

An Evaluation of the Relationship Between the use of Methamphetamine and Suicide Ideation

by

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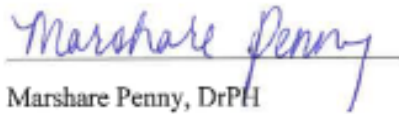
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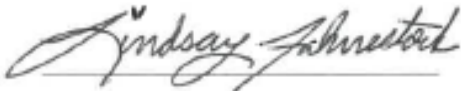
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Abstract

Methamphetamine (MA) use is a worldwide problem, with more users than cocaine and opiates combined (LaGasse et al., 2012). According to the World Health Organization (WHO) (2019), over 35 million individuals regularly use/abuse one of the types of amphetamine/methamphetamine. Abusing methamphetamine can cause mental health issues and a lot of emergency room visits that cost 23.4 billion in 2005 (Nicosia, 2005). The purpose of this study was to evaluate the relationships between methamphetamine use and suicidal ideation as well as methamphetamine use and depression. The study was conducted using the 2017 National Survey on Drug Use and Health data (NSDUH), which is a cross-sectional study that interviews United States residents and evaluates their drug use and health. Subjects were drawn using a random sample of all adults' ages 18 years of age and above. The 2,814 participants in the study consisted of 1,407 methamphetamine users and 1,407 non methamphetamine users; however not all participants sampled answered all questions and therefore each analysis features a smaller different sample size all above the minimum sample size required. A Chi-Square Test of Independence was conducted to analyze the relationship between the use of methamphetamine, suicidal ideation, depression and gender. The results indicated a significant relationship between methamphetamine and suicidal ideation ($P > 0.043$). A smaller sample ($n = 597$) of participants were eligible to complete the suicidal ideation question and therefore included in the analysis for the research question comparing suicidal ideation in methamphetamine users and those who have never used methamphetamines. Results indicated a significant relationship between methamphetamine use and self-reporting depression ($P < .001$). An analysis of the 414 individuals in the sample who both used methamphetamines and who responded to the suicidal ideation question indicated no significant relationship between gender and suicidal ideation amongst those who have used methamphetamines at some point; 42.6% of males, compared to

54.4% females ($P > 0.503$). This study illustrated an association between Methamphetamine use and factor that caused depression and suicidal ideation. Future studies should evaluate other socioeconomic or social determinant factors.

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Review of Literature

Introduction

Methamphetamine (MA) use is a worldwide problem, with more users than cocaine and opiates combined (LaGasse et al., 2012). According to the World Health Organization (WHO) (2019), over 35 million individuals regularly use/abuse one of the types of amphetamine/methamphetamine. Cocaine use is limited to approximately 15 million worldwide and heroin is used by fewer than 10 million. MA is frequently compared to cocaine as both are sympathomimetic agents, are substances that mimic or modify the actions of endogenous catechol amines of the sympathetic nervous system. However, the neurotoxic effects of MA may be greater than cocaine due to its longer half-life and more sympathomimetic mechanisms. The prevalence of methamphetamine use continues to be an escalating concern. The abuse of methamphetamine is becoming one of the biggest drug issues in the United States. According to the 2010 National Survey on Drug Use and Health, 353,000 individuals in the United States used methamphetamine in the past month. In contrast to other illicit drugs, methamphetamine is unique in that it is the only substance that can be manufactured from accessible store-bought chemicals. MA is one of the easiest but incredibly dangerous drugs to gain exposure. MA abuse continues to be a significant problem in this country and poses important health risks including being one of the leading causes of suicidal ideation (NIDA, 2018). Methamphetamine is one of the most addictive drugs of abuse in the United States (Barr et al., 2006).

