



## Unveiling Autism Myths, Facts, and AI/ML in Early Diagnosis

**Bahman Zohuri\***

Adjunct Professor, Golden Gate University, Ageno School of Business, San Francisco, California, USA

\*Corresponding Author: Aahman Zohuri, Adjunct Professor, Golden Gate University, Ageno School of Business, San Francisco, California, USA.

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**Bahman Zohuri.**

### Abstract

Autism spectrum disorder (ASD) is a complex neurodevelopmental condition that has seen a significant rise in prevalence among children in the United States over the past few decades. With current estimates indicating that approximately 1 in 54 children are diagnosed with ASD, understanding the disorder and its implications is more critical than ever. This article explores the growth of autism diagnoses, dispelling common myths and presenting factual insights to foster a deeper understanding of the condition. It addresses the challenges of early diagnosis, such as symptom variability and the shortage of trained professionals, while highlighting the importance of timely intervention. The integration of Artificial Intelligence (AI) and Machine Learning (ML) in the diagnostic process represents a promising opportunity to enhance early detection rates. By analyzing behavioral data and recognizing subtle signs of autism, these technologies can support healthcare professionals in identifying at-risk children more accurately and efficiently. Furthermore, the article emphasizes the role of organizations like the World Health Organization (WHO) in promoting awareness, research, and inclusive health services for individuals with autism. Overall, this comprehensive overview underscores the importance of understanding autism, leveraging technology for early diagnosis, and addressing the needs of those on the spectrum and their families.

**Keywords:** Autism; Spectrum; Diagnosis; Early Intervention; Artificial Intelligence; Machine Learning; Prevalence; Myths; Healthcare; Neurodevelopmental

### Introduction

Autism, a complex neurodevelopmental condition, has seen a significant rise in diagnosis rates in the United States of America (USA). This section introduces the topic, highlighting the importance of understanding Autism Spectrum Disorder (ASD) and the challenges associated with its early identification.

According to data from the Centers for Disease Control and Prevention (CDC), children with autism spectrum disorder (ASD) are being diagnosed with it more frequently. A 2020 research that was conducted by the CDC's Autism and Developmental Disabilities Monitoring Network across 11 surveillance sites revealed that the estimated prevalence of autism spectrum disorder was one in 36 (2.8%), up from one in 44 (2.3%) in 2018 and one in 150 (0.7%) in 2000.

### Note that

The Autism and Developmental Disabilities Monitoring (ADDM) Network is an active surveillance program that provides estimates of the prevalence of ASD among children aged 8 years. In

2020, there were 11 ADDM Network sites across the United States (Arizona, Arkansas, California, Georgia, Maryland, Minnesota, Missouri, New Jersey, Tennessee, Utah, and Wisconsin). To ascertain ASD among children aged 8 years, ADDM Network staff review and abstract developmental evaluations and records from community medical and educational service providers. A child met the case definition if their record documented:

- An ASD diagnostic statement in an evaluation,
- A classification of ASD in special education, or
- An ASD International Classification of Diseases (ICD) code.

In summary, Autism Spectrum Disorder (ASD) has become increasingly recognized and diagnosed among children in the United States over the past few decades. This article explores the current landscape of autism, separating myths from facts, and delves into the role of Artificial Intelligence (AI) and Machine Learning (ML) in early diagnosis.

### What is autism spectrum disorder?

Here in this section, we are delving to into the definition and characteristics of understanding of Autism Spectrum Disorder

(ASD) and what is ASD in simple term by explaining this disorder among children and why it is in rise in United States according to Center for Disease Control (CDC) data.

We delve into the definition and characteristics of ASD, examining its spectrum nature and the diverse range of symptoms and impairments it encompasses.

As “a developmental disability that can cause significant social, communication, and behavioral challenges,” ASD is described by the CDC. (Neurodeficiencies that cause ASD can be attributed to recognized hereditary diseases, as well as as-yet-unidentified causes, or most likely a combination of these).

A difficult birth, illnesses during pregnancy, elderly parents, and environmental factors are possible additional contributors.

Autism spectrum disorders can affect how people learn, behave, and interact with others. While some people require assistance with everyday tasks and are nonverbal, others possess sophisticated conversational skills and can live freely with minimal or no help. The CDC states that ASD usually manifests as a permanent condition that starts before the age of three, though symptoms may lessen with maturity [1-3].

Autism cannot be tested for medically, and diagnosis might be challenging. Receiving a diagnosis during youth or maturity is not unusual. The CDC issues a warning, noting that individuals without autism can also exhibit ASD symptoms.

