Autism Screening: You Are Audiologically Responsible

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- Pediatric Audiologist at Cincinnati Children's Hospital and Medical Center (2004)
  - Hearing Aid Program & Telehealth Coordinator
  - Primary interests and specialties include pediatric amplification, telehealth, student development, functional outcomes, process-improvement methodologies, and advocacy for audiology on the state and federal levels
- Master's degree in 2003 and Clinical Doctorate in 2005 from the University of Tennessee, Knoxville
- Member of the American Speech Language Association (ASHA)
  - Committee of Ambassadors (CoA)
  - Audiology Advisory Council
  - TeleAudiology Member Advisory Group
- Board Member of the Kentucky Speech Hearing Association (KSHA)
- Board Member of the Kentucky Commission on the Deaf & Hard of Hearing (KCDHH)

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Disclosures

- Financial
  - Registration fee waived
- Non-Financial
  - None

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Autism

#trending

- Links between acetaminophen and autism in the news…

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Prevalence Data

- Approximately 3% of children will have a diagnosis of ASD (1 in 31)
  - Could be even higher
- Approximately 0.3% of children will have a diagnosis of permanent congenital hearing loss (1 in 333)

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CDC Prevalence

Identified prevalence of ASD

ADDM Network 2000-2022: Combining data from all ADDM Network sites

Surveillance Year	Birth Year	Number of ADDM Sites Reporting	Combined Prevalence per 1,000 Children (Range Across ADDM Sites)	This is about 1 in X children
2022		16	32.2 (9.7 - 53.1)	1 in 31
2020	2012	11	27.6 (23.1-44.9)	1 in 36
2018	2010	11	23.0 (16.5-38.9)	1 in 44
2016	2008	11	18.5 (18.0-19.1)	1 in 54
2014	2006	11	16.8 (13.1-29.3)	1 in 59
2012	2004	11	14.5 (8.2-24.6)	1 in 69
2010	2002	11	14.7 (5.7-21.9)	1 in 68
2008	2000	14	11.3 (4.8-21.2)	1 in 88
2006	1998	11	9.0 (4.2-12.1)	1 in 110
2004	1996	8	8.0 (4.6-9.8)	1 in 125
2002	1994	14	6.6 (3.3-10.6)	1 in 150
2000		6	6.7 (4.5-9.9)	1 in 150

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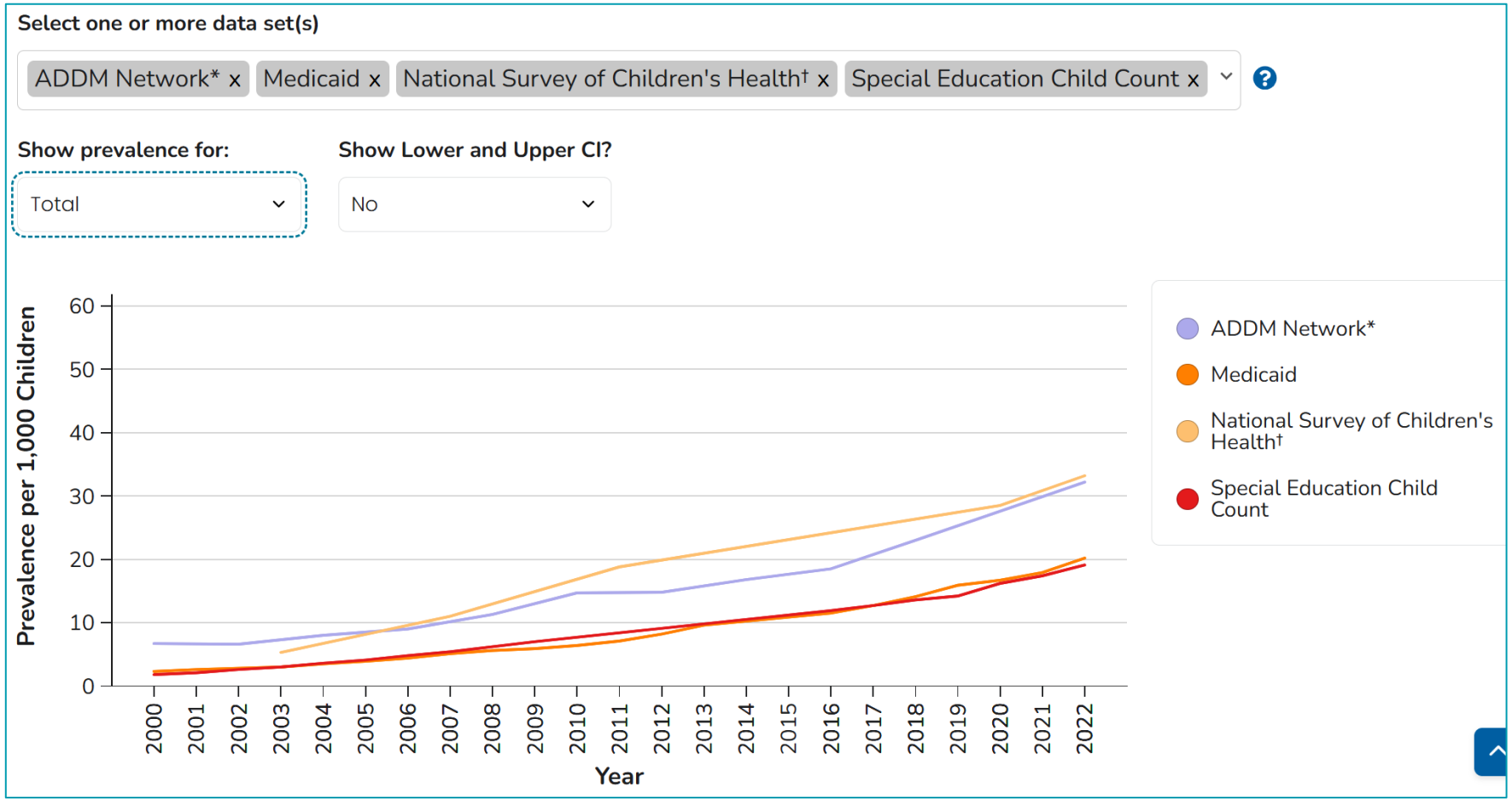
CDC Prevalence



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Why has prevalence increased so much?

- Definition of autism
- Screening
- Public awareness
- Better diagnostics
- Increased reporting & metrics

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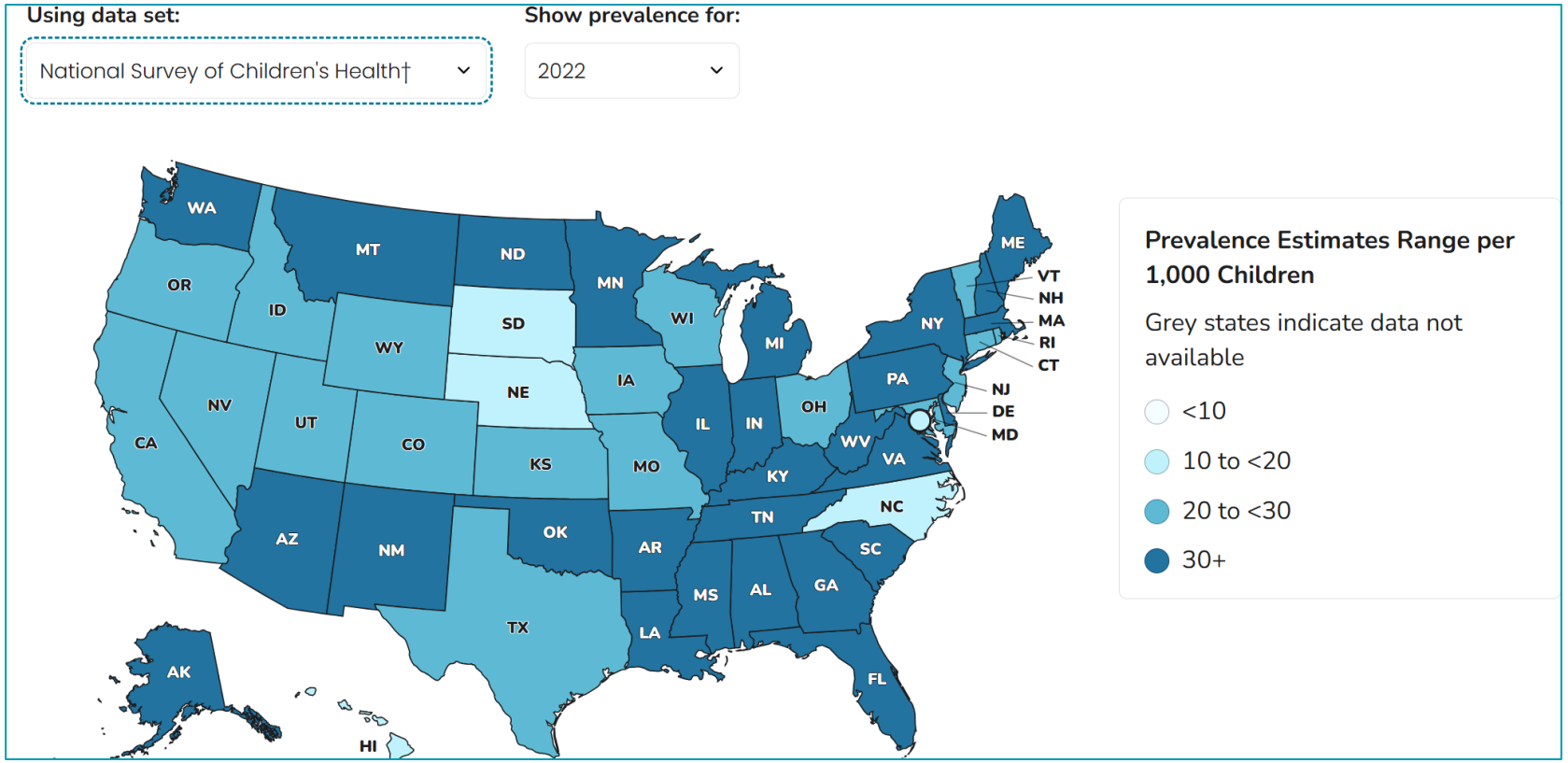
Prevalence by State



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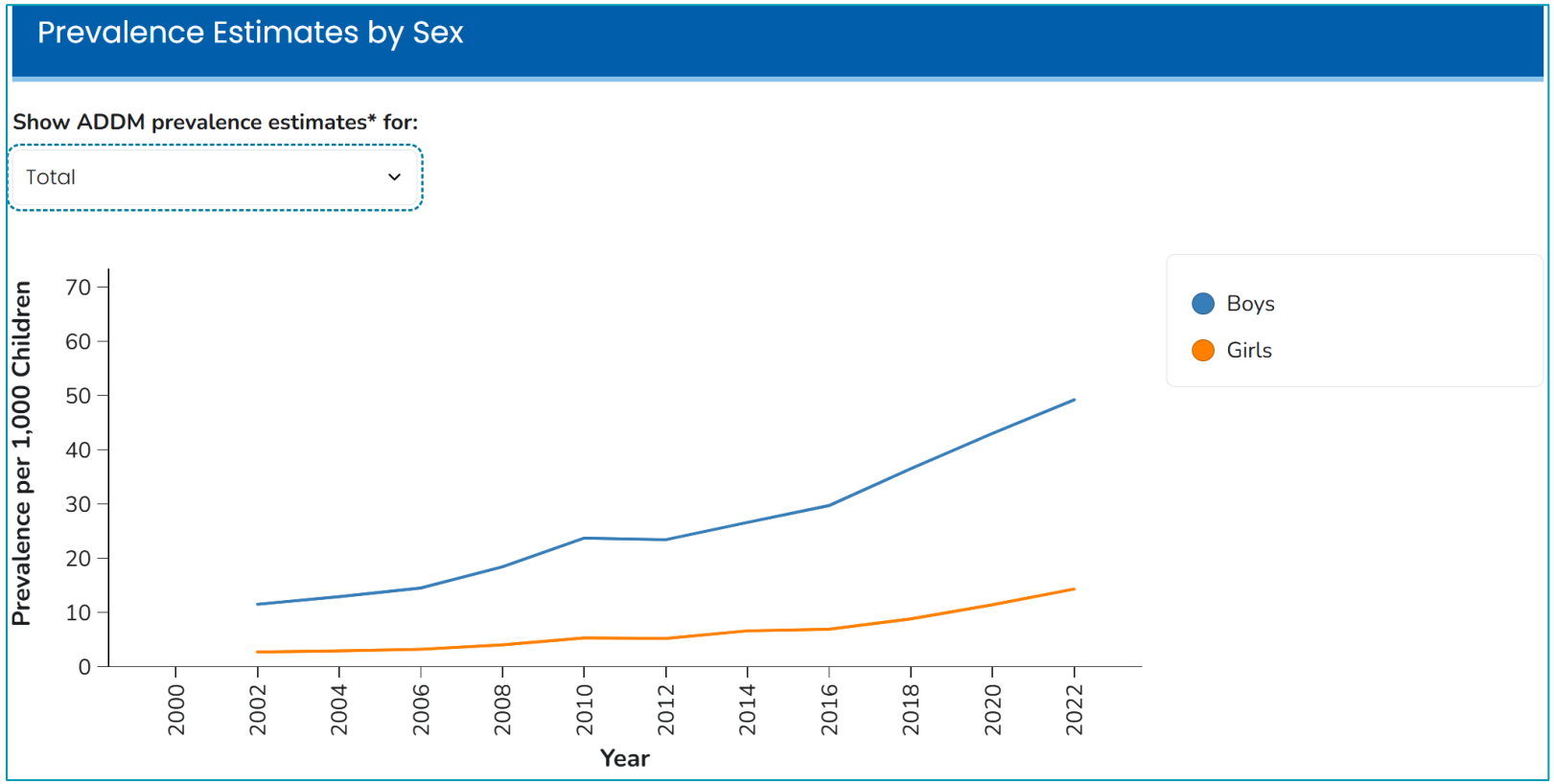
Boys are 3-4 times more likely to have ASD…



