

# Screening for Autism Spectrum Disorders: You Find What You Look For

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SKIRBOLL AUTISM COMMUNITY CONFERENCE

# Funding/Conflicts of Interest:

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Speaker: Pediatric Meltdowns

Consultant to Baby Navigator/Autism Navigator

Consultant to HRSA funded Healthy Weight Network

Funding:

- Department of Defense
- Autism Speaks
- Golisano Foundation

# Goals for Today's Talk:

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Why do we screen for Autism Spectrum Disorders (ASDs)?

Who do we screen?

When do we screen?

How do we screen?



# Why do we screen?

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- To detect a condition before the symptoms are manifested to be able to introduce interventions to reduce risk and improve outcome

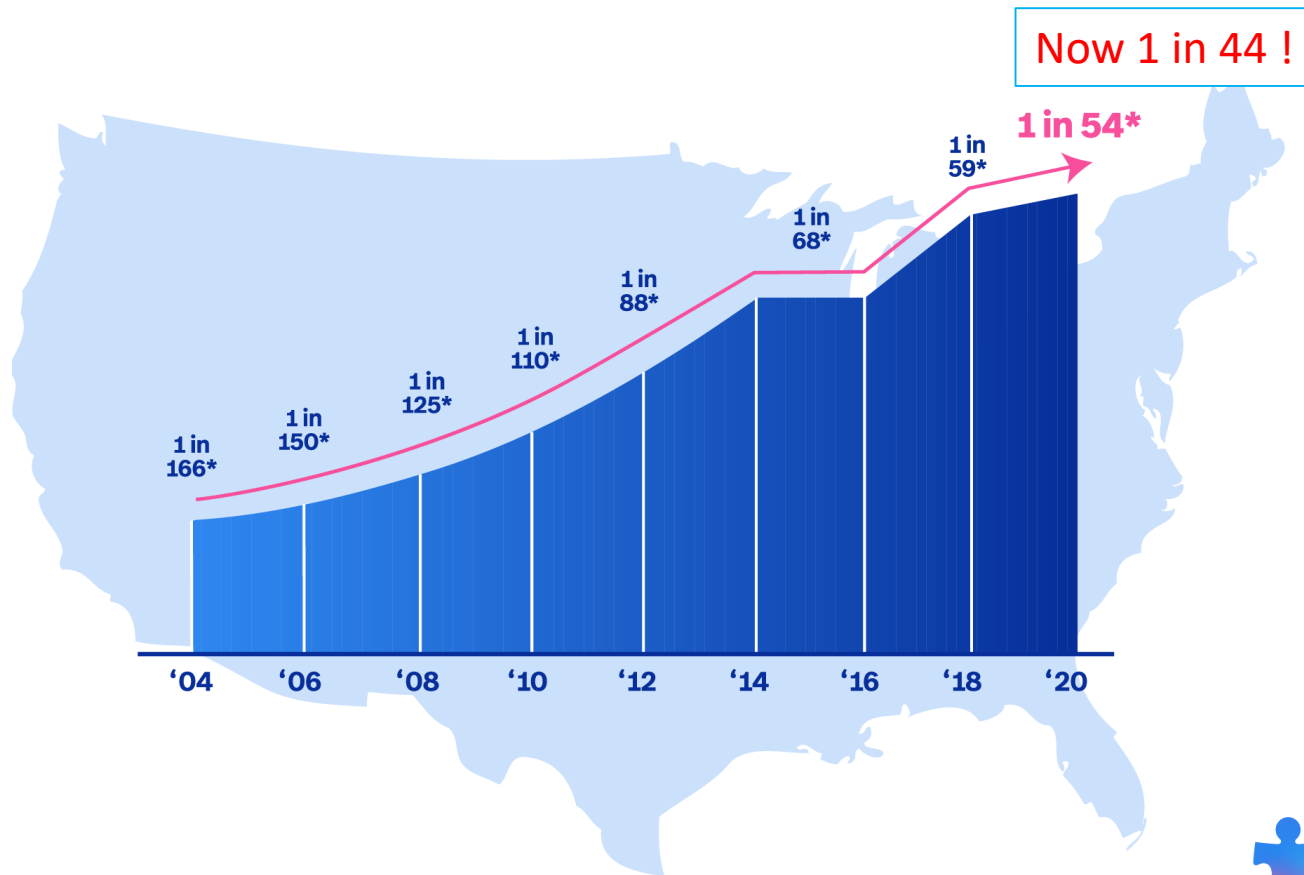
Screening is indicated when a condition:

