National Institute on Drug Abuse
Advancing Addiction Science

Research Report
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Substance Use in Women Research Report

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Summary

People may face unique issues when it comes to substance use, as a result of both sex and gender. *Sex differences* result from biological factors, such as sex chromosomes and hormones, while *gender differences* are based on culturally defined roles for men and women, as well as those who do not identify with either category. Gender roles influence how people perceive themselves and how they interact with others.[1,2] Sex and gender can also interact with each other to create even more complex differences among people. While the NIH is working to strengthen research on sex/gender differences across domains of health, current evidence is limited; for the purpose of this report, male and female subjects identify as such across both sex and gender.

Examples of Sex and Gender Influences in Smoking Cessation

Sex Difference: Women have a harder time quitting smoking than men do. Women metabolize nicotine, the active ingredient in tobacco, faster than men. Differences in metabolism may help explain why nicotine replacement therapies, like patches and gum, work better in men than in women. Men appear to be more sensitive to nicotine's pharmacologic effects related to substance use disorder.

Gender Difference: Although men are more sensitive than women to nicotine's addiction-related effects, women may be more susceptible than men to non-nicotine factors, such as the sensory and social stimuli associated with smoking (e.g. greater sensitivity to visual and olfactory cues as triggers and greater concern about weight gain while quitting).

Sources: ORWH, 2015; NIDA, 2002

For example, women and men sometimes use drugs for different reasons and respond to them differently. Additionally, substance use disorders can manifest differently in women than in men. A substance use disorder occurs when a person continues to use drugs or alcohol even after

experiencing negative consequences.

Some of the unique issues women who use drugs face relate to their reproductive cycles. Some substances can increase the likelihood of infertility[3–5] and early onset of menopause.[6] Substance use is also further complicated during pregnancy and breastfeeding. Pregnant women using drugs, including tobacco and alcohol, can pass those drugs to their developing fetuses and cause them harm. Similarly, new mothers using drugs can pass those to their babies through breast milk and cause them harm. (See Substance Use While Pregnant and Breastfeeding)

Unfortunately, it can be difficult for a person with a substance use disorder to quit, and some women with such disorders fear that seeking help while pregnant or afterward could cause them legal or social problems. Communities can build support systems to help women access treatment as early as possible,[7] ideally before becoming pregnant. If a woman is unable to quit before becoming pregnant, treatment during pregnancy improves the chances of having a healthier baby at birth.[8,9]

Women, pregnant or not, have unique needs that should be addressed during substance use disorder treatment. Effective treatment should incorporate approaches that recognize sex and gender differences, understand the types of trauma women sometimes face, provide added support for women with child care needs, and use evidence-based approaches for the treatment of pregnant women.[10] (See Sex and Gender Differences in Substance Use Disorder Treatment)

Despite the many differences between men and women, for many years most animal and human research has traditionally used male participants. To find out more about sex and gender differences to inform better treatment approaches, federal agencies have developed guidelines to promote the inclusion of women and analyses of sex and gender differences in research.[11,12] (See The Importance of Including Women in Research)

Sex and Gender Differences in Substance Use

Men are more likely than women to use almost all types of illicit drugs,[13] and illicit drug use is more likely to result in emergency department visits or overdose deaths for men than for women. "Illicit" refers to use of illegal drugs, including marijuana (according to federal law) and misuse of prescription

drugs. For most age groups, men have higher rates of use or dependence on illicit drugs and alcohol than do women.[14] However, women are just as likely as men to develop a substance use disorder.[15] In addition, women may be more susceptible to craving[16–19] and relapse,[20,21] which are key phases of the addiction cycle.

> Research has shown that women often use drugs differently, respond to drugs differently, and can have unique obstacles to effective treatment as simple as not being able to find child care or being prescribed treatment that has not been adequately tested on women.

Illegal Drugs

Marijuana (Cannabis)

Similar to other addictive drugs, fewer females than males use marijuana.[13] For females who do use marijuana, however, the effects can be different than for male users. Research indicates that marijuana impairs spatial memory in women more than it does in men,[22,23] while males show a greater marijuana-induced high.[24,25]

In one study specific to teenagers, male high school students who smoke marijuana reported poor family relationships and problems at school more often than female students who smoke marijuana.[26] However, a few studies have suggested that teenage girls who use marijuana may have a higher risk of brain structural abnormalities associated with regular marijuana exposure than teenage boys.[27,28]

Animal studies show that female rats are more sensitive to the rewarding,[29,30] pain-relieving,[31–33] and activity-altering[31,33,34] effects of marijuana's main active ingredient, *delta-9-tetrahydrocannabinol* (THC). Many of these differences have been attributed to the effects of sex hormones,[29,31,35–37] although rodent research also points to the possibility that there are sex differences in the functioning of the endocannabinoid system, the system of brain signaling where THC and other cannabinoids exert their actions.[30,38]

Marijuana Use Disorder

Men	Women
Similarities	
▪ At least one other mental health disorder ▪ Low rate of seeking treatment	
Differences	
▪ Other substance use disorders ▪ Antisocial personality disorder ▪ Severity of disorder	▪ Panic attacks ▪ Anxiety disorders ▪ Disorder develops more quickly

