

Overcoming Racial Bias In AI Systems And Startlingly Even In AI Self-Driving Cars

Racial bias in a medical algorithm favors white patients over sicker black patients

AI expert calls for end to UK use of 'racially biased' algorithms

AI Bias Could Put Women's Lives At Risk - A Challenge For Regulators

Gender bias in AI: building fairer algorithms

Bias in AI: A problem recognized but still unresolved

Machines Taught by Photos Learn a Sexist View of Women

Algorithms showed a tendency to associate women with shopping and men with shooting.

Amazon, Apple, Google, IBM, and Microsoft worse at transcribing black people's voices than white people's with AI voice recognition, study finds

Millions of black people affected by racial bias in health-care algorithms

Study reveals rampant racism in decision-making software used by US hospitals – and highlights ways to correct it.

When It Comes to Gorillas, Google Photos Remains Blind

Google promised a fix after its photo-categorization software labeled black people as gorillas in 2015. More than two years later, it hasn't found one.

The Week in Tech: Algorithmic Bias Is Bad. Uncovering It Is Good.

Apple's credit card is being investigated for discriminating against women

Customers say the card offers less credit to women than men

Google 'fixed' its racist algorithm by removing gorillas from its image-labeling tech

Artificial Intelligence has a gender bias problem – just ask Siri

MIT apologizes, permanently pulls offline huge dataset that taught AI systems to use racist, misogynistic slurs

The Best Algorithms Struggle to Recognize Black Faces Equally

US government tests find even top-performing facial recognition systems misidentify blacks at rates five to 10 times higher than they do whites.

Facebook's ad-serving algorithm discriminates by gender and race

Even if an advertiser is well-intentioned, the algorithm still prefers certain groups of people over others.

California investigating racial bias in healthcare algorithms

'The Computer Got It Wrong': How Facial Recognition Led To False Arrest Of Black Man

Equitable Artificial Intelligence in Healthcare

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Medical Advisor, *Cognito & Medical Intelligence One*