- Is common and impacts public health
- has interventions that improve outcome that increases with early detection.

Screening tests should:

- lead to demonstrated improved health outcomes
- be widely available, as must the interventions that follow a positive result
- be safe to administer
- be reasonable in cost
- be capable of detecting a high proportion of affected individuals

# Estimated Autism Prevalence 2020



Centers for Disease Control and Prevention (CDC) prevalence estimates are for 4 years prior to the report date (e.g. 2020 figures are from 2016)



# Autism is Common.

CDC 2018 data in 11 states participating in monitoring reported a prevalence of 1:44 (2.3%) in 8 year old children (born 2010)

Range in prevalence by location

- Missouri prevalence 1/60, California 1/26

Reported prevalence increased over the past 4 decades:

- Change in definitions from DSM III → DSM IV → DSM5
- Increased awareness
- Need for diagnosis to access effective intervention
- Screening

# Autism Has Significant Impact on Health, Education, Family Functioning

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## Health impact of ASD

- Medical co occurring conditions include seizures, sleep disorders, feeding disorders, obesity
- Behavioral health comorbidity is high: ADHD, Anxiety
- Family health compromised by care needs

## Educational resource needs

- Ave educational incremental cost \$12,243/yr (2018)

## Quality of Life

## Cost



# Intervention is Effective.



Not Curative..... intervention most effective if **early, intense, and includes the family**

- Early Intervention for children 0-3 years of age
- Preschool intervention for ages 3-5 years

Community based interventions for children with ASD result in small but significant improvement in communication, cognition, adaptive and social functioning. *Nahmias et al, J Child Psychol Psychiatry 2019*

Interventions targeting symptoms of ASD delivered in research settings have greater improvement in outcome measures, probably due to consistency and intensity of intervention



# Barriers to Autism Screening

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Time

Cost

Screening tools need to be tested that are appropriate for use across cultures, languages

Concern about accuracy of screening

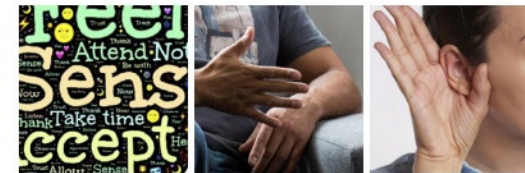
Concern about next steps

- Limited access to diagnosis, delays in diagnosis
- Limited services once diagnosed

Knowing how to guide families



**Provider's Guide to Effective  
Communication with Families  
Affected by Autism**



<https://www.autismspeaks.org/sites/default/files/2018-08/Guide%20to%20Delivering%20Feedback.pdf>