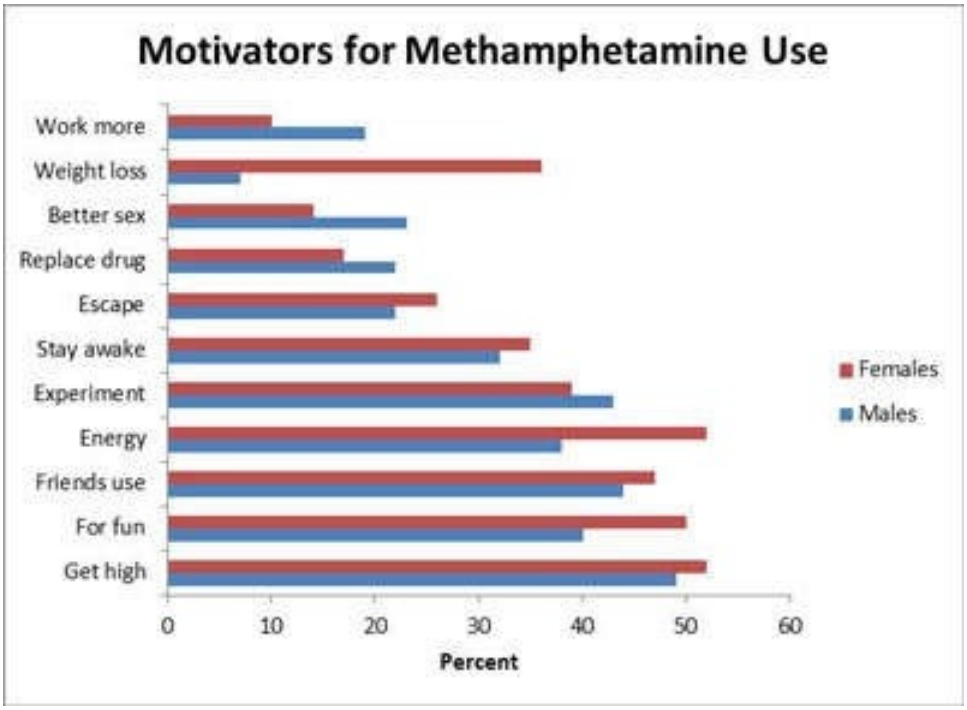
For both sexes, marijuana use disorder is associated with an increased risk of at least one other mental health condition, such as depression or anxiety. However, men who are addicted to marijuana have higher rates of other substance use problems as well as antisocial personality disorders. By contrast, women who are addicted to marijuana have more panic attacks[39] and anxiety disorders.[40,41] Although the severity of marijuana use disorders is generally higher for men, women tend to develop these disorders more quickly after their first marijuana use.[42] Rates of seeking treatment for marijuana use disorder are low for both sexes.[43]

Stimulants (Cocaine and Methamphetamine)

Research in both humans and animals suggests that women may be more vulnerable to the reinforcing (rewarding) effects of stimulants, with estrogen possibly being one factor for this increased sensitivity.[44–47] In animal studies, females are quicker to start taking cocaine—and take it in larger amounts—than males. Women may also be more sensitive than men to cocaine's effects on the heart and blood vessels. In contrast, female and male cocaine users show similar deficits in learning, concentration, and academic achievement, even if women had been using it longer. Female cocaine users are also less likely than male users to exhibit

abnormalities of blood flow in the brain's frontal regions. These findings suggest a sex-related mechanism that may protect women from some of the detrimental effects of cocaine on the brain.[48]

As for methamphetamine, women report using the drug because they believe it will increase energy and decrease exhaustion associated with work, home care, child care, and family responsibilities. Weight loss is another incentive women cite for methamphetamine use—and one reported significantly more by women than by men.[49,50] Women also report using methamphetamine because they believe it will increase energy and decrease exhaustion associated with work, home care, child care, and family responsibilities.[49,50] Women who use methamphetamine also have high rates of co-occurring depression.[51–54]



Source: Brecht et al., 2004

Women tend to begin using methamphetamine at an earlier age than do men,[50,51] with female users typically more dependent on methamphetamine compared to male users.[53,55] Women are also less likely to switch to another drug when they lack access to methamphetamine.[50] In

addition, as with other substances, women tend to be more receptive than men to methamphetamine treatment.[51,54,56]

MDMA (Ecstasy, Molly)

Research suggests that MDMA produces stronger hallucinatory effects in women compared to men, although men show higher MDMA-induced blood pressure increases.[57] There is some evidence that, in occasional users, women are more prone than men to feeling depressed a few days after they last used MDMA.[58] Both men and women show similar increases in aggression a few days after they stop using MDMA.[58,59]

MDMA can interfere with the body's ability to eliminate water and decrease sodium levels in the blood, causing a person to drink large amounts of fluid. In rare cases, this can lead to increased water in the spaces between cells, which may eventually produce swelling of the brain and even death. Young women are more likely than men to die from this reaction, with almost all reported cases of death occurring in young females between the ages of 15 and 30.[60,61] MDMA can also interfere with temperature regulation and cause acute hyperthermia, leading to neurotoxic effects and even death.[62]

Heroin

Research suggests that women tend to use smaller amounts of heroin and for less time, and are less likely than men to inject it.[63] Most women who inject heroin point to social pressure and sexual partner encouragement as factors.[63–66] One study indicates that women are more at risk than men for overdose death during the first few years of injecting heroin, but it is unclear why this might be the case. One possibility is that women who inject heroin are more likely than their male counterparts to also use prescription drugs—a dangerous combination. Women who do not overdose within these first few years are more likely than men to survive in the long term. This could be due to differences in treatment and other environmental factors that impact heroin use.[67]

Compared with men, women who use heroin are:

- younger
- likely to use smaller amounts and for a shorter time
- less likely to inject the drug
- more influenced by drug-using sexual partners

Prescription Drugs

Prescription drug misuse is the use of a medication without a prescription, in a way other than as prescribed, or for the experience or feelings elicited. Prescription drug misuse can be dangerous if mixed together without a physician's guidance, or mixed with other drugs or alcohol.

Prescription Opioids

Some research indicates that women are more sensitive to pain than men[68] and more likely to have chronic pain,[69] which could contribute to the high rates of opioid prescriptions among women of reproductive age.[70] In addition, women may be more likely to take prescription opioids without a prescription to cope with pain, even when men and women report similar pain levels. Research also suggests that women are more likely to misuse prescription opioids to self-treat for other problems such as anxiety or tension.[71]

A possible consequence of prescription opioid misuse is fatal overdose, which can occur because opioids suppress breathing. In 2016, 7,109 women and 9,978 men died from prescription opioid overdose (a total of 17,087)* which is about 19 women per day compared to about 27 men dying from overdosing on prescription opioids. However, from 1999 to 2016, deaths from prescription opioid overdoses increased more rapidly for women (596 percent or sevenfold) than for men (312 percent or fourfold). Women between the ages of 45 and 54 are more likely than women of other age groups to die from a prescription opioid overdose.[72]

*Note that in this instance, “prescription opioids” includes other opioids and methadone (ICD-10 codes T40.2-T40.3).