Misuse of MA creates a significant risk factor for suicide, second only to depression (Samhsa, 2016). Among illicit drug-users, suicide is an assisting agent to additional mortality, estimated to account for more than 10% of deaths (Darke et al., 2007). "Illicit" refers to use of illegal drugs, and misuse of prescription drugs (NIDA, 2018). Research suggests that

methamphetamine use is associated with high rates of suicidal behaviors (Barr et al., 2006). In a study of 1,016 methamphetamine- dependent adults entering treatment, 28% of women and 13% of men reported a lifetime history of suicide attempts (SA) (Glasner-Edwards et al., 2009). The relationship between neurobiological and psychosocial contributes to suicidality in methamphetamine users, methamphetamine intoxication and withdrawal are associated with psychiatric symptoms that may elevate risk, including impulsivity and depressed mood (Glasner-Edwards et al., 2009). MA can be smoked, snorted, and even injected directly to one's veins. Although most MA users do not inject the substance, previous studies indicated those who do inject are more severely dependent (McKetin et al., 2008), increasing their risk of non-fatal overdose. These individuals are also more likely to engage in risk behaviors that contribute to HIV infection and are more likely to experience social stigma (Semple et al., 2004). The National Institute on Drug Abuse (NIDA) reports, as of 2015 around 6 percent of the American population (aged 12 and older) has tried MA at least once (NIDA, 2018).

Methamphetamine

Methamphetamine use has increased significantly since the 1990s, reported being the second most widely misused substance, exceeded only by cannabis (WHO, 1997). MA was trafficked mainly by motorcycle gangs during the 1960s and 1970s. Because the chemicals necessary to produce MA are relatively easy to obtain, a lot of home-based laboratories have been commonly uncovered by law enforcement agencies (Darke, 2008). MA has become a cultural phenomenon. Methamphetamine is a powerful, highly addictive stimulant that affects the central nervous system (George, 2005). Crystal methamphetamine is a form of the drug that has the appearance of glass fragments or shiny, bluish-white rocks. It is chemically similar to amphetamine, a drug used to treat attention-deficit hyperactivity disorder (ADHD) and

narcolepsy, a sleep disorder (Volkow, 2014). Other common names for methamphetamine include blue, crystal, ice, meth, and speed. Methamphetamine abuse has spread to every region of the United States in the past 10 years. Its long-lasting, difficult-to-treat medical effects destroy lives and create psychiatric and physical comorbidities (Gonzales et al., 2010). Long-term methamphetamine use has many other negative consequences, including; extreme weight loss, severe dental problems, intense itching, leading to skin sores from scratching, anxiety, changes in brain structure and function, confusion, memory loss, sleeping problems, violent behavior, paranoia, extreme and unreasonable distrust of others, and even hallucinations, sensations and images that seem real though they are not (Volkow, 2014).

Methamphetamine is a controlled substance since it can be used for a small number of medical conditions. It is rarely prescribed by providers unless truly necessary because of the high potential for abuse and addiction as well as the side effects (Rawson, 2001). It increases energy, focus, and concentration. It makes the user feel awake, alert, and euphoric (Rawson, 2001). For these reasons, many people turn to MA as a substance of abuse. Side effects also include paranoia, extreme mood swings, violent outbursts, homicidal tendencies and anxiety. The signs and symptoms of MA use and schizophrenia have many similarities, such as psychosis, delusions, and extreme paranoia. (Rawson, 2001) MA is noted for its addictiveness, occurs more rapidly than with cocaine (Gonzalez, 2000). While suicidal thoughts have long been known as a side effect of meth use, recent research has found that meth users are much more likely to attempt suicide than users of other types of drugs (Zweben et al, 2004). Even those who use the drug less frequently are at an increased risk for suicide. One possible reason modeled by the researchers is that meth users tend to be more socially isolated than people who use other drugs (Zweben et al, 2004).

