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Adverse Childhood Experiences among Individuals with Opioid Use Disorder

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ADVERSE CHILDHOOD EXPERIENCES AMONG INDIVIDUALS WITH OPIOID
USE DISORDER

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts

By:

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B.A., Wright State University, 2017

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Wright State University

WRIGHT STATE UNIVERSITY

GRADUATE SCHOOL

October 29,2020

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY Megan Creviston ENTITLED Adverse Childhood Experiences among Individuals with Opioid Use Disorder BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF Master of Arts.

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ABSTRACT

Creviston, Megan. M.A., Applied Behavioral Sciences Graduate Program, Wright State University, 2020 Adverse Childhood Experiences among Individuals with Opioid Use Disorder

The study examines adverse childhood experiences among individual who use illicit opioids, focusing on emotional, physical, and sexual abuse. The study uses data collected from a sample of 357 individuals with opioid use disorder who were recruited in the Dayton area between May 2017 and October 2018. The study builds on the life course and social learning theories to examine the association between childhood experiences and drug use behaviors in later life. The key aims of the study are to: 1) assess the prevalence of adverse childhood experiences in the community-recruited sample of individuals with opioid use disorder; 2) analyze the relationship between adverse childhood experiences and family history when growing up, including economic hardship and parental history of mental and substance use problems, and 3) analyze the associations between adverse childhood experiences and selected drug use characteristics, such as age of first use, frequency of use, and whether or not they inject. Participants were recruited used targeted and respondent-driven sampling. Structured interviews were conducted by trained interviewers and covered history and patterns of drug use, socio-demographic characteristics, and adverse childhood experiences (ACE). Descriptive statistics and univariate analyses were used to characterize the sample. Chi-square test was used for categorical variables. One-way ANOVA was used to assess differences in drug use characteristics (continuous variables) between those who experienced childhood abuse and those who did not. Multiple linear regression analysis was used to assess the relationships between age heroin initiation (dependent variable) and childhood abuse experiences (independent variable), controlling for socio-demographics and family history when growing up. Multivariate Logistic Regression analyses were used to assess the association between a) early initiation of alcohol use (dependent variable) and childhood abuse experiences (independent), controlling for socio-demographics and family history when growing up; and by injection heroin use (dependent variable) childhood abuse experiences (independent), controlling for socio-demographics and family history when growing up. Statistical analyses were conducted using SPSS. Out of a total sample of 357 participants, 50.4% were male and the majority (90.7%) were whites. Most participants reported emotional abuse at 57.3% ,53% reported physical abuse and 35.8% sexual abuse. 68.2% reported having experienced at least one or more childhood abuse experiences. Those who had reported at least one childhood abuse experience were more likely than those without childhood abuse to report earlier initiation of alcohol (13.61 vs. 15.40 years of age, $p<0.001$), heroin (26.61 vs 28.77 years old, $p<0.05$) and street fentanyl (33.4 vs 35.9 years old, $p<0.05$). Individuals who had experienced childhood abuse were significantly more likely to indicate that their mother had mental health and/or drug use problem, compared to those who did not report a history of childhood abuse (76.3% vs. 52.1%), and the differences were statistically significant ($p<0.001$). Individuals who had experienced childhood abuse were significantly more likely to report their father had mental health and/or drug use problem, in comparison to those who did not report a history of childhood abuse (74.9% vs. 52%), and the differences were statistically significant ($p<0.001$). Individuals who reported a history of childhood abuse were significantly more likely to report financial hardship when growing up, compared to individuals

without childhood abuse experiences (79.3% vs. 57.8%), and the differences were statistically significant ($p < 0.001$).

The overall findings indicate high prevalence of childhood abuse among individuals with OUD and a need for trauma-informed care. Theoretical implications as well as suggested future research are discussed.

Key words: Opioid use disorder, Heroin, Opioids, Childhood experiences, Mental health, Drug initiation

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INTRODUCTION

“Consumption of all kinds occurs within an economic and cultural framework and both demand-side and supply side forces can bring innovation to established consumption patterns” (Ciccarone, 2019 page 1). Many urban areas once prosperous from the industrial era, have seen a huge impact on their communities from the decline of supply and demand. The economical shift in how demand and supply changed within a culture resulted in empty factory buildings due to outsourcing, and economic disparities among those still living in the communities. They experience job shortages and unemployment. Drugs may act as a market economy that for some help close the financial gaps faced due to the industrial decline (Nagelhout, Hummel, Goeij, Vries, Kaner & Lemmens, 2017). During an economical shift, people may feel overwhelmed by the transitional changes occurring in their environment. This can entice a person to use drugs as a coping mechanism. Drug misuse may also cause devastating adverse health consequences and death. According to the National Institute of Health data, an estimated average of 130 overdose deaths were reported daily in 2017 in the U.S. because of opioid misuse (NIH, 2019).

Environmental changes work like a trickledown effect, going from the macro to micro level. Individuals and their family are impacted by the shift in the economic sector. Many families who face financial hardship often experience a sense of stress. Environmental stability or instability can also determine socio-demographics factors and life chances or opportunities. Stress stemmed from financial hardships can affect the family dynamics. Parents may find it difficult to properly nurture a child and provide a stable environment. “During times of heavy parental substance abuse, children may be neglected both emotionally and physically. One study suggests that 83% of opioid user’s children have varying degrees of medical or nutritional disorders” (Shulman, Shapira, & Hirshfield, 2000). As stress increases, parents may not realize the impact of their decisions, and the effects it can have over the children in the home. This can create adverse childhood experiences.

Prior research has shown that adverse childhood experiences may contribute to increased risk for developing a range of physical and mental health problems (Hughes, Lowey, Quigg & Bellis, 2016). Some studies have also examined an association between the measures of Adverse Childhood Experiences (ACE) and drug use (Dube, Felitti, Dong, Chapman, Giles & Anda, 2003). In the context of ravaging illicit opioid use epidemic in the US, more research is needed to better understand adverse childhood experiences and their relationships to drug use among individuals with opioid use disorder.

Opioid use disorder is a complex chronic health condition, and its etiology involves interactions between biological, psychological and socio-cultural factors. Individuals are influenced by their family and friends as a means of initiation into drug use. This ties into Sampson and Laub's life course theory in terms of understanding how behavior is learned (Mowen & Boman, 2019). As a child is growing and their brain is developing, they learn through observation and socialization acceptable social cues within society. When a person is learning how to navigate life, they may find it difficult to overcome life challenges because they have not been taught how to properly respond to situations (Scheidell, 2018). Drug use from parents, or guardians can reflect in their child's development because a child is dependent on their parents to teach them right from wrong. When a parent is engaging in drug use, their mental ability to function is alternated. This altered ability influences the parent's decision-making process, which affects how the child perceives what they are observing or internalizing. Drug use may be a coping mechanism. When someone learns that drugs can provide a quick escape from a problem, they may be more enticed to engage in drug use. Self-control of an individual will help them progress through life and solve life challenges and transitions as they come. But when a person experiences a lower sense of self control because they lack the ability to cope, they often seek a quicker solution to escape their problem, rather than solving them. A child who grows up in a stressful environment is likely to have one or more adverse childhood experience attributes. As the factors pile up, the person may

find self-control harder to maintain and fall into the behavior, or patterns they are familiar which leads into drug initiation. The prevalence of adverse childhood experiences in the community recruited sample of individuals with opioid use disorder help to highlight the importance of understanding the population of users, by looking into social demographic factor. By understanding the people most impacted can help to expand the need for more treatment facilities and further research in terms of treatment options. The importance of understanding this can be supported with the two theories used in the research to show that environmental stability and care when growing up can be shaped or influenced by learned behavior. Parental care and support are necessary for life navigation.