Anti-Anxiety Medications and Sleeping Aids

Women are more likely to seek treatment for misuse of central nervous system depressants,[14] which include sedatives sometimes prescribed to treat seizures, sleep disorders, and anxiety, and to help people fall asleep prior to surgery. Women are also more likely than men to die from overdoses involving medications for mental health conditions, like antidepressants. Antidepressants and benzodiazepines (anti-anxiety or sleep drugs) send more women than men to emergency departments.[73] Because women are also more at risk than men for anxiety[74,75] and insomnia,[76] it is possible that women are being prescribed more of these types of medications; greater access can increase the risk of misuse and lead to substance use disorder or overdose.

Other Substances

Alcohol

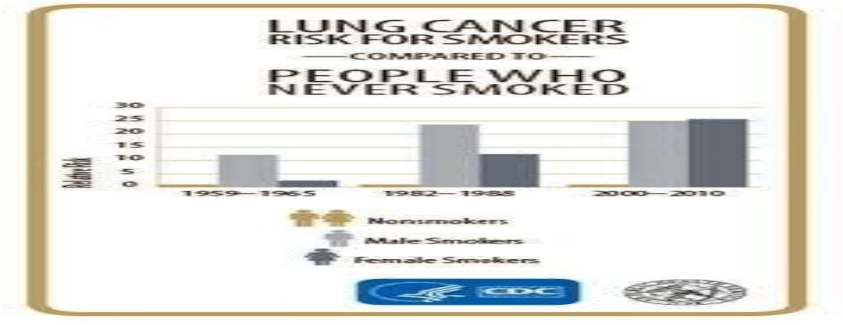
In general, men have higher rates of alcohol use, including binge drinking. However, young adults are an exception: girls ages 12 to 20 have slightly higher rates of alcohol misuse and binge drinking than their male counterparts.[13]

Drinking over the long term is more likely to damage a woman's health than a man's, even if the woman has been drinking less alcohol or for a shorter length of time.[77,78] Comparing people with alcohol use disorders, women have death rates 50 to 100 percent higher than do men, including deaths from suicides, alcohol-related accidents, heart disease, stroke, and liver disease.[79] In addition, there are some health risks that are unique to female drinkers. For example, heavy drinking is associated with increased risk of having unprotected sex, resulting in pregnancy or disease,[80] and an increased risk of becoming a victim of violence and sexual assault. In addition, drinking as little as one drink per day is associated with a higher risk of breast cancer in some women, especially those who are postmenopausal or have a family history of breast cancer.[79]

In addition, men and women metabolize alcohol differently due to differences in gastric tissue activity. In fact, after drinking comparable amounts of alcohol, women have higher blood ethanol concentrations.[79,81–83] As a result, women become intoxicated from smaller quantities of alcohol than men.[82]

More information on sex and gender differences in alcohol use is available from the National Institute of Alcohol Abuse and Alcoholism (NIAAA).

Nicotine (Tobacco)



Research indicates that men and women differ in their smoking behaviors.

Source: CDC, 2014

For instance, women smoke fewer cigarettes per day, tend to use cigarettes with lower nicotine content, and do not inhale as deeply as men.[84] Women also may smoke for different reasons than men, including regulation of mood and stress.[85] It is unclear whether these differences in smoking behaviors are because women are more sensitive to nicotine, because they find the sensations associated with smoking less rewarding, or because of social factors contributing to the difference; some research also suggests women may experience more stress and anxiety as a result of nicotine withdrawal than men.[86]

Risk of death from smoking-associated lung cancer, chronic obstructive pulmonary disease, heart disease, and stroke continues to increase among women—approaching rates for men.[87] According to data collected from 2005 to 2009, approximately 201,000 women die each year due to factors related to smoking—compared to about 278,000 men.[88] Some dangers associated with smoking—such as blood clots, heart attack, or stroke—increase in women using oral contraceptives.[89]

The number of smokers in the United States declined in the 1970s and 1980s, remained relatively stable throughout the 1990s, and declined further through the early 2000s. Because this decline in smoking was greater among men than women, the prevalence of smoking is only slightly higher for men today than it is for women. Several factors appear to be contributing to this narrowing gender gap, including women being less likely than men to quit and more likely to relapse if they do quit.[90]

Substance Use While Pregnant and Breastfeeding

Research shows that use of tobacco, alcohol, or illicit drugs or misuse of prescription drugs by pregnant women can have severe health consequences for infants. This is because many substances pass easily through the placenta, so substances that a pregnant woman takes also reach the fetus.[91] Recent research shows that smoking tobacco or marijuana, taking prescription pain relievers, or using

illegal drugs during pregnancy is associated with double or even triple the risk of stillbirth.[92] Estimates suggest that about 5 percent of pregnant women use one or more addictive substances.[93]

Regular use of some drugs can cause neonatal abstinence syndrome (NAS), in which the baby goes through withdrawal upon birth. Most research in this area has focused on the effects of opioids (prescription pain relievers or heroin). However, data has shown that use of alcohol, barbiturates, benzodiazepines, and caffeine during pregnancy may also cause the infant to show withdrawal symptoms at birth.[94] The type and severity of an infant's withdrawal symptoms depend on the drug(s) used, how long and how often the birth mother used, how her body breaks the drug down, and whether the infant was born full term or prematurely.[95]