New research indicates that methamphetamine, a drug that has increased in interest amongst the young adult crowd for some time, is more likely to push a user to the brink of suicide compared to other drugs. Those who use MA through injection are also eighty percent more likely to attempt a suicide than addicts who abuse other drugs are (Lineberry et al, 2006). As previously described, compared to other injection drug users, it is possible that methamphetamine users are more isolated and have poorer social support systems. Previous studies contend that since MA is a highly addictive drug which causes more volatile behavior and thought patterns, making suicide a more likely outcome for those abusing the substance. An estimated 964,000 people aged 12 and older qualified as having a methamphetamine use disorder in 2017, becoming dependent on it (NIDA, 2018). Death due to MA rises from 10,749 in 2017 to 12,987 in 2018 (NIDA, 2018). The physical effects of this drug can lead to fatalities, but the truly troubling side effects are psychological (Lineberry et al, 2006). MA being associated with criminality and social decline; it makes it a social and political dilemma for public health (Darke, 2008).

Suicide

Depression is one of the most common co-occurring mental health disorders seen amongst MA users. Research indicates that approximately 40 percent of adults using amphetamines have a lifetime history of depression (Glasner-Edwards et al, 2009). Intravenous MA users reported more depressive symptoms compared to users who smoked or snorted meth (Glasner-Edwards et al, 2009). With chronic MA use, dopamine levels and activity can become severely depleted in the brain, resulting in a condition called anhedonia or an impaired ability to experience pleasure (Glasner-Edwards et al, 2009). Some of the features of depression, such

as isolation and lack of motivation, make it difficult to recovery. MA addiction and co-occurring depression can increase your vulnerability to self-harming behaviors and suicidal thoughts. Studies of deceased and living substance users indicate that individuals with higher levels of depression, prior aggression or victimization, higher levels of interpersonal stress, and more severe substance use are more likely to die by suicide or make a suicide attempt (Britton et al 2010).

According to the CDC (2017) unintentional injury and suicide are the 5th and 11th overall leading causes of death in the U.S., respectively Overdoses (ODs) are major contributors to these outcomes, representing the 2nd leading cause of unintentional injury-related deaths and the 3rd leading cause of death by suicide. ODs that do not result in death also contribute to significant physical morbidity including peripheral neuropathy, pulmonary edema, arrhythmia, acute cardiomyopathy, hemoglobinemia, rhabdomyolysis, and hypoxia, and result in expensive treatment (Warner-Smith et al., 2002). Non-fatal overdoses and suicide attempts are also common among individuals with substance-related problems (Borges et al., 2000).

Gender

Men are more likely than women to use almost all types of illicit drugs and are more likely to experience a negative outcome such as a related emergency department visit or overdose death (Roy, 2003). For most age groups, men have higher rates of use or dependence on illicit drugs than do women (Roy, 2003). However, women are just as likely as men to develop a substance use disorder. In addition, women may be more susceptible to craving and relapse, which are key phases of the addiction cycle. Research has shown that women often use and respond to drugs differently, and can have unique obstacles to effective treatment, such as not being able to find child care or being prescribed treatment that has not been adequately tested on women (National Institute on Drug Abuse (NIDA), 2018)

Research has suggested that women may be more vulnerable to the reinforcing effects of stimulants, with estrogen possibly being one factor for this increased sensitivity (NIDA, 2018). With methamphetamines, women report using the drug because they believe it will increase energy and decrease exhaustion associated with work, home care, child care, weight loss and family responsibilities. Women who use methamphetamine also have high rates of co-occurring depression. Women tend to begin using methamphetamine at an earlier age than do men, with female users typically more dependent on methamphetamine compared to male users (NIDA, 2018). Women are also less likely to switch to another drug when they lack access to methamphetamine. In addition, as with other substances, women tend to be more receptive than men to methamphetamine treatment (NIDA, 2018).