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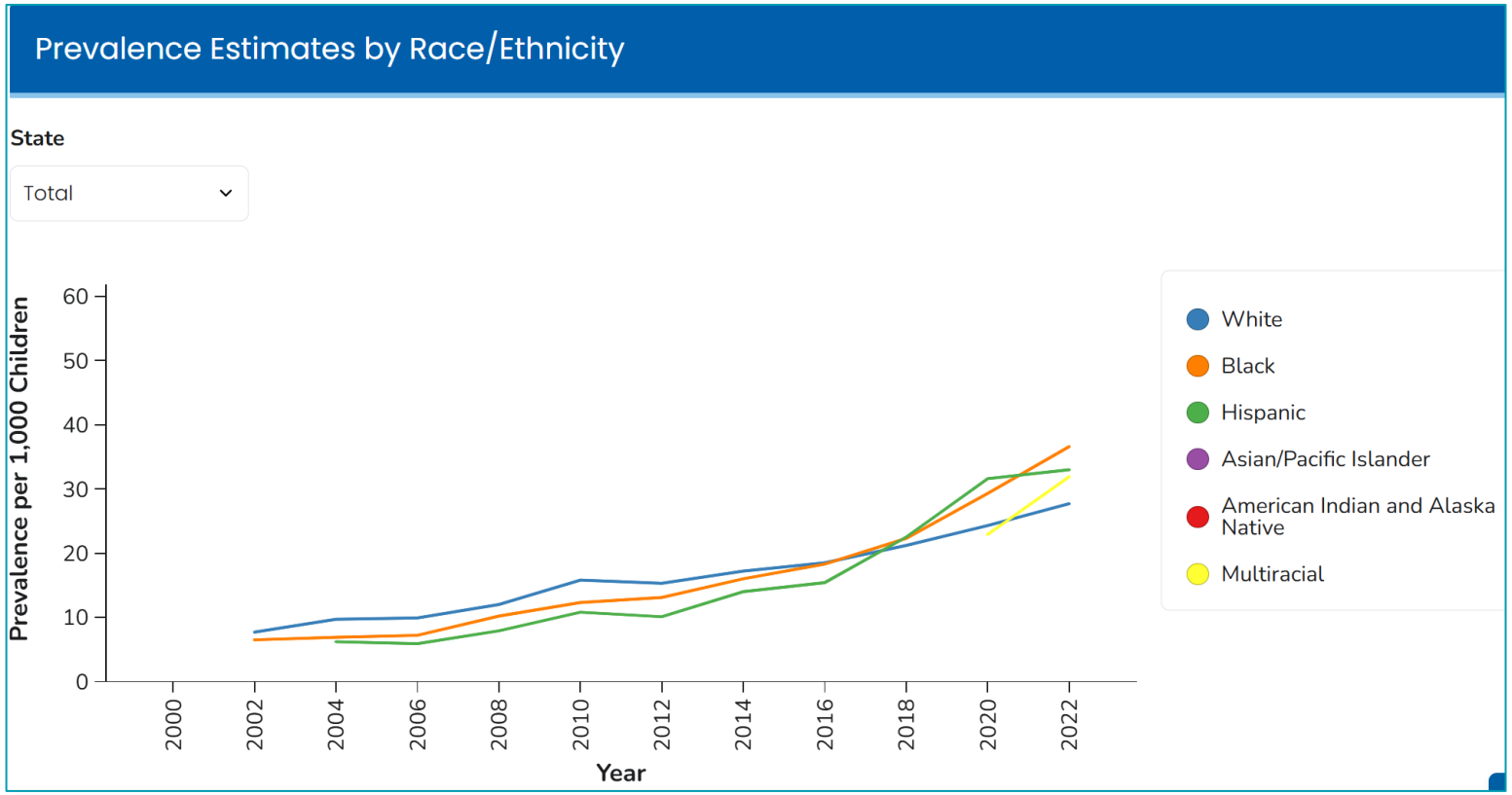
ASD does not discriminate…



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Diagnostic Criteria

- Poor social Communication, engagement, & interaction
- Echolalic speech patterns
- Repetitive behavioral patterns
- Impulsive
- Poor, non-purposeful eye contact
- Hyper of hypo sensory issues
- Difficulty with transitioning activities
- Pre-occupied interests
- Expressive language may exceed receptive language

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Audiology Red Flags

- Difficulty transitioning from waiting room to booth
- Difficulty engaging with provider/assistant
- Ear defensive
- Show no/limited response to voice/name
- Responds better to tones than speech
- May show no obvious behavior response to sound
- May be hypersensitive to stimuli
- Quickly fatigues to stimuli

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Audiology Tricks

- Low lighting
- Reduce transitions
- Ask parents if they are sensory seeking or sensory avoidant
- Use of favorite videos for distraction
- Reliance on DPOAEs when possible

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Diagnostic Team

- Developmental Pediatrician
- Neurologist
- Psychologist
- Speech Pathologist
- Audiologist
- Social Worker

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Diagnosing…

- Diagnostic testing for ASD is sensitive and can be made as early as 24 months of age **BUT average age of diagnosis in U.S. is still closer to 4 years of age.**

- American Academy of Pediatrics Guidelines indicates the necessity for developmental screenings.
  - **18 & 24 months** well care visits

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Why The Gap

- Access to healthcare
- Cost of healthcare
- Parent denial
- Adherence to healthcare appointments
- Poor screening
- Complexities of healthcare systems

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Who are the first people to observe symptoms of autism?

- Parents/family
- Pediatricians
- **Audiologists**, Speech Pathologist, Early Intervention

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Quick Facts

- ASD impacts all ethnicities and backgrounds
- Boys are close to 4 times more likely to be diagnosed with ASD
- **Audiologists and speech pathologists are often the first providers to observe behavioral concerns in children**
- Pediatricians & parents can often miss subtle/soft signs of ASD
- Screening tools for ASD exist and are within scope of practice for anyone to administer
- Earlier diagnosis/intervention of ASD results in significantly improved language and pragmatic outcomes

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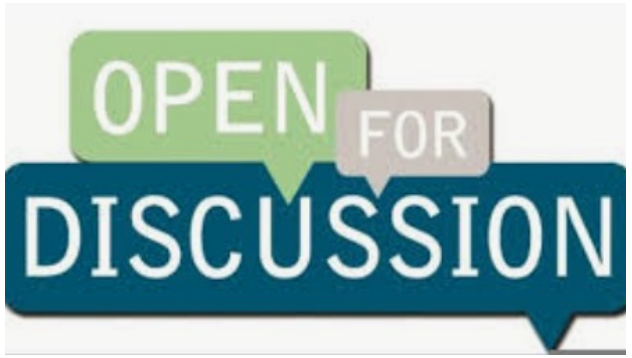
Critical Observations

- Audiologists do not have the scope to diagnose autism spectrum disorders **BUT they can be an active participant in the screening and referral process.**

- Audiologists have a **window of opportunity** to interface with parents and to address development/behavioral concerns. If they do not the patient is at risk for delayed diagnosis, delayed intervention, and loss to follow-up.

- Audiologists have the **professional obligation to make referrals when hearing, medical, developmental and/or behavioral concerns are present**.

- Autism Screening via the MCHAT provides Audiologists with concrete data (not just observations) opens the discussion with parents and to make referrals.



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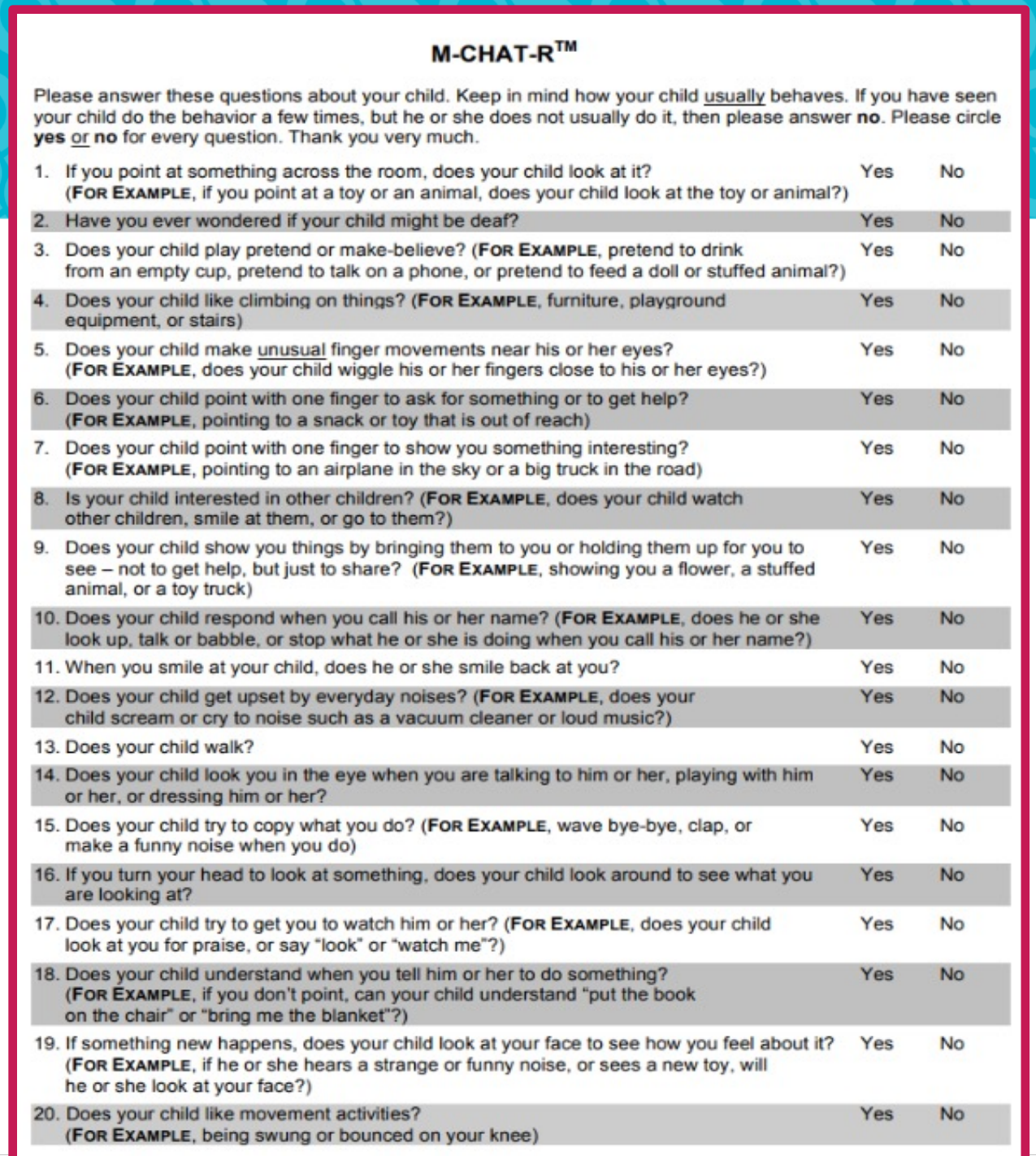
Autism Screening

- **Tool**
  - MCHAT M-CHAT™ - Autism Screening (mchatscreen.com)
    - High Sensitivity and Specificity for ASD
- **Eligibility**
  - 16 months to 48 months corrected age
  - Scheduled for routine hearing test
  - English is primary language
  - No prior diagnosis of ASD, Down syndrome, or Global Developmental Delay
  - No prior administration of MCHAT
- **Administration**
  - Provided one time only as part of registration & intake process
  - **Parent/Guardian completes the questionnaire (not administered by provider)**



M-CHAT-R™

Please answer these questions about your child. Keep in mind how your child usually behaves. If you have seen your child do the behavior a few times, but he or she does not usually do it, then please answer **no**. Please circle **yes** or **no** for every question. Thank you very much.