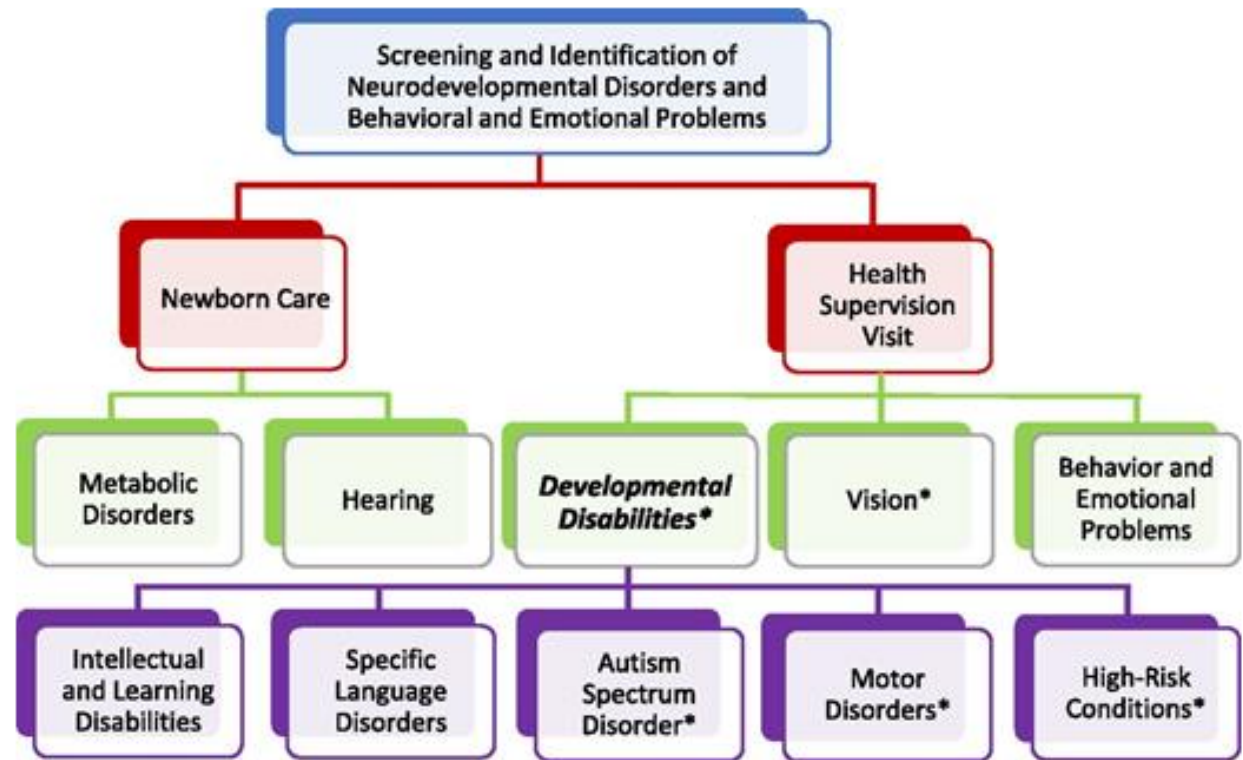
# Who Do We Screen?

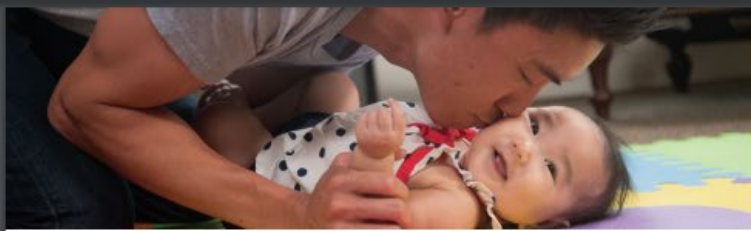
The American Academy of Pediatrics recommends universal screening for ASD for all children at 18 and 24 or 30 months with ongoing surveillance.

General developmental screening at 9, 18, 24 or 30 m

Screening is complimented by surveillance

<https://www.cdc.gov/ncbddd/actearl/y/milestones/index.html>





# Milestones Matter

Track your child's developmental milestones and try brain building tips to add learning to everyday moments!

## Track Your Child's Development

Track how your child plays, learns, speaks, acts, and moves with CDC's *Milestone Tracker* app—and share all progress and any concerns with their doctor during well-child visits. [www.cdc.gov/MilestoneTracker](http://www.cdc.gov/MilestoneTracker)



**BY 2 MONTHS:**  
Smiles at you



**BY 6 MONTHS:**  
Laughs with you



**BY 12 MONTHS:**  
Plays games with you,  
like "peek-a-boo"



**BY 18 MONTHS:**  
Points to show you  
something interesting

## Brain Building Tip:

*Suggested Age: 0–2 years*

Powered by  
**vroom.**

We're surrounded by words that are ready for reading. Try reading signs aloud to your child and talk to them about what they mean.