Conclusion

According to data from the 2017 National Survey on Drug Use and Health (NSDUH), over 14.7 million people have tried methamphetamine at least once. NSDUH also reports that almost 1.6 million people used methamphetamine in the year leading up to the survey, remaining one of the most commonly misused stimulant drugs in the US. Methamphetamine use is becoming a growing epidemic in the world (Galbraith, 2015). Using MA once can cause cravings that drive repeated use. Smoking, snorting or shooting the drug for multiple days can lead to methamphetamine withdrawal symptoms and addiction. Once people develop a meth addiction, they're at risk of developing a variety of health problems (Volkow, 2014). MA have a devastating impact on the body and used repeatedly can cause major physical changes. Many effects take years to heal and some are permanent. Short-term side effects of MA, such as rapid heartbeat, high blood pressure and increased body temperature, usually fade when MA leaves the body (Volkow, 2014). However, the long-term effects don't go away as quickly. Some effects of

meth continue for years after last use. MA causes euphoria by changing the balance of chemicals in the brain that regulate mood. These chemicals, including dopamine, affect how the brain functions. With repeated MA use, the brain's chemical balance becomes disrupted. As a result, many people experience mental health problems. The death rate, being 1.9 per 10, for MA use is extremely high because MA takes control of one's brain (Darke, 2019). When being addicted to such a powerful drug like MA, the problem is when you try to stop using it, it makes you feel really slowed down. Some might even say depressed; some even start having suicidal thoughts. And for some people the only way for them to come off MA is to end their lives, by suicide (Roy, A. 2003).

Research shows that men are more likely than women to use almost any type of illicit drugs and are more likely to end up in the emergency room (Hser, 2005). Both men and women are equally likely to develop a substance use disorder, but women are more likely to be susceptible to cravings and relapse. Women use and respond to drugs differently. Women report using the drug because they believe it increases energy and decrease exhaustion associated with work, home care, child care and all other family responsibilities (Hser, 2005). Weight loss is another incentive reported more by women than men who use MA. In a study done by Brecht, women who use MA have a higher rate of co-occurring depression (2004). Even though it has been proven that women tend to begin using MA at an earlier age than men, females typically become more dependent on MA but are less likely to switch to another drug once they lack access to MA. Women tend to be more receptive to treatment than men (Hser, 2005).

MA is a highly addictive stimulant with long-lasting effects on the body (Darke, 2008). Long-term use of MA can lead to several mental health disorders, depression being the most common (Darke, 2008). When an individual is on MA, the brain isn't producing the pain

relieving and euphoric chemicals needed, causing depressive feelings to emerge. MA and depression together create cyclic states of hopelessness and euphoria, because of that approximately 40 percent of adults using MA have life time history of depression, leading to suicidal ideation (Darke, 2008). According to the CDC, suicide is the tenth leading cause of death, having more than 41,000 deaths in 2013 (2015). Data from the National Survey on Drug Use and Health indicated that 9.4 million people age 18 or older have had serious thoughts of suicide in the past 12 months (SAMHSA, 2014). The prevalence of suicide ideation and suicide attempts vary based on multiple factors, such as; demographic, individual, age and substance use. Within the adult population, 2.7 million reported making a suicide plan and 1.1 million reported a suicide attempt (SAMHSA, 2015). People with substance use disorder are particularly susceptible to suicide and suicide attempts. According to the SAMHSA data, the number of emergency department visits for drug-related suicide attempts increased 51 percent overall from 2005 to 2011 (2014).

Purpose of the Study

The purpose of this study is to attempt to understand the differences in suicidal ideation between those who do and do not use Methamphetamine as well as understand gender differences of those MA users and suicide ideation. Previous studies have indicated that Methamphetamine is a very serious public health concern. The use of this drug has been associated with consequences, not for only the users but also their loved ones. Second, it has been indicated through previous studies that MA has negative consequences, resulting in not only physical damages but also psychological damages, leading to suicidal thoughts and eventually death. Due to the high rate of use of MA in the United States, understanding the risks of suicide ideation is essential.

Research Questions

In this study there are three research questions which include:

1. Is there a significant association between the self-reported rate of suicidal ideation and methamphetamine use?
2. Is there a significant association between the self-reported rate of depression and methamphetamine use?
3. For those who self-report using methamphetamine at some point in their lifetime, is there a relationship between the self-reported rate of suicidal ideation and gender?