1. If you point at something across the room, does your child look at it? (FOR EXAMPLE, if you point at a toy or an animal, does your child look at the toy or animal?)	Yes	No
2. Have you ever wondered if your child might be deaf?	Yes	No
3. Does your child play pretend or make-believe? (FOR EXAMPLE, pretend to drink from an empty cup, pretend to talk on a phone, or pretend to feed a doll or stuffed animal?)	Yes	No
4. Does your child like climbing on things? (FOR EXAMPLE, furniture, playground equipment, or stairs)	Yes	No
5. Does your child make unusual finger movements near his or her eyes? (FOR EXAMPLE, does your child wiggle his or her fingers close to his or her eyes?)	Yes	No
6. Does your child point with one finger to ask for something or to get help? (FOR EXAMPLE, pointing to a snack or toy that is out of reach)	Yes	No
7. Does your child point with one finger to show you something interesting? (FOR EXAMPLE, pointing to an airplane in the sky or a big truck in the road)	Yes	No
8. Is your child interested in other children? (FOR EXAMPLE, does your child watch other children, smile at them, or go to them?)	Yes	No
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? (FOR EXAMPLE, showing you a flower, a stuffed animal, or a toy truck)	Yes	No
10. Does your child respond when you call his or her name? (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?)	Yes	No
11. When you smile at your child, does he or she smile back at you?	Yes	No
12. Does your child get upset by everyday noises? (FOR EXAMPLE, does your child scream or cry to noise such as a vacuum cleaner or loud music?)	Yes	No
13. Does your child walk?	Yes	No
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?	Yes	No
15. Does your child try to copy what you do? (FOR EXAMPLE, wave bye-bye, clap, or make a funny noise when you do)	Yes	No
16. If you turn your head to look at something, does your child look around to see what you are looking at?	Yes	No
17. Does your child try to get you to watch him or her? (FOR EXAMPLE, does your child look at you for praise, or say "look" or "watch me"?)	Yes	No
18. Does your child understand when you tell him or her to do something? (FOR EXAMPLE, if you don't point, can your child understand "put the book on the chair" or "bring me the blanket"?)	Yes	No
19. If something new happens, does your child look at your face to see how you feel about it? (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?)	Yes	No
20. Does your child like movement activities? (FOR EXAMPLE, being swung or bounced on your knee)	Yes	No

MCHAT Questionnaires

Primary

Secondary pending score on Primary

M-CHAT-R™

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6. Does your child point with one finger to ask for something or to get help? (**For Example**, pointing to a snack or toy that is out of reach)	Yes	No
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8. Is your child interested in other children? (**For Example**, does your child watch other children, smile at them, or go to them?)	Yes	No
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20. Does your child like movement activities? (**For Example**, being swung or bounced on your knee)	Yes	No

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? (**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? (**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? (**For Example**, furniture, playground equipment, or stairs)	Pass	Fail
5. Does your child make unusual finger movements near his or her eyes? (**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? (**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? (**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? (**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? (**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? (**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? (**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? (**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? (**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? (**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? (**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? (**For Example**, being swung or bounced on your knee)	Pass	Fail

Total Score: _____

MCHAT

- 1. Administration of primary questionnaire
  - YES or NO response whereas most responses marked as No would indicate at-risk; however, items 2, 5, and 12 are reverse scored.

- 2. Administration of follow-up questionnaire pending score on primary questionnaire

Scoring M-CHAT-R/F - M-CHAT™ (mchatscreen.com)

M-CHAT-R_F_Cover (secureservercdn.net)

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Audiologist Instructions

- 1. Score the questionnaire (EPIC questionnaires will do this automatically)

- 2. Scores between **3-7** indicates need for the follow-up questionnaire. Administer follow-up questionnaire
  - 0-2 = low, no additional questions
  - 8-20 = high risk, referral to behavioral pediatrician

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Audiologist Information on M-CHAT

- Scoring and Analysis
  - **Low Risk:** **Total score is 0-2**; if child is younger than 24 months, screen again after 2nd birthday. No further action required unless surveillance indicates risk for ASD.
  - **Medium Risk:** **Total score is 3-7**; Administer the Follow-Up (second stage of M-CHAT-R/F) to get additional about at-risk responses. If M-CHAT-R/F score remains at 2 or higher, the child has screened positive. Action required: refer child for diagnostic evaluation and eligibility evaluation for early intervention. If score, on Follow-Up is 0-1, child has screened negative. No further action required unless surveillance indicates risk for ASD. Child should be rescreened at future well-child visits.
  - **High Risk:** **Total score is 8-20**; it is acceptable to bypass the Follow-Up and refer immediately for diagnostic evaluation and eligibility evaluation for early intervention.

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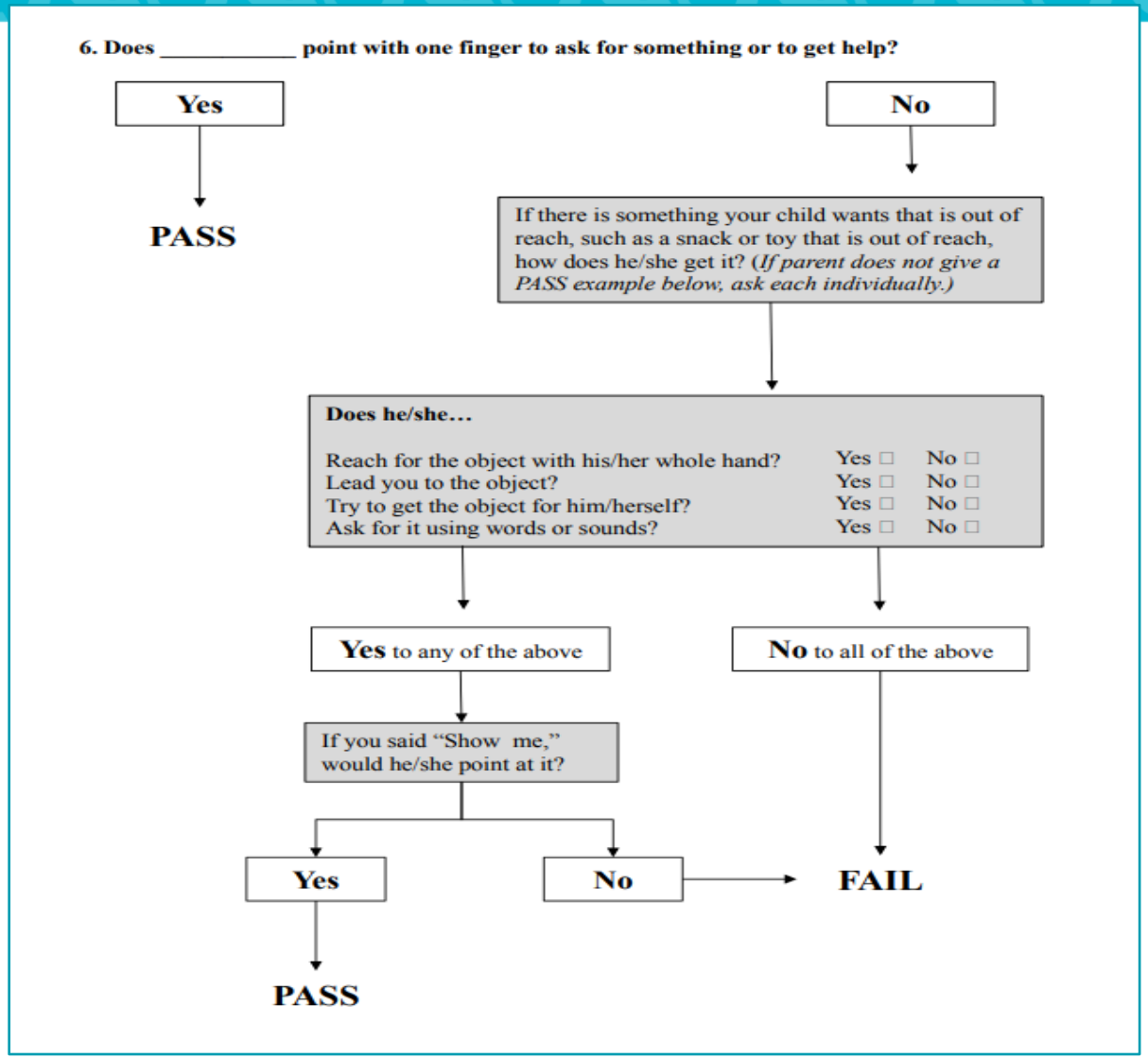
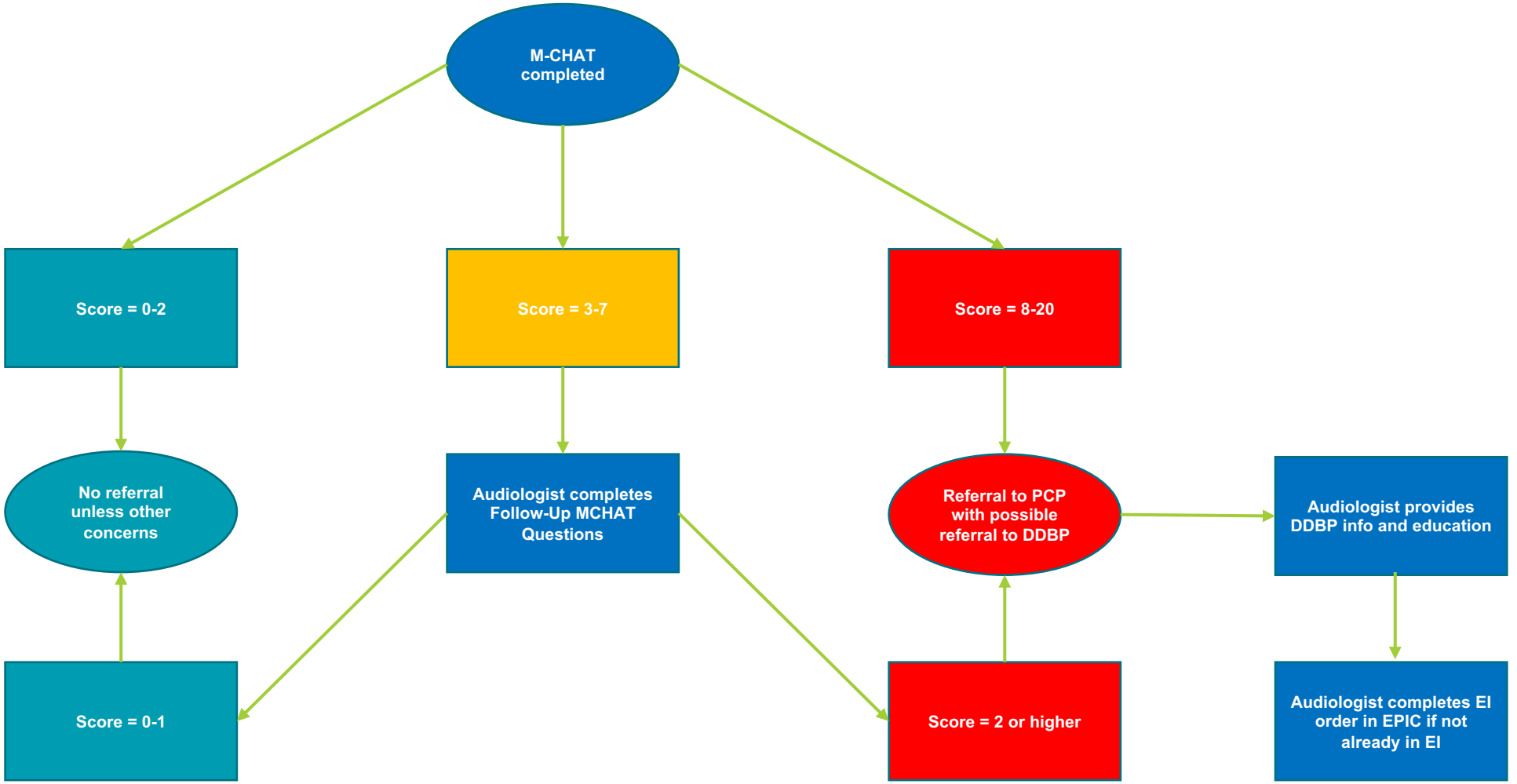
MCHAT Follow-Up Questionnaire (Scores 3-7)

- The MCHAT follow-up questionnaire's purpose is to reframe and re-ask ONLY those questions that were considered a fail from the initial questionnaire.
- For example, if the patient score positively on questions 3, 5, 11, 12, and 14 you would only complete the follow-up questionnaire for those same questions.
- Follow the paradigm to re-ask those questions with clarifying questions to determine a pass or fail for each question that was scored positively in the initial questionnaire.
- A score of 2 or greater will indicate a referral for specialty evaluation





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False-Negatives

- Parent questionnaire results do not indicate concerns but observation of child from provider reveals developmental concerns upon completion of hearing evaluation
- Option to go over M-CHAT and repeat manually if appropriate
- Discuss mismatch in questionnaire results, observed, behavior, and recommend to the family that development surveillance by their pediatrician is strongly recommended and a referral to a developmental pediatrician should be considered.