It doesn't matter if it's a book, magazine, or billboard – it all counts! Reading to your child, anywhere and everywhere, helps them develop a rich, diverse vocabulary. Find more tips at [vroom.org](http://vroom.org).

Learn the Signs.  
Act Early.



Centers for Disease  
Control and Prevention

[www.cdc.gov/ActEarly](http://www.cdc.gov/ActEarly)  
1-800-CDC-INFO

**Do you have concerns about how your child plays, learns, speaks, acts or moves?  
Visit [www.cdc.gov/concerned](http://www.cdc.gov/concerned) and talk with your child's doctor.**

CDC does not endorse private products, services, or enterprises. Vroom Tips are not a diagnostic tool.

# When Do We Screen?

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Empiric observation of social communication milestones lead to development of questionnaires that include parent report items like:

12 m: response to name

14 m: points to objects to show interest

18 m: pretend play

Ongoing surveillance is necessary, since children with typical cognitive abilities and language may not be noted to have unusual social interaction until the demands of preschool or later when social expectations are more sophisticated.



If your baby rarely shares enjoyment with you, especially when you're available to interact, this can be an early sign of autism.



Babies are eager to share their interests with you, first with gestures like showing and pointing, and then with sounds and words.

16by16

7. LITTLE OR NO IMITATING OTHER PEOPLE OR PRETENDING



If your child is showing little or no imitating of others, and is not beginning to pretend in play, it can be an early sign of autism.

16 EARLY SIGNS OF AUTISM BY 16 MONTHS

Autism  
NAVIGATOR

16by16

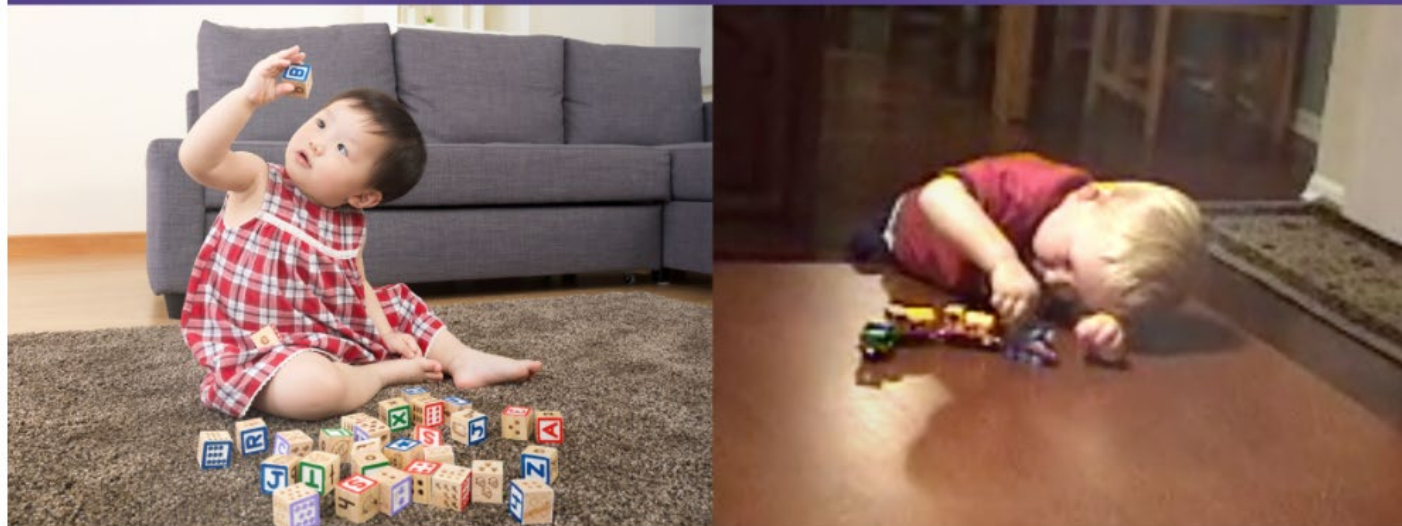
12. DEVELOPS RITUALS AND MAY GET VERY UPSET OVER CHANGE



Children with autism may develop rituals and be unwilling to complete a series of behaviors a different way.

