



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.

Research shows that binge drinking* and regular heavy drinking put a fetus at the greatest risk for severe problems.¹ However, even lesser amounts can cause damage.^{2,3} In fact, there is no known safe level of alcohol consumption during pregnancy.

Alcohol passes easily from a mother's bloodstream into her developing baby's blood. Alcohol present in a developing baby's bloodstream can interfere with the development of the brain and other critical organs, structures, and physiological systems.

Prenatal alcohol exposure is a leading preventable cause of birth defects and neurodevelopmental abnormalities in the United States. It can cause a range of developmental, cognitive, and behavioral problems, which can appear at any time during childhood and last a lifetime.

The most profound effects of prenatal alcohol exposure are brain damage and the resulting impairments in behavioral and cognitive functioning.



Fetal Alcohol Spectrum Disorders

Scientists define a broad range of effects and symptoms caused by prenatal alcohol exposure under the umbrella term Fetal Alcohol Spectrum Disorders (FASD).

The medical disorders collectively labeled FASD include the Institute of Medicine of the National Academies (IOM) diagnostic categories:⁴

- » Fetal Alcohol Syndrome (FAS)
- » Partial FAS (pFAS)
- » Alcohol-Related Neurodevelopmental Disorder (ARND)
- » Alcohol-Related Birth Defects (ARBD)

In addition to the IOM medical diagnoses, the latest edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM–5) includes the psychiatric diagnosis, Neurobehavioral Disorder Associated with Prenatal Alcohol Exposure (ND-PAE).⁵ People who meet criteria for an FASD diagnosis according to the IOM may also meet criteria for ND-PAE.

* The National Institute on Alcohol Abuse and Alcoholism defines binge drinking as a pattern of drinking alcohol that brings blood alcohol concentration (BAC) to 0.08 percent—or 0.08 grams of alcohol per deciliter—or higher. For a typical adult female, this pattern of alcohol consumption corresponds to consuming 4 or more drinks in about 2 hours. (NIAAA. [2007, November]. Defining binge drinking. *What Colleges Need to Know Now*. Available at: https://www.collegedrinkingleadingprevention.gov/media/1College_Bulletin-508_361C4E.pdf.)

The essential features common to the IOM medical diagnoses and the DSM–5 psychiatric diagnosis are prenatal alcohol exposure and central nervous system (CNS) involvement.

Evidence of CNS involvement can be structural (e.g., small brain size, alterations in specific brain regions) or functional (e.g., cognitive and behavioral deficits, motor and coordination problems). Advanced imaging studies have revealed differences in brain structure and activity that are consistent with data from neuropsychological testing, including deficits in sensory processing, cognition, and behavior in persons with FASD compared to people without FASD.⁶

FASD-Related Problems

Each individual with FASD experiences a unique combination of day-to-day challenges that may include medical, behavioral, educational, and social problems. People with FASD may have difficulty in the following areas:⁷

- » Learning and remembering
- » Understanding and following directions
- » Shifting attention
- » Controlling emotions and impulsivity
- » Communicating and socializing
- » Performing daily life skills, including feeding, bathing, counting money, telling time, and minding personal safety

FASD-related brain damage makes it difficult to address routine life situations. It causes people to make bad decisions, repeat the same mistakes, trust the wrong people, and have difficulty understanding the consequences of their actions.

FASD cases are seriously under-diagnosed. FASD can be difficult for practitioners to distinguish from other developmental disorders since these disorders share certain learning and behavioral problems.