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False Positives

- Parent questionnaire results indicate a positive screening but there are no observed or apparent concerns following completion of the hearing evaluation.

- **This is highly unlikely and typically related to parent not understanding and/or reading the questionnaire correctly.**

- Option to go over M-CHAT and repeat manually if appropriate as parent may have answered questions inappropriately via the Welcome Tablet
  - If parents continue to express concerns then referral back to PCP is appropriate for developmental surveillance
  - If there are truly no parental concerns then no action or referral is necessary

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Autism Screening Checklist

- ❑ All children seen for RHT between 16-36 months will be screened once via Welcome Tablet (older children can be screened manually if concerns arise)
- ❑Ensure screen was scored correctly
- ❑Document results in EMR
- ❑Discuss results with family regardless of pass or fail
- ❑Discuss referrals, if appropriate
- ❑Provide appropriate educational information (i.e. DDBP, First Steps)
- ❑Complete release of information for EI, if appropriate

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Systemic Goals

- **Early Screening**
  - 100% of eligible children will be screened in Audiology using the MCHAT questionnaire
- **Early Identification**
  - Audiology will help to decrease the age of diagnosis by implementing MCHAT screening
  - Goal is diagnosis by 2 years of age
- **Early Intervention**
  - Children with ASD will receive better outcomes because they will have been identified earlier and treated with appropriate therapies earlier.

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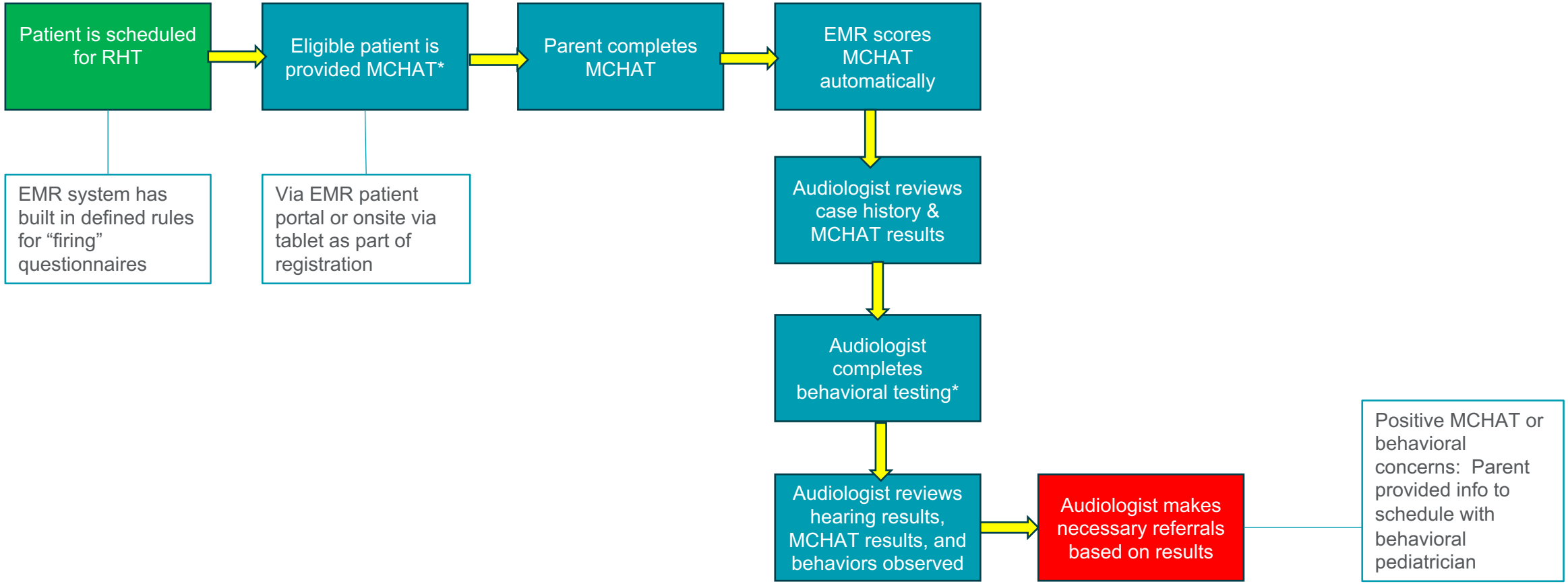
CCHMC Process



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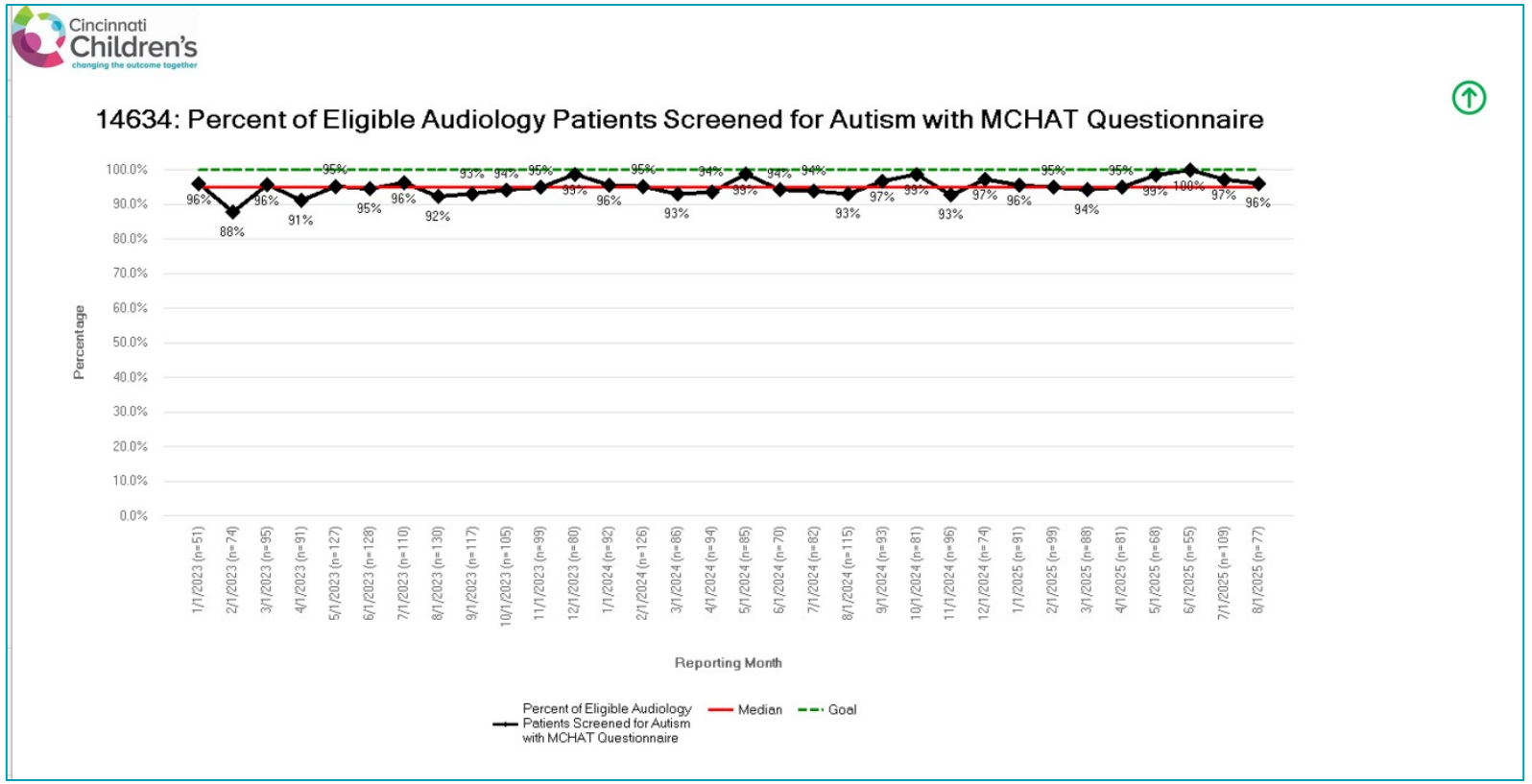
Program Data: 96% Screened



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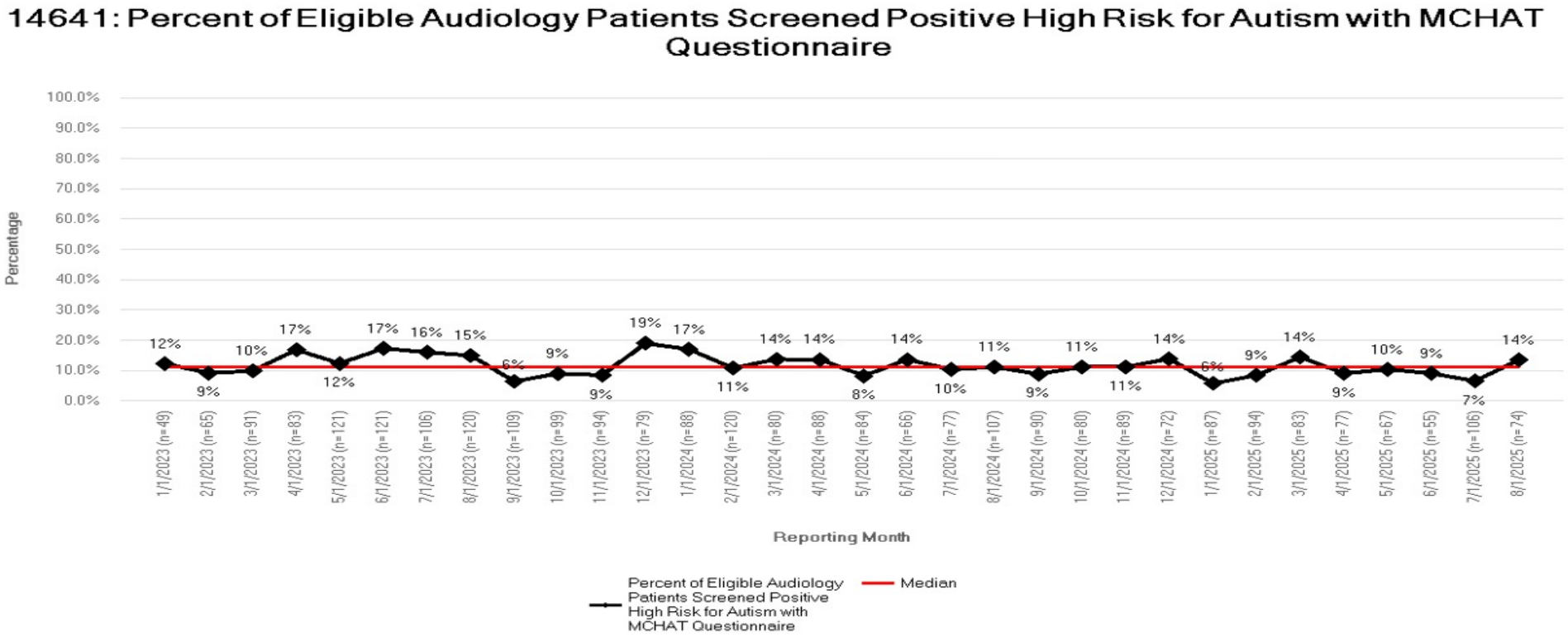
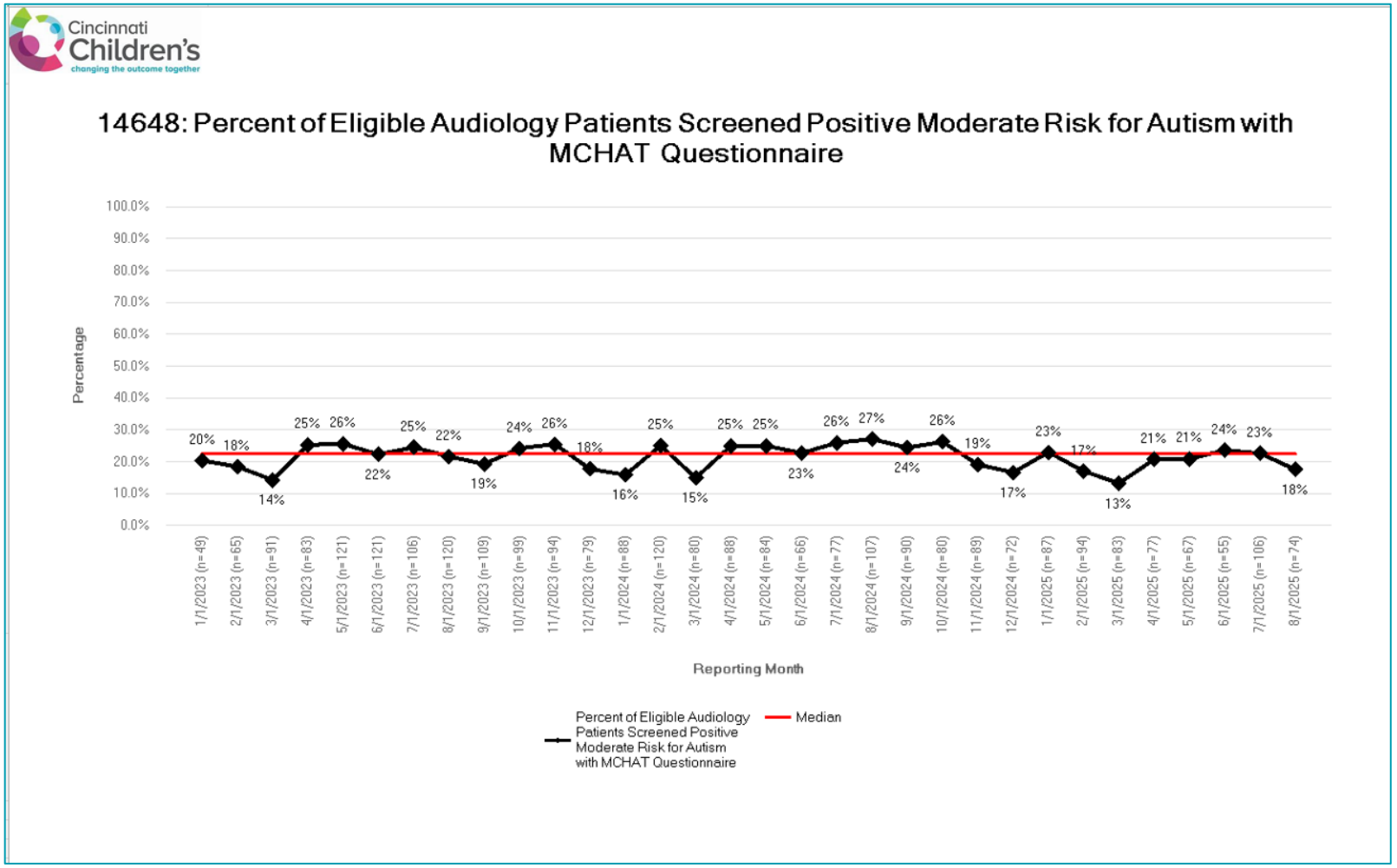
Program Data: 12% High Risk