Hypotheses

H1: It is hypothesized that there is a relationship between self-reported suicidal ideation and methamphetamine use at any point in respondents' lifetime.

H2: It is hypothesized that there is a relationship between self-reported depression and methamphetamine use at any point in respondents' lifetime.

H3: It is hypothesized that even though women use methamphetamine at a higher rate, men who use methamphetamines are more likely to experience suicidal ideation.

Methods

Design

This study utilizes a cross sectional study design and includes data from the 2017 National Survey on Drug Use and Health (NSDUH), which was collected by the Substance Abuse and Mental Health Services Administration (SAMHSA). With a total of 68,032 data entries, only 56,276 of those entries were released in the public dataset used in this study. The NSDUH is a respected national survey which includes data related to substance use, physical health, and mental health among people aged 12 years and older in the population of the United States. This survey provides annually updated data on the use of illegal drugs, prescription drugs, alcohol, tobacco, mental disorders, treatment, and co-occurring substance use and mental disorders at the national, state and sub-state levels.

Participants

The data used for this study included NSDUH participants 12 years old and over, answering interview questions about whether they have ever used methamphetamine in their lifetime, whether or not they ever felt depressed, and if they ever experienced any suicidal ideations. Due to the large sample size of adult respondents provided by the 2017 NSDUH data and to avoid any type 1 errors, a sample was drawn from all 2017 respondents. The sample size was drawn using G*Power Software, Version 3.1.9.2, with a moderate effect size, an alpha level of .05, and a power of 80%, which provided a minimum sample size of 278 participants. In an effort to include a large enough sample of individuals who answered “yes” or “no” to methamphetamine ever in lifetime use and suicidal ideation, a subset question, a larger initial sample was taken and the data for all inapplicable responses recoded to remove those respondents. To guarantee representativeness of the sample, a stratified 5% sample was drawn

three times to guarantee all frequencies and descriptive analysis were similar to the overall population. A final stratified random sample of 2,814 participants was taken, including 1,407 methamphetamine users and 1,407 individuals who have never used methamphetamines. The first research question only utilized a smaller sample ($n = 597$) of participants who were eligible to respond and reported “yes” or no” to suicidal ideation question since only these individuals could be included in the analysis for the research question comparing suicidal ideation in methamphetamine users and those who have never used methamphetamines.

Procedures

The Substance Abuse and Mental Health Services Administration (SAMHSA) is the agency within the U.S. Department of Health and Human Services that leads public health efforts to advance the behavioral health of the nation, which is responsible for collecting the data for the National Survey on Drug Use and Health (NSDUH) (National Survey on Drug Use and Health, 2017). SAMHSA's mission is to reduce the impact of substance abuse and mental illness on America's communities (NSDUH, 2017). Since reliability and validity are important, there are multiple steps to collecting their data. A computer-assisted interviewing (CAI) method is used to provide private and confidential setting to complete the interview, since no names of respondents are collected for this data. Data is collected quarterly, with each data collection effort lasting the full 3 months. Each US household is selected randomly by the NSDUH to participate. Then an introductory letter is sent to the sampled addresses, followed by a Field Inspector (FI) visit. Then FI schedules to ask to speak with an adult resident who can serve as the screening respondent, and within a 5-minute a screening is done on a handheld tablet computer. Immediately after completion of the screener, FIs attempt to conduct the NSDUH interview with each sampled person in the household. In the ACASI portion of the interview, the respondent reads questions

on the computer screen or listens to questions through headphones and then enters his or her answers directly into the computer without the FI knowing the response. FIs transmit the completed interview data to RTI a non-profit organization in Research Triangle Park, North Carolina. Screening and interview data are encrypted while they reside on the laptop and tablet computers (National Survey on Drug Use and Health, 2017). Data are transmitted back to RTI on a regular basis using wireless connection to the Internet. All data are encrypted while in transit across Internet connections. In addition, the screening and interview data are transmitted back to RTI in separate data streams and are kept physically separate (on different devices) before transmission occurs (National Survey on Drug Use and Health, 2017). It is noted that just because the RTI interviewer started the process, doesn't mean they will be selected for the survey. After the data are transmitted to RTI, certain cases are selected for verification. Samples of respondents who completed screenings or interviews are randomly selected for verification. Those selected receive a 30-dollar incentive for completing the interview. To ensure the uttermost confidentiality each NSDUH participant is assigned a unique code number, not even the interviewer will know the participants unique code or answers to the interview questions (National Survey on Drug Use and Health, 2018).