### Myths and facts about autism

This segment debunks common myths surrounding autism while presenting verified facts based on current research and clinical understanding. Key myths addressed include misconceptions about causes, treatments, and the capabilities of individuals on the autism spectrum.

The conversation surrounding autism is often clouded by misconceptions and myths that can lead to stigma, misunderstanding, and ineffective interventions. It is crucial to differentiate between myths and facts to foster a more accurate understanding of Autism Spectrum Disorder (ASD) as pointed out in the following points.

#### Myth 1: Autism is caused by vaccines.

One of the most persistent myths is the belief that vaccines, particularly the Measles, Mumps, and Rubella (MMR) vaccine, cause autism. This misconception gained traction from a now-discredited study published in 1998 that suggested a link between vaccines and autism. Extensive research since then, involving large-scale studies, has found no causal relationship between vaccines and the development of autism. Public health organizations, including the CDC and World Health Organization (WHO), strongly advocate

for vaccination, emphasizing its critical role in preventing serious diseases without any evidence of harm related to autism.

Note that: The World Health Organization (WHO) is a specialized agency of the United Nations established in 1948 with the primary goal of promoting global health, ensuring that all people attain the highest possible level of health. The WHO's mission encompasses a wide range of health-related issues, including disease prevention, health education, and the establishment of health standards. It provides leadership on global health matters, shapes the health research agenda, and sets norms and standards for health practices worldwide.

In the context of autism spectrum disorder (ASD), the WHO plays a crucial role in raising awareness, providing resources, and supporting research to improve the understanding and management of the condition. The organization advocates for early diagnosis and intervention, recognizing that timely support can significantly enhance the quality of life for individuals with autism and their families. The WHO also emphasizes the importance of inclusive health services that cater to the diverse needs of individuals on the autism spectrum, promoting policies that support their integration into society.

Through its collaborative efforts with member states and other stakeholders, the WHO aims to create a comprehensive framework for addressing autism globally, addressing disparities in access to care, and ensuring that all individuals, regardless of their circumstances, receive the support and resources they need to thrive.

#### Myth 2: Individuals with autism lack empathy and emotions

Another common myth is that individuals with ASD do not experience empathy or emotions. While it is true that some individuals may struggle to recognize or interpret social cues and emotions, many people with autism have a deep emotional understanding and can express empathy in unique ways. Individuals on the spectrum may feel emotions intensely and care deeply about others, even if they struggle with conventional social interactions.

#### Myth 3: Autism only affects children

A prevalent misconception is that autism is a childhood disorder that individuals outgrow as they reach adulthood. However, autism is a lifelong condition. While symptoms may evolve or become less pronounced with age, many individuals continue to face challenges associated with autism throughout their lives. Transitioning into adulthood can be particularly challenging, as individuals may require ongoing support in areas such as employment, social skills, and independent living.

#### Myth 4: All individuals with autism are the same

The term “spectrum” in ASD emphasizes the vast diversity of abilities and challenges experienced by individuals on the spec-

trum. Autism manifests differently in each person, with a wide range of cognitive abilities, communication styles, and sensory sensitivities. Some individuals may have high-functioning autism and excel in specific areas, while others may have more significant challenges. This diversity underscores the importance of personalized support and intervention tailored to everyone's unique needs.

#### Myth 5: Autism is solely a behavioral issue

Many people view autism primarily as a collection of behavioral problems. While behavioral challenges are an aspect of autism, the condition encompasses a wide range of neurodevelopmental differences, including sensory processing issues, communication difficulties, and executive functioning challenges. Effective interventions should address these multifaceted needs rather than solely focusing on behavior modification.

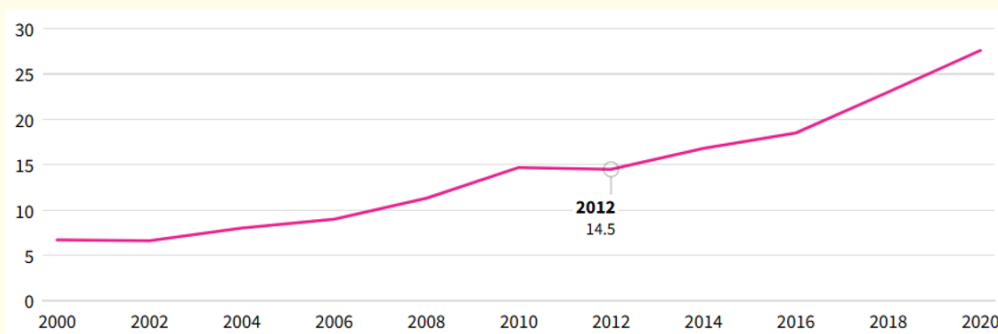
In summary, debunking these myths with factual information is essential for promoting understanding and acceptance of indi-

viduals with autism. By acknowledging the realities of autism and addressing misconceptions, society can better support those on the spectrum and their families, leading to improved outcomes and a more inclusive environment.