Program Data: 22% Moderate Risk



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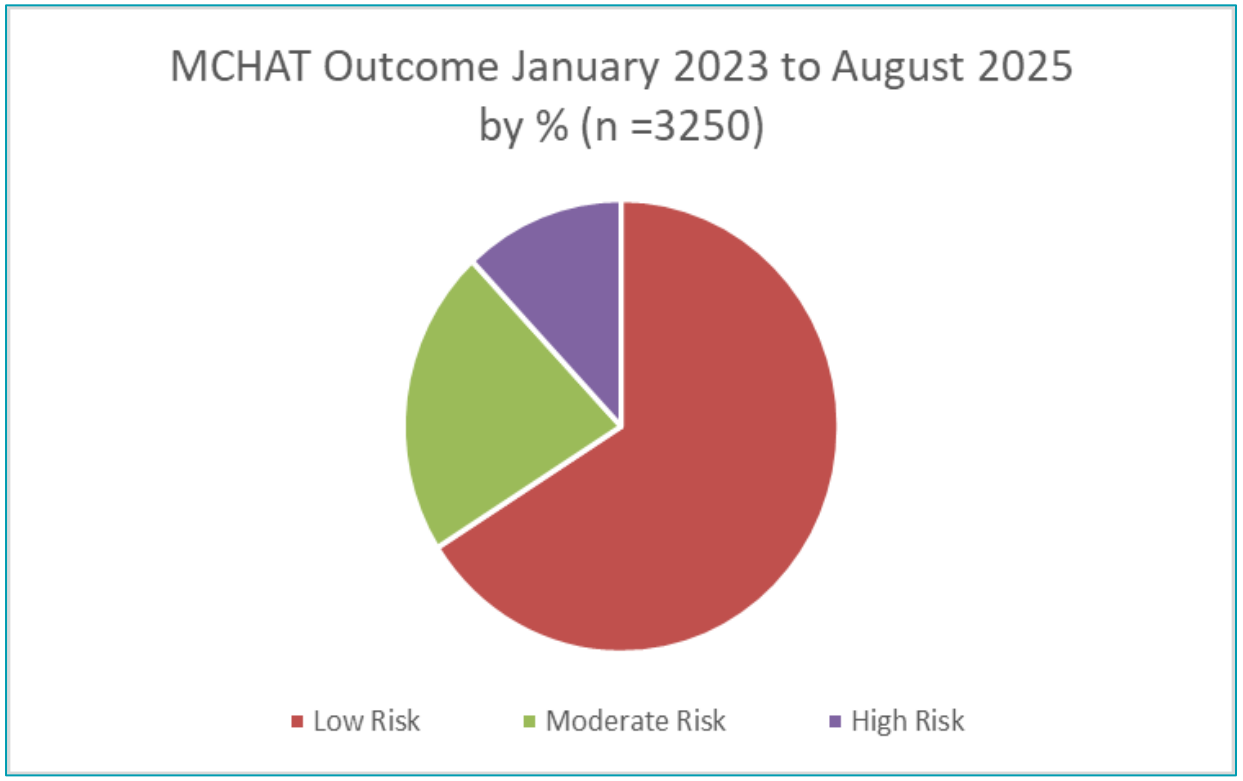
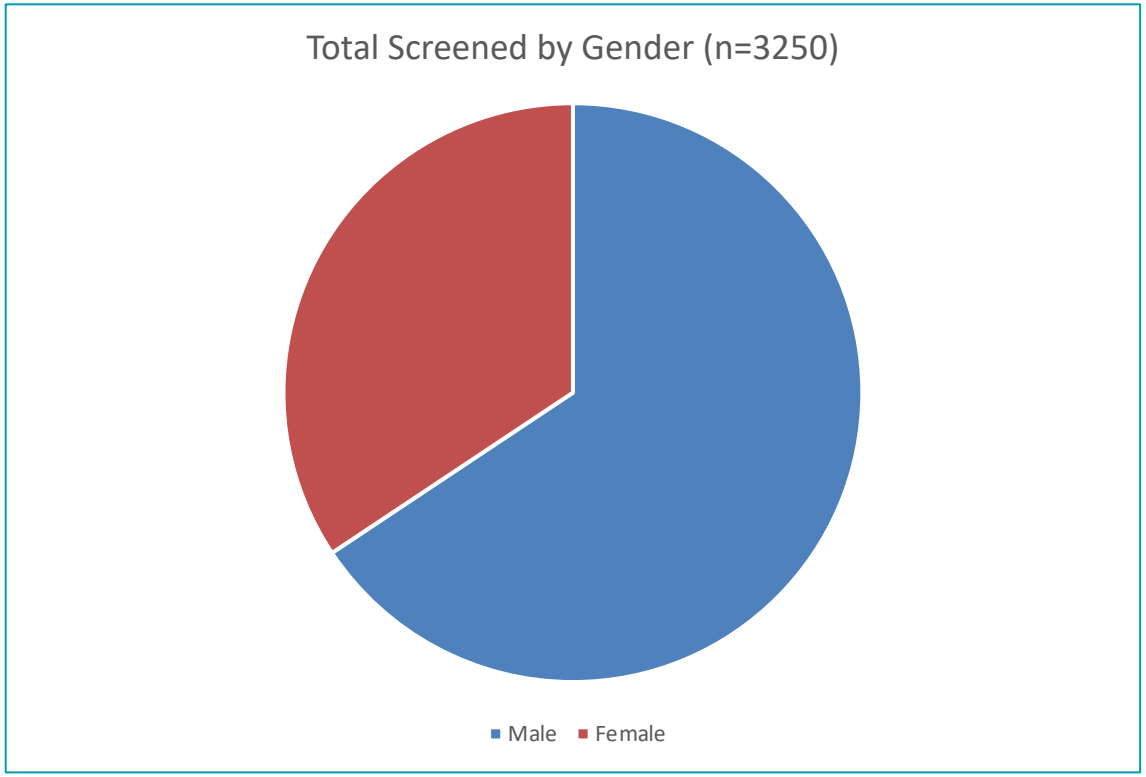
Total Screens (n= 3250)





Total Sample Size (n=3250)

- 66% Low Risk
- 12% High Risk
- 22% Moderate Risk

Total Sample Size (n=3250)

- 34% Female
- 66% Male

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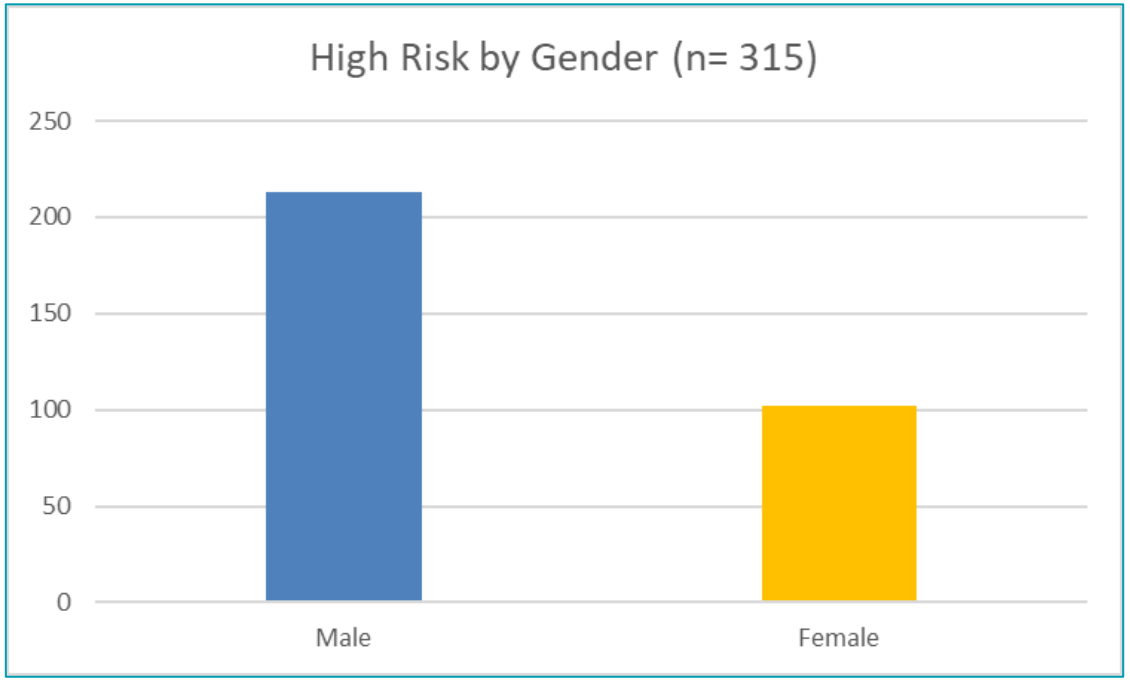
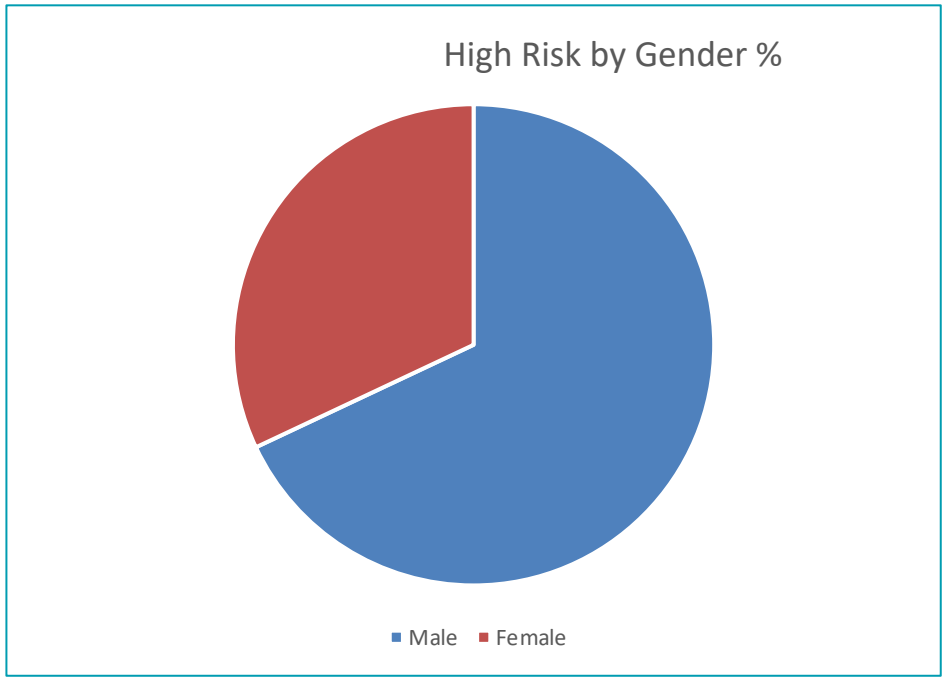
Gender Screening Break Down: Screened High Risk





