD was not analyzed in this paper.

A third limitation was the way rural was defined in this thesis. Different entities define rural and urban populations in diverse ways, which creates issues when researching rural and urban communities. The Center for Rural Pennsylvania definition was used in this thesis because it was the definition used in the 2016 Drug Enforcement Agency Report. The data on overdose deaths

and death rates were extracted from the same 2016 report. The Center for Rural Pennsylvania's definition was also used because The Center for Rural Pennsylvania is a legislative agency of the Pennsylvania General Assembly. This legislative agency uses their definition when developing new policy and adapting existing policies across the Commonwealth of Pennsylvania.

There is no simple solution to solving the opioid epidemic and variations in access to care throughout the nation. It will require a combination of approaches that work together to overcome the multitude of barriers present at individual, environmental, and policy levels. This can be accomplished by working to integrate new methods of patient care, acknowledging and overcoming stigma, and adapting Medicaid policy to more accurately account for the current landscape of healthcare in the United States. The continued rise of synthetic opioids throughout both rural and urban communities is making it even more difficult to manage OUD and overdose in this county. Coordination and flexibility should be optimized to increase access and account for the various differences in rural and urban populations. Future policy in healthcare should account for the differences between rural and urban populations so that the needs of both are met accordingly, and a uniform decrease in overdose deaths can be seen across Pennsylvania and the United States.

APPENDIX: PRISMA FLOW DIAGRAM OF SEARCH RESULTS



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