Risks of Stillbirth from Substance Use in Pregnancy

- Tobacco use—1.8 to 2.8 times greater risk of stillbirth, with the highest risk found among the heaviest smokers
- Marijuana use—2.3 times greater risk of stillbirth
- Evidence of any stimulant, marijuana, or prescription pain reliever use—2.2 times greater risk of stillbirth
- Passive exposure to tobacco—2.1 times greater risk of stillbirth

Source: Tobacco, drug use in pregnancy, 2013

Symptoms of drug withdrawal in a newborn can develop immediately or up to 14 days after birth and can include[94]:

- blotchy skin coloring
- diarrhea
- excessive or high-pitched crying
- abnormal sucking reflex
- fever

- hyperactive reflexes
- increased muscle tone
- irritability
- poor feeding
- rapid breathing
- seizures
- sleep problems
- slow weight gain
- stuffy nose and sneezing
- sweating
- trembling
- vomiting

Effects of using some drugs could be long-term and possibly fatal to the baby:[95]

- birth defects
- low birth weight
- premature birth
- small head circumference
- sudden infant death syndrome (SIDS)

> ## Risks of Sudden Infant Death (SIDS)
>
> Children born to mothers who both drank and smoked beyond the first trimester of pregnancy have a twelvefold increased risk for sudden infant death syndrome (SIDS) compared to those unexposed or only exposed in the first trimester of pregnancy. New information from the NIH Safe Passage Study calls for stronger public health messaging regarding the dangers of drinking and

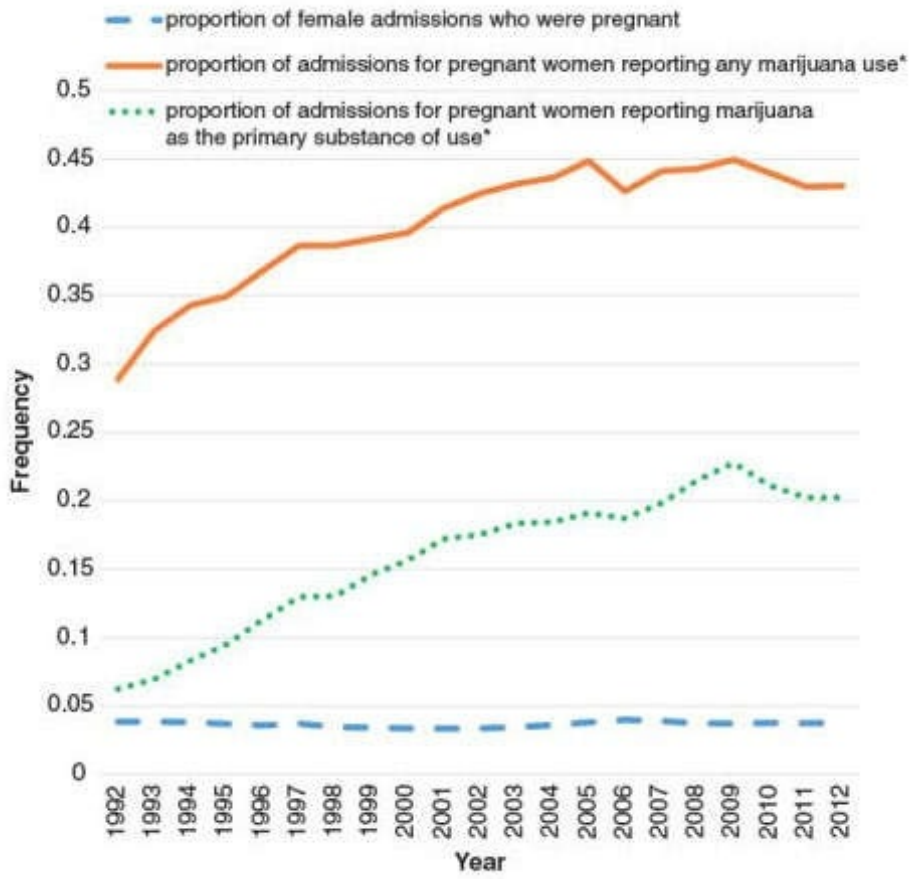
smoking during pregnancy.

Illegal Drugs

Marijuana (Cannabis)

More research needs to be done on how marijuana use during pregnancy could impact the health and development of infants, given changing policies about access to marijuana, significant increases in the number of pregnant women seeking substance use disorder treatment for marijuana use, and confounding effects of polysubstance use.[96] A 2017 opinion posted by the American College of Obstetrics and Gynecology (ACOG) suggests that cannabis effects on fetal growth (e.g., low birth weight and length) may be more pronounced in women who consume marijuana frequently, especially in the first and second trimesters. ACOG recommends that pregnant women or women contemplating pregnancy should be encouraged to discontinue use of marijuana for medicinal purposes in favor of an alternative therapy for which there are better pregnancy-specific safety data.[190]

A recent study suggests that cannabis use more than doubled among pregnant women in the United States from 2010-1017. [191] Cannabis use was more common during the first trimester than during the second and third. Between 2002-2003 and 2016-2017, past-month cannabis use increased from 3.4% to 7.0% among pregnant women overall and from 5.7% to 12.1% during the first trimester. The study included information from 467,100 women aged 12-44 who participated in the National Survey on Drug Use and Health (NSDUH). Researchers also concluded that past-month clinician-recommended cannabis use was low among pregnant women, and nonmedical use was lower than among nonpregnant women, possibly reflecting the AGOC recommendations.