Independent Variable

The study consisted of three research questions. The independent variable for all three questions was Methamphetamine use, measured by the question, "*Have you ever, even once, used methamphetamine?*" Gender was also an independent variable for the third research question "*For those who self-report using methamphetamine at some point in their lifetime, is there a relationship between the self-reported rate of suicidal ideation and gender?*" when evaluating if there was a relationship between suicidal ideation and gender.

Dependent Variables

In this study there were two dependent variables. The dependent variable for the first research question was patients' self-reported suicidal ideation, measured by the question "*Did you think about committing suicide?*" With the response options of Yes, No, don't know and some even refused to respond. When running the data, only the participants who responded with Yes or No were used for this study.

The second dependent variable was whether or not any self-reported depression, determined by the question: "*Have you ever had a period of time lasting several days or longer when most of the day you felt very discouraged or hopeless about how things were going in your life?*" with the possible response of Yes, No, bad data (logically assigned), don't know, refused, left blank or legitimate skip. But only the participants who responded with Yes or No were used for this study.

Data Analysis

The first research question was evaluated by using a Chi Square Test of Independence to understand if there is a relationship between self-reported suicidal ideation and methamphetamine use. The second question of the study was also assessed using a Chi Square Test of Independence to determine if there is a relationship between methamphetamine use and depression. The third question was also evaluated using a Chi Square Test of Independence to determine if there is a relationship between gender and suicidal ideation among methamphetamine users.

Results

Participant Demographics

To evaluate the research questions for this study, data was analyzed from the 2017 National Survey on Drug Use and Health. Due to the low proportion of the sample who utilized methamphetamines, a stratified random sample was taken in order to compare similar samples of those who have and have not used methamphetamines. The total sample size for this research was 2,814 participants, 1,407 individuals of whom had used methamphetamine during their lifetime and 1,407 who self-reported they had never used methamphetamine. Forty-four percent of participants were male and 55.8 percent were female. Participants that answered yes or no to self-reported suicidal ideation made up 30 percent of the sample leaving 70 percent reporting they have never thought of suicide at the time of the interview. Sixty-seven percent of participants who answered yes to using methamphetamine self-reported being depressed. Participants ranged from ages 18 years old and older and were classified as of Hispanic or Latino descent or not.

Self-reported rate of suicidal ideation and methamphetamine use

In order to answer the research question, “Is there a significant association between the self-reported rate of suicidal ideation and methamphetamine use?” a Chi-square test of independence was performed utilizing data for the 597 respondents. Results determined there was a significant association between methamphetamine use and suicidal ideation, $X^2(1) = 1.435, p = .043$. With an odds ratio of 1.435 (Table 2). Since an odds ratio determines the strength of the association between methamphetamine and suicidal ideation, being 1.435 makes the odds higher, but it also represents an elevated risk of at least 1% (1.01, 2.040).

Self-reported rate of depression and methamphetamine use

To answer the second research question, “Is there a significant association between self-reported depression and methamphetamine use?” a Chi-square test of independence was performed. In alignment with the research hypothesis and supporting literature that states methamphetamine use is a determinate factor of depression, the results determined there was a significant association between methamphetamine and reported rates of depression, $X^2(1) = 2.193, p < .001$. With an odds ratio of 2.193 (Table 3). Since an odds ratio determines the strength of the association between methamphetamine and suicidal ideation, being 2.193 makes the odds higher, but it also represents an elevated risk of at least 85% (1.853, 2.595).