16 EARLY SIGNS OF AUTISM BY 16 MONTHS

Autism  
NAVIGATOR



... looking out the side of their eye or closely inspecting a block or toy train as it rolls by ...

# How Do We Screen?

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Caregiver questionnaires:

- Caregiver Questionnaires in primary care
- Daycare and preschool questionnaires

Ongoing Surveillance in primary care

Biomarkers (?!)



## M-CHAT-R Follow-Up™ Scoring Sheet

**Please note: Yes/No has been replaced with Pass/Fail**

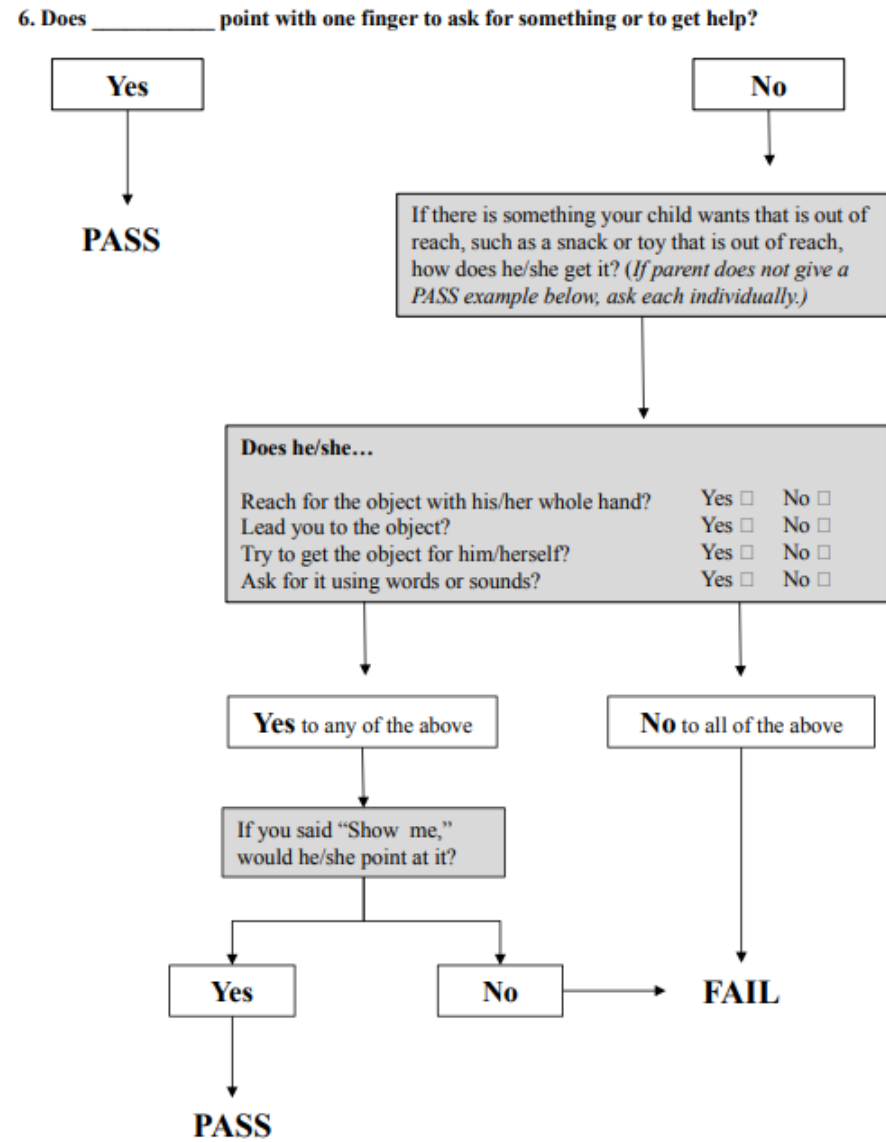
|   |      |      |
|---|------|------|
| 1. If you point at something across the room, does your child look at it?<br>(FOR EXAMPLE, if you point at a toy or an animal, does your child look at the toy or animal?)  | Pass | Fail |
| 2. Have you ever wondered if your child might be deaf?  | Pass | Fail |
| 3. Does your child play pretend or make-believe?<br>(FOR EXAMPLE, pretend to drink from an empty cup, pretend to talk on a phone, or pretend to feed a doll or stuffed animal)                                    | Pass | Fail |
| 4. Does your child like climbing on things?<br>(FOR EXAMPLE, furniture, playground equipment, or stairs)  | Pass | Fail |
| 5. Does your child make <u>unusual</u> finger movements near his or her eyes?<br>(FOR EXAMPLE, does your child wiggle his or her fingers close to his or her eyes?)   | Pass | Fail |
| 6. Does your child point with one finger to ask for something or to get help?<br>(FOR EXAMPLE, pointing to a snack or toy that is out of reach)   | Pass | Fail |
| 7. Does your child point with one finger to show you something interesting?<br>(FOR EXAMPLE, pointing to an airplane in the sky or a big truck in the road)   | Pass | Fail |
| 8. Is your child interested in other children?<br>(FOR EXAMPLE, does your child watch other children, smile at them, or go to them?)  | Pass | Fail |
| 9. Does your child show you things by bringing them to you or holding them up for you to see – not to get help, but just to share?<br>(FOR EXAMPLE, showing you a flower, a stuffed animal, or a toy truck)       | Pass | Fail |
