Autism is a range of complex neurobiological developmental disabilities which are defined by social interaction impairments, communication difficulties, and repetitive behaviors (Autism Speaks, 2019f). Autism occurs in all ethnic and socioeconomic groups. The prevalence of autism in children has continued to grow over recent years from approximately 1 in 150 in 2000 to 1 in 59 in 2014 (Centers for Disease Control and Prevention [CDC], 2019a). In acknowledging the significance of this dramatic increase from previous data, the Centers for Disease Control and Prevention (CDC) refers to autism as an "important public health concern" and thus supports extensive research to understand why autism occurs (CDC, 2019b).

AUTISM SPECTRUM DISORDERS (ASD)

After a 14-year review process, the American Psychiatric Association published the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) in May 2013. The DSM-5 is used by physicians to diagnose and classify mental disorders, including Autism. The diagnoses criteria for Autism were updated in the DSM-5. The change was recommended as a better reflection of the state of knowledge of Autism. The new single umbrella disorder, Autism Spectrum Disorder, will encompass the separate diagnosis labels of Asperger's Syndrome, Autistic Disorder and Pervasive Development Disorder. The change is expected to improve the diagnosis of ASD and should not substantially change the number of children being diagnosed (American Psychiatric Association, 2018). While the most current published materials on autism reflect the new terminology of the DSM-5, the terminology has

not been adopted by all clinicians and the information that follows explains the DSM-4 terms (Applied Behavior Analysis, 2019).

Autism is any one of three disorders previously diagnosed separately. The three disorders have similar symptoms and signs in problems with social interaction, communication, and behaviors, but differ in severity, occurrence, and the nature of symptoms (CDC, 2019b).

A pervasive developmental disorder (PDD) is another term commonly used to categorize autism. PDD is an umbrella term under which the specific diagnoses are defined. All three disorders in ASD are considered to be part of PDD. Some confusion and debate has occurred among professionals in the autism field on how to correctly refer to and categorize autism, but generally autism literature will refer to autism as being an ASD and/or a PDD (Applied Behavior Analysis, 2019). It may be some time before the medical journals and professional literature reflect the DSM-5 terminology for Autism (ASD) exclusively.

➢ **Autistic Disorder** – Individuals with this disorder can experience difficulties in social interaction, communication, and display unusual behaviors and interest. They suffer from delays in cognitive abilities and language disorders; it is commonly referred to as "classic" autism (CDC, 2019b).

➢ **Asperger Syndrome** – Individuals who suffer from this disorder have difficulties in social interaction and show a limited range of interests and/or repetitive behaviors. One difference between this disorder and autistic disorder is that persons affected

with Asperger syndrome do not have trouble with language, and generally have an IQ in the normal to superior range (Autism Speaks, 2019a).

➢ **Pervasive Developmental Disorder-Not Otherwise Specified** – Also called "subthreshold autism," this group is for individuals who have autistic symptoms and signs, but who do not meet the specific diagnostic criteria of the other two disorders or have mild symptoms. For example, individuals may have extensive symptoms in one area, but moderate or no symptoms in another (Autism Speaks, 2019c).

PREVALENCE OF AUTISM

While current figures show that autism occurs in all facets of society, there are three groups that appear to have a higher-than-normal risk for autism:

➢ **Boys** – Males are almost four times more likely to have autism than females.

➢ **Siblings of those with a form of autism** – Families that have one child with autism show a rate of recurrence of autism in another child of about 2-18 percent (significantly higher than the general population).

➢ **Individuals with other diagnoses**– Autism occurs more often (around 10%) in people who have certain genetic and chromosomal disorders such as fragile X syndrome, Down syndrome, and tuberous sclerosis (CDC, 2019a).

Autism Prevalence in Texas
Children with autism, ages 3-21, constitute the fourth largest component of special education eligibility in Texas (Texas Education Agency (TEA), 2019b). The actual prevalence of autism is not entirely known, but an analysis of educational data provides perhaps the closest indications. The following table, with data from the Texas Education Agency (2019), illustrates the growth of autism cases in Texas among 3-21 year old students during the 2016-2018 school years. For the 2018 school year, students with autism represented 13.4% of the total students with disabilities population, up from 12.7% in 2017 and 12% in 2016.

NUMBER OF CHILDREN WITH AUTISM IN TEXAS SCHOOL SYSTEM

	2016	2017	2018
Ages 3-5	8,030	9,120	10,408
Ages 6-21	47,570	51,576	56,366
TOTAL	55,600	60,696	66,774

(TEA, 2019b)

Autism Prevalence in San Antonio area
According to data from the Texas Education Agency, the number of individuals ages 3-21 with a diagnosis of ASD being educated in the Texas school system has increased during the past three school years. This is consistent with national studies showing that autism in children is increasing.