#### Prevalence of autism spectrum disorder (ASD) over time

The prevalence of Autism Spectrum Disorder (ASD) has increased significantly over the past few decades. In the early 1990s, estimates suggested that approximately 1 in 2,500 children were diagnosed with autism. However, by the early 2000s, this figure had risen to 1 in 150, and more recent estimates indicate that as of 2020, approximately 1 in 54 children in the United States are identified as having ASD (See Figure-1, where Autism spectrum disorders have been increasing steadily since 2000).

This upward trend can be attributed to several factors, including heightened awareness of autism, improved diagnostic criteria, and



**Figure 1:** Combined Prevalence of Autism Spectrum Disorder (ASD) per 1,000 8-year-old children, 2000-2020. (Source: Center for Disease Control and Prevention Get the data Embed Download image Download SVG.)

expanded access to healthcare services, which have contributed to more comprehensive screening and identification efforts. Additionally, ongoing research has revealed the complexity and variability of autism, leading to more individuals being recognized as falling on the spectrum. While the exact reasons for the increase in prevalence remain a topic of research, it underscores the necessity for continued efforts in early diagnosis, intervention, and support for individuals and families affected by autism.

Data combined from Autism and Developmental Disabilities Monitoring, collected from select peer-reviewed autism prevalence studies. Data is not necessarily representative of the entire United States.

The CDC's Autism and Developmental Disabilities Monitoring Network (ADDMMN), which started studying autism in 2000, states that diagnoses for autism spectrum disorder in children have increased as detection techniques have improved. According to the most recent ADDMMN monitoring data, 2.8% of observed children

were diagnosed with autism in 2020, up from 1.5% in 2010 and 0.7% in 2000. However, this data only includes children from 11 locations and may not be typical of all children in the United States.

Note that: The Children's Health Act of 2000 authorized the CDC to create the Autism and Developmental Disabilities Monitoring (ADDMM) Network to "track the number and characteristics of children with ASD and other developmental disabilities using CDC's Metropolitan Atlanta Developmental Disabilities Surveillance Program (MADDSP) as a guide." The ADDMM method is population-based and "reflect real-world community practices." CDC reports that it "will continue to monitor the number and characteristics of children with ASD over time, track progress in the early identification of ASD, and describe health and service needs of adolescents with ASD."

#### Prevalence of ASD by demographics

Autism spectrum disorder is more commonly identified in boys than girls. In 2020, 4.3% of 8-year-old boys were estimated to have autism, compared with 1.1% of girls of the same age.

Until 2010, autism was more prevalent among children of higher socioeconomic status. That trend has lessened in recent years, which the CDC interprets as caused by “improvements in more equitable identification of ASD, particularly for children in groups that have less access or face greater barriers in obtaining services.”

In 2020 the CDC estimated autism to be less prevalent among white children than Black, Hispanic, or Asian children for the first time. Past estimates showed ASD diagnoses were 50% higher in white children than Black or Hispanic children. That gap has narrowed in recent years, and the three categories were even in 2016 and 2018 estimates.

In 2020, Asian and Pacific Islander children had the highest rate of ASD diagnoses and Figure-2 is presentation of prevalence of autism spectrum disorder in 8-year-old children by race/ethnicity, 2020.

### Why has the prevalence of autism increased?

It is possible that rising autism rates are a result of increased awareness of the disorder, advancements in screening, and more accessibility to services related to diagnosing autism. The CDC states that younger, non-White children from lower-class homes are particularly prone to experience it.

For the first time, ADDM data found that the percentage of 8-year-old Black (2.9%), Hispanic (3.2%), and Asian or Pacific

Islander (3.3%) children with ASD was higher compared with 8-year-old White children (2.4%). This is the opposite of racial and ethnic differences observed in previous ADDM reports.