Research Support from *Innovative Health Solutions*

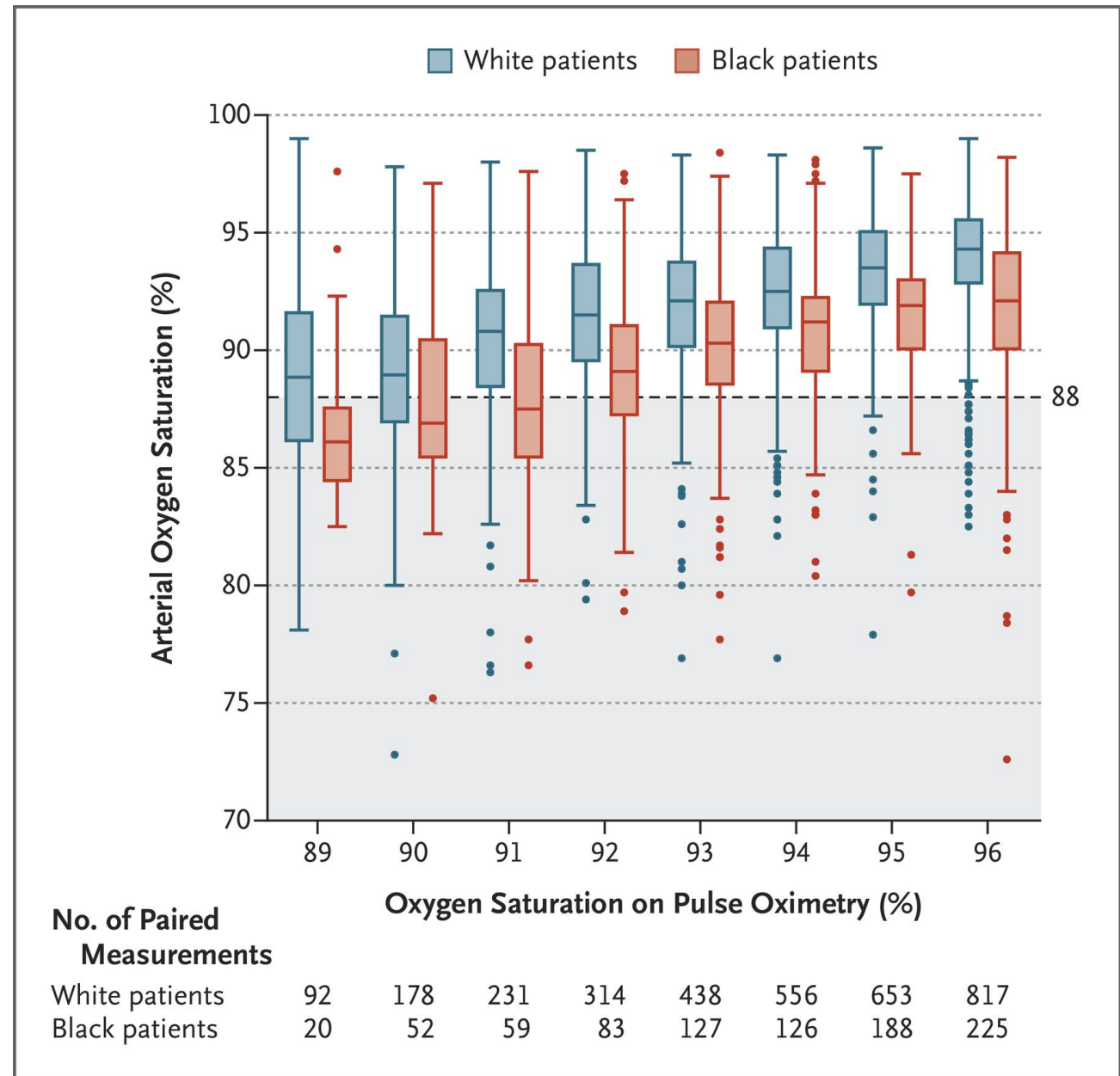


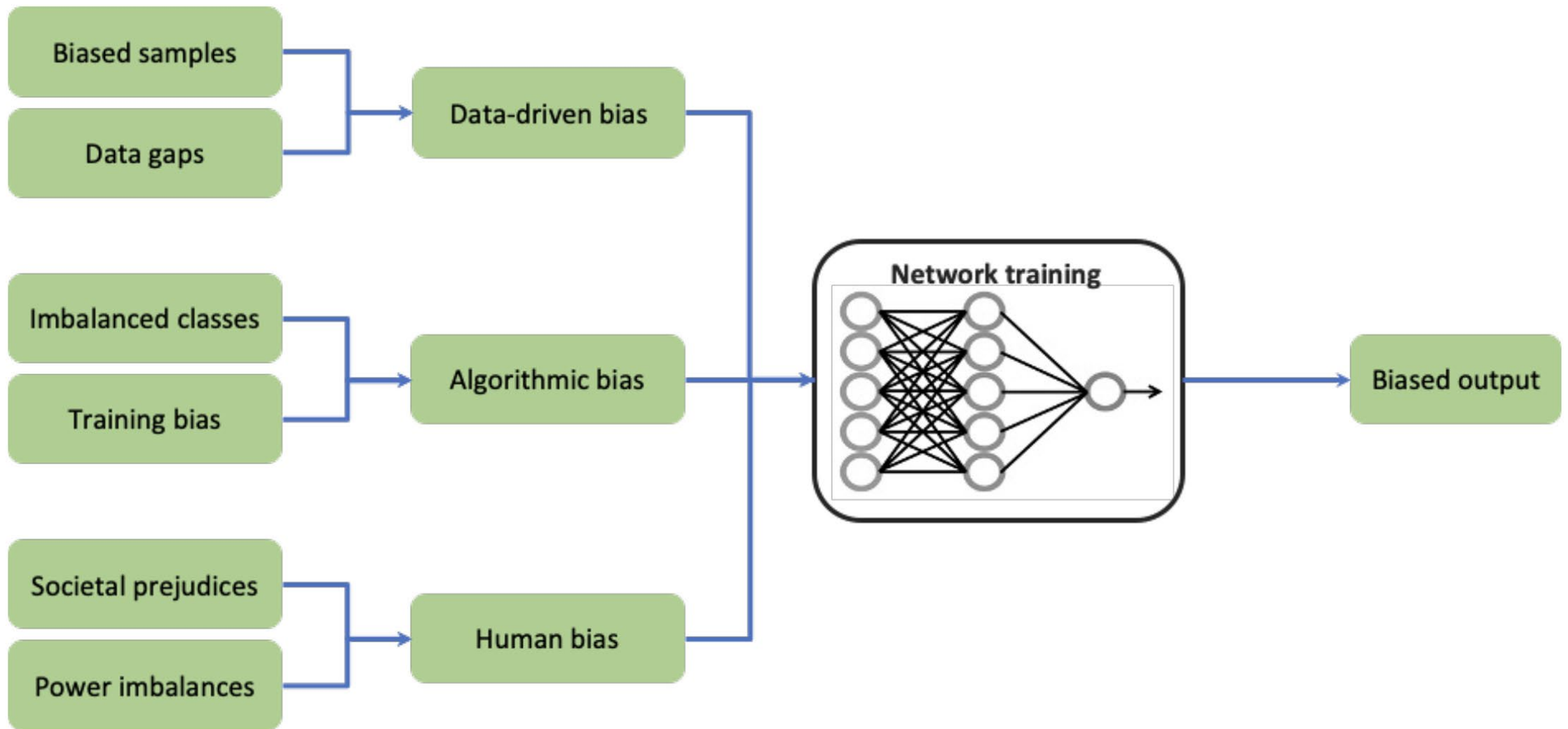
American Academy of Pediatrics
Orange County Chapter
INCORPORATED IN CALIFORNIA



Disclosures

I am an employee of Cognoa and hold Cognoa stock options. I am an employee of the Pediatric Subspecialty faculty which is a foundation with CHOC. I am an employee of Chapman University. I receive consulting fees for Cognito Therapeutics. I am a paid advisor for MI10 LLC. I am a co-founder and own stock for NTX, Inc. I am an advisor for HandzIn and have vested stock. I am a volunteer board member of the AAP - OC chapter and AAP - California.