Self-reported rate of suicidal ideation and gender

To answer the third research question, “For those who self-report using methamphetamine at some point in their lifetime, is there a relationship between the self-reported rate of suicidal ideation and gender?”, a Chi-square test of independence was performed. While the research hypothesis stated that while women have been shown to use methamphetamine at a higher rate, men who use methamphetamines may be more likely to experience suicidal ideation, the results determined there was no significant association between methamphetamine use and reported rates of depression, $X^2(1) = .876, p = .503$ (Table 4). Since an odds ratio determines the strength of the association between methamphetamine and suicidal ideation, being .876 makes the odds lower.

Discussion

Summary of Major Findings

The purpose of this study was to determine if there was a relationship between methamphetamine use and suicidal ideation. It was also intended to examine a potential relationship between methamphetamine use and depression as well as gender and methamphetamine use. Numerous studies demonstrated a relationship between methamphetamine users and suicidal ideation, and this study found the same outcome (Isometsa, 2014). Since methamphetamine is a highly addictive stimulant with long-lasting effects on the body, it can lead to several mental health disorders, including depression (Isometsa, 2014). Chronic methamphetamine exposure has been associated with neurotoxic effects, profound neuropsychological deficits, and significant impairment in health-related quality of life, including degraded physical and social functioning (Isometsa, 2014). Forty percent of adults using MA have a lifetime history of depression, leading to suicidal ideation (Isometsa, 2014). The Centers for Disease Control and Prevention (CDC) classify suicide as the tenth leading cause of death (CDC, 2018). My study is different from other studies because I focused primary on those who answered the methamphetamine question, to see how the use of methamphetamine can really effect ones brain and the effects of self- reported depression leading to suicidal ideation. Future studies should continue to explore gender differences in methamphetamine use, since the information might be helpful in developing new treatment programs.

Future studies should be completed to understand the damages of chronic methamphetamine use. A large number of methamphetamine users come from a lower socioeconomic background, where they cannot always afford methamphetamine so they create the substance at home, potentially causing even more harm to themselves (Darke, 2008).

Methamphetamine use is only growing and according to the Montana Meth Project (MMP), building awareness can help minimize usage (Anderson, 2010). According to the WHO, gender is a determinant of the differential power and control men and women have over the socioeconomic determinants of their mental health and lives, their social position, status and treatment in society (Hellem, 2015). Depression is not only the most common women's mental health problem but may be more persistent in women than men (Hellem, 2015). Although research has shown men are more likely to use methamphetamine than women, women are more likely to crave and relapse (Hellem, 2015). Men and women may use methamphetamine for difference reasons. Women are more likely to seek help from and disclose mental health problems to their primary health care physician, while men are more likely to seek specialist mental health care and are the principal users of inpatient care (Hellem, 2015).

Study Limitations

The research in this study has numerous limitations, which need further exploration. First, this study only sampled data collected through the 2017 National Survey on Drug Use and Health data, and the approach of the data collection has not changed since 1991 (SAMHDA, 2019). That is a limitation because technology has improved so much since then, door to door doesn't have to be an option anymore, and data can now be collected via telephone apps, where everything will still stay 100 percent confidential. A small stratified 5% sample was drawn allowing for comparison of equal number of methamphetamine users and those who have never used methamphetamines. With that being said the outcome of this study might have improved if we used a cohort study instead of a cross sectional study.

Most of the NSDUH data is self-reported and cannot be interpreted into objective information because of self-perception. The data collected was through a computer, which can

also be a limited way to sample. For instance, since the respondent either reads the question themselves or uses headphones as the Field Investigator is standing there, the respondent can feel uncomfortable and answer quickly just to complete the survey. Making it a self-report bias, and since the participants are being observed they are effected by the Hawthorne effect. Non-response errors by respondents can also be another limitation. Some of the answers provided, were noted in categories such as “don’t know” or “refused” requiring re-coding and impacting the original sample size available for analysis. Some respondents even skipped questions, leaving them blank resulting in insufficient information and establishing unreliable findings when analyzing data.