Purpose of the Study

The study will examine adverse childhood experiences among individual who use illicit opioids, focusing on emotional, physical, and sexual abuse. The study will use data collected from a sample of 357 individuals with opioid use disorder who were recruited in the Dayton area between May 2017 and October 2018. The key aims of the study are to: 1) assess the prevalence of adverse childhood experiences in the community-recruited sample of individuals with opioid use disorder; 2) analyze the relationship between adverse childhood experiences and family history when growing up, including economic hardship and parental history of mental and substance use problems, and 3) analyze the associations between adverse childhood experiences and selected drug use characteristics, such as age of first use, frequency of use, and whether or not they inject.

LITERATURE REVIEW

Opioids

Opioids are a class of drugs that bind to opioid receptors and include illegally produced drugs (e.g., heroin, non-pharmaceutical fentanyl) and pharmaceutical opioids (e.g., hydrocodone, oxycodone) that are prescribed for pain control but can also be diverted and used illicitly for euphoric or self-medication purposes (Brady, Mccauley, & Back, 2016). There are three types of opioids: 1) naturally derived opioids, also referred to as opiates (e.g., morphine, codeine); 2) semi-synthetic (e.g., hydrocodone, oxycodone, heroin), and 3) synthetic (e.g., methadone, fentanyl, fentanyl analogues). Endogenous opioid peptides commonly known as endorphins are naturally produced in the body (Rosenblum, Marsch, Joseph, & Portenoy, 2008). These work to help individuals manage basic pain, such as a headache. The release of the endorphins is not enough to treat severe pain, such as a broken bone. In such cases, use of opioid medications help reduce and manage pain. Besides pain control, opioids also may produce a euphoric sensation, that is also referred to as feeling “high.”

Opioid drug use is associated with a risk of drug poisoning or overdose. Misuse of opioids may lead to developing an opioid use disorder, which is characterized by a problematic pattern of illicit opioid use that leads to serious impairment or distress. To be diagnosed with having an opioid use disorder, a person must experience within a 12-month period at least two of the eleven symptoms, such as withdrawal, increased tolerance, craving, or a strong urge, desire to use, spending majority of the day attempting to obtain, use, or recover from opioid use; experiencing negative social consequences due to opioid use, and so on (CDC, 2016). The number of

symptoms reported will determine whether a person is diagnosed with a mild (2-3 symptoms), moderate (4-5 symptoms), or severe (6 or more symptoms) opioid use disorder (APA, 2013).

Opioid Crisis: Triple Wave Epidemic

The history of illicit opioid epidemic in the U.S. has been described as a "triple-wave epidemic" (Ciccarone,2019). The first wave is seen as the driving force behind the tripling of prescription opioids reaching the population first starting in the 1990s and peaking around 2011 (Kolodny et al., 2015 page 2). The U.S. is one of the largest consumers of prescription opioids in the world, 100% of Vicodin is found here, compared to 81% for Percocet (NIDA, 2014). Doctors were under the impression from drug manufactures and representatives that certain prescription opioids would help to relieve their clients from pain, chronic or acute, without causing addiction. This helped to reinforce the doctor's decision to prescribe, and refill prescriptions beyond the amount regulated now. This is an important factor into how the first wave gained its strength. The drug suppliers helped to reassure doctors, and other prescribing practitioners that they would be easing the pain of their patients, without the risk of developing an addiction. Doctors felt comfortable initially with prescribing these because patients may not have realized at first that they were becoming addicted to the medications. Once patients began to slowly report addictive patterns after they stopped using prescription opioids, doctors were able to realize the risks of addiction associated with misuse of prescription opioids. (Cicero, Ellis, & Surratt, 2012; Mars, Bourgois, Karandinos, Montero, & Ciccarone, 2014).

The second wave of the opioid crisis happened as part of the "cleanup" from the first wave. While drug manufacturers were forced to disclose the addictive potential of their medications, doctors became more restrictive on how they would determine the need for prescription opioids for treatment. Since many people were left with addictions and minimal treatment after their experience with prescription opioids, they found accessible forms to curb their cravings from the

black market. People began using heroin to achieve their desired high, because it was easier to access and cheaper in cost (Kolodny et al,2015). This again helped to fuel the supply and demand of the black market. Many people who have used heroin, started with prescription opioids.

The third wave is marked by a shift to illicitly manufactured fentanyl and other novel synthetic opioids (Ciccarone,2019). Fentanyl is found to be cheaper than heroin or other street drugs. Fentanyl is fully synthetic and non-pharmaceutical. Fentanyl and many analogs are also significantly more potent than heroin, which has contributed to increases in overdose mortality in the US. Fentanyl is easy and cheap to make. This has helped to transition the users of the first wave. Easier access to drugs such as fentanyl, can lead into exacerbated physical dependence and higher tolerance for those users who inject drugs (Cicero, Ellis & Kasper ,2017; Helander, Backberg, Signell, & Beck, 2017; Marshall et al.,2017; Somerville et al., 2017). Fentanyl can be mixed and pressed into counterfeit pills made to look like the real versions of prescription drugs. These pressed counterfeit pills can be made to look like Oxycontin, Percodan, and Xanax (Green & Gilbert, 2016). This has increased the potential harm or risk of ingesting a counterfeit prescription pill, due to the lack of regulation from the FDA to ensure the quality, and safety of a pill to consumers. A person may ingest these pills without knowledge they are counterfeit, and essentially tainted with fentanyl. This can increase the potential harm for those in direct contact with the drug, as well as medical or police assisting in helping a person who has consumed the counterfeit product. The identifiable markers are also replicated making it impossible to tell from observation, this puts everyone in society at risk.

According to 2017 CDC data, 20 states exceeded the national average rate of overdoses by 21.7 per 100,000 people. Three states had the highest rate of opioid overdoses. These states include West Virginia, Ohio, and Pennsylvania (CDC, 2017). Ohio's policy response focused on combating over-prescription of pharmaceutical opioids. Available data indicate that prior history

of prescription opioid abuse is a key risk factor for illicit drug use such as heroin and fentanyl (Ohio Department of Health, 2017).

Currently, illicit fentanyl and related drugs are the driving force behind overdose deaths in Ohio. In 2017, Montgomery County had the highest overdose mortality rate in the state of Ohio with 521 drug –related overdose deaths, and an age-adjusted rate of 95.24 per 100,000 (Rossen, Bastian, Warner, Khan & Chong, 2019). Since 2017, in Montgomery County, Ohio, about 90% of all overdoses that were fatal tested positive for non-pharmaceutical fentanyl-type drugs (NPFs) (Daniulaityte et al., 2017; 2019b).

Adverse Childhood Experiences

Adverse childhood experiences (ACE) can be understood as events that occur during childhood that are stressful or traumatic. When a child is growing, they require three specific needs to be met to develop mentally and physically. The first need a child must have is safety. Safety protects the child from potential danger such as neglect, violence, and threats within social and physical environments. The second is stability. A child needs a consistent lifestyle and environment. This helps the child develop a sense of predictability, because they will develop a routine schedule and have a sense of what to expect from different scenarios. The last specific need a child has is nurturing. Parents do this by providing comfort, sensitivity, and availability to whatever the child's needs are (Turner et al., 2017).

Adverse childhood experiences are a result of abuse and neglect. Neglect is defined as leaving a child unsupervised and an inability to provide basic needs. Abuse can have multiple layers associated with it, these are emotional, physical, and sexual. Emotional abuse can be described as hearing hurtful things, and making the child feel unwanted or not loved. Physical abuse is shown through alternations such as slapping, hitting, kicking, or being thrown. Sexual abuse is defined as being touched or fondled in a sexual manner by someone over the age of 18 or at least 5 years older (Quinn, Frueh, Scheidell, Schatz, Scanlon & Khan, 2019).