Real world patterns of health inequality and discrimination



Unequal access and resource allocation



Discriminatory healthcare processes



Biased clinical decision making



Application injustices



Disregarding and deepening digital divides



Exacerbating global health inequality and rich-poor treatment gaps



Hazardous and discriminatory repurposing of biased AI systems



Discriminatory data



Sampling biases and lack of representative datasets



Patterns of bias and discrimination baked into data distributions

World → Data

Use ← Design

Biased AI design and deployment practices



Power imbalances in agenda setting and problem formulation




Biased and exclusionary design, model building and testing practices



Biased deployment, explanation and system monitoring practices



biases



*AI can make
the visible
invisible*

*and make the
invisible visible.*

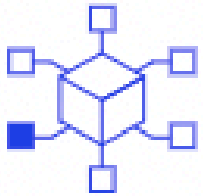
-Anthony Chang, MD, MBA, MPH, MS



Socially Responsive AI for Equitable Outcomes

- **Equitable**
 - ✓ **Race/Ethnicity**
 - ✓ **Gender**
 - ✓ **Age**
 - ✓ **Developmental Condition**
- **Interpretable**
 - **Can be tuned to prevalence in target population**
 - **Can be tuned to cultural norms in target locale**

1



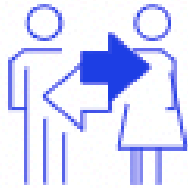
Be aware of contexts in which AI can help correct for bias and those in which there is high risk for AI to exacerbate bias

2



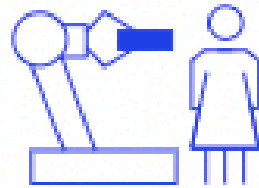
Establish processes and practices to test for and mitigate bias in AI systems

3



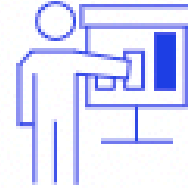
Engage in fact-based conversations about potential biases in human decisions

4



Fully explore how humans and machines can best work together

5



Invest more in bias research, make more data available for research (while respecting privacy), and adopt a multidisciplinary approach

6



Invest more in diversifying the AI field itself

Racial, Ethnic, and Sociodemographic Disparities in Diagnosis of Children with Autism Spectrum Disorder

Brandon S. Aylward, PhD,* Diana E. Gal-Szabo, PhD,* Sharief Taraman, MD*†

ABSTRACT: This special article uses a biosocial-ecological framework to discuss findings in the literature on racial, ethnic, and sociodemographic diagnostic disparities in autism spectrum disorder. We draw explanations from this framework on the complex and cumulative influences of social injustices across interpersonal and systemic levels.

(*J Dev Behav Pediatr* 42:682–689, 2021) **Index terms:** ASD, health inequities, systemic racism, disparities.

Inequities & Inefficiencies

VAST OPPORTUNITIES TO IMPROVE OUTCOMES

Waiting lists of up to **18 months**¹



Parents visit **4-5 clinicians** on diagnostic journey²

2/3 of toddlers flagged for autism are NOT referred to specialists³



85%



85% of children identified with ASD had concerns noted in their records by age 3³

40%



40% of children were not evaluated for ASD within the early intervention window⁴



Girls are diagnosed with autism **1.5 years later**, on average, than boys⁵



1 of 4 children under age 8 with ASD – most of them **African American or Hispanic** – are not being diagnosed⁶