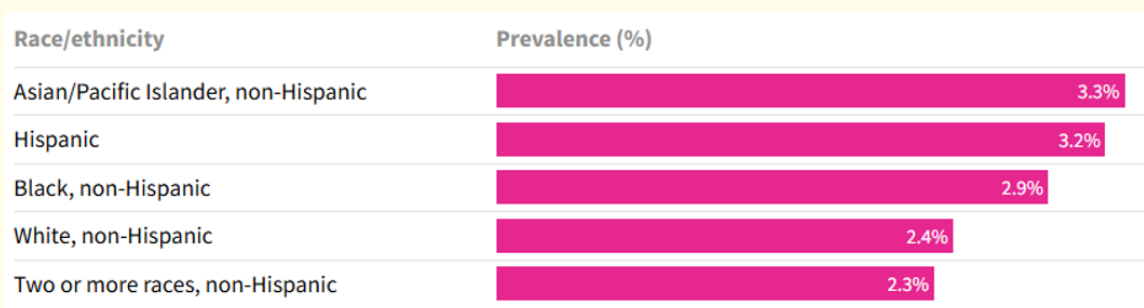
Also, for the first time, the percentage of 8-year-old girls identified with ASD was higher than 1%, but boys were nearly 4 times as likely as girls to be identified with ASD.

### Children identified with ASD by 48 months

Recent years have seen improvements in the early diagnosis of autism spectrum disease, leading to a rise in the number of younger children receiving an ASD diagnosis and with help from Artificial Intelligence (AI) with integrated Machine Learning (ML), this matter has been enhanced with better and accurate results. Compared to 1.1% of children born in 2012, 1.8% of all children born in 2016 had an autism diagnosis or special education classification by the time they were four years old.

### How did the pandemic impact diagnoses and treatment for autism?

Fewer four-year-olds were diagnosed with autism and given treatment as a result of the COVID-19 pandemic’s disruption of autism examinations. According to the CDC, these delays “may have long-lasting effects,” and it is recommended that communities assess the effects that these delays have had on children [4-7].



**Figure 2:** Prevalence of Autism Spectrum Disorder in 8-Year-Old Children by Race/ethnicity, 2020. (Source: Center for Disease Control and Prevention Get the data Embed Download image Download SVG.)

Data combined from Autism and Developmental Disabilities Monitoring, collected from select peer-reviewed autism prevalence studies. Data is not necessarily representative of the entire United States.

### What actions do public health officials recommend for supporting children with ASD?

According to the Autism and Developmental Disabilities Monitoring Network, one of the most crucial steps communities can take to better support children with autism spectrum disorder is

early screening and identification. According to its 2023 community report, “the earlier that children are identified with ASD, the earlier they can access services and supports.”

### Early diagnosis: current challenges and opportunities

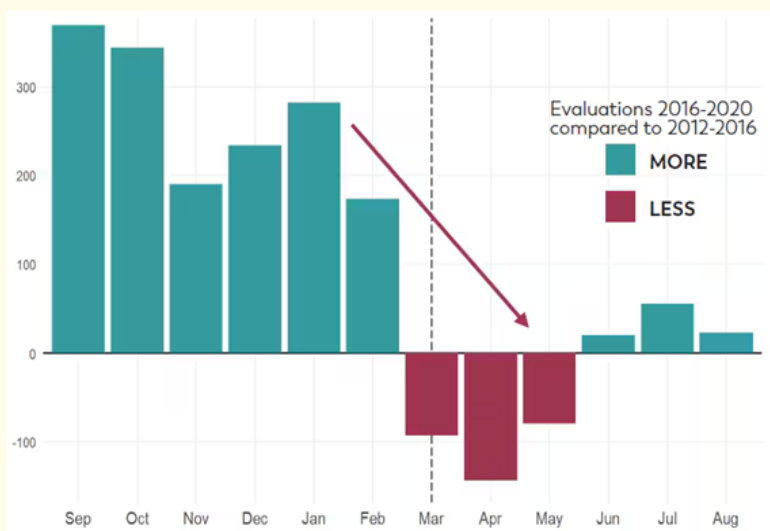
Early diagnosis of autism is crucial for timely intervention and support, yet it remains challenging due to varied symptom presentations and the need for specialized expertise. This section discusses existing methods and their limitations, paving the way for the introduction of AI and ML technologies in improving early detection rates.