Emotional aspects and consequences of adverse childhood experiences can include depression, anxiety, impulsivity, and suicidal intention/ or thought. Also, actions associated with emotional impulse can include risk taking, and delinquency, which can be criminal and typically starts in adolescence (Petersen, et al.,2013). ACE also has a physiological effect on the child's ability to grow and develop. These experiences shape the way the child will perceive things in

life, as well as their ability to navigate through life successfully. Neuroscience has suggested that these experiences may affect the early development of the child's central nervous system. This is the control center for emotions, and the ability to cope with them (Perry and Pollard, 1998). When the central nervous system does not develop to its full functioning ability, self-regulation may be affected. Self-regulation is how a person responds emotionally and behaviorally in everyday life (Dunn et al., 2017; van der Kolk et al., 1991). The Adverse Childhood Experience Study focused on 8,613 adult who attended a primary care clinic in California. The adults completed a survey that included topics about childhood abuse and neglect, household dysfunction when growing up. Also, illicit drug use and other health related issues were included. In this study there was ten categories of adverse childhood experiences. The results of found a strong relationship between initiation of drug use in all age ranges along with drug use, drug addiction, and parenteral drug use problems. The results of the survey showed when a respondent reported at least one of the adverse childhood experiences, the exposure to other categories of ACE increased dramatically, reporting one exposure at an 86.5% rate; and for any two additional ACE reports changed the median probability to 69.5%. Early adolescence had the strongest relationship between initiation and ACE. Drug initiation increased as the self-reports of ACE increased. Prior to this study, previous studies about early childhood trauma suggest that these experiences can lead to negative life outcomes in terms of behavioral and health. These experiences can also influence substance abuse in early adolescents into adulthood. Previous studies have found an association between sexual, physical child abuse and illegal drug use (Dube et al., 2003). During childhood our developmental and emotional state are established, so when a child is being exposed to traumatic experiences it may impact their self-regulating responses, leading to drug use as a coping mechanism to escape emotional or physical pain. Parental drug use attributed to abusive, and traumatic experiences with two thirds (64%) of the respondents reporting to these type of events (Dube et al., 2003). It is important to look further into the parental impact of trauma during childhood, to help prevent drug initiation. Parental drug

use increases the risk for an individual to begin using drugs because of the environment in which they are surrounded in. Drugs become a vicious cycle for coping and avoiding past traumas because of the dependency. Adverse Childhood Experiences (ACE) scores have been linked to smoking, alcohol abuse, and illicit drug use (Allen et al., 2015; Anda et al., 2002; Douglas et al., 2010; Dube et al., 2003.) Traumatic childhood experiences have been associated with opioid dependence as well (Afifi et al., 2012; Moselhy et al., 2010) and the age of injection begins at earlier in life. The age of initiation can impact developmental stages which can transition into a dependency (Anthony and Petronis, 1995; Baldwin et al., 2013; Chen et al., 2009; King and Chassin, 2007). An opioid user will typically change their method of drug initiation, by transitioning from ingesting a prescription opioid to injection of heroin. Injection of heroin can lead to a higher risk of overdose (Lake et al., 2015). In a study of 457 participants who entered a detoxification facility were interviewed, asking participants about their drug use, such as age of opioid initiation, have they injected drugs within the past month, and also whether they experienced overdoses. The participants were also asked about adverse childhood experiences based off the same 10-item ACE questionnaire (Felitti et al., 1998). This study found that females were significantly more likely to experience sexual ACE factors of being touched or fondled and felt unloved by family. Women overall reported more ACEs and were more than four times more likely to report childhood sexual abuse than men, this is consistent with prior research (Cavanaugh et al., 2015; Finkelhor et al., 2014.) ACE factors also increased the likelihood that a person would initiate drug injection. The findings from this study demonstrate that adverse experiences during childhood are associated with each opioid relation behavioral marker in a graded, dose response manner. Intersecting factors such as environmental and biological influences may contribute to a child's response through direct modeling of parental behavior. "Drug use to cope with negative affect states, and also by exacerbating environmental stresses such as abuse, neglect, poverty, parental criminal justice involvement. These can drain critical resources, disrupt social learning, and inhibit skills acquisitions in children (Lake et al., 2015). Substance misuse and negative

childhood experiences are associated with impaired cognitive, emotional, social development, and maladaptive coping mechanism.

ACE Effects and Health

Individuals with multiple ACE factors experience a greater impact compared to those who have one attribute that contributes to the causation of ACE (Stein, et al., 2017).

"Adverse childhood experiences are related to the development of a wide range of health problems throughout a person's lifespan, including those associated with substance misuse" (Freeze, 2019 page 1-7). When a person has a sense of stability and support when growing up, they have a better chance for opportunity because they are not feeling the burden of environmental factors, such as poverty. It has been found that "ACE strongly predicts behaviors that increase the risk of adult cancer, something that health care providers would benefit from knowing when assessing risk" (Mouton et al., 2016). Individuals may engage in more risky behavior that can influence their overall health. As a person gets older, their health care becomes more critical to maintain. The body will respond to stressors in based life experiences, genetic mutations and learned behavior will also influence the way an individual perceives their life experience. Chronic disease has multiple layers that can influence the genes within an individual to sustain their illness. Since genes can be alternated when they are adapting to the progression of the disease, it is hard to see how ACE can have actuating effects on gene mutation when a patient is experiencing chronic disease and pain while managing their childhood experiences. Culture, social, and individual factors influence an individual's perception and experience of psychosocial stress (Daniulatityte, et al., 2011). The overall physical health of an individual will also influence the way a person is able to navigate through life. Stress also has an impact on the overall wellbeing of an individual. A person's ability to manage stress varies based on environmental and life factors. Mental distress can create a great amount of stress in an individual.

An individual's health may be impacted from stress when the body loses resilience, and their coping strategies are exhausted. This can be a range of problems, such as cardiovascular, immune dysfunction, and possible development of psychiatric disorders" (Anisman & Merali, 1999). When a person experiences a disability, they are forced to develop new strategies to sustain life and manage their life. This can impact the person's stress level.

A dose-response relationship exists between the number of ACEs and the likelihood of depression and suicide, such that a patient with an ACEs score of 6 or more is 24 times more likely to attempt suicide than a patient with an ACEs score of 0" (Merrick, et al.,2017). This finding suggests that a person who has ACE experiences during their life course have a greater chance of feeling depressed. When a person also experiences a disability, or chronic pain they are also at risk of feeling depressed. Because of the increased risk of developing depression, and chronic diseases it is important to expand the research on how ACE factors may contribute to a person's health. "Understanding ACE research allows us a new avenue in an area where medicine has largely failed, helping patients who have been suffering from decades of chronic illness with little hope" (Nakazawa, 2015).

ACE and Drug Use

The ACE study found a dose response relationship between the number of ACEs individuals report having experienced and various adult health outcomes, including alcoholism, drug abuse, and depression (Cavanaugh C.E., 2014). A study conducted with 195 Latinos found that individuals with 3 or more attributes of ACE were three times more likely to experience mental distress and eight times more likely to have a problem with drug and alcohol use (Barrera,2019). The initiation of drug use can be influenced by adverse childhood experiences, but this is not always the case necessarily. A person with adverse childhood experience may find alternative coping mechanisms to manage their distress. When a person uses drugs as a coping mechanism it can lead to potentially risky behaviors. Because drugs affect the brains ability to function properly, the decision-making process is also altering the way a person navigates through life while using drugs. The factors of ACE contribute to drug use, because a person is at greater risk of becoming a drug user and feeling depressed while attempting to navigate through life. These factors put a person at a higher risk of also attempting suicide. A person may feel they have lost a sense of social cohesion due to the changes in their life because of their chronic pain, or disability. The feeling of isolation can also contribute to drug use, in a sense that a person may use as a coping mechanism to manage.

