What Is Autism Spectrum Disorder?

Autism spectrum disorder (ASD) is a developmental disability that is caused by differences in how the brain functions. People with ASD may communicate, interact, behave, and learn in different ways. Signs of ASD begin during early childhood and usually last throughout a person’s life (1).

Previously, the term “ASD” collectively referred to the following three conditions that were diagnosed separately: autistic disorder, pervasive developmental disorder not otherwise specified (PDD-NOS), and Asperger disorder (2). ASD now encompasses a single diagnosis of “autism spectrum disorder” (see pg. 7 for more information on this change). The term “spectrum” in ASD means that each person can be affected in different ways, and symptoms can range from mild to severe. People with ASD share some similar symptoms, such as difficulties with social interaction, difficulties with communication, and highly focused interests and/or repetitive activities. How the symptoms affect a person’s functioning depends on the severity and combination of those symptoms.

Developmental Monitoring

Developmental monitoring is important for all young children from birth to age 5 years. Caregivers, such as parents, healthcare providers, and early educators, should be aware of developmental milestones—how children grow, move, communicate, interact, learn, and play. This information helps caregivers know what to expect, get ideas on how to promote positive development, and be aware of potential concerns about development as early as possible. Developmental monitoring is an ongoing process, and CDC’s “Learn the Signs. Act Early.” program has tools and information to help at www.cdc.gov/ActEarly.

Screening, Evaluation, and Diagnosis

Screening, evaluating, and diagnosing children with ASD as early as possible is important for ensuring that these children access the services and support they need. At this time, there is no medical test, such as a blood test or brain scan, to diagnose ASD. Instead, ASD is diagnosed by qualified professionals who conduct comprehensive psychological and behavioral evaluations.

A Developmental Screen is a short test to tell if a child is learning basic skills, and can help identify if there might be a delay. The American Academy of Pediatrics recommends that all children be screened for developmental delays and disabilities during regular well-child doctor visits at 9 months, 18 months, and 24 or 30 months of age. They also recommend that children be screened specifically for ASD at 18 and 24 months of age (3-4).

A Comprehensive Developmental Evaluation is a thorough review of the child’s behavior and development. These evaluations can include clinical observation, parental reports of developmental and health histories, psychological testing, and speech and language assessments. A range of professionals can conduct comprehensive evaluations, including teachers, social workers, nurses, psychologists, doctors, and speech-language pathologists.

Diagnosis occurs when a developmental pediatrician, child neurologist, child psychiatrist, or child psychologist uses the results of the comprehensive evaluation to determine if a child has ASD based on the criteria in the Diagnostic and Statistical Manual of Mental Disorders (1). Also, neurologic and genetic testing can be used to rule out other disorders and to check for genetic or neurological problems that sometimes co-occur with ASD.

“CDC data continue to show that schools are vital in evaluating and serving children with ASD. Children, especially those with developmental delays or special needs, spend large portions of the day at school, working with educators and therapists. This supports that a partnership between the medical and educational community is vital.”

-Susan Levy, MD, MPH
Chair, Autism Subcommittee, Council on Children with Disabilities, American Academy of Pediatrics
**Signs and Symptoms**

**A child with ASD might**

✓ Avoid eye contact and want to be alone.

✓ Have trouble understanding other people’s feelings or talking about his or her own feelings.

✓ Have delayed speech and language skills (for example, use words much later than siblings or peers or not use words to communicate).

✓ Repeat words or phrases over and over.

✓ Give unrelated answers to questions.

✓ Get upset by minor changes in routine (for example, getting a new toothbrush).

✓ Have obsessive interests (for example, having a very strong interest in trains that is difficult to interrupt).

✓ Flap his or her hands, rock his or her body, or spin in circles.

✓ Have unusual ways of playing with or using objects, such as spinning or lining them up repeatedly.

✓ Have unusual reactions to the way things sound, smell, taste, look, or feel.

**A child with ASD might not**

✓ Respond to his or her name by 12 months of age (for example, appear not to hear).