In other words, in summary, Early diagnosis of Autism Spectrum Disorder (ASD) is critical for implementing timely interventions that can significantly improve developmental outcomes for children. However, the current landscape presents several challenges. One of the primary obstacles is the variability in symptoms among children on the spectrum; ASD manifests differently in each individual, with some exhibiting pronounced signs while others may display subtler indicators that can be easily overlooked. This variability often leads to delays in diagnosis, as caregivers and even healthcare professionals may misinterpret early signs or attribute them to other developmental delays. Additionally, a shortage of trained specialists capable of conducting comprehensive assessments contributes to prolonged wait times for evaluations, resulting in missed opportunities for early intervention. Despite these challenges, there are significant opportunities on the horizon. Advances in research are yielding improved screening tools that can identify risk factors and symptoms at a much earlier age. Moreover, the integration of Artificial Intelligence (AI) and Machine Learning (ML) into diagnostic processes shows promise for analyzing behavioral data and identifying patterns indicative of ASD. These technologies can enhance the accuracy and speed of diagnoses, allowing for earlier intervention and support for families. By leveraging these advancements, healthcare systems can improve early detection rates, ultimately fostering better outcomes for children with autism and their families.

Early ASD identification was disrupted following the start of the COVID-19 pandemic. In 2020, children born in 2016 were 1.6 times as likely as children born in 2012 to be identified as having ASD by 48 months of age. This is important because the earlier a child is identified with ASD, the earlier they can access services and supports.

Figure 3 is illustrating From 2016 to the beginning of 2020, 4-year-old children had more evaluations and identifications than children aged 8-years (when they were 4) had from 2012 through 2016. (Displayed as 6 months prior and 6 months after March 2020.)

When the COVID-19 pandemic started, 4-year-old children were getting more evaluations and identifications for ASD than 8-year-old children were at that age. This was discovered through comparing the number of evaluations and ASD identifications before and after the pandemic. Nevertheless, starting in March 2020, these advancements in assessment and ASD identification were eliminated. Due to the COVID-19 pandemic, delays in identification and service commencement may result in long-term consequences from evaluation delays.



**Figure 3:** Early ASD Identification was Disrupted Following the Start of the COVID-19 Pandemic.

**Role of AI and ML in early diagnosis**

AI and ML hold promise in revolutionizing the early diagnosis of autism by analyzing behavioral patterns, speech characteristics, and other relevant data to detect subtle signs indicative of ASD. This part explores current research and applications where AI algorithms are being trained to assist clinicians in identifying potential cases of autism earlier than traditional methods allow.

Moreover, Artificial Intelligence (AI) and Machine Learning (ML) are increasingly playing a transformative role in the early diagnosis of Autism Spectrum Disorder (ASD). By analyzing large datasets that include behavioral patterns, speech nuances, and developmental milestones, AI algorithms can identify subtle indicators of autism that may be overlooked by traditional diagnostic methods. These technologies facilitate the development of predictive models that enhance the accuracy of assessments, enabling earlier detection of ASD signs, sometimes even before formal symptoms manifest [8-12].



For instance, AI can analyze videos of a child's interactions or monitor their social behaviors, offering insights into communication and engagement levels. Additionally, machine learning models can continuously improve their predictive capabilities by learning from new data, thereby refining the diagnostic process over time. This innovative approach not only accelerates the identification of at-risk children but also allows for personalized intervention strategies, ultimately leading to improved outcomes for those on the autism spectrum.

### Ethical considerations and challenges

While AI and ML offer advancements in early diagnosis, ethical considerations such as data privacy, algorithm biases, and the role of human oversight must be addressed. This section examines these challenges and proposes strategies to ensure responsible and equitable implementation of AI in autism diagnosis.

### Future Directions and Conclusion

The article concludes by outlining future directions in research and technology aimed at enhancing our understanding of autism and improving diagnostic accuracy through AI and ML. It underscores the importance of continued collaboration between healthcare professionals, researchers, and technology developers to better support individuals with autism and their families.

This structure provides a comprehensive overview of autism, dispels myths with facts, and integrates the potential of AI and ML in early diagnosis, all within a few pages of framework of this article.

Furthermore, Understanding autism spectrum disorder (ASD) is essential in fostering an inclusive society that recognizes the unique strengths and challenges faced by individuals on the spectrum. The significant rise in autism diagnoses over recent decades highlights the need for increased awareness, accurate information, and timely interventions. By dispelling myths and presenting factual insights, we can promote a more informed perspective that acknowledges the diversity within autism and the lifelong impact of early diagnosis and support. The advent of Artificial Intelligence (AI) and Machine Learning (ML) offers exciting opportunities to revolutionize the early detection of ASD, enabling healthcare professionals to identify at-risk children more accurately and provide personalized interventions tailored to their unique needs. Collaborative efforts among healthcare providers, researchers, and organizations like the World Health Organization (WHO) are vital in ensuring that all individuals with autism receive the support and resources necessary to thrive. As we continue to advance our understanding and approaches to autism, we must remain committed to creating a more inclusive environment that empowers individuals with ASD and their families to lead fulfilling lives.

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