Another study conducted with 582 women aimed to assess early childhood abuse, neglect, and substance abuse and related problems in adulthood. It found that in “middle adulthood, PTSD, stressful life events, and delinquent and criminal behavior were independent mediators of the relationship between adverse childhood experiences and substance misuse, but when assessed together, only stressful life events for substance use problems and only PTSD for illicit drug use remained mediators.” (White & Widom, 2008). The link between criminal behavior and adverse childhood experiences show that there is a need to provide guidance and leadership

to the at-risk youth, to help prevent criminal behavior, while offering support to the child for the trauma they have endured. Often when a person is off their medication when treating a mood disorder, irrational decisions are made, that often lead to negative consequences, as well as instability or intractability to the behaviors or actions that individual will participate in. When multiple adverse childhood experiences are present or experienced by an individual, they have a greater chance of using drugs, and attempting to commit suicide. A large retrospective cohort study of health maintenance organization used 17,337 adult participants. They found those who reported having experienced emotional, physical, or sexual abuse had attempted suicide at a rate of three to five times more likely (Dube et al., 2001).

Theoretical Approach

Life Course Theory

Life course theory is conceptualized as understanding the multiple layers and factors that attribute to how a person shapes their life. This works in the interdisciplinary form of understanding things from birth to death. The cultural and historical context helps understand how families and individuals within the family establish their identity and shape themselves. A person will adapt to environmental changes as well as a family dynamic shift. This can be negative and positive experience, helping to see how these factors work to shape that individual. Life trajectories can be considered pathways for development into one's future. This means that based on different experiences, a person's life opportunities and chances can be influenced. Life trajectories are viewed as long term. A person who has adverse childhood experiences are at increased risk for adverse experiences later in life. This means it can impact a person's movement or shift from different roles. The impact that transitory events can have on a person are situational. This is important to understand when discussing drug use. A person may have more understanding of the impact drug use can have on them, opting not to use, or fall into the same patterns as their environment in which they live. However, when a person shifts roles, through transitory events, their life course also changes. This can be a positive or negative transition. When a person is arrested, they may develop a sense of cumulative continuity. This can be understood as a person failing in one area of their life such as school, that they are likely to fail again in a different arena. This is a result of transitory events that contribute to the changes within that person's individual life. The path each individual chooses to take in life can be understood by looking at these multiple layers which influence their life decisions. Sampson and Laub, suggest that family involvement also has an association to delinquent behavior. The suggestion that a "lack of supervisions, erratic or harsh discipline, and parental rejection" can lead to engaging in delinquent behavior (Winfree,

Abadinsky, 2017). This ties into adverse childhood experiences because of the exposure to physical or emotional abuse.

Social learning theory

Along with life course theory, it is important to understand why a person may begin using drugs. Social learning theory states that by observing others partaking in risky behavior, a person can learn the social cues of this habit. The person who is surrounded by drug use, will likely emerge into the drug scene, at least once in their lifetime (Bandura, 1977). Social learning theory focuses on the how, the what, and the where of learning. Human behavior can be understood as operant and respondent behavior (Vargas, 2017). Operant behavior is regulated by the brain and can be understood as voluntary. Whereas respondent behavior is understood as a reflexing, and automatic. Voluntary behavior is dependent on the consequences of a person's environment. This means that a person understands the punishments and rewards. This can be explained through social reinforcements. Social reinforcement are exterior factors of a person's life. They can be viewed as a symbolic. According to Akers, social reinforcements are more plentiful in a person's environment and therefore play a more important role in learning than do nonsocial reinforcements (Akers, Sellers, 2013). These may be physiological, unconditioned, and intrinsically rewarding. According to the social learning theory, a person is likely to observe the behavior of others, which can be negative or positive actions, and then learn how to mimic these behaviors through interaction. When a child is living in a home where drug use is present, it can have an influence over the environment in which that child learns how to behave. This can be damaging to a child because a child's frontal lobe is constantly developing into early adulthood (Guerra & Pascual, 2019). When a child is exposed to behaviors and surroundings that can be damaging to a person's development, they are at risk for adverse childhood experiences. Due to challenging circumstances when growing up, children may not learn to distinguish right from wrong, and accept unhealthy and deviant behaviors such as drug use as a normal coping strategy.

Understanding what acceptable behavior can help a person navigate their life in a healthy form, which will lead to success. When a person does not understand societal expectations on how to behave, they are at risk for becoming involved with the criminal justice system. A person's ability to understand whether certain behavior is acceptable or not within their environment is through internal signals known as discriminative stimuli (Langthorne & McGill, 2009).

Deviance and crime may be viewed in a positive light, when discriminative stimuli allow the offender to neutralize the aspects of a crime that are negative (Akers, Sellers, 2013).

Peer influence can provide a person with positive reinforcements and punishments. Reinforcement for engaging in drugs can influence a person to seek that form of validation. When a person faces punishments from their peer influencers, they are likely to steer away from the negative reinforcement. Differential associations focus on the where that guide behavior is learned, this is important to understand because it provides a positive form of reinforcement through peer influence rather than peer pressure (Akers & Sellers 2013). After repeated experiences of engagement, a person becomes solidified by the reinforcement or punishment. People may have two different types of friend groups, one that engage in drug use and ones that do not. This is because social structures are linked to an individual behavior.

METHODOLOGY

Eligibility and Recruitment

This study uses data that were collected for a natural history study on non-prescribed use of buprenorphine among individuals with opioid use disorder who resided in the Dayton area (Daniulaityte et al.,2019). The data were collected from May 2017 to October 2018. To recruit participants, the study used targeted recruitment (Korf et al.,2010; Sifaneck and Neaigus, 2001) and Respondent Driven Sampling (Daniulaityte et al.,2012). Recruitment for the study included Facebook and Craig's list ads, as well as flyers hung up in a variety of locations such as gas stations, and laundromats. Support and service providers also helped distribute flyers. Participants were encouraged to refer at least three other participants to help expand recruitment opportunities.

Eligibility assessment consisted of a two-stage process. First, interested individuals were prescreened via phone. Those who passed phone-based eligibility assessment were invited for office-based assessment and subsequent interview. Informed consent procedures were administered before office-based eligibility assessment (and subsequent interviews, if eligible). Participants had to be at least 18 years old to participate. A picture ID or documentation was requested to ensure the age of the participant as well as to eliminate multiple participation from one participant. They had to meet criteria for current diagnosis of opioid use disorder (moderate or severe). Finally, they had to self-report use of non-prescribed buprenorphine at least once in the past 6 months. Opioid use disorder was assessed using DSM-5 checklist (Foreman et al., 2004)., that included questions to assess 11 criteria that are used to diagnose opioid use disorder (e.g., "In the past 12 months, did you find that you needed to use a lot more of these drugs (heroin/fentanyl or non-prescribed opioids) to obtain the desired effects that you did when you

first started using them? [OUD criterion: Tolerance]; “In the past 12 months, did you have withdrawal symptoms, that is, felt sick when you cut down or stopped using illicit opioids (heroin/fentanyl or non-prescribed pain pills?” [OUD criterion: Withdrawal]; “During the past 12-month period, have you had times when you used illicit opioids (heroin/fentanyl or non-prescribed pain pills) so often that you used them instead of working, going to school, or spending time in hobbies or activities with your family and friends?” [OUD criterion: Important social, occupational, or recreational activities are given up or reduced because of drug use] and so on).

Participants were compensated with a \$50 Walmart gift card or a check. They were paid \$15 for referring additional participants. Additionally, individuals were also asked to submit an unobserved urine sample for drug testing. Request to participate in drug screening before the start of data collection is recognized as a useful method to increase the accuracy of self-reports (Donovan et al., 2012). A total of 357 participants met the eligibility criteria for the study. To ensure privacy for all participants in the study personal information such as their name is linked to a unique number and kept confidential in a locked file at Wright State University, separate from the data files. This study was protected by a Federal Grant of Confidentiality. The study was approved by the Wright State University Institutional Review Board (IRB).

Structured interviews and variables

Structured interviews were conducted in a private office by trained interviewers. The interviews lasted around 1.5 to 2 hours. For computer-based data entry and storage, the study relied on REDCap system (Harris et al., 2009). The interview questionnaire included a section on basic sociodemographic factors (age, sex, ethnicity, etc.) and history and patterns of opioid and other drug use. Computerized version of Diagnostic Interview Schedule that was developed and validated by the University of Florida Epidemiology Department.