In addition, people with FASD are more likely to suffer from the following mental health disorders:⁹

- » Attention Deficit Hyperactivity Disorder (ADHD)
- » Depression and anxiety
- » Problems with hyperactivity, conduct, and impulse control
- » Increased incidence of alcohol and other substance use disorders

Key Statistics for the United States—Maternal Drinking

- » About 20 to 30 percent of women have reported drinking at some point during pregnancy—most typically during the first trimester.¹²
- » More than 8 percent of women have reported binge drinking at some time during pregnancy—most typically during the first trimester.¹²
- » Almost 10 percent of pregnant women reported drinking alcohol in the previous month.¹³
- » Almost 5 percent of pregnant women reported binge drinking in the previous month (4 or more drinks per occasion).¹³

Relevant Clinical Diagnoses

IOM Diagnoses

Fetal Alcohol Syndrome (FAS)

Fetal Alcohol Syndrome (FAS) was the first form of FASD discovered and is the most well-known. Heavy alcohol use during the first trimester of pregnancy can disrupt normal development of the face and the brain. In fact, exposure at any point during gestation may affect brain development. An FAS diagnosis requires:

- » Evidence of prenatal alcohol exposure
- » Evidence of central nervous system (CNS) abnormalities (structural or functional)
- » A specific pattern of three facial abnormalities: narrow eye openings, a smooth area between the lip and the nose (vs. the normal ridge), and a thin upper lip
- » Growth deficits either prenatally, after birth, or both



Partial FAS (pFAS)

Partial FAS (pFAS) involves prenatal alcohol exposure, and includes some, but not all, of the characteristics of full FAS.

Alcohol-Related Neurodevelopmental Disorder (ARND)

A diagnosis of Alcohol-Related Neurodevelopmental Disorder (ARND) requires evidence of both prenatal alcohol exposure and CNS abnormalities, which may be structural or functional. Functional abnormalities may involve a complex pattern of cognitive or behavioral problems that are not consistent with developmental level, and that cannot be explained by factors other than prenatal alcohol exposure (e.g., family background, environment, and other toxicities). Facial abnormalities and growth retardation need not be present.

Alcohol-Related Birth Defects (ARBD)

This disorder includes medical conditions linked to prenatal alcohol exposure such as: heart, kidney, and bone problems and other malformations; difficulty seeing and hearing; and reduced immune function. Alcohol-Related Birth Defects (ARBD) is rarely seen alone but rather as a secondary disorder accompanying other FASD conditions (e.g., FAS and ARBD).

DSM–5 Diagnosis

Neurobehavioral Disorder Associated with Prenatal Alcohol Exposure (ND-PAE)

Neurobehavioral Disorder Associated with Prenatal Alcohol Exposure (ND-PAE) is a new psychiatric diagnosis in the DSM–5. It requires evidence of both prenatal alcohol exposure and CNS involvement, as indicated by impairments in the following three areas: cognition, self-regulation, and adaptive functioning. This new diagnosis for use by mental health professionals will improve understanding of the multifaceted behavioral deficits seen in some people exposed to alcohol prenatally, and facilitate improved diagnosis and treatment of these individuals.

Risk Factors⁹

The severity of alcohol's effects on a fetus primarily depends on the following:

- » Quantity—how much a pregnant woman drinks per occasion
- » Frequency—how often a pregnant woman drinks
- » Timing—in what stage of pregnancy a woman drinks and if she drinks heavily just as the fetus develops a particular feature or brain region

Other factors can also play a role in how prenatal alcohol exposure affects children. These include:

Maternal Characteristics

Research demonstrates that children may be more affected by prenatal alcohol exposure if their mothers:

- » Have poor nutrition
- » Have had multiple pregnancies and births
- » Have lower-than-average weight, height, and body mass index (BMI)
- » Smoke
- » Are older
- » Are a member of a family of heavy drinkers



Environmental Factors

Research demonstrates that children can be more affected by prenatal alcohol exposure if their mothers experience adverse-living conditions and high levels of stress. These may include: social isolation, living in circumstances where alcohol misuse is common and accepted, and living in a community where resources for prenatal care are limited.

Genetics

The extent of FASD symptoms may depend on the mother's genetic makeup, her child's genetic makeup, and changes in gene activity caused by prenatal alcohol exposure.