| 10. Does your child respond when you call his or her name?<br>(FOR EXAMPLE, does he or she look up, talk or babble, or stop what he or she is doing when you call his or her name?)                               | Pass | Fail |
| 11. When you smile at your child, does he or she smile back at you?   | Pass | Fail |
| 12. Does your child get upset by everyday noises?<br>(FOR EXAMPLE, a vacuum cleaner or loud music)  | Pass | Fail |
| 13. Does your child walk?   | Pass | Fail |
| 14. Does your child look you in the eye when you are talking to him or her, playing with him or her, or dressing him or her?  | Pass | Fail |
| 15. Does your child try to copy what you do?<br>(FOR EXAMPLE, wave bye-bye, clap, or make a funny noise when you do)  | Pass | Fail |
| 16. If you turn your head to look at something, does your child look around to see what you are looking at?   | Pass | Fail |
| 17. Does your child try to get you to watch him or her?<br>(FOR EXAMPLE, does your child look at you for praise, or say "look" or "watch me")   | Pass | Fail |
| 18. Does your child understand when you tell him or her to do something?<br>(FOR EXAMPLE, if you don't point, can your child understand "put the book on the chair" or "bring me the blanket")                    | Pass | Fail |
| 19. If something new happens, does your child look at your face to see how you feel about it?<br>(FOR EXAMPLE, if he or she hears a strange or funny noise, or sees a new toy, will he or she look at your face?) | Pass | Fail |
| 20. Does your child like movement activities?<br>(FOR EXAMPLE, being swung or bounced on your knee)   | Pass | Fail |

Total Score: \_\_\_\_\_

<https://mchatscreen.com/>



# Follow up Questions:



# Artificial Intelligence Applied to Screening

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## Digital Diagnostic device:

- Machine learning based software recently granted FDA clearance to aid in ASD diagnosis, 18-72 m
- Combines parent questionnaire, video taken on a smartphone analyzed by trained observers at the company, and a brief clinician observation questionnaire
- May have a role in prospective multistage assessment

Needs additional testing for use in Universal screening and/or to support PCP diagnosis in primary care settings