Adverse Childhood Experiences

The questions regarding Adverse Childhood Experiences (ACE) attributes are based off an 11-item measure from another study published in the American Journal of Preventive Medicine, titled Development and Evaluation of a Short Adverse Childhood Experiences Measure (Wade et al., 2017). For this study two questions per each subsection were taken from the 11-item measure survey.

To measure different pile-up factors of adverse childhood abuse experiences, the study focused on mental, emotional, and physical experiences, resulting in six total questions. The level of measurement for each nominal question has two attributes (0= no, 1=yes). Each variable question regarding adverse childhood experiences was computed together using Statistical Product and Service Solutions (SPSS). To measure emotional adverse childhood experiences the following questions were asked: 1) "Did a parent or other adult in your household often or very often swear at you, insult you, put you down, or humiliate you?" 2) "Did a parent or other adult in your household often or very often act in a way that made you afraid that you might be physically hurt?"

The next subsection regarding adverse childhood abuse experiences focuses on the physical abuse by asking the following two questions: 1) "Did a parent or other adult in your household often or very often push, grab, slap, or throw something at you?" 2) "Did a parent or other adult in your household ever hit you so hard that you had marks or were injured?"

Lastly, to assess experiences of sexual abuse during childhood, the following two questions were asked: 1) "Did an adult or person at least 5 years older than you ever touch or fondle you or have you touch their body in a sexual way?" 2) "Did an adult or person at least 5 years older than you ever attempt or have oral, anal, or vaginal intercourse with you?"

Sociodemographic

The gender of the participant was determined by the interviewer as they appeared, with the attribute of (0 =female; 1=male). This is a nominal level of measurement. Race is a nominal level of measurement and was divided into two attributes of (0= non-white; 1= white). The age of the participant is collected by asking the participants date of birth by obtaining the month, day and year. The level of measurement for age is a continuous variable ranging from 20-72 years old. A person's education was determined by asking "What is the highest level of schooling you have completed?" The level of measurement is ordinal and can be ranked, with attributes of (1 = less than high school graduation, 2= a GED (Graduate Equivalency Degree), 3= Completed High School, 4= Some college (no degree)/ some technical, trade school education, 5= Completed associate degree or other technical 2-year degree, 6= Completed College (Bachelor's degree), 7= Post graduate education degree (MA/MS/PHD/MD/JD). Employment was best described by the participants present work situation; the level of measurement is nominal. The attributes for employment status are as followed, 1= working full time- 35 hours or more a week, 2= working part time- less than 35 hours a week, 3= unemployed, 4= not employed due to disability, 5= not employed because retired, 6= not employed because in school/student, 7= not employed due to home or caring duties.

To assess the type of hardship the participant has endured the following variables were computed into one variable, and the level of measurement is also nominal with two attributes, (0= no,1= yes). The following questions were asked: "Have you been homeless in the past 6 months?" and "Before you were 18 years old, was there ever a time when your family received money from government assistance like welfare or food stamps?"

Family history

After completing the demographic section, the interviewer proceeded to ask questions regarding family history. The importance of this information is to look for a relationship or impact regarding parental history for nervous/mental disorders, as well as alcohol and drug addiction. To assess these histories, the following question was asked: 1) "To the best of your knowledge, has your biological mother ever had any of the following health problems? Nervous/ mental disorders? Alcohol or Drug problems?" were also assessed, with the attributes of (0= no, 1= yes). To assess the history of the participants biological father the following question was asked, "has your biological father ever had any of the following health problems?" Nervous/ mental disorders? Alcohol or Drug problems?" were also assessed, with the attributes of (0= no, 1= yes). The variables are at a nominal level of measurement. This information will help to see if a parent's health history has a relationship with their child's adverse childhood experience, these questions help to understand how social learning can impact a person's choice to engage in drug use.

Drug Use Characteristics

By assessing a person's age when they first began using various drugs such as alcohol, marijuana, non-prescribed opioid pain pills, heroin, and fentanyl, this will help to show the duration of drug use. The following question was asked to determine the age of the participant the very first time they consumed alcohol: "How old were you the very first time you used alcohol?" The following question was asked to determine the age of first marijuana use: "How old were you the very first time you used marijuana?" The following question was asked to determine the age of the participant the first time they use non-prescribed pain pills: "How old were you the very first time you used non-prescribed "pain pills"/ pharmaceutical opioids like hydrocodone (Vicodin, Lorcet), immediate release oxycodone (Percocet), morphine, hydromorphone (Dilaudid), etc. (excluding OxyContin, buprenorphine)?" The attribute for these questions is interval ratio, and open ended (age in years). The following question was asked to determine the age of the participant when they use heroin and fentanyl for the first time: "How old were you the very first time you used heroin?" "How old were you the very first time you used non-prescribed fentanyl?" The attribute for these questions is interval ratio, and open ended (age in years).

To assess lifetime history of injection use of heroin, the following question was asked: "Have you ever injected heroin?" The attributes are (0= No, 1= Yes). The level of measurement is a nominal variable. By looking into the participants age when injection first began will also show a progression in drug engagement. To determine frequency of drug use in the past 6 months, the following question was asked: "During the past 6 months, how often did you use heroin and/or fentanyl?" This question contains 8 attributes for frequency (level of measurements is ordinal) 1= never/none, 2= less than once a month, 3= about 1 to 3 times a month, 4= about 1 day a week/

4 times a month, 5= about 2 days a week, 6= about 3 to 5 days a week,7= about 6 to 7 days a week/daily. Timeline. Follow-back method was used to collect information about the days of heroin/fentanyl use in the past 6 months.

Data Analysis

Descriptive statistics and univariate analyses were used to characterize the sample. To assess the differences in sociodemographic variables and drug use characteristics between those who experienced childhood abuse and those who did not, Chi-square test was used for categorical variables. The categorical variables include gender, race, homelessness in the last six months, education level, current work situation, and ever injecting heroin. One-way ANOVA was used to assess differences in drug use characteristics (continuous variables) between those who experienced childhood abuse and those who did not. The continuous variables include six-month frequency use of heroin/fentanyl by the number of days. Drug use characteristics include the age of first alcohol use, marijuana use, non-prescribed pain pill use, age of first heroin use, and age of first fentanyl use (Table 6).

Multiple linear regression analysis was used to assess the relationships between age heroin initiation (dependent variable) and childhood abuse experiences (independent variable), controlling for socio-demographics and family history when growing up. Multivariate Logistic Regression analyses were used to assess the association between a) early initiation of alcohol use (dependent variable) and childhood abuse experiences (independent), controlling for socio-demographics and family history when growing up; and by injection heroin use (dependent variable) childhood abuse experiences (independent), controlling for socio-demographics and family history when growing up. Statistical analyses were conducted using SPSS.

RESULTS

Socio-Demographic Characteristics

Out of the total sample of 357 participants, 177 were females (49.6%) and 180 (50.4%) were males. The average age of the participants was 39.22 years old (standard deviation of 9.62), ranging from 20 to 72 years old age. 63% of the sample have also reported being homeless within the past six months. Out of the total sample, 323 participants identified as white, non-Hispanic, resulting in 90.7%, while 33 participants reported being non-white resulting in 9.2% (Table 1).

In terms of education, 78 respondents (21.8%) reported having less than a high school graduation, 75 (21%) reported having a graduate equivalency degree (GED), 47 (13.2%) reported they had completed high school, and about 44% reported some college education or more (Table 1). The majority of the study participants were unemployed. As seen in Table 1, 37 (10.4%) of respondents described their current work situation to be working full time, 55 (15.4%) are working less than 35 hours a week, 184 (51.5%) of respondents reported their current work situation to be unemployed, resulting in 51.5% of the total sample (Table 1).