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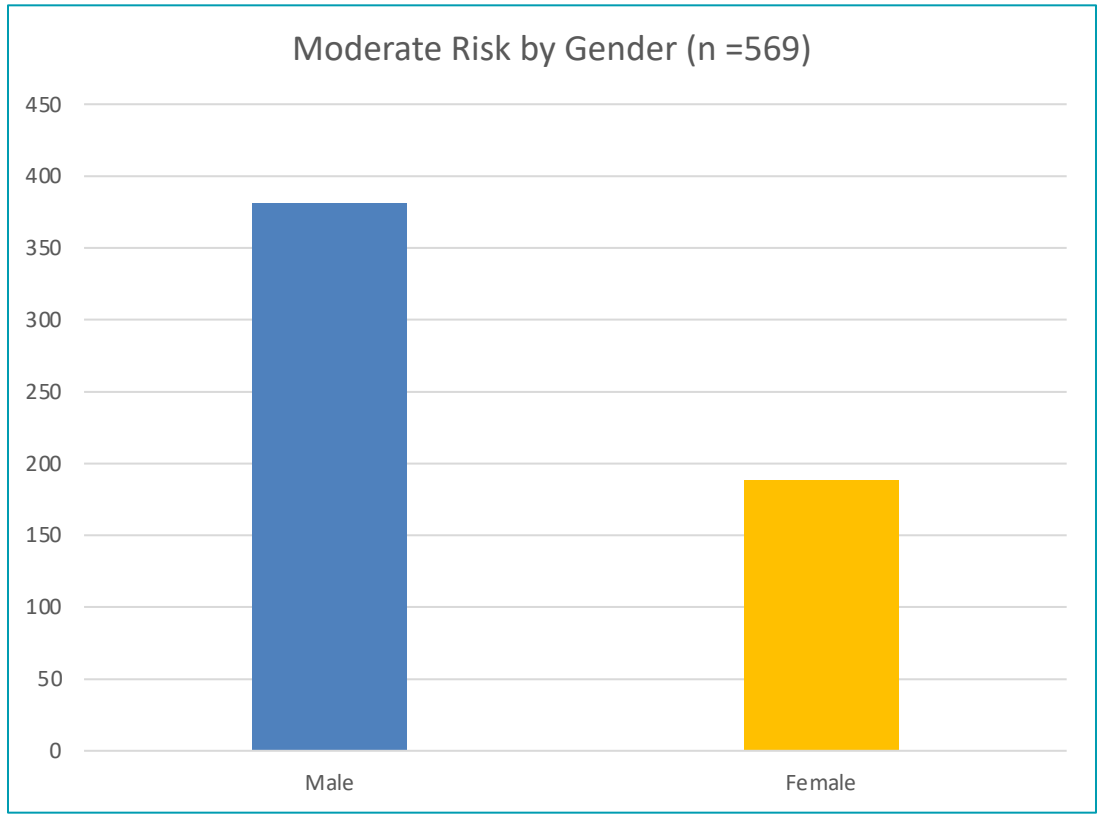
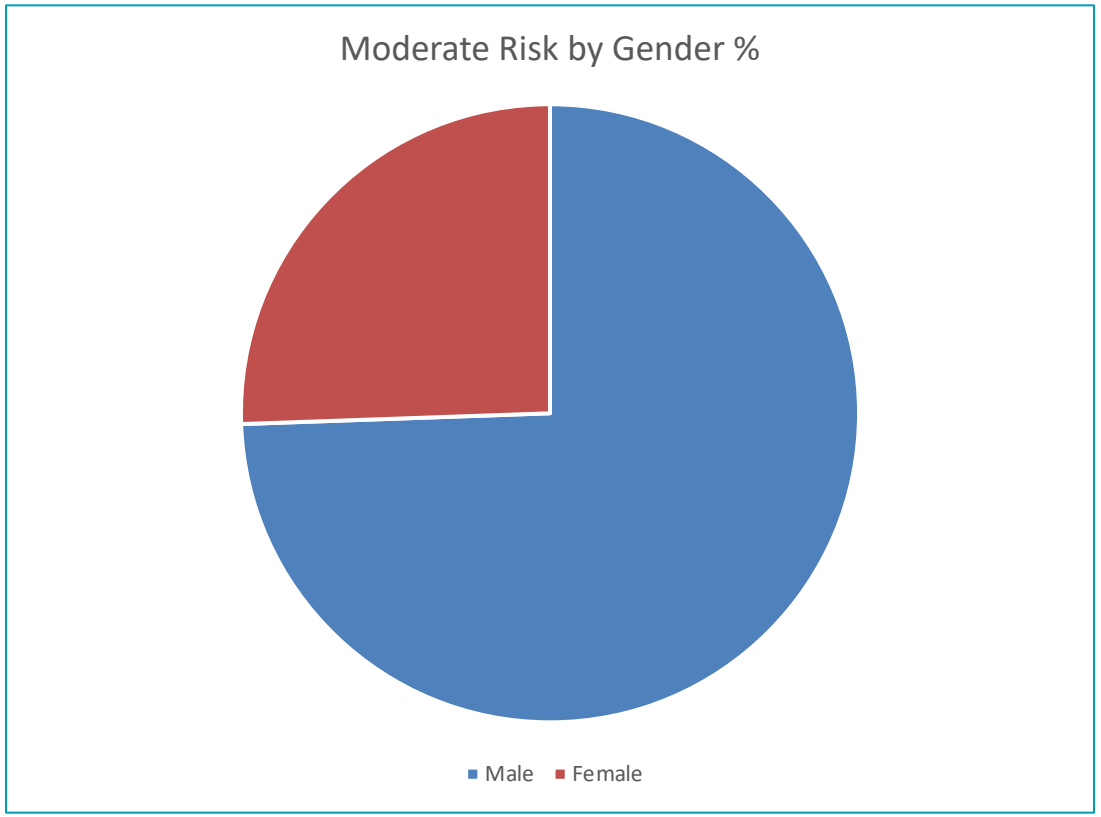
Gender Screening Break Down: Screened Moderate Risk





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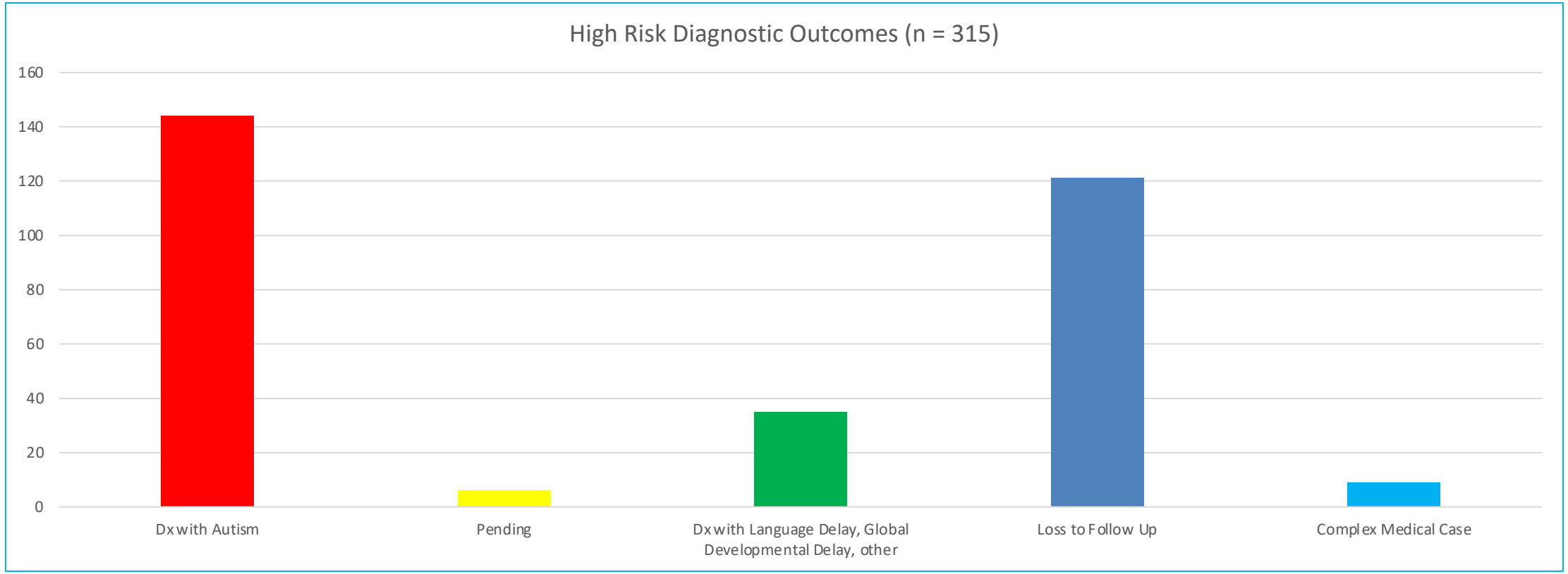
High Risk Diagnostic Outcomes



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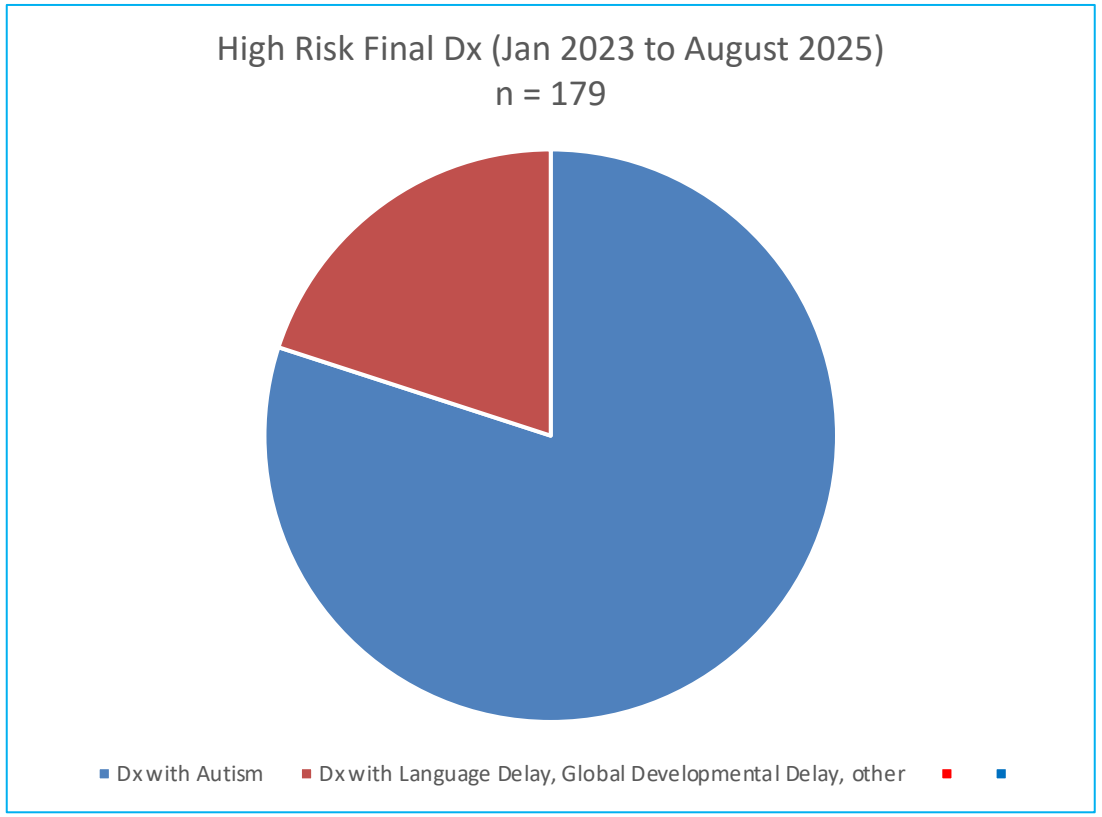
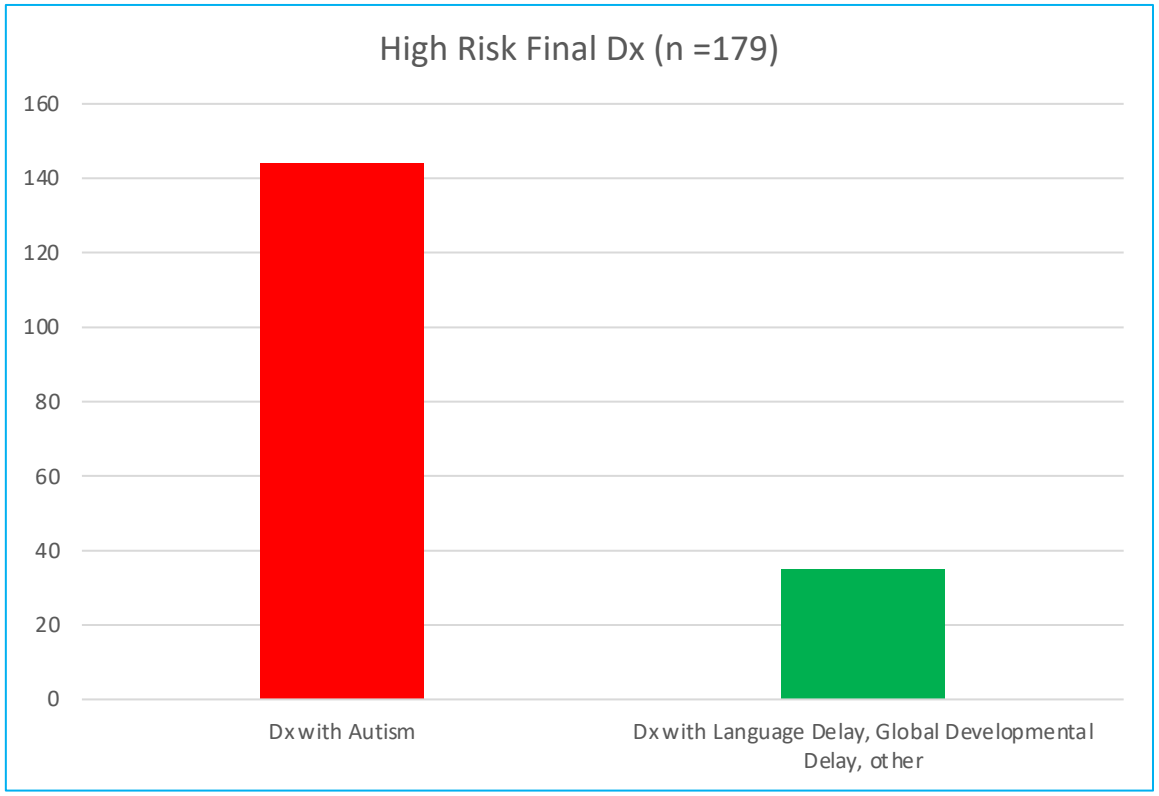
High Risk Final Diagnosis (Patient's Who Followed Up ☺)