The number of children with autism in Region 20 is also increasing each year. The data below shows that from 2014 through 2016, the number of autistic children in school increased 26%. From 2016 to 2018, the number of children with autism increased 18%. The Region 20 school system includes school districts in the following counties: Atascosa, Bandera, Bexar, Dimmit, Frio, part of Guadalupe and Karnes, the majority of Kendall, Kerr, Kinney, La Salle, Maverick, Medina, Real, Uvalde, Wilson, and Zavala. This data represents the most recent figures released.

NUMBER OF CHILDREN WITH AUTISM IN REGION 20 SCHOOL DISTRICT

	2014	2016	2018
Ages (3-21)	4,445	5,607	6,658

(J. Enriquez, Personal Communication, September 10, 2019)

The 81st Texas Legislature (2009) created the Texas Autism Research and Resource Center (TARRC) in response to the needs of the autism community. TARRC provides support to families, coordination of services by local groups, training and education for professionals, current research on autism, and information on university research programs in Texas related to ASD (TARRC, 2017).

DIAGNOSING AUTISM

Researchers have determined that early diagnosis and intervention has a noticeable impact on an autistic child's development. It is

recommended that children be tested for autism at 9, 18 and 24 months of age (CDC, 2019d).

The signs and symptoms of autism appear in varying degrees and are classified under three main categories: social skill impairments, communication impairments and repetitive behaviors.

Social Deficits
- Impaired use of nonverbal behaviors (eye contact, facial expression, gestures, etc.) to regulate social interaction
- Little seeking to share interests with people, lack of development of peer relationships
- Lack of social-emotional reciprocity

Communication Deficits
- Delay in or absence of spoken language
- Distinctive or repetitive use of language
- Limited ability for make-believe play
- Inability to maintain a conversation with others

Repetitive and Stereotyped Behavior
- Preoccupations with one or more stereotyped interests that is abnormal in intensity or focus
- Adherence to specific rituals
- Stereotyped body movements (hand or finger flapping or twisting, etc.)
- Persistent preoccupation with parts or sensory qualities of objects

(Autism Speaks, 2019d)

While some parents may be hesitant in taking their children to see a physician and initially attribute the symptoms as temporary, the following "red flags" should signal for immediate evaluation by a qualified physician:

"Red Flags"
- ✓ Does not offer joyful expressions, such as big smiles, by six months of age
- ✓ Does not reciprocate facial expressions by the age of nine months
- ✓ Does not babble by 12 months
- ✓ Does not gesture (point, wave, etc.) by 12 months
- ✓ No words by the age of 16 months
- ✓ Does not say two-word phrases (excluding repeating and/or imitating) by 24 months
- ✓ Has any loss of language or social skills at any age (Autism Speaks, 2019b)

Currently, no medical tests are available to detect autism. However, researchers of Warwick University have developed a method of analyzing abnormal proteins found in blood and urine samples that "may provide improved diagnosis of ASD" (Anwar et al., 2018). This may lead to earlier diagnosis and interventions in the future.

POSSIBLE CAUSES
While there are various projects investigating possible causes of autism, there are no definite known reasons for its occurrence at this time. A variety of factors linked to autism continue to be investigated. These factors include genetics, the environment, neurobiology, and the mother's pregnancy.

Genetics
Evidence supporting the link between genetics and autism can be illustrated by examining the frequency of twins with autism. A recent study found that when autism was identified in one twin the other twin had a high incidence of having autism. The concordance rate for fraternal twins has been shown to be between 0-31%, while the rate among identical twins is estimated to be approximately 36-95% (CDC, 2019a).

A study published in September 2015 identified 239 genes which, if disabled by a mutation, had a high likelihood of causing autism. It found that mutations of genes that they classify as "vulnerable" play a causal role in roughly half of all ASD cases. The vulnerable genes to which they refer harbor what they call an LGD, or likely gene-disruption. These LGD mutations can occur "spontaneously" between generations, and when that happens they are found in the affected child but not found in either parent" (Tarr, 2015).

In 2016, one study reported that mutations in non-coding regions of the genome in a parent's eggs or sperm can have a major effect on early brain development contributing to autism and that the majority of autism-linked de novo (new) mutations originated from the father and increased significantly with age (Yuen et al., 2016).

In 2018 it was reported that that it appeared that "children who have autism as a consequence of inherited genetic factors have less general cognitive damage than those with severe de novo mutations" (Tarr, 2018).