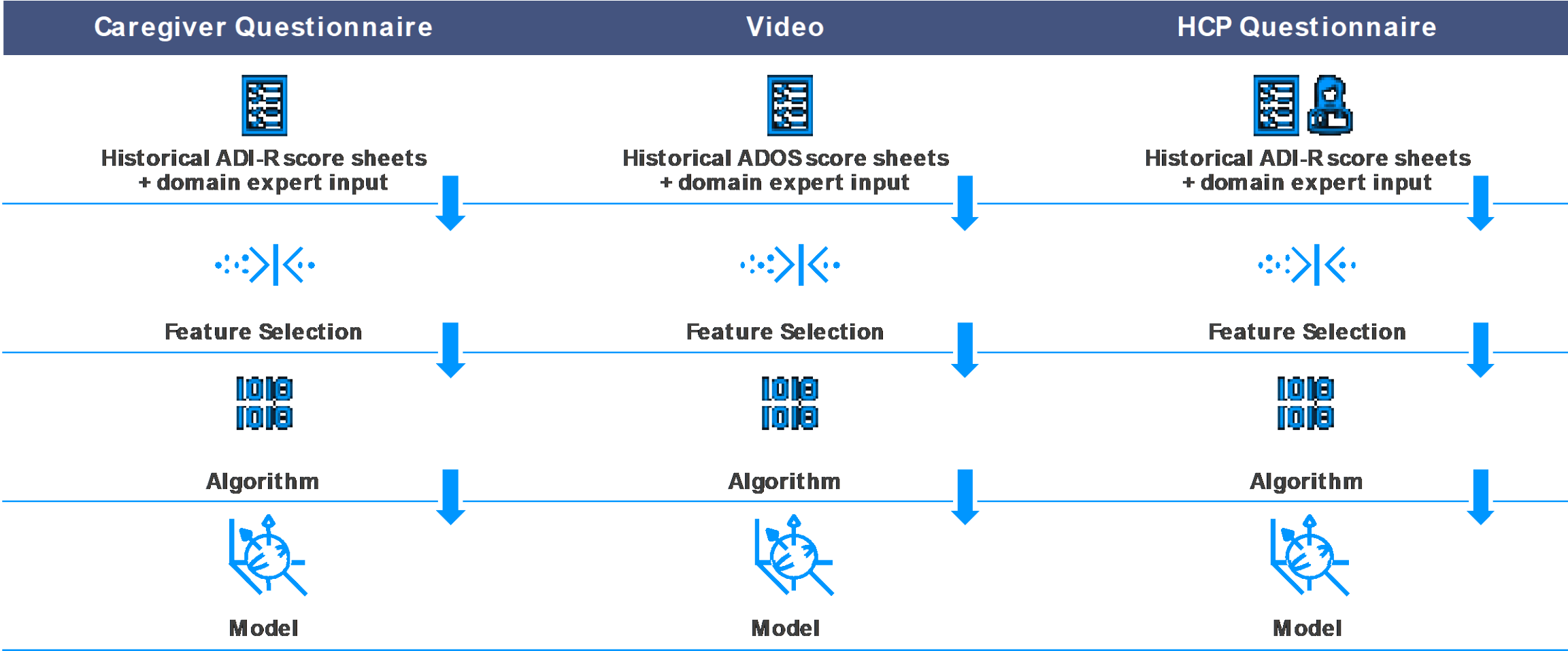
1. Begeer, Bouk, Boussaid, Terwogt, & Koot, 2009
2. Goin-Kochel, Mackintosh, & Myers, 2006

3. Centers for Disease Control and Prevention.
4. Monteiro S.A. et al. Pediatrics, 2019

5. McCormick et al., 2020
6. Baio, Wiggins, Christensen et al., 2018

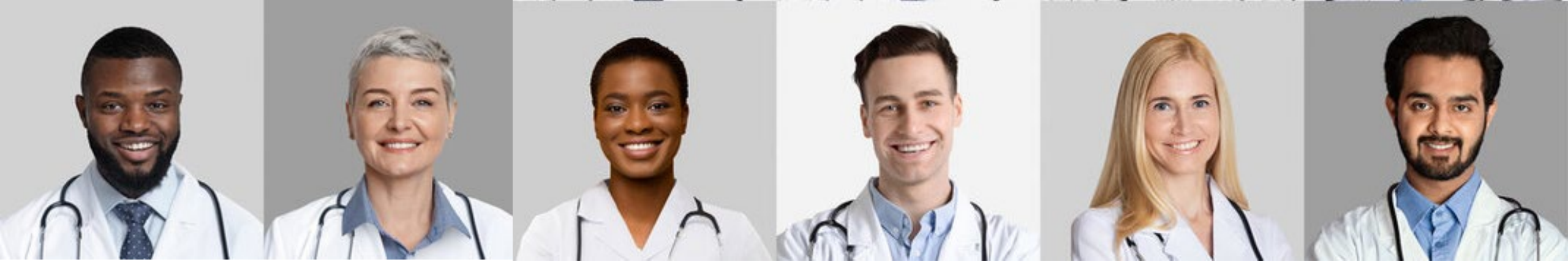
Canvas Dx

Canvas Dx* is the first FDA-authorized Software as a Medical Device that aids healthcare providers to diagnose or rule out autism in young children. Canvas Dx harnesses clinically validated artificial intelligence technology to aid providers in diagnosing ASD in children between the ages of 18 and 72 months who are at risk of developmental delay