Diagnosis for High Risk MCHATs (n=65)

- 80% Autism
- 20% Language or Global Delay

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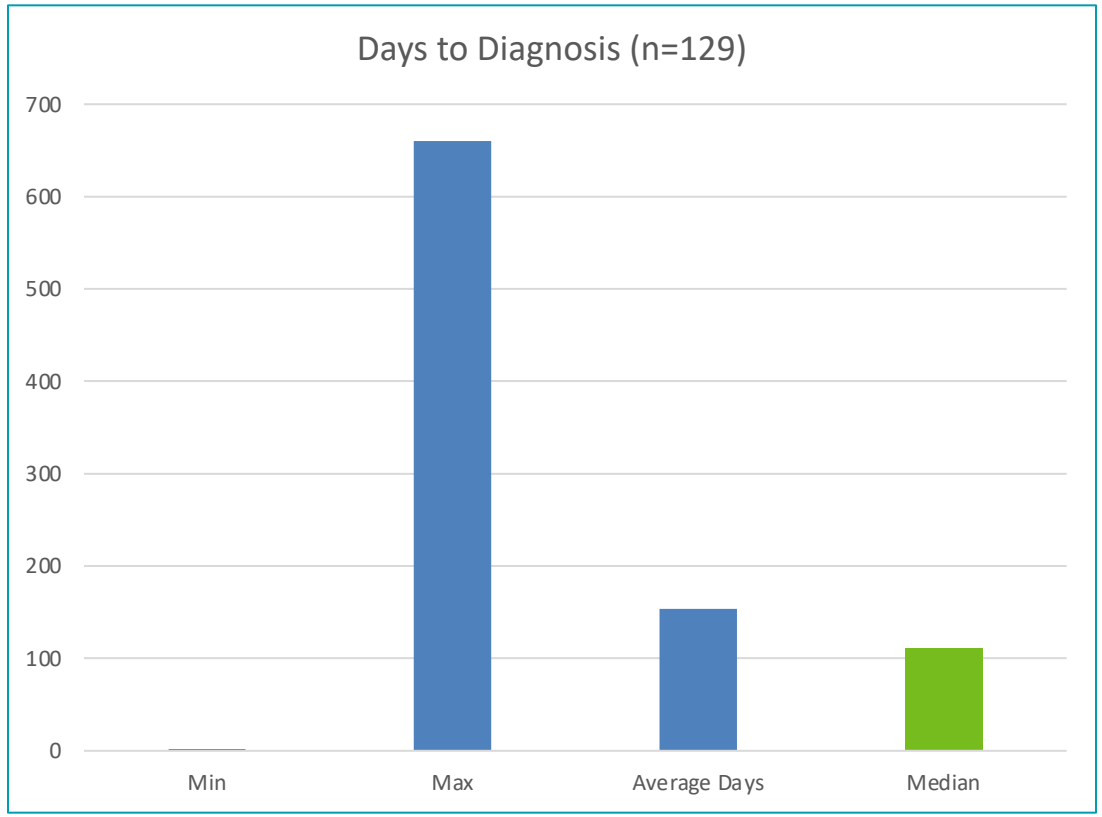
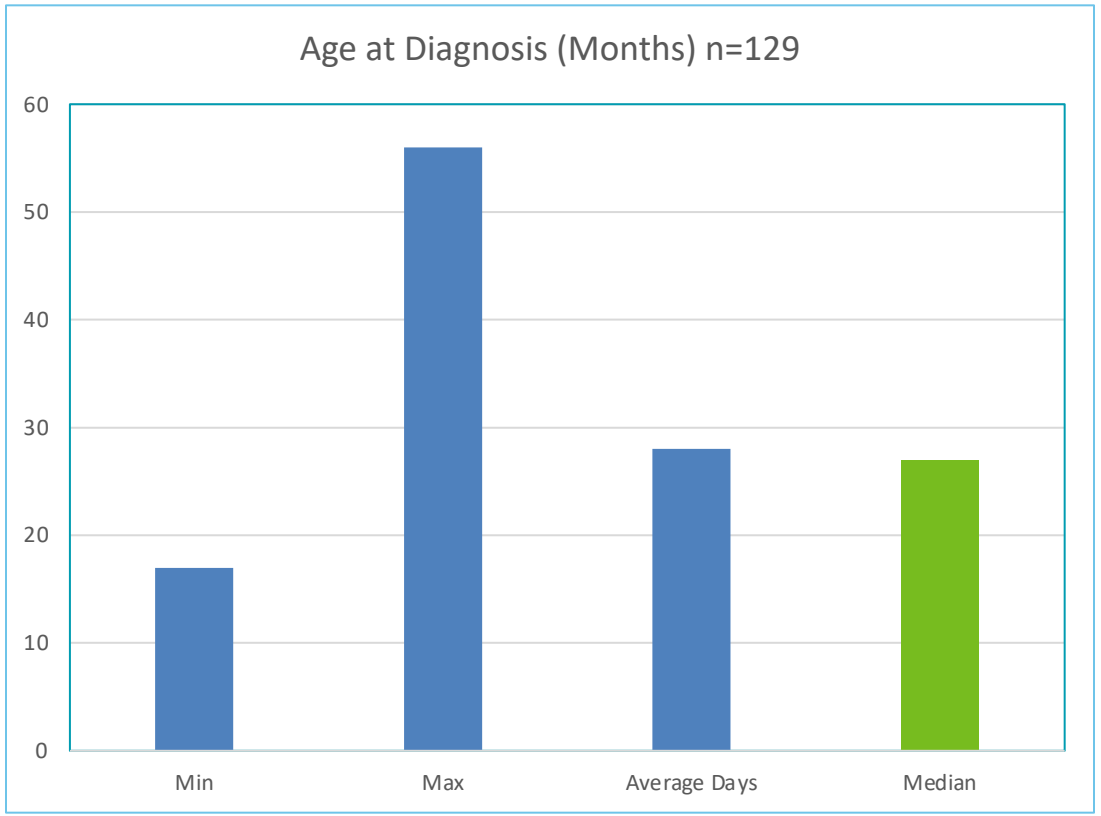
How Long Does It Take to Get Diagnosed?





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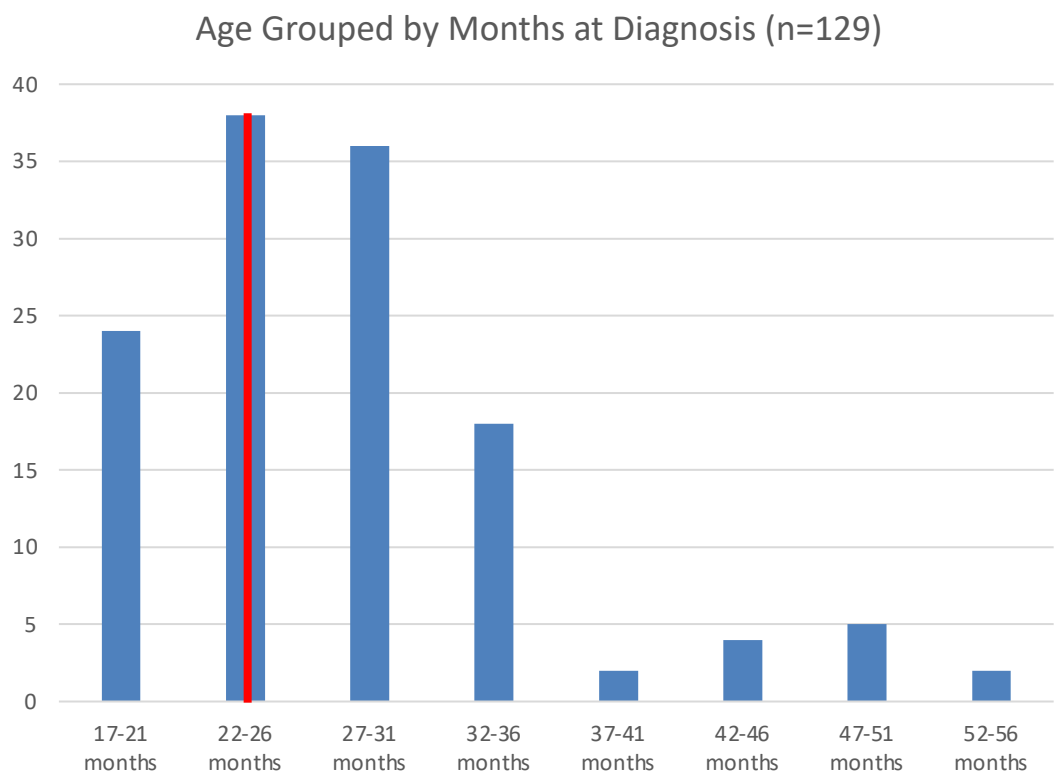
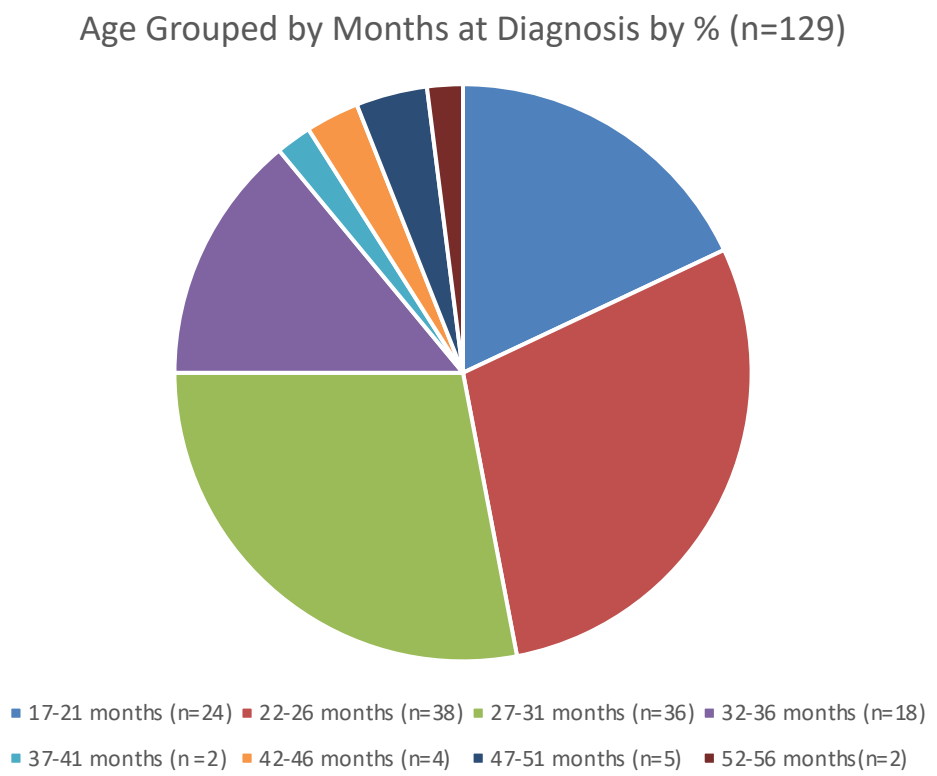
Age at Diagnosis