✓ Point at objects to show interest by 14 months of age (for example, point at an airplane flying over).

✓ Play “pretend” games by 18 months of age (for example, pretend to “feed” a doll).

To access downloadable checklists of developmental milestones for children from 2 months to 5 years of age, and to watch real-life examples of ASD symptoms, please visit [www.cdc.gov/ActEarly](http://www.cdc.gov/ActEarly).
**Risk Factors and Causes**

ASD is a complex disorder, and most scientists who study ASD believe that there is no single cause. We have learned that there are likely many causes for multiple types of ASD. There may also be many different factors, including environmental and genetic factors, which make a child more likely to have ASD. Understanding more about these factors will help us learn about the causes of ASD. The table below highlights some of the factors which have been found to have strong evidence for putting children at greater risk for ASD and some which are suspected of putting children at greater risk. It is important to remember that no single risk factor leads to ASD, and many of these risk factors are outside of an individual’s control.

Currently, CDC is working on one of the largest studies in the United States to try to identify the factors that might make a child more likely to develop ASD. This study, called the *Study to Explore Early Development* (SEED), is examining many factors—from genes to characteristics of the pregnancy, birth, and newborn period. SEED is unique because it includes a large sample of children that allows for complex evaluation of how child characteristics and environmental and genetic factors all interact to increase a child’s risk for ASD (25).

<table>
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<th>Strong Evidence</th>
<th>Suspected</th>
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<td><strong>Family history of ASD</strong>, such as having siblings or a twin with ASD (5 -7)</td>
<td><strong>Family history of immune-associated conditions</strong>, such as thyroid disease or rheumatoid arthritis (11)</td>
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<tr>
<td><strong>Older age of mother and/or father</strong> (8 - 9)</td>
<td><strong>Genes, genetic mutations, and epigenetic processes</strong> (changes in how a gene is expressed without changes to the DNA), including complex interactions between genes and environmental factors before, during, and immediately after pregnancy (12-14)</td>
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<td><strong>Select single gene disorders</strong>, such as fragile X syndrome, Rett syndrome and tuberous sclerosis complex (10)</td>
<td><strong>Various factors related to pregnancy</strong>, such as extremely preterm delivery, very low birthweight, maternal infection, use of infertility treatments, maternal exposure to environmental pollutants, obstetric complications, use of certain medications during pregnancy, and maternal diabetes or obesity (15 – 24)</td>
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“The CDC’s prevalence data are essential because they inform our efforts to build out the infrastructure -- schools, and later adult housing and services -- that people with autism need and deserve. The insights we glean from these data, including information about disparities in diagnosis along racial and ethnic lines, also impact the direction of autism science and advocacy. None of us can ever forget that our children, our sons and daughters, are not just numbers. We have to be relentless in our fight for more research and services.”

- Alison Singer

Co-Founder and President, Autism Science Foundation
Economic Costs
Caring for a child with ASD can place a heavy economic burden on families and communities and can extend beyond paying for a child’s services and supports.

- The total costs per year for children from birth to 17 years old with ASD in the United States were estimated to be between $11.5 billion - $60.9 billion in 2011 US dollars. This significant economic burden can represent a variety of direct and indirect costs, from medical care to special education (26-27-21).
- Some parents report having to stop work to care for their child with ASD (28-29-23).
- Mothers who maintain employment end up working about 7 hours less per week and earn 56% less than mothers of children with no major health issues (30).

Staying Healthy with ASD
Children with ASD need health care and health programs for the same reasons anyone else does—to stay well and active, and to be able to participate in their community. Some conditions have been found to be more common among children with ASD such as anxiety, attention deficits, Down syndrome, depression, epilepsy, fragile X syndrome, gastrointestinal problems, hearing loss, intellectual disability, obesity, sensory-processing difficulties, sleep problems, tuberous sclerosis, and vision impairment (31-34). It is important to recognize these conditions and treat them accordingly. Regular medical and dental examinations are essential components of a child’s care plan, as are preventive measures, such as routine childhood immunizations and flu shots.