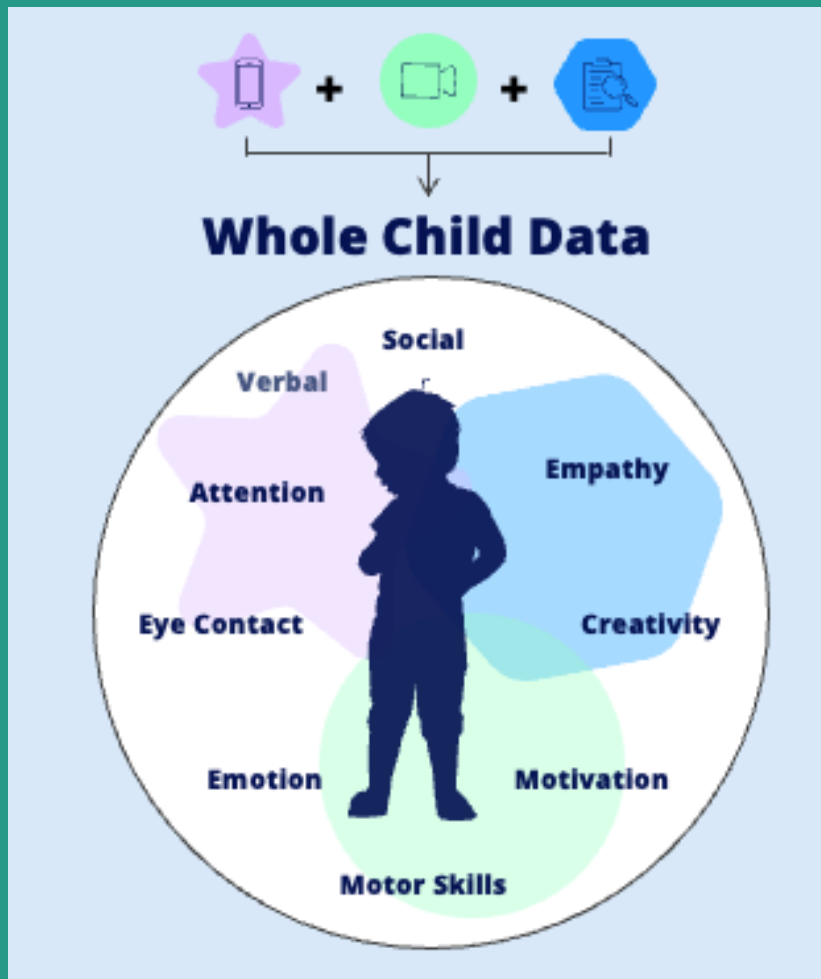


1. Abbas H, et al. JAm Med Inform Assoc. 2018;25(8):1000-1007. doi:10.1093/jamia/ocy039
2. Abbas H, et al. Sci Rep. 2020;10(1):5014. doi:10.1038/s41598-020-61213-w

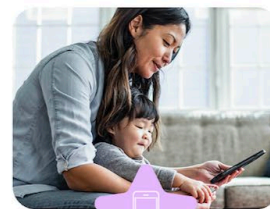
*Canvas Dx is manufactured by Cognoa Inc.,



Using Multiple Sources To Prevent Bias



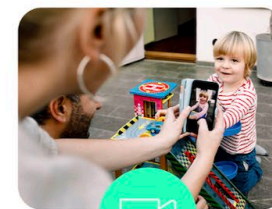
How It Works



1. Caregiver Input

APPROX. 5 MINUTES

Caregiver uses smartphone to answer a brief questionnaire (18 or 21 items) about the child's behavior.



2. Video Input

APPROX. 11 MINUTES

Caregiver uses smartphone to record and upload two short home videos of the child. Videos are securely transmitted to a portal where trained analysts identify key features in a 28 or 33 item questionnaire.



3. HCP Input

APPROX. 10 MINUTES

The child's physician (or other qualified healthcare provider) independently answers a short 13 or 15 item HCP questionnaire.



Algorithm Analysis and Classification

Inputs are combined into a mathematical vector for machine learning analysis and classification.

Positive ASD

Negative ASD

Indeterminate

Canvas Dx is designed to abstain when presented with insufficient inputs. This is an important safety mechanism to reduce the risk of false classifications

Canvas Dx Pivotal Study

Multi-site, Prospective, Blinded, Method-comparison Cohort Study¹

Objective

To compare the diagnostic output of the device (with algorithm V1) to the clinical reference standard, consisting of diagnosis made by a care specialist based on DSM-5 criteria and validated by one or more reviewing care specialists

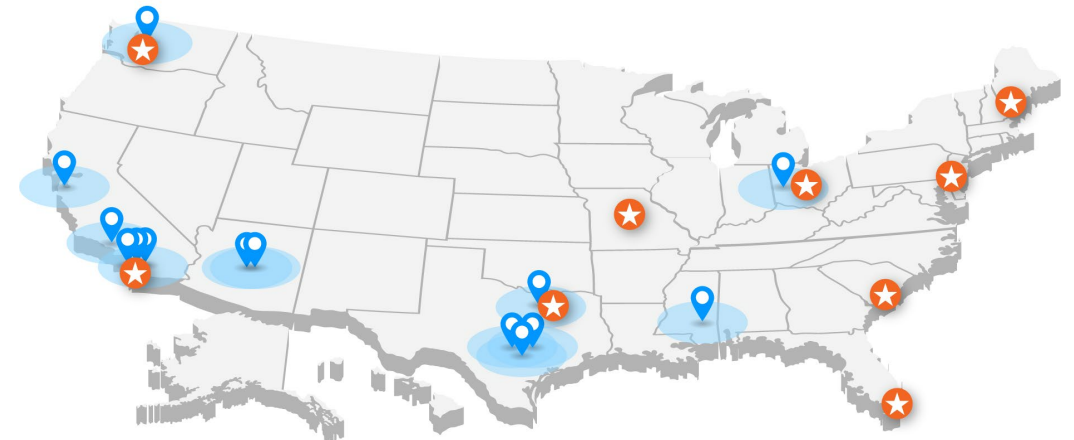
Study Endpoints

- **Primary Endpoints**
 - Positive predictive value (PPV)
 - Negative predictive value (NPV)
 - Measurement of the proportion of all children for whom the device provides an indeterminate output
- **Secondary Endpoints**
 - Sensitivity and specificity