Table 1. Sociodemographic characteristics (N=357)

Characteristics	N	or	%	or	Median
	Mean		SD		
Gender					
Female	177		49.6%		
Male	180		50.4%	--	
Race					
White	323		90.5%		
Non-white	33		9.2%		
Age (Years)	39.22		9.62		46
Homeless in past 6 months	195		62.9%		
Education					
Less than High School Graduation	78		21.8%		
GED (Graduate Equivalency Degree)	75		21%		
Completed High School	47		13.2%		
Some college (No Degrees)	108		30.3%		
Completed Associate or other technical 2-year degree	39		10.9%		
Completed college (Bachelor's degree)	9		2.5%		
Post Graduate Education Degree (MA/MS/PHD/MD)	1		.3%		
Present work situation					
Working full time- 35 hours or more a week	37		10.4%		
Working part time-less than 35 hours a week	55		15.4%		
Unemployed	184		51.5%		
Not employed due to disability	67		18.8%		
Not employed because retired	3		.8%		
Not employed because in school/student	5		1.4%		
Not employed due to home or caring duties	6		1.7%		

Experiences of Childhood Abuse (Adverse Childhood Experiences) and Family History

The key focus was to investigate the adverse childhood experiences that some of the participants may have experienced while growing up. The three sub-sections of focus while looking into the adverse childhood experiences are emotional, physical, and sexual abuse. Two questions were asked per each sub-section, and the results presented in the Table 2 indicate that one or both questions per each section were endorsed by the participant. Emotional abuse experiences were reported by 200 participants, resulting in 57.3% of the total sample. Physical abuse was reported by 185 participants, which represents 53% of the total sample. Sexual abuse was reported by 125 participants, which represents 35.8% of the total sample (Table 2).

When assessing the number of different types of childhood abuses experienced by the participants, 56 participants reported having at least one type of abuse, resulting in 16% of the sample, while 92 participants reported having at least two types of childhood abuses, they represent 26.4% of the total sample, and 90 participants reported having all three childhood abuse counts representing 25.8% of the total sample 9 (Table 2)

A high percentage of participants reported that their mother or father had either or both mental health and drug use problems. About 66% (n=237) reported their mother having at least one or both conditions. About 71% (n=255) reported their father having at least one or both conditions. There were 15.1% (n=54) of participants who did not know if their father had these problems. A total of 175 participants (49.9%) also reported their family receiving government assistance while growing up. This indicates experiences of financial hardship and instability when growing up.

Table 2. Experiences of childhood abuse experiences and family history when growing up (N=357)

Characteristics	N	%
Experiences of Childhood Abuse (Adverse Childhood Experiences)		
By the type of abuse		
Emotional Abuse	200	57.3%
Physical Abuse	185	53.0%
Sexual Abuse	125	35.8%
By the number of abuse experiences		
None	111	31.8%
One type of childhood abuse	56	16%
Two types of childhood abuse	92	26.4%
Three types of childhood abuse	90	25.8%
At least one type of childhood abuse or more	238	68.2%
Family history when growing up		
Biological Mother Had Mental Health/ Alcohol or Drug Problems	237	66.4%
Biological Father Had Mental Health/ Alcohol or Drug Problems	255	71.4%
When Growing Up, Family Received Government Assistance	175	49.9%

Drug Use Characteristics

The average age of first alcohol use was 14.16 (standard deviation of 3.93). The average age of first marijuana use was 14.22 years old (standard deviation of 3.51). The average age of first pain pill was 21.27 years old (standard deviation of 7.42), with a range from 7 to 55 years old, with a median of 19. The age of first use of fentanyl was 34.1 years old (standard deviation of 9.75), with a range from 15 to 65 years old, with a median of 33. The average age of first heroin use was 27.22 years old (standard deviation of 8.74), with a range from 10 to 59 years old, with a median of 34.5 (Table 3).

A total of 290 (83.6%) participants reported that they used heroin via injection route. About 48% of participants reported that they used fentanyl on a daily basis (6 to 7 days per week) in the past 6 months, and about 54% reported daily heroin use in the past 6 months. This represents the severity of their addiction. The average number of days of use was 103.6 with a standard deviation of 67.2 (Table 3).

Table 3. Drug Use Characteristics (N=357)			
Characteristic	Mean or N	St. Dev. Or %	Medi an
Age of first alcohol use	14.16	3.928	14
Age of first use marijuana	14.22	3.509	14
Age of first pain pill	21.27	7.423	19
Age of first heroin use	27.22	8.739	26
Age of first fentanyl use	34.10	9.752	33
Ever injected heroin	290	83.6%	
6-month frequency use of heroin/fentanyl; number of days	103.60	67.196	124

Association between the Experiences of Childhood Abuse and Family Characteristics when Growing Up

A mother's health history was examined looking into mental disorders and alcohol or drug problems. A total of 237 respondents reported that their mother had a history of at least one condition, showing 66.4% of the total sample. The father's health history was examined by looking into the same disorders (mental disorder and/or alcohol or drug problems). As seen in Table 4, individuals who had experienced childhood abuse were significantly more likely to indicate that their mother had mental health and/or drug use problem, compared to those who did not report a history of childhood abuse (76.3% vs. 52.1%), and the differences were statistically significant ($p < 0.001$)

Individuals who had experienced childhood abuse were significantly more likely to report their father had mental health and/or drug use problem, in comparison to those who did not report a history of childhood abuse (74.9% vs. 52%), and the differences were statistically significant ($p < 0.001$). While assessing financial hardships within the home, participants were asked if their family received government assistance while growing up. Individuals who reported a history of childhood abuse were significantly more likely to report financial hardship when growing up, compared to individuals without childhood abuse experiences (79.3% vs. 57.8%), and the differences were statistically significant ($p < 0.001$).

Table 4. Association between childhood abuse experiences and family history while growing up (N=357).

Variables	Childhood abuse n (%)		p
	No n=111	Yes (at least one of the three) n=238	
Mother had mental health and/or drug problems			
Yes	61 (52.1%)	177 (76.3%)	<.001*
No	56 (47.9%)	55 (23.7%)	
Fathers had mental health and/or drug problems			
Yes	53 (52%)	185 (74.9%)	<.001*
No	49(48%)	62 (25.1%)	
While growing up, family received government assistance			
Yes	104 (57.8%)	134 (79.3%)	<.001*
No	76 (42.2%)	35 (20.7%)	

Association between the Experiences of Childhood Abuse and socio-demographic and drug use characteristics

As seen in Table 5, there were significant gender differences in the history of childhood abuse. Among females, 74% (n=128) reported childhood abuse, and among males 62.5% (110) reported childhood abuse. The difference was statistically significant at $p=0.021$. Among those who are non-white, 60.6% (n=20) reported childhood abuse. Among those who are white, 68.9% (n=217) reported childhood abuse. However, these differences did not reach a level of statistical significance (Table 5).

Among those who reported homelessness in the last six months, 67.9% reported childhood abuse experiences, while those who did not report homelessness in the last six months 68.6% reported childhood abuse. (Table 5).

Table 5. Association between childhood abuse experiences and sociodemographic and drug use characteristics (categorical variables) (N=357).

Variables	Childhood abuse n (%)		p
	No n=111	Yes (at least one of the three) n=238	
Gender			
Male	66 (59.5%)	110 (46.2%)	.021*
Female	45 (40.5%)	128 (53.8%)	
Race/ethnicity			
Non-white	13 (11.7%)	20 (8.4%)	.331
White	98 (88.3%)	217 (91.6%)	
Homeless in the last 6 months			
Yes	61 (64.9%)	129 (62%)	.632
No	33 (35.1%)	79 (38%)	
Education			
High School or	65 (58.6%)	129 (54.2%)	.446
Some college or more	46 (41.4%)	109 (45.8%)	
Ever injected heroin			
Yes	18 (16.5%)	192 (83.5%)	.999
No	91 (83.5%)	38 (16.5%)	

By comparing the means of the drug characteristics by childhood abuse experiences, we can determine the relationship between childhood abuse and age of drug use initiation and frequency of opioid use in the past 6 months. Individuals who had childhood abuse experiences started alcohol use at an earlier age than those who did not have childhood abuse (13.61 vs 15.4 years old), and the difference was statistically significant at $p < 0.001$ (Table 6). The age of initiation for marijuana and pharmaceutical opioids was not different between the two groups (the differences were not statistically significant). The age of first pain pill without childhood abuse is 22.02 years old, with a standard deviation of 7.507, but with childhood abuse the age of first use is 21.03 years old, with a standard deviation of 7.46. Individuals with childhood abuse started heroin use at an earlier age than those who did not have childhood abuse (26.61 vs 28.77 years old, and the difference was statistically significant at $p < 0.05$).