Source: Martin et al., 2015

There is no human research connecting marijuana use to the chance of miscarriage,[98,99] although animal studies indicate that the risk for miscarriage increases if marijuana is used early in pregnancy.[100] Some associations have been found between marijuana use during pregnancy and future developmental and hyperactivity disorders in children.[101–104] There is substantial evidence of a statistical association between marijuana smoking among pregnant women and low birth weight.[105] Researchers theorize that elevated levels of carbon dioxide might restrict fetal growth in women who use marijuana during pregnancy.[106] Evidence is mixed related to premature birth,[107] although some evidence suggests long-term use may elevate these risks.[108] Given the potential of marijuana to negatively impact the developing brain, the American College

of Obstetricians and Gynecologists recommends that obstetrician-gynecologists counsel women against using marijuana while trying to get pregnant, during pregnancy, and while they are breastfeeding.[109]

Some women report using marijuana to treat severe nausea associated with their pregnancy;[110,111] however, there is no research confirming that this is a safe practice, and it is generally not recommended. Women considering using medical marijuana while pregnant should not do so without checking with their health care provider. Animal studies have shown that moderate concentrations of THC, when administered to mothers while pregnant or nursing, could have long-lasting effects on the child, including increasing stress responsivity and abnormal patterns of social interactions.[112] Animal studies also show learning deficits in prenatally exposed individuals.[113,114]

Human research has shown that some babies born to women who used marijuana during their pregnancies display altered responses to visual stimuli, increased trembling, and a high-pitched cry,[115] which could indicate problems with neurological development.[116] In school, marijuana-exposed children are more likely to show gaps in problem-solving skills, memory,[117] and the ability to remain attentive.[103] More research is needed, however, to disentangle marijuana-specific effects from those of other environmental factors that could be associated with a mother's marijuana use, such as an impoverished home environment or the mother's use of other drugs.[118] Prenatal marijuana exposure is also associated with an increased likelihood of a person using marijuana as a young adult, even when other factors that influence drug use are considered.[119] More information on marijuana use during pregnancy in NIDA's Marijuana Research Report. More research is needed, but for now, the Food and Drug Administration recommends that pregnant women should not use any vaping product, regardless of the substance.

> Despite various surveys, the precise number of women who use marijuana while pregnant is unclear. One study found that women were about twice as likely to screen positive for marijuana use via a drug test than they state in self-reported measures. This suggests that

> self-reported rates of marijuana use in pregnant females is not an accurate measure of marijuana use and may be an underestimation.[97]

Very little is known about marijuana use and breastfeeding. One study suggests that moderate amounts of THC find their way into breast milk when a nursing mother uses marijuana.[120] Some evidence shows that exposure to THC through breast milk in the first month of life could result in decreased motor development at 1 year of age.[121] There have been no studies to determine if exposure to THC during nursing is linked to effects later in the child's life. With regular use, THC can accumulate in human breast milk to high concentrations.[120] Because a baby's brain is still forming, THC consumed in breast milk could affect brain development. Given all these uncertainties, nursing mothers are discouraged from using marijuana.[109,122] New mothers using medical marijuana should be vigilant about coordinating care between the doctor recommending their marijuana use and the pediatrician caring for their baby.

Stimulants (Cocaine and Methamphetamine)

It is not completely known how a pregnant woman's cocaine use affects her child, since cocaine-using women are more likely to also use other drugs such as alcohol, to have poor nutrition, or to not seek prenatal care. All of these factors can affect a developing fetus, making it difficult to isolate the effects of cocaine.[123]

Research does show, however, that pregnant women who use cocaine are at higher risk for maternal migraines and seizures, premature membrane rupture, and placental abruption (separation of the placental lining from the uterus).[93] Pregnancy is accompanied by normal cardiovascular changes, and cocaine use exacerbates these changes—sometimes leading to serious problems with high blood pressure (hypertensive crisis), spontaneous miscarriage, preterm labor, and difficult delivery.[123] Babies born to mothers who use cocaine during pregnancy may also have low birth weight and smaller head circumferences, and are shorter in length than babies born to mothers who do not use cocaine. They also show symptoms of irritability, hyperactivity, tremors, high-pitched cry, and excessive sucking at birth.[124] These symptoms may be due to the effects of cocaine itself, rather than withdrawal, since cocaine and

its metabolites are still present in the baby's body up to 5 to 7 days after delivery.[125,126] Estimates suggest that there are about 750,000 cocaine-exposed pregnancies every year.[123]

Pregnant women who use methamphetamine have a greater risk of preeclampsia (high blood pressure and possible organ damage),[127] premature delivery, and placental abruption. Their babies are more likely to be smaller and to have low birth weight.[128] In a large, longitudinal study of children prenatally exposed to methamphetamine, exposed children had increased emotional reactivity and anxiety/depression, were more withdrawn, had problems with attention, and showed cognitive problems that could lead to poorer academic outcomes.[129,130]

MDMA (Ecstasy, Molly)

More research is needed on the effects of MDMA use during pregnancy. What research exists suggests that prenatal MDMA exposure may cause learning, memory,[131] and motor problems in the baby.[132,133]

Heroin

Heroin use during pregnancy can result in neonatal abstinence syndrome (NAS) specifically associated with opioid use. NAS occurs when heroin passes through the placenta to the fetus during pregnancy, causing the baby to become dependent on opioids. Symptoms include excessive crying, high-pitched cry, irritability, seizures, and gastrointestinal problems, among others.[134]

Medications

Prescription and Over-the-Counter (OTC) Drugs

Pregnancy can be a confusing time for women facing many choices about legal drugs, like tobacco and alcohol, as well as prescription and over-the-counter (OTC) drugs that may affect the developing fetus. These are difficult issues for researchers to study because scientists cannot give potentially dangerous drugs to pregnant women. Here are some of the known facts about popular medications and pregnancy:

There are more than 6 million pregnancies in the United States every year,[135] and about 9 out of 10 pregnant women take medication.[136] The U.S. Food and Drug Administration issued rules on drug labeling to provide clearer instructions for pregnant and nursing women, including a summary of the risks of use during pregnancy and breastfeeding, a discussion of the data supporting the summary, and other information to help prescribers make safe decisions.[137]

Even so, we know little about the effects of taking most medications during pregnancy. Fewer than 10% of prescriptions have enough information to determine fetal risks.[138]
This is because pregnant women a
medications before they come on t
prescription opioids such as oxyco
tobacco and/or certain antidepress
of NAS in the infant.[139]

See CDC Treating for Two webpage

Although some prescription and OTC medications are safe to take during pregnancy, a pregnant woman should tell her doctor about all prescription and over-the-counter medications, and herbal or dietary supplements she is taking or planning to take. This will allow her doctor to weigh the risks and benefits of a medication during pregnancy. In some cases, the doctor may recommend the continued use of specific medications, even though they could have some impact on the fetus. Suddenly stopping the use of a medication may be more risky for both the mother and fetus than continuing to use the medication while under a doctor's care.[140] This could also include medications to treat substance use disorders—something that is discussed in further detail in the "Sex and Gender Differences in Substance Use Disorder Treatment."