Study Details^{1,2}

- N=425 completed subjects
- 18-72 months with concern for developmental delay
- 14 sites
- Study population mirrored US population across race, ethnicity, socioeconomic status

 Clinical Sites  Central Review Panelists



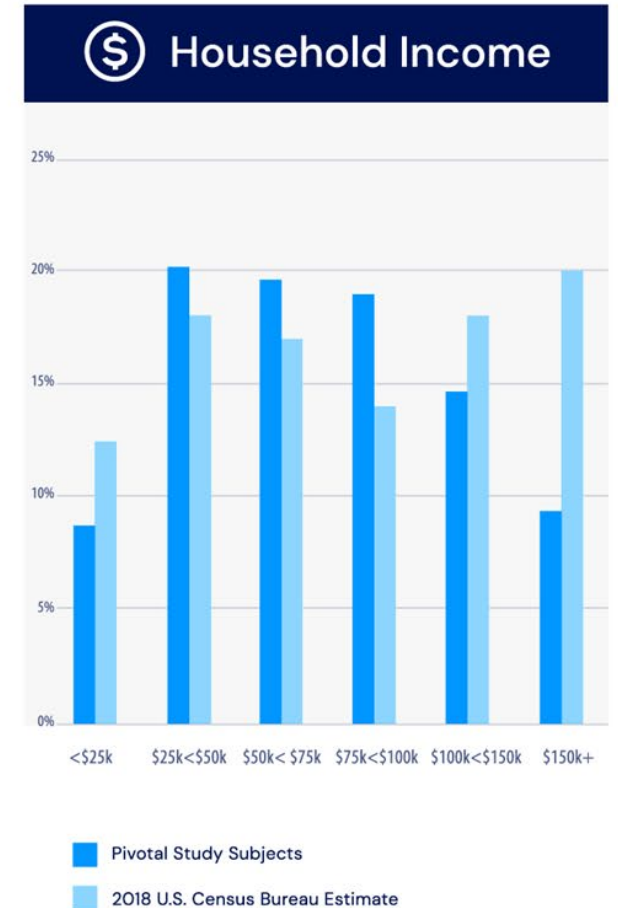
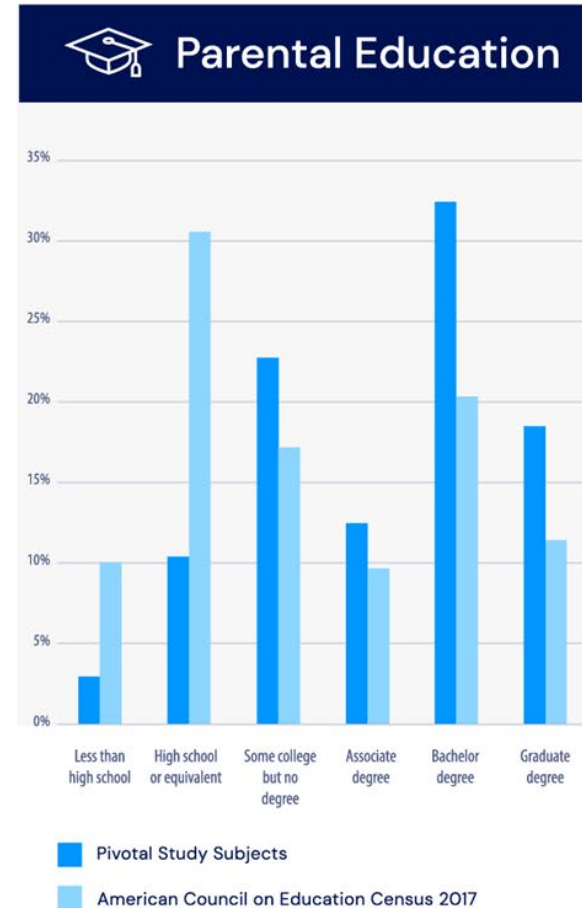
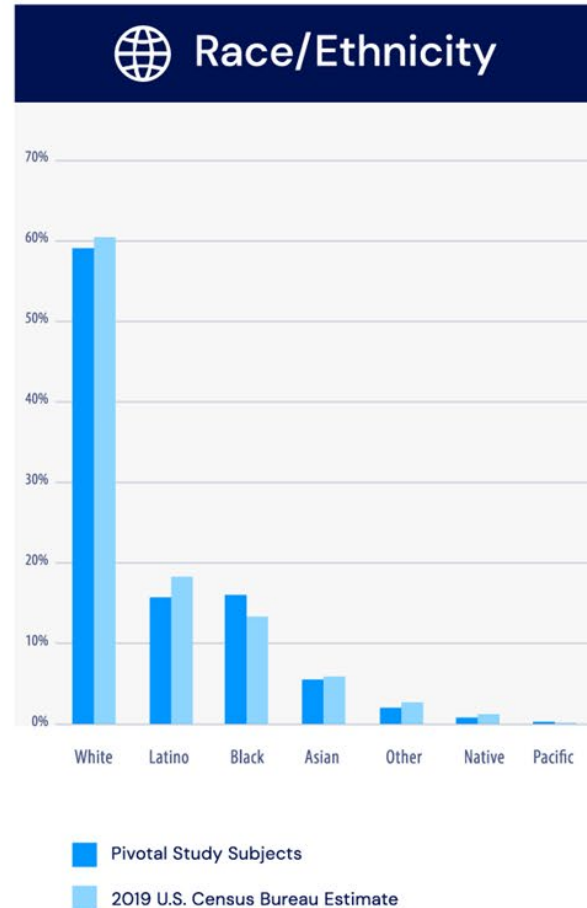
1. Cognoa. Clinical Study Report. Cognoa ASD Diagnosis Aid Validation Study. Q170886. October 29, 2020.