Public Health Implications

The findings of this study indicate that there is a relationship between methamphetamine use and suicidal ideation, despite the fact that most methamphetamine users develop depression (Isometsa, 2014). Depending on gender, individuals may delay seeking medical care or services (Isometsa, 2014). The results from this study can help explain the many risk factors of methamphetamine abuse. Future studies exploring methamphetamine use and suicidal ideation should dive deeper into other factors that may explain how methamphetamine impacts decision making and self-control, why people start using methamphetamine initially, and why the drug is so easily accessible. A long-term cohort study is ideal, to see if the effects of methamphetamine is long term or just while the person is using the drug.

Understanding that there is a relationship between methamphetamine use and suicidal ideation further reinforces how methamphetamine is a very dangerous substance. The relationship between methamphetamine use and suicidal ideation also illustrates that more data needs to be analyzed to understand the many health risks of methamphetamine. This research can

also help identify the real danger of substance abuse, especially methamphetamine. Research can help inform the creation of additional educational materials that are geared towards receiving the right treatment and rehabilitation support before it is too late. This may also help grant writers and fund-raising departments really focus on the public health substance abuse related issues that require the most funding, advocacy, education, and treatment. Since amphetamines can be prescribed by a doctor, one public health implication can be to regulate a policy on prescribing amphetamines. With that being said this can support the advocacy for community resources, better treatment centers, and prevention education. This further research can also help to better our public health communities by reducing the overall mental health issues created by substance abuse. Empowering our communities with providing proper health education and proper treatment can save lives.

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Appendix

Tables

Table 1

Demographics Details for 2017 NSDUH Participants (n = 2,814)

		<i>N</i>	<i>%</i>
Gender	Male	1458	51.8
	Female	1356	48.2
Age	18 to 25	564	20
	26 to 34	564	20
	35-49	771	27.4
	50 and Older	542	19.3
Ethnicity	White	1881	66.8
	Black	241	8.6
	Native American/Alaska Native	78	2.8
	Native Hawaiian/ Other Pacific Islander	18	.6
	Asian	72	2.6
	More than one race	105	3.7
	Hispanic	419	14.9
Suicidal Ideation	Yes	827	30
	No	1,987	70

Note: n = sample size; % = percentage. Data Source: 2017 NSDUH

Table 2

Bivariate Association between Methamphetamine and Suicidal Ideation (n=597)

Methamphetamine	Yes- Suicidal Ideation <i>n (%)</i>	No- Suicidal Ideation <i>n (%)</i>	Adjusted OR 95% CI
Yes	209 (73.3)	205(65.7)	1.435*
No	76 (26.7)	107 (34.3)	(1.01, 2.040)

OR=Odds Ratio; CI = Confidence Interval. Chi-Square Test of Independence to determine relationship between Methamphetamine and Suicidal Ideation. * $p = .043$

Table 3

Bivariate Association between Methamphetamine and Depression (n=671)

Methamphetamine	Yes- Depression <i>n</i> (%)	No- Depression <i>n</i> (%)	Adjusted OR 95% CI
Yes	671 (67.4)	694(48.6)	2.193*
No	324 (32.6)	735 (51.4)	(1.853, 2.595)

OR=Odds Ratio; CI = Confidence Interval. Chi-Square Test of Independence to determine relationship between Methamphetamine and Depression. * $p = .001$

Table 4

Bivariate Association between Gender and Suicidal Ideation (n=414)

Methamphetamine	Yes- Suicidal Ideation <i>n (%)</i>	No- Suicidal Ideation <i>n (%)</i>	Adjusted OR 95% CI
Male	89 (42.6)	94(45.9)	.876
Female	120 (57.4)	111 (54.1)	(.594, -1.291)

OR=Odds Ratio; CI = Confidence Interval. Chi-Square Test of Independence to determine relationship between Gender and Suicidal Ideation. * $p= .503$