Some prescription and OTC medications are generally compatible with breastfeeding. Others, such as some anti-anxiety and antidepressant medications, have unknown effects,[141] so mothers who are using these medications should consult with their doctor before breastfeeding. Nursing

mothers should contact their infant's health care provider if their infants show any of these reactions to the breast milk: diarrhea, excessive crying, vomiting, skin rashes, loss of appetite, or sleepiness.[142]

Other Substances

Alcohol

Alcohol use while pregnant can result in Fetal Alcohol Spectrum Disorders (FASD), a general term that includes Fetal Alcohol Syndrome, partial Fetal Alcohol Syndrome, alcohol-related disorders of brain development, and alcohol-related birth defects. These effects can last throughout life, causing difficulties with motor coordination, emotional control, schoolwork, socialization, and holding a job. More information can be found on the NIAAA Fetal Alcohol Exposure webpage.

> Fetal alcohol exposure occurs when a woman drinks while pregnant. Alcohol can disrupt fetal development at any stage during a pregnancy—including at the earliest stages before a woman even knows she is pregnant.

There is currently little research into how a nursing mother's alcohol use might affect her breastfed baby. What science suggests is that, contrary to folklore, alcohol does not increase a nursing mother's milk production, and it may disrupt the breastfed child's sleep cycle.[143] The American Academy of Pediatrics recommends that alcohol drinking should be minimized during the months a woman nurses and daily intake limited to no more than 2 ounces of liquor, 8 ounces of wine, or two average beers for a 130-pound woman. In this case, nursing should take place at least 2 hours after drinking to allow the alcohol to be reduced or eliminated from the mother's body and milk. This will minimize the amount of alcohol passed to the baby.[144]

Nicotine (Tobacco Products and e-Cigarettes)

Almost 10 percent of pregnant women in the United States have smoked cigarettes in the past month.[13] Carbon monoxide and nicotine from tobacco smoke may interfere with the oxygen

supply to the fetus. Nicotine also readily crosses the placenta, and concentrations of this drug in the blood of the fetus can be as much as 15 percent higher than in the mother.[145] Smoking during pregnancy increases the risk for certain birth defects, premature birth, miscarriage, and low birth weight and is estimated to have caused more than 1,000 infant deaths each year.[146] Newborns of smoking mothers also show signs of stress and drug withdrawal consistent with what has been reported in infants exposed to other drugs. In some cases, smoking during pregnancy may be associated with sudden infant death syndrome (SIDS), as well as learning and behavioral problems and an increased risk of obesity in children. In addition, smoking more than one pack a day during pregnancy nearly doubles the risk that the affected child will become addicted to tobacco if that child starts smoking.[147] Even a mother's secondhand exposure to cigarette smoke can cause problems; such exposure is associated with premature birth and low birth weight, for example.[148]

Research provides strong support that nicotine is a gateway drug, making the brain more sensitive to the effects of other drugs such as cocaine.[149] This shows that pregnant women who use nicotine may be affecting their fetus's brain in ways they may not anticipate. Additionally, e-cigarettes (or e-vaporizers) frequently contain nicotine. Therefore, those products may also pose a risk to the fetus's health. More research is needed, but for now, The Food and Drug Administration recommends that pregnant women should not use any vaping product, regardless of the substance.

Similar to pregnant women, nursing mothers are also advised against using tobacco. New mothers who smoke should be aware that nicotine is passed through breast milk,[150] so tobacco use can impact the infant's brain and body development—even if the mother never smokes near the baby. There is also evidence that the milk of mothers who smoke smells and may taste like cigarettes. It is unclear whether this will make it more likely that exposed children may find tobacco flavors/smells more appealing later in life.[151]

Secondhand Smoke

Newborns exposed to secondhand smoke are at greater risk for SIDS, respiratory illnesses (asthma, respiratory infections, and bronchitis), ear infections,[88] cavities,[152] and increased medical visits and hospitalizations.[153] If a woman smokes and is planning a pregnancy, the ideal

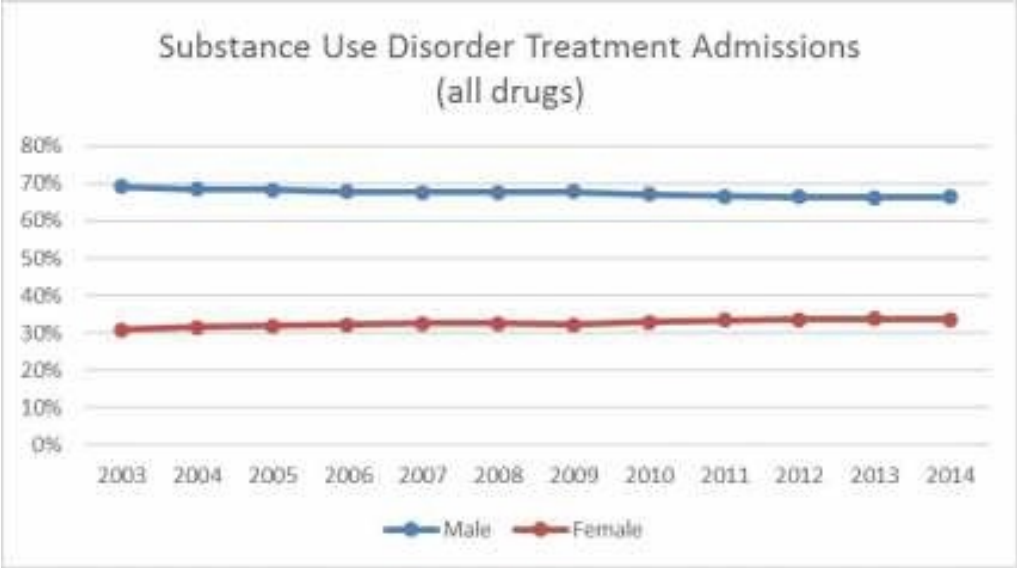
time to seek smoking cessation help is before she becomes pregnant.