2. Megerian, J.T., Dey, S., Melmed, R.D. *et al.* Evaluation of an artificial intelligence-based medical device for diagnosis of autism spectrum disorder. *npj Digit. Med.* 5, 57 (2022). <https://doi.org/10.1038/s41746-022-00598-6>

Pivotal Study Completers vs U.S. Census

- Study participants broadly representative of the U.S. population in terms of race, ethnicity, and socioeconomic background.

The sample population had a higher level of parental education and a lower household income relative to the most recent U.S. census data estimates.



- Megerian, J.T., Dey, S., Melmed, R.D. et al. Evaluation of an artificial intelligence-based medical device for diagnosis of autism spectrum disorder. *npj Digit. Med.* 5, 57 (2022). <https://doi.org/10.1038/s41746-022-00598-6>
- U.S. Census Bureau (2019). www.census.gov/quickfacts/fact/table/US/PST045219
- American Council on Education (2017). www.equityinhighered.org/indicators/u-s-population-trends-and-educational-attainment/educational-attainment-of-the-u-s-population/
- U.S. Census Bureau (2018). www.census.gov/data/tables/time-series/demo/income-poverty/cps-finc/finc-01.2018.html

“There was no evidence of device performance inconsistency across subjects’ sex, race/ethnicity, household income, parental education level, or geographic location. This is a promising initial finding given ongoing concerns about gender, racial and geographic biases in traditional ASD diagnostic processes.” *



FDA Authorizes Marketing of Diagnostic Aid for Autism Spectrum Disorder

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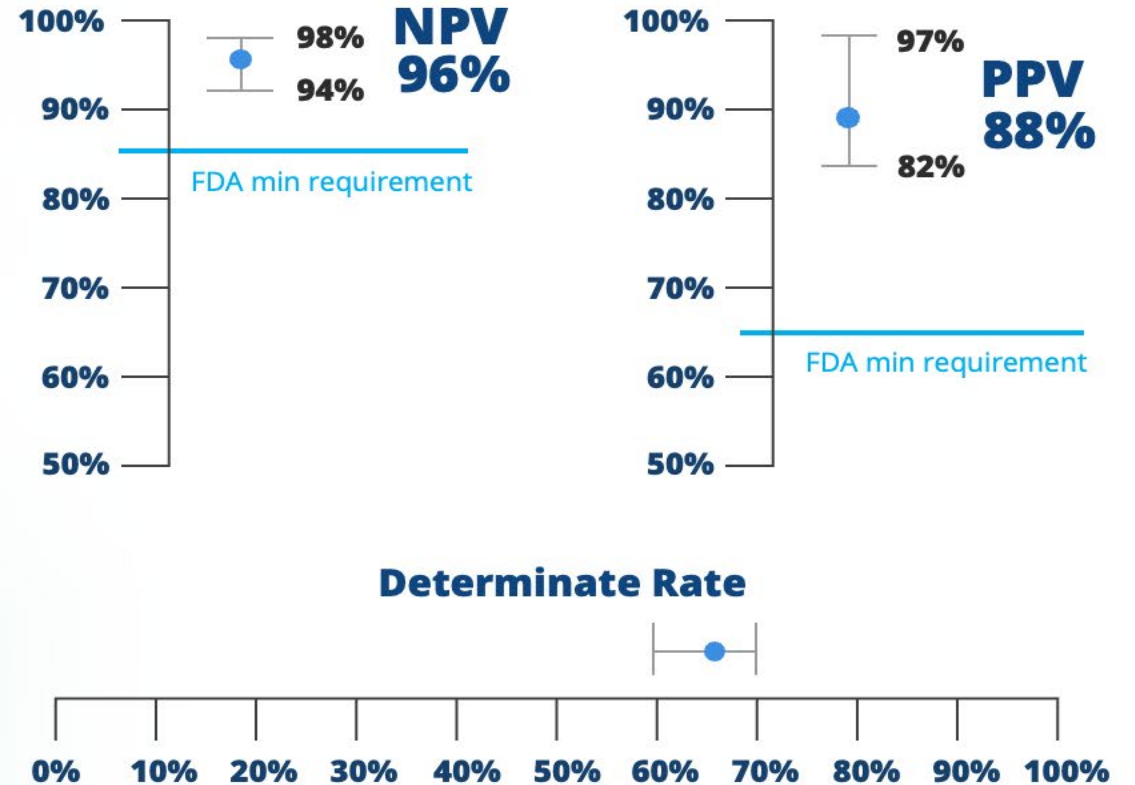
For Immediate Release: June 02, 2021