Other evidence supporting genetic causes of autism includes genetic vulnerability. Autism tends to occur more frequently when certain other conditions are present including; Fragile X syndrome, tuberous sclerosis, congenital rubella syndrome, and untreated phenylketonuria (Autism Society of America, n.d.a).

The Environment
A study published in the Archives of General Psychiatry found that 40% of autism risk was linked to genetics, while 55% was connected to environmental factors (Pearson, 2017). It has been found that many children with autism have a metabolic impairment that reduces their ability to rid the body of heavy metals and toxins, leading to brain/nervous system damage and developmental delays (Autism Society of America, 2018).

A study conducted at the UT Health Science Center in San Antonio showed a statistically significant link between industrial release of mercury and autism. The researchers discovered that the prevalence of autism was reduced by 1 to 2 percent for every 10-mile distance from the pollution source (UT Health Science Center San Antonio, 2008). More recently, a study published in 2015 reported that there was a significant increase in autism prevalence in children residing within 28 miles of air pollutant releasing industrial facilities (Dickerson, et al., 2015). Pollution and environmental toxins were again cited as having an impact on "fetal brain development, immune system development, and the pathophysiology of ASD" (Bilbo, Block, Bolton, Hanamsager, and Tran, 2018) in a study published in 2018.

In prior years, it was believed that the increase of autism cases was linked to children's vaccines. This belief has been entirely disproved. The CDC (2019c) states, "studies continue to show that vaccines are **not** associated with ASDs."

Neurobiology
The emergence of brain imaging technologies such as CT, MRI, and PET scans has allowed researchers to identify numerous areas of the brain involved in autism. In a review of previous research, it was suggested that injury to the cerebellum (which contains nearly half of the brain's nerve cell connections) either before or during birth results in a significantly increased risk of autism (Hampson & Blatt, 2015). More recently, 974 functional connections in the brains of infants with autism were identified using functional connectivity magnetic resonance imaging (fcMRI). In two separate analyses, researchers were able to accurately predict (82%-93% accuracy) which high-risk infants (those with siblings with autism) would subsequently be diagnosed with autism. It was suggested that "in the future, neuroimaging may be a useful tool to diagnose autism or help health care providers evaluate a child's risk of developing the disorder" (National Institute of Health [NIH], 2017).

Also being studied are the roles of neurotransmitters such as serotonin, dopamine, and epinephrine. It has been shown that abnormal brain development in a child's first months may be a contributing cause of autism (Magellan Healthcare, 2019).

Pregnancy
Metabolic conditions (diabetes, hypertension, and obesity) during pregnancy may be associated with ASD (Krakowiak et al., 2012). The age of the mother is another factor; the older the mother during pregnancy, the higher risk of autism (Sandin et al., 2012). Prenatal exposure to valproic acid and thalidomide has been linked to higher risks of ASD (CDC, 2019b).

A study by researchers at the University of California-Davis MIND Institute showed that high daily iron intake reduced the risk of having an Autistic child by 50% compared to mothers not taking iron supplements (Schmidt et al, 2014). While not guaranteed to reduce the chance of having an autistic child, "[r]esearchers found that children born to mothers who took either folic acid, a multivitamin, or a combination of

the two before pregnancy were 61 percent less likely to have a child with autism spectrum disorder, compared to children whose mothers did not take folic acid or a multivitamin. Women who took either or both of the supplements during pregnancy were 73 percent less likely to have a child with an autism spectrum disorder" (NIH, 2018).

TREATMENT

No known cure for autism exists nor does one single treatment package help all individuals with autism. Doctors specializing in diagnosing ASD will evaluate the child's condition and often provide a variety of different treatments that will help improve his/her lifestyle. The available treatments include behavioral, educational and medical interventions (NIH, 2019).

Behavioral Interventions
Applied behavior analysis (ABA) is an umbrella term used to describe interventions that work to reinforce desired behaviors and reduce unwanted behaviors. A variety of treatment models are available including:
- Early Start Denver Model (ESDM)
  - Children ages 12-48 months
  - Uses play and everyday activities
  - Based on normal toddler learning and development
  - Improves language, social, and cognitive skills (Autism Speaks, 2019e)
- Lovaas Approach
  - Children ages 2-8
  - Uses positive reinforcement to develop constructive and positive relationships
  - Overall strategy is "breaks down skills into manageable pieces and then builds upon those skills so that a child learns how to learn in the natural environment" (Lovaas Institute, 2019)

Cognitive Behavioral Intervention (CBI) refers to "interventions that are used to alter behavior by teaching individuals to understand and change thoughts and behaviors" (TEA, 2019a).
- Children ages 6-18
- Used when behavior is related to specific emotion (anger, anxiety)