Sex and Gender Differences in Substance Use Disorder Treatment

There are more men than women in treatment for substance use disorders. However, women are more likely to seek treatment for dependence on sedatives such as anti-anxiety and sleep medications.[14] In addition, although men have historically been more likely to seek treatment for heroin use, the rate of women seeking treatment has increased in recent decades.[154]

Substance use disorders may progress differently for women than for men. Women often have a shorter history of using certain substances such as cocaine,[155] opioids,[42] marijuana,[42,43,156] or alcohol.[42,157,158] However, they typically enter substance use disorder treatment with more severe medical, behavioral, psychological, and social problems. This is because women show a quicker progression from first using the substance to developing dependence.[159]

Substance Use Disorder Treatment Admissions (all drugs)



Source: 2014 SAMHSA TEDS

Many women who are pregnant or have young children do not seek treatment or drop out of treatment early because they are unable to take care of their children; they may also fear that authorities will remove their children from their care. The combined burdens of work, home care, child care, and other family responsibilities, plus attending treatment frequently, can be overwhelming for many women. Successful treatment may need to provide an increased level of support to address these needs.[7]

Women and Smoking Cessation Treatment

Research shows that women are less likely to try to quit smoking and more likely to relapse if they do quit.[90] Nicotine-replacement options, such as the patch or gum, are r[illegible]val may be more intense for women.[160,161] N[illegible] vary across the menstrual cycle, which may further complicate a woman's attempts to quit.

See SAMHSA's Behavioral Health Treatment Services Locator webpage

> The stress on the heart due to smoking one pack of cigarettes per day is the equivalent of being 90 pounds overweight.

Some women continue to smoke because they are afraid they will gain weight. However, research shows only a modest weight gain after quitting. The average smoker gains 6 to 10 pounds after quitting smoking, but certain diet and lifestyle changes can reduce the risk of weight gain. If a person does gain weight, the average person loses much of the extra weight within 6 months.[164] In fact, long-term quitters gain, on average, only 2 pounds.[165] Most importantly, the health benefits of quitting smoking far exceed the risks of gaining a few pounds. Quitting also decreases risks for various types of cancers, heart attack, and lung disease.[164]

Substance Use Disorder Treatment for Mothers and Their Babies While Pregnant or Breastfeeding

A pregnant woman should ask for medical help to stop her drug use. If she attempts to suddenly withdraw from addictive drugs and alcohol without medical assistance, she could be putting her fetus at risk.[166]

Intensive outpatient treatment, which provides a higher treatment level than traditional outpatient programs but does not require structured residential living, has produced positive results for pregnant women. Pregnant women are more likely to stay in these treatment programs if they provide services such as child care,[168] parenting classes, and vocational training.[169,170]

> Federal law requires that pregnant women receive priority admission into publicly funded substance use disorder treatment programs, allowing them to bypass waiting lists and gain immediate admission when a bed in a residential program is available. The primary treatment provider must secure prenatal care if a pregnant woman is not already receiving such care.[167] State-level contacts for this program are available from SAMHSA.

In addition, it is important to monitor newborns of substance-using mothers for symptoms of withdrawal and provide proper treatment if necessary. Treatment of drug dependency in newborns depends on the severity of symptoms and, while nonpharmacological treatments are preferred, it sometimes may include hospitalization in order to receive intravenous fluids and medications. These medications are gradually tapered off until the infant adapts to being drug-free.

Treating Opioid Use Disorders in Pregnant Women

Pregnant women who are addicted to opioid pain relievers or heroin face special problems because the baby can be born dependent. Currently, the U.S. Food and Drug Administration has not approved medications to treat opioid-dependent pregnant women, but methadone or buprenorphine maintenance combined with prenatal care and a comprehensive drug treatment program can improve many of the adverse outcomes associated with untreated opioid use disorder.[166,171] In general, it is neither recommended nor necessary for pregnant women to cease methadone or buprenorphine treatment.[167,171] However, newborns exposed to methadone during pregnancy can require treatment for withdrawal symptoms.

Some studies suggest that buprenorphine (Suboxone®, Subutex®) has some advantages over single-dose methadone as a treatment for opioid use disorder in pregnant women. Infants born to mothers treated with buprenorphine had fewer symptoms of dependence and reduced length of hospital stay compared to those treated with methadone.[172]

Pregnant women who take buprenorphine for opioid use disorder during pregnancy should be aware that the amount of buprenorphine passed through breast milk may be inadequate to prevent opioid withdrawal in their infant. In some cases, treatment of the infant may be required.[173]

Pregnant women who are addicted to opioids, even if they are in treatment, should monitor their babies for drowsiness, inadequate weight gain, and failure to meet developmental milestones—especially in younger, exclusively breastfed infants. Although unlikely, if a breastfed baby of a woman on buprenorphine therapy shows signs of increased sleepiness, difficulty feeding or breathing, or limpness, a health care provider should be contacted immediately. Infants should be observed for withdrawal signs if breastfeeding is abruptly stopped.[173]

As for infants born with NAS due to opioids, recovery can require hospitalization and possibly treatment with morphine or methadone to relieve symptoms;[94] researchers have also studied buprenorphine for this purpose.[174] There is some evidence that buprenorphine is superior to morphine in treating infants with opioid-related NAS. A NIDA-funded study published found that treating NAS babies with sublingual buprenorphine resulted in a shorter duration of treatment than oral morphine. It also resulted in a shorter length of hospital stay, with similar rates of adverse events.[175]

Other Sex and Gender Issues for Women Related to Substance Use

Co-Occuring Mental Health Disorders

More information about comorbidity can be found in NIDA's Research Report.