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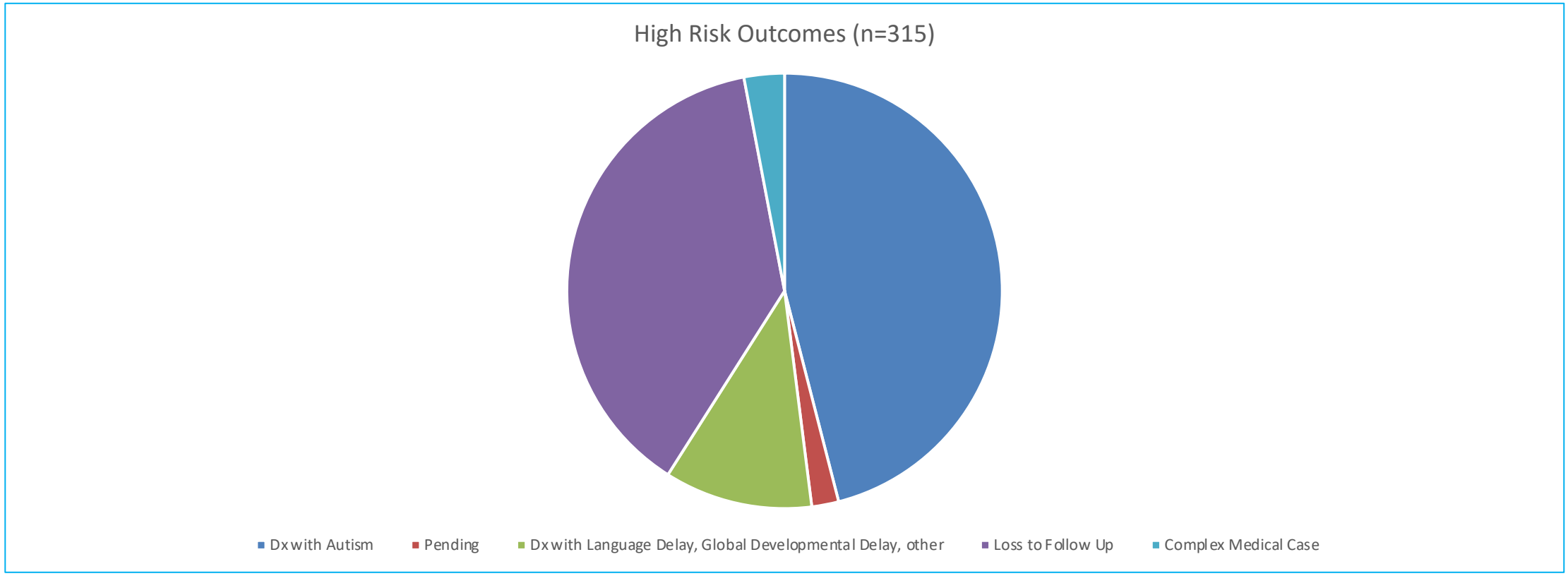
Loss to Follow-Up (38%)



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Loss to Follow-Up Intervention

- Collaboration with CCHMC Division of Behavioral Pediatrics and Cincinnati Primary Care/Physician Liaison Group

- What can we do to reduce the loss to follow-up?
  - Direct referral
  - **Phone call to PCP**

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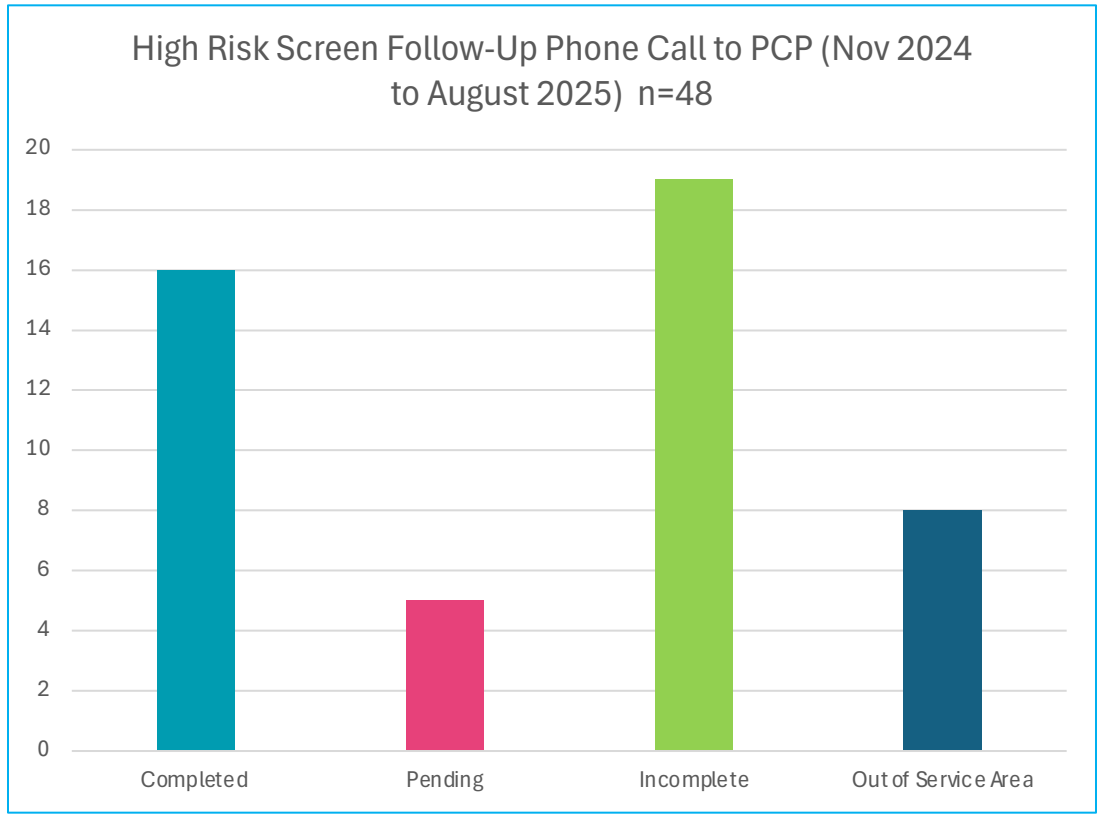
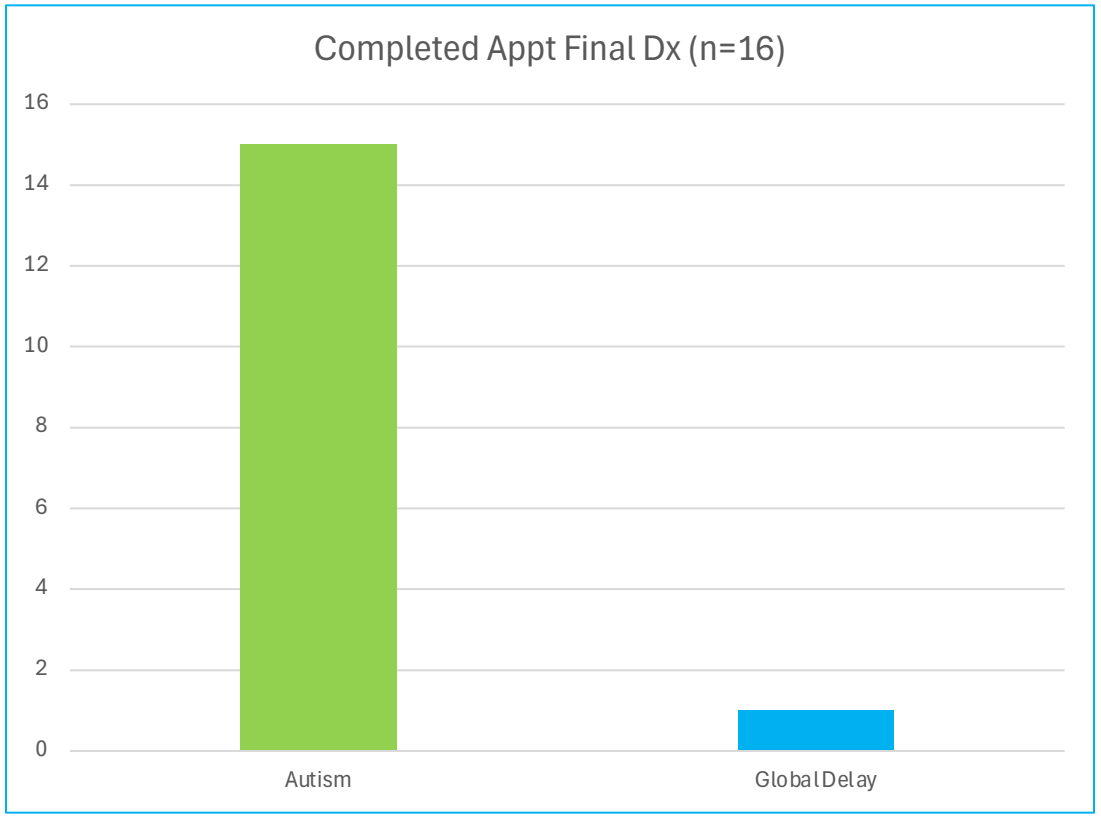
QI Intervention: Direct Phone Call to PCP from Division of Audiology





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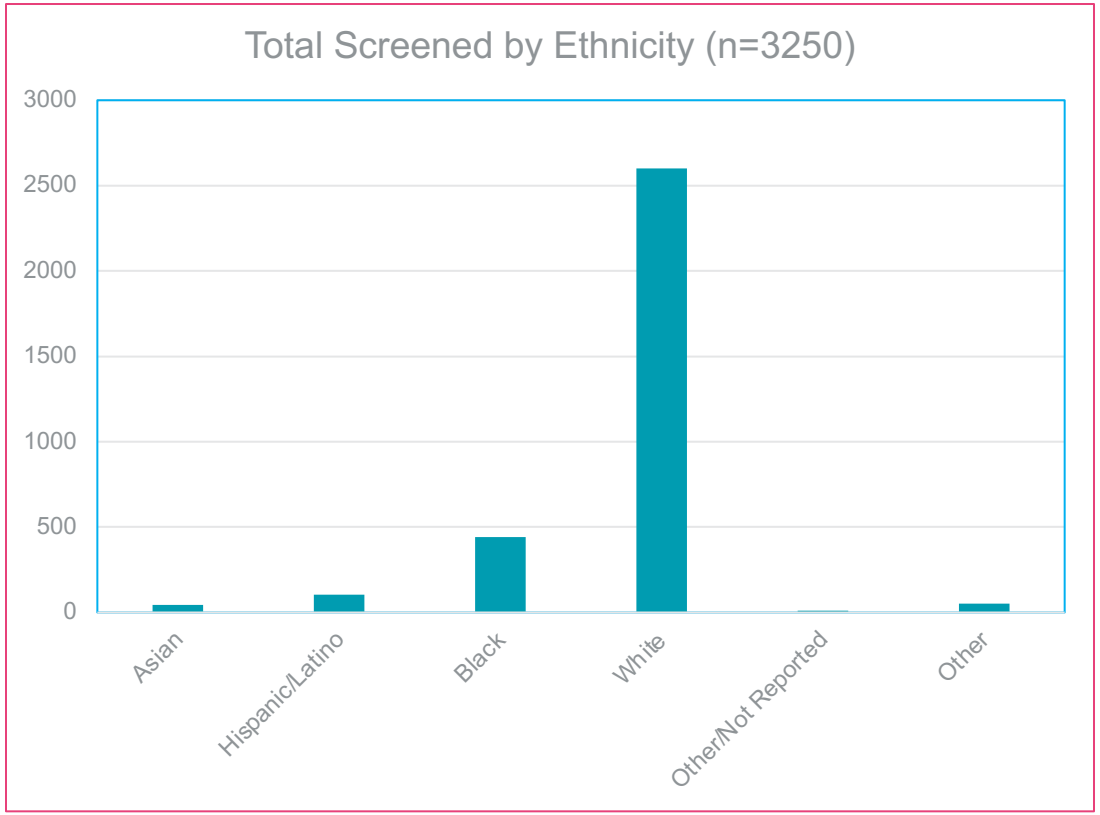