Interventions

Researchers and clinicians have developed effective learning and behavioral interventions to help people with FASD. For example, school-based interventions can help children with FASD learn more easily. School-based interventions may include specialized teaching strategies that provide a consistent routine and allow children to practice new skills over and over again.¹⁰ Other promising interventions include:

- » Family support groups and classes to help parents better care for a child with FASD.¹⁰
- » Nutritional supplements for pregnant women and postnatal supplements for their children.¹¹
- » Behavioral interventions for affected children, including training in social skills, problem solving, and personal safety.¹⁰

For more information, please visit: <https://www.niaaa.nih.gov>

- ¹ Maier, S.E., and West, J.R. Drinking patterns and alcohol-related birth defects. *Alcohol Research and Health* 25(3):168–169, 2001.
- ² Hamilton, D.A., Barto, D., Rodriguez, C.I., Magcalas, C.M., Fink, B.C., Rice, J.P., Bird, C.W., Davies, S., and Savage, D.D. Effects of moderate prenatal alcohol exposure and age on social behavior, spatial response perseveration errors and motor behavior. *Behavioral Brain Research* 269: 44–54, 2014.
- ³ Day N.L., Helsel, A., Sonon, K., and Goldschmidt, L. The association between prenatal alcohol exposure and behavior at 22 years of age. *Alcoholism: Clinical and Experimental Research* 37(7):1171–1178, 2013.
- ⁴ Stratton, K., Howe, C., and Battaglia, F. (eds.) *Fetal Alcohol Syndrome: Diagnosis, Epidemiology, Prevention, and Treatment*. The Institute of Medicine Report. Washington, DC: National Academy Press, 1996.
- ⁵ American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (pp. 86, 798–801). Washington, DC: American Psychiatric Association, 2013.
- ⁶ Moore, E.M., Migliorini, R., Infante, M.A., and Riley, E.P. Fetal alcohol spectrum disorders: Recent neuroimaging findings. *Current Developmental Disorders Reports* 1(3):161–172, 2014.
- ⁷ Mattson, S.N., Crocker, N., and Nguyen, T.T. Fetal alcohol spectrum disorders: Neuropsychological and behavioral features. *Neuropsychology Review* 21(2): 81–100, 2011.
- ⁸ O'Connor, M.J. Mental health outcomes associated with prenatal alcohol exposure: Genetic and environmental factors. *Current Developmental Disorders Reports* 1(3):181–188, 2014.
- ⁹ May, P.A., and Gossage, J.P. Maternal risk factors for fetal alcohol spectrum disorders. *Alcohol Research & Health* 34(1):16–23, 2011.
- ¹⁰ Paley, B., and O'Connor, M.J. Intervention for individuals with fetal alcohol spectrum disorders: Treatment approaches and case management. *Developmental Disabilities Research Reviews* 15:258–267, 2009.
- ¹¹ Warren, K.R.; Hewitt, B.G.; and Thomas, J.D. Fetal alcohol spectrum disorders: Research challenges and opportunities. *Alcohol Research & Health* 34(1):4–14, 2011.
- ¹² Ethen, M.K., Ramadhani, T.A., Scheuerle, A.E., Canfield, M.A., Wyszynski, D.F., Druschel, C.M., and Romitti, P.A., National Birth Defects Prevention Study. Alcohol consumption by women before and during pregnancy. *Maternal and Child Health Journal* 13(2):274–285, 2009.
- ¹³ Substance Abuse and Mental Health Services Administration (SAMHSA). Table 6.20B—Alcohol Use, Binge Alcohol Use, and Heavy Alcohol Use in Past Month among Females Aged 15 to 44, by Pregnancy Status, Demographic, Socioeconomic, and Pregnancy Characteristics: Percentages, 2018 and 2019. Available at: <https://www.samhsa.gov/data/sites/default/files/reports/rpt29394/NSDUHDetailedTabs2019/NSDUHDetTabsSect6pe2019.htm#tab6-20b>. Accessed 9/25/20.



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