- Addresses social, communication, behavior, cognitive, adaptive, and mental health outcomes (TEA, 2019a)

Educational Interventions
Educational interventions are intended to be administered in an educational setting. An educational intervention program frequently used is the Training and Education of Autistic and Related Communication Handicapped Children (TEACCH), a structured teaching approach which moderates the challenges students with ASD encounter in school. Its principles include:
- Understanding the culture of autism
- Developing individual plans versus standard curriculum
- Structuring the physical environment
- Using visual supports for daily activities and individual tasks
(TEA, 2019c)

Medical Interventions
Medication is often only prescribed to alleviate some symptoms associated with autism. Among drugs used are selective serotonin reuptake inhibitors (SSRIs), anti-psychotics, stimulants, and anti-anxiety drugs. Studies reported significant improvements in measures of challenging behavior in the short term in children receiving the medications, but there is insufficient evidence of long-term results (AHRQ, 2017). Some have seen an improvement in autistic symptoms with the usage of dietary supplements and/or a gluten-free, casein-free diet (GFCF); however, at this time there is not enough research to prove that diet change has an impact on autism (Autism Speaks, 2015).

COST

Caring for a child with Autism is expensive. "It is estimated to cost at least $17,000 more per year to care for a child with ASD compared to a child without ASD. Costs include health care, education, ASD-related therapy, family-coordinated services, and caregiver time. For a child with more severe ASD, costs per year increase to over $21,000" (National Conference of State Legislatures, 2018). Additionally, some

intensive behavioral therapy interventions can cost $40,000 to $60,000 per year per child (CDC, 2019a).

AUTISM RESOURCES IN SAN ANTONIO

Any Baby Can (ABC) of San Antonio's "Autism Services Program" includes parent education services for families of children who have been diagnosed with ASD, several autism support and education groups including one in Spanish, and group and individual counseling with a licensed psychologist. These services are provided at ABC's Bexar, Comal and the 17 surrounding county locations. There is also an autism library with books, videos, and magazines, and an autism resource guide that provides additional information about autism services in the San Antonio area. In addition to monthly events, there are "Parent's Night Out" evenings, which provide parents with some autism-free "me" time (Any Baby Can San Antonio, 2018).

The Early Childhood Intervention (ECI) program is a statewide program administered by the Texas Department of Assistive and Rehabilitative Services (DARS) that focuses exclusively on services for infants from birth to age three that suffer from disabilities or developmental delays, including autism. The benefits offered by ECI include promoting development and learning, providing support to families, coordinating services, and decreasing the need for costly special programs (Texas Department of Assistive and Rehabilitative Services [DARS], n.d.a). There are several organizations in the San Antonio area that offer ECI services:

➢ Bexar County: Brighton Center, Center for Health Care Services (CHCS), and Easter Seal Rehabilitation Center
➢ Bandera County: Camino Real Community Services (located in Lytle, TX)
➢ Comal County: Camino Real Community Services (located in Lytle, TX)
➢ Kendall County: Center for Life Resources (located in Brownwood, TX)

(DARS, n.d.b).

Autism Treatment Center, headquartered in Dallas, has a day program and several community-based group homes in San Antonio. Services provided include educational opportunities for persons ages 3-21, a diagnostic program which includes assessments and developmental autism screenings, and a Therapy Clinic that offers occupational and speech therapy (Autism Treatment Center, n.d.).

Founded in 2008, the Autism Service Center of San Antonio d.b.a. Autism Community Network was created with the long-term vision that it would become the "hub" for collaboration of autism services in the San Antonio area. Its mission to maximize the potential of children with autism, provide services to underserved children and families, and promote awareness in the community is encompassed in three primary goals to provide:

➢ Education and training to autism service providers
➢ Interdisciplinary diagnosis and treatment to young children with ASD
➢ Comprehensive information and networking for San Antonio's autism community

(Autism Community Network, 2017)

Autism Lifeline Links (ALL) is a coalition of agencies and organizations founded through an initiative funded by the Kronkosky Charitable Foundation. ALL works as a one-time stop for families that are looking for autism related services ranging from diagnosis, respite care to where an individual with autism can get a haircut. It includes 14 referral agencies who work directly with individuals with autism and eight (8) community partners including other local nonprofits and Universities.

ALL's referral agencies are part of a HIPPA-secured information sharing platform operated by TAVConnect. The platform allows only the referral agencies to share the information and it is fully designated to streamline and simplify connecting individuals and families with agencies and organizations that provide services addressing the challenges of Autism Spectrum Disorder (Autism Lifeline Links, 2019).

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