Today, the U.S. Food and Drug Administration authorized marketing of a device to help diagnose autism spectrum disorder (ASD). The Cognoa ASD Diagnosis Aid is a machine learning-based software intended to help health care providers diagnose ASD in children 18 months through 5 years of age who exhibit potential symptoms of the disorder.

“Autism spectrum disorder can delay a child’s physical, cognitive and social development, including motor skill development, learning, communication and interacting with others. The earlier ASD can be diagnosed, the more quickly intervention strategies and appropriate therapies can begin,” said Jeff Shuren, M.D., J.D., director of the FDA’s Center for Devices and Radiological Health. “Today’s marketing authorization provides a new tool for helping diagnose children with ASD.”

The Centers for Disease Control and Prevention [defines](#) ASD as a “developmental disability that can cause significant social, communication and behavioral challenges” and [is estimated to affect about 1 in 54 children](#). Because ASD symptoms can vary greatly, the disorder may be difficult to diagnose. While ASD may be detected as early as 18 months old, many children are not diagnosed until later in childhood, which can delay treatment and early intervention. The average age of diagnosis for ASD is 4.3 years. Some delays in diagnosis are due to the need for children to be referred to specialists with expertise in ASD.

Current Canvas Dx performance metrics (with algorithm V2)



Sensitivity 85% & Specificity 96%; respectively in those with determinate results

Canvas Dx is a Software as a Medical Device (SaMD) That Aids Physicians in Diagnosing Autism Spectrum Disorder (ASD) in Young Children

Canvas Dx harnesses clinically validated artificial intelligence (AI) technology to aid physicians in diagnosing ASD in children between the ages of 18 and 72 months who are at risk of developmental delay.

It received Breakthrough Device designation from the FDA in October 2018 and was granted De Novo marketing authorization in June 2021.^{1,2}

Indications for Use

Canvas Dx is intended for use by healthcare providers as an aid in the diagnosis of autism spectrum disorder (ASD) for patients ages 18 months through 72 months who are at risk for developmental delay based on concerns of a parent, caregiver, or healthcare provider.

The device is not intended for use as a stand-alone diagnostic device but as an adjunct to the diagnostic process. The device is for prescription use only (Rx only).

Contraindications

There are no contraindications to using Canvas Dx.

Precautions, Warnings

The Device is intended for use by healthcare professionals trained and qualified to interpret the results of a behavioral assessment examination and to diagnose ASD.

1. FDA. <https://www.fda.gov/news-events/press-announcements/fda-authorizes-marketing-diagnostic-aid-autism-spectrum-disorder>. 2. Cognoa. <https://cognoa.com/cognoa-seeks-fda-clearance-for-breakthrough-digital-autism-diagnostic-device-after-successful-pivotal-study/>.

Important Information

Precautions, Warnings

The Device is intended for use in conjunction with patient history, clinical observations, and other clinical evidence the HCP determines are necessary before making clinical decisions. For instance, additional standardized testing may be sought to confirm the Device output, especially when the Device result is not Positive or Negative for ASD.

Canvas Dx is intended for patients with caregivers who have functional English capability (8th grade reading level or above) and have access to a compatible smartphone with an internet connection in the home environment.

The Device may give unreliable results if used in patients with other conditions that would have excluded them from the clinical study.

Among those conditions are the following:

- Suspected auditory or visual hallucinations or with prior diagnosis of childhood onset schizophrenia
- Known deafness or blindness
- Known physical impairment affecting their ability to use their hands
- Major dysmorphic features or prenatal exposure to teratogens such as fetal alcohol syndrome
- History or diagnosis of genetic conditions (such as Rett syndrome or Fragile X)
- Microcephaly
- History or prior diagnosis of epilepsy or seizures
- History of or suspected neglect
- History of brain defect injury or insult requiring interventions such as surgery or chronic medication

The Device evaluation should be completed within 60 days of the time it is prescribed because neurodevelopmental milestones change rapidly in the indicated age group.

In Conclusion

Artificial Intelligence has potential to either perpetuate or address bias and inequity in healthcare

Data-driven Bias,
Algorithmic Bias &
Human Bias can all drive
biased product outputs

Bias can be reduced by
awareness of context, use
of demographically
representative data &
deliberate application of
processes to test for and
mitigate bias. Investment
in bias research, and
efforts to diversify the field
of AI itself, are also needed