Many women with substance use disorders are also diagnosed with other mental disorders. This is important because interactions between illnesses can worsen the course of both. Patients who have both a substance use disorder and another mental health condition often have symptoms that are more persistent, severe, and resistant to treatment compared with patients who have either disorder

alone. Both disorders should be treated at the same time to improve the likelihood of success. Although men are more likely than women to report both a mental health and substance use disorder within the past year,[13] women are more likely to suffer from certain mental health conditions, such as depression,[176] anxiety, post-traumatic stress disorder (PTSD),[177] and eating disorders.[178] Some women report using substances to relieve stress or negative emotions.[179–181] In addition, women are more vulnerable to developing substance use or other mental health disorders following divorce, loss of child custody, or the death of a partner or child.[10]

Women, Violence, and Substance Abuse

More than 1 in 3 women have experienced physical violence at the hands of an intimate partner, including a range of behaviors from slapping, pushing, or shoving to severe acts such as being beaten, burned, raped, or choked.[182] Victims of violence are at increased risk of chronic health conditions, including obesity, chronic pain, depression, and substance use.[183] In recognition of the severity of violence against women and the need for a national strategy to address this issue, in 1994 Congress enacted the Violence Against Women Act to hold offenders accountable and to provide services to victims.[184] In 2013, President Obama reauthorized the Act to expand programs for reaching especially vulnerable populations.[185]

The Institute of Medicine and the U.S. Preventive Services Task Force (USPSTF) have recommended that clinicians screen and counsel for interpersonal violence. To help meet that need, the Affordable Care Act of 2010 (Section 2713) requires that health insurance providers cover all preventive services recommended by the USPSTF without copays or deductibles. However, improved prevention and screening guidelines are needed to help clinicians identify those who need help and link them to the care they need.[186]

Race and Ethnicity

Women of color may face unique issues with regard to drug use and treatment needs. For example, African-American and American Indian/Alaska Native women are more likely than women of other racial and ethnic groups to be victims of rape, physical violence, and stalking by an intimate partner in their lifetime. As discussed above, these issues are risk factors for substance use and should be addressed during treatment. More information can be found in Women of Color: Health Data Book.

The Importance of Including Women in Research

In the past, women were not included in most clinical research. This was often based on two notions: (1) that women are more biologically complicated than men; and (2) as primary caregivers of young children, a woman had too many competing time demands to participate in research studies.[187] More than two decades ago, NIH established the Office of Research on Women's Health, in recognition that excluding specific subgroups from research produces knowledge that only helps a portion of the public. In 1991, the U.S. Department of Health and Human Services established the Office on Women's Health to ensure that broader public health issues related to sex and gender were addressed. Since these offices were established, significant progress has been made in several major areas:

- Policies have been implemented ensuring that women and minorities are included in NIH-funded clinical research
- Research on women's health and sex differences has expanded.
- Career development and mentoring programs have increased the numbers of women's health researchers.
- Research results have been translated into health benefits for women.[188]
- There has been greater communication to a variety of public audiences about sex and gender differences in basic and behavioral science, as well as in public health.

> "Remember the famous study, take an aspirin a day to keep the heart attack away? That study was done on 10,000 men. Not one woman was included. In a study of the aging process, they told me women weren't included because there wasn't a ladies room available for study participants. Yet the results of these studies were being applied to men and women. I vowed to fix that."
>
> *The Honorable Barbara Mikulski, U.S. Senator, Maryland*
> *August 16, 2010*
>
> *More information can be found in NIDA's research report on comorbidity.*

Although significant strides have been made to include women in clinical research, most animal-based research still tends to over-rely on males. Because these studies are important in guiding clinical studies, NIH announced a new policy in 2014 requiring that both sexes be represented in NIH-funded research involving animal and cell models.[12]

Since its inception, NIDA has sponsored research on issues related to women and substance use. Beginning with an early focus on the effects of drug use on pregnant women and the children they carry, NIDA then expanded its interest to sponsor research into women's specific substance use disorder risk factors and treatment needs. When the HIV/AIDS epidemic emerged in the 1980s, NIDA responded with funding for projects on gender-specific risk factors for infection and on the impact of drug use on HIV transmission between mother and newborn and the subsequent health of both. In 1995, NIDA formally established the Women and Sex/Gender Differences Research Program to understand the underlying causes of substance use disorders and the best ways to prevent and treat them in both men and women.[189]

Where can I get further information about substance use in women?

NIDA's website includes:

- Information on drugs that people use and misuse and related health consequences
- NIDA publications, news, and events
- Resources for health care professionals, educators, and patients and families
- Information on NIDA research studies and clinical trials
- Funding information (including program announcements and deadlines)
- International activities
- Links to related websites (access to websites of many other organizations in the field)
- Information in Spanish (en español)

NIDA Websites and Webpages

- www.nida.nih.gov/related-topics/women-drugs
- www.researchstudies.drugabuse.gov
- www.irp.drugabuse.gov

For Physician Information

- NIDAMED: www.nida.nih.gov/nidamed

Other Websites

Information on substance use in women is also available through:

- Substance Abuse and Mental Health Services Administration (SAMHSA)
- Drug Enforcement Administration (DEA)
- Monitoring the Future
- Partnership for Drug-Free Kids
- NIDA's Substance Use in Women DrugFacts
- CDC's Fact Sheet on Substance Use During Pregnancy

Treatment Resources

- Find behavioral health treatment (SAMHSA)
- Find Smoking cessation programs. The U.S. Department of Health and Human Services has resources to help a woman quit smoking.

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