The age of first fentanyl use was 35.85 (Std. Dev 10.17) years old among those who did not report childhood abuse, and 33.41 (9.527) years among those with childhood abuse experiences, and the difference was statistically significant at $p < 0.05$ (Table 6). This shows that a person is engaging in drug use much sooner.

There were no statistically significant differences between the two groups in terms of the frequency of heroin/fentanyl use in the past 6 months (Table 6).

Table 6. Association between childhood abuse experiences and drug use characteristics (continuous variables) (N=357)

Characteristics	Childhood Abuse Experiences		p
	No, n=111 (Mean, Std Dev)	Yes, n=238 (Mean, Std)	
Age of first alcohol use	15.40 (4.918)	13.61 (3.234)	<.001*
Age of first marijuana	14.57 (3.333)	14.08 (3.625)	.231
Age of first pain pill	22.02 (7.507)	21.03 (7.46)	.258
Age of first heroin use	28.77 (9.984)	26.61 (8.037)	.033*
Age of first fentanyl use	35.9 (10.2)	33.4 (9.5)	.039*
Day of heroin/fentanyl use in the past 6 months	110.73 (66.023)	100.37 (68.038)	.687

Multivariable Logistic Regression to assess the relationship between childhood abuse and early initiation of alcohol use (before age 15)

Multivariable Logistic regression analysis was conducted to assess the association between early initiation of alcohol use and childhood abuse experiences, controlling for socio-demographic and other family history while growing up. Multivariable logistic regression analysis results show that individuals who had any childhood abuse experiences had 2.046 greater odds of early alcohol initiation compared to those who did not have childhood abuse experiences, which was statistically significant at $p < 0.006$. Those who reported their race as white had four times greater odds of early alcohol initiation compared to non-whites, which was statistically significant at $p < 0.001$. Individuals who had mothers with mental and/or drug use problems had nearly 2 times greater odds of early alcohol initiation compared to those who did not, which was found to be statistically significant at $p < 0.007$. Fathers mental/drug use history and government assistance before the age of 18 were not significantly associated with the odds of early alcohol initiation. For this section, a total of 343 participants were included in the analysis with a missing case total of 14. The dependent variable was early initiation alcohol use (before age 15), with multiple independent variables. It has been found that those who report having childhood abuse experiences are more likely to initiation alcohol use at a younger age, controlling for other variables (Table 7).

Table 7: Logistic regression model for childhood abuse and early alcohol use

Characteristic	B	Exp. B	SE
Childhood Abuse	.716	2.046*	.259
Gender (Male vs. female)	.186	1.205	.239
Race (White vs Other)	1.386	3.999*	.414
Mother had mental or drug problems	.646	1.909***	.256
Fathers had mental or drug problems	.038	1.038	.267
Family received government assistance	.105	2.046	.243
Model X ² = 426.304			
Cox & Snell r ² = .091			
Nagelkerke r ² = .123			

n=357

*p< .01, ***p<.001

Multivariable Logistic Regression to assess the relationship between childhood abuse and injection use of heroin

Multivariable logistic regression analysis results show that odds of injection use of heroin decreased with increased age (0.95). Those who reported homelessness in the past 6 months, had over two times greater odds for reporting heroin use by injection $p < 0.01$. Adverse childhood experiences and other variables were not significantly associated with the odds of ever injecting heroin. For this section, a total of 281 participants were included in the analysis with a missing case total of 76. The dependent variable is ever injected heroin, with multiple independent variables. Table 8 shows the logistic regression for participants who have injected heroin as the dependent variable using adverse childhood experiences of emotional, physical, and sexual experiences. It has been found that as age increases, injection of heroin, goes down, while the report of being homeless goes up so does the likelihood of injecting heroin.

Table 8 Logistic regression- Ever injected heroin by childhood abuse

	B	Exp. B	SE
Gender	-.242	.785	.355
Age	-.056	0.946*	.018
Homeless 6-months	.943	2.568*	.426
Government assistance	-.213	.808	.352
Mental childhood abuse	-.274	.760	.477
Physical childhood abuse	.002	1.002	.479
Sexual childhood abuse	.043	1.044	.405
Mothers mental health/drug	.115	1.122	.373
Fathers mental health/drug	-.082	.921	.412
Model X ² = 17.25			
Cox & Snell= .060			
Nagelkerke r ² = .100			
n=357			
*p< .01			

Multiple linear regression analysis to assess association between childhood abuse and age of heroin initiation

Table 9 focuses on the relationship between the age of first-time heroin use and childhood abuse experience. The dependent variable is the age of first heroin use. and Childhood abuse experiences, family history when growing up and homelessness are the independent variables. The experience of homelessness was associated with decreased age of heroin initiation, in other words, those who reported homelessness in the past 6 months, were more likely to start heroin use at a younger age than those individuals who were not homeless. Individuals who experienced mental abuse in their childhood were also more likely to report younger age of initiation of heroin use. Other types of childhood abuse experiences did not show statistically significant association with age of initiation of heroin use.

Table 9: Multiple linear regression – Association between the Age of first heroin use and childhood abuse experiences, controlling for other factors

	B	SE	SIG
Gender	-.908	.929	.329
Age	.470	.048	.000***
Homeless 6-months	-3.69	1.317	.006**
Government assistance	-1.049	.938	.264
Mental childhood abuse	-2.491	1.223	.043*
Physical childhood abuse	-.653	1.223	.594
Sexual childhood abuse	1.946	1.064	.069
Mothers mental health/drug	1.009	1.009	.318
Fathers mental health/drug	1.949	1.103	.078
Constant	11.86	2.65	0

n=281

*p < .05, **p<0.01***p< 0.001

Adj R²=.28

Discussion

The study found that the majority of the study participants reported experiences of childhood abuse (68.2%, reported experiencing at least one type of abuse or more). The high prevalence of childhood abuse experiences in the community recruited sample of individuals with opioid use disorder helps to emphasize the importance of trauma-informed care when designing prevention and treatment approaches. The increased prevalence of opioid addiction has become a key driver in morbidity and mortality. Interventions are necessary to help expand primary prevention by identifying early signs of addiction. Prior research has shown that childhood abuse may contribute to increased risk for developing a range of physical and mental health problems (Hughes, Lowey, Quiggs & Bellis, 2016.). Abuse and household dysfunction have repeatedly demonstrated a strong graded relationship to health problems (Anda et al., 2001; Dube et al., 2001). This means that within the sample, 238 respondents reported having at least one of the three experiences. When looking into the number of abuse type experiences those who reported at least one were 16%, those with two types were reported at 26.4%, and those with three types of childhood abuse were reported at 25.8%.

The study shows findings between drug initiation and adverse childhood experiences. In this study the population of female to male ratio was similar with three less females than males in the total sample population (49.5% vs 50.4%). However, female respondents were more likely to report childhood abuse than males. In another study women overall reported more childhood abuse and were more than four times likely to report childhood sexual abuse than men, our findings are consistent with prior research (Cavanaugh et al., 2015; Finkelhor et al., 2014).