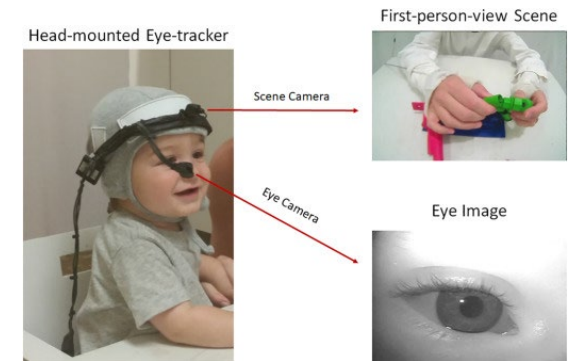
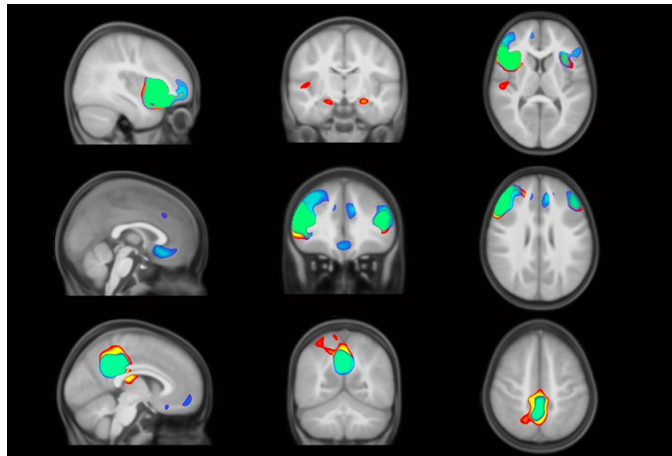
# Biomarkers: Neurologic Factors that May Be Associated with or Responsible for ASD (or other!) Symptoms

## Physiologic measures

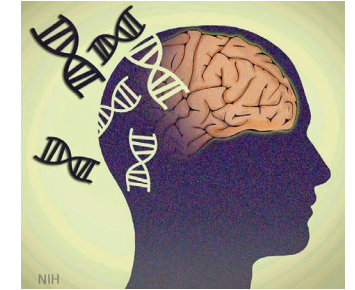
- EEG
- Eye gaze

## Toddler Vocalization

## Imaging/MRI



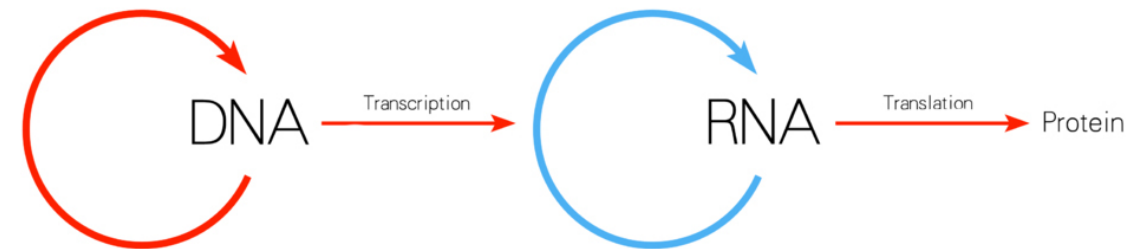
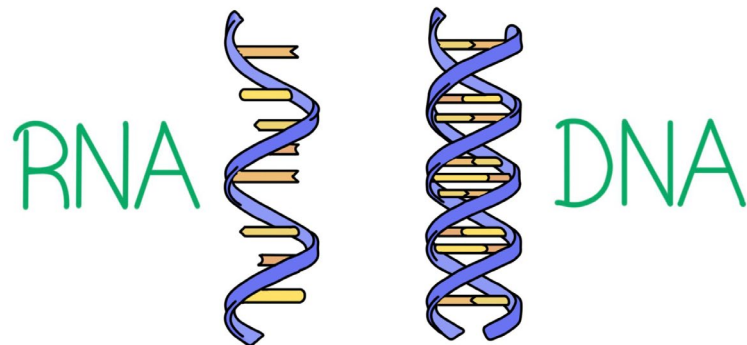
# Genetic Biomarkers:



Genetic panels - over 100 genes strongly linked to ASD, over 1000 genes have reported associations

Micro RNA -

- Ongoing study across the US (including here in Rochester) to look at how RNA may regulate expression of gene networks through alterations in how the RNA works making proteins that tell cells how to work
  - Salivary miRNA assayed in children 2-6 yrs (ASD=224, TD=133, DD=86)
  - 4 miRNAs distinguished ASD/non ASD, 9 were associated with social affect, 14 with RRBs



## Genetic Risk Variants

Aneuploidy  
 Indels  
 Copy number variants  
 5q32: miR-378  
 1q44: miR-3916  
 16p13.3: piR-12423  
 Trinucleotide repeats  
 Single nucleotide variants  
 FMR1: miR-410  
 TSC1: miR-92a  
 PTEN: miR-10a  
 SCN2A: miR-106a

+

**piRNA**  
 piR-24684, piR-9491,  
 piR-15023, piR-27400,  
 piR-6463, piR-29114,  
 piR-12423, piR-24085

Genes involved in:  
 Chromatin organization  
 Transcriptional regulation



Genes involved in:  
 Synaptic function  
 Neuronal projection

**miRNA**  
 miR-10a: BDNF  
 miR-92a-3p: SLC6A1  
 miR-106a-5p: HTR2a  
 miR-146a, miR-146b-5p  
 miR-125a-5p: RORA  
 miR-361-5p: GSTO2  
 miR-378a-3p, miR-410  
 miR-3916, SNORD118

**ASD**

## Neuro-behavioral traits

Social-emotional deficits  
 Nonverbal communication  
 Relationship deficits  
 Repetitive movements  
 Inflexible rituals  
 Fixated interests  
 Reactivity to sensory inputs

Food texture aversions  
 Restricted diets  
 GI disturbance

## Microbiome disruption

Leadbetterella byssophila  
 Alphaproteobacteria  
 Fusarium, Staphylococcus  
 Clostridiales, Ottowia  
 Pasteurella multocida  
 Corynebacterium uterequi  
 Lactobacillus, Yarrowia  
 Streptococcus gallolyticus

## Environmental Risks

Parental age  
 Maternal BMI  
 Premature birth  
 Gestational diabetes/HTN  
 Short interval pregnancy  
 Birth complications  
 Maternal autoimmunity  
 Maternal medications



# Other Biomarkers Under Investigation That Have Been Proposed for Future Use in Screening:

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- Metabolomics- untargeted screening of blood and/or urine
- Neuroimmunologic markers
- Microbiome assays – Stool, saliva
- Combination approaches to predict ASD and symptom severity

**The Diagnosis remains a clinical one!**

**Risk factors may be risk for co-occurring symptoms (like ADHD !).**

**This is why it is SO important that research is carefully done!**

# In Summary:

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## Why do we screen?

- ASD is common, with 1/44 children diagnosable by age 8
- Early identification → Early diagnosis → Earlier intervention → Improved outcome
- Goal for equitable diagnosis and access to services

## Who do we screen?

- AAP recommends **universal** screening using caregiver questionnaires at 18 and 24/30 m.
- Continued surveillance is necessary since some symptoms may not be identified until language emerges and the child faces the social demands of school
- Children who are siblings of a child with ASD, have a history of prematurity and other higher risk situations need heightened surveillance

## When do we screen?

- Clinically significant differences in the emergence of social communication milestones like gesture, joint referencing, pretend play are captured in clinical screening at 18 and 24/30 months with ongoing surveillance.

## How do we screen?

- Current practice includes clinical surveillance in concert with valid questionnaires (e.g. MCHAT R/F, POSI)
- Clinical judgment, shared decision making and timely referral for dx and services are critical components of successful screening programs
- Biomarkers may permit earlier identification of risk, more rapid diagnosis in the future

*Don't Defer, Refer! (for diagnosis and intervention)*