When focusing on sociodemographic factors that can impact childhood abuse, the study found an association between childhood abuse and maternal and paternal mental

health/substance use problems when growing up This helps to highlight the importance of a mother's health and/ or drug problems. By understanding the impact that parent's mental health history may have over a child's life trajectory is important, to help offer support for mothers who have experienced this history before or while raising a child. Culture, social, and individual factors influence an individual's perception and experience of psychosocial stress (Daniulatyte, et al., 2011). Parental care and support are necessary for life navigation. A lack of supervisions, erratic or harsh discipline, and parental rejection can lead to delinquent behavior (Winfree, Abadinsky, 2017). Stability within the household can provide a child with a sense of safety and offer a guidance in how to navigate life without engaging in criminal behavior. When a parent is engaging in heavy substance abuse, children can experience neglect emotionally and physically, as one prior study found that 83% of opioid user's face a variety of medical or nutritional disorders (Shulman, Shapira, & Hirshfield, 2000).

When looking into the factors of education, it was found that those with less than a high school graduation represented 56% of the sample, while those who had some college represented 44% of the total sample. Additional socio demographic factor that can impact a present opioid use disorder is their current work situation. The majority of respondents reported being unemployed, representing 51.5% of the total sample. As the economic hardships hit the United States, especially during the recession after 2007, many families experienced financial hardships and a loss of job sectors. During this economic shift, drugs became a source of income to make up for economic disparities, meaning drugs may act as a market economy that help to close the financial gap people may experience due to the industrial decline (Nagelhout,et al, 2017). Those who reported being in a family who received government assistance when growing up were also more likely to report childhood abuse experiences. This helps to highlight the importance of financial stability for a family. When economic hardships impact a family, stress is likely to increase, as well as childhood abuse.

Prior to this study, previous studies about early childhood trauma suggest that these experiences can lead to negative life outcomes in terms of behavior and health. These experiences can also influence substance abuse in early adolescents into adulthood. Previous studies have found an association between sexual, physical child abuse and illegal drug use (Dube et al., 2003). Adverse childhood experiences are a result of abuse and neglect. Emotional aspects and consequences of childhood abuse can include depression, anxiety, impulsivity, and suicidal intention/ or thought. Also, actions associated with emotional impulse can include risk taking, and delinquency, which can be criminal and typically starts in adolescence (Petersen, et al., 2013). This is important to highlight to show that environmental factors and stability at home is important for a child to life navigate their life as the get older.

Individuals who reported any childhood abuse were more likely to report earlier initiation of alcohol, heroin and fentanyl, compared to those without childhood abuse experiences. The more childhood abuse experiences a child endures the more likely they to face other hardships throughout their life course. When a person is learning how to navigate life, they may find it difficult to overcome life challenges because they have not been taught how to properly respond to situations (Scheidell, 2008). A child's central nervous system works as the control center that regulates emotions, and the ability to cope with them (Perry and Pollard, 1998). The prevalence of childhood abuse impacts the overall development of a child, this is why it is important for communities to implement multiple support groups for individuals exposed to early trauma. Prior research has also noted that traumatic childhood experiences have been associated with opioid dependence as well (Afifi et al., 2012; Moselhy et al., 2010). Opioid drug use is associated with a risk of drug poisoning and overdose. Misuse of opioids may lead to developing an opioid use disorder, which is characterized by a problematic pattern of illicit opioid use that leads to serious impairment or distress. The age of initiation can impact developmental stages which can transition into a dependency (Anthony and Petronis, 1995; Baldwin et al., 2013; Chen et al., 2009; King and

Chassin, 2007). Prior history of prescription opioid abuse is a key risk factor for illicit drug use such as heroin and fentanyl (Ohio Department of Health, 2017). When comparing various variables starting from first alcohol use to age of first pain pill, the results show that drug initiation begins at a much sooner age with those who experienced childhood abuse compared to those who did not report childhood abuse experiences.

Public health organizations have established a variety of strategies to help communities in the United States, these include overdose education, naloxone distribution programs, and the Good Samaritan Laws (Lambdin et al., 2018; McClellan et al., 2018; Strang et al., 2012; Walley et al., 2013). By understanding childhood abuse research has a new avenue in an area where medicine has largely failed in terms of helping patients who have suffered with chronic illness for decades (Nakazawa, 2015).

Theoretical and Practical Implications of Research Findings

The study found that drug initiation started at an earlier age for those who reported at least one childhood abuse experience. This helps to show that those who experienced childhood abuse while growing are more likely to engage in drug use at a much younger age than those who did not report any childhood abuse experiences while growing up. The person who is surrounded by drug use, will likely emerge into the drug scene, at least once in their lifetime (Bandura, 1977). This finding helps to support the social learning theory in terms of influence or mimicking behaviors observed. According to social learning theory, a person is likely to observe the behaviors of others, which can be negative or positive actions, and they learn how to mimic these behaviors through interactions. When a child is living in a home where drug use is present, it can have an influence over the environment in which that child learns how to behave. When a child is exposed to behaviors and surroundings that can be damaging to a person's development, they are at risk for adverse childhood experiences. Environmental and community support can influence a person's opportunities. Hardships can create stress and social strains on relationships. This can impact the social support, leading to delinquent or erratic behavior including drug use.

Individuals who had experienced childhood abuse were significantly more likely to indicate their mother had mental health or drug problems, compared to those who did not report any abuse. The parental impact and childhood abuse are contributing factors to drug initiation. Voluntary behavior is dependent on the consequences of a person's environment. This study focused on economic factors: this helps show stability when growing up. These factors are important because they can influence a person's opportunities in life which will impact the

trajectory of the individual. Individuals who reported a history of childhood abuse were significantly more likely to report financial hardship while growing up. These findings help to support the theory that environmental factors may impact drug initiation. When a child is growing up in a chaotic household, they may seek social reinforcements in life from friends. Due to challenging circumstances when growing up, children may not learn to distinguish right from wrong, and accept unhealthy and deviant behaviors such as drug use as a normal coping strategy. A person's ability to understand whether certain behavior is acceptable or not within their environment is through internal signals known as discriminative stimuli (Langthorne & McGill, 2009). When deviance and crime are viewed in a positive light when discriminative stimuli allow the offender to neutralize the aspects of a crime that are negative (Akers & Sellers, 2013). Positive reinforcement for engaging in drugs can influence a person to seek that form of validation because peer influence can provide a person with positive reinforcement and punishment. A person may feel solidified in their engagement of drugs by reinforcements after repeated experiences of engagement. This can offer a sense of social cohesion and support from others who are engaging in drugs. However, a person may have two different types of friend groups, one that engages in drug use and one that does not. This is because social structures are linked to an individual behavior. Drug engagement is likely to increase when a person receives positive reinforcement from their social support system. They may experience a sense of validation for their behavior, this can increase drug use and addictive patterns.

Individuals who experienced mental abuse in their childhood were more likely to report a younger age of initiation of heroin. Drug progression was found starting at alcohol consumption, all the way to injection of heroin. The findings help to show that it is necessary when growing up for children to have a safe, and functional household without drug use or childhood abuse. A link between childhood abuse and earlier drug initiation has been found, these findings suggest that

it is essential to have prevention, and intervention programs for at risk individuals that are based on trauma-informed care.

Limitations:

This study has several limitations. First is the sample population which was limited to people living Dayton, Ohio and the surrounding metropolitan area. The data cannot be generalized to the entire United States population, since the sample was taken from a selected area. The second limitation was the majority of the sample population reported their race as white, non-Hispanic, this can cause an underrepresentation of other minority groups who have severe opioid use disorder and childhood abuse experiences. A third is participants answering questions in person with an interviewer, this could lead to response bias by underreporting childhood abuse history, and characteristics of drug use.

Suggestions for further research

The study focused on three of the ten possible categories of childhood abuse experiences. By broadening the categories, future studies may find additional factors that lead to drug initiation characteristics. According to the CDC, in 2017, the top three states that reported the highest rate of opioid use overdoses were West Virginia, Ohio, and Pennsylvania. With a prevalence of 20 states exceeding the national average rate of overdoses by 21.7 per 100,000 people, it would be important to study a variety of locations that have these exceeding rates reported by the CDC. Future research should focus on women who have childhood abuse and the relationship of opioid initiation related risk, because women are more likely to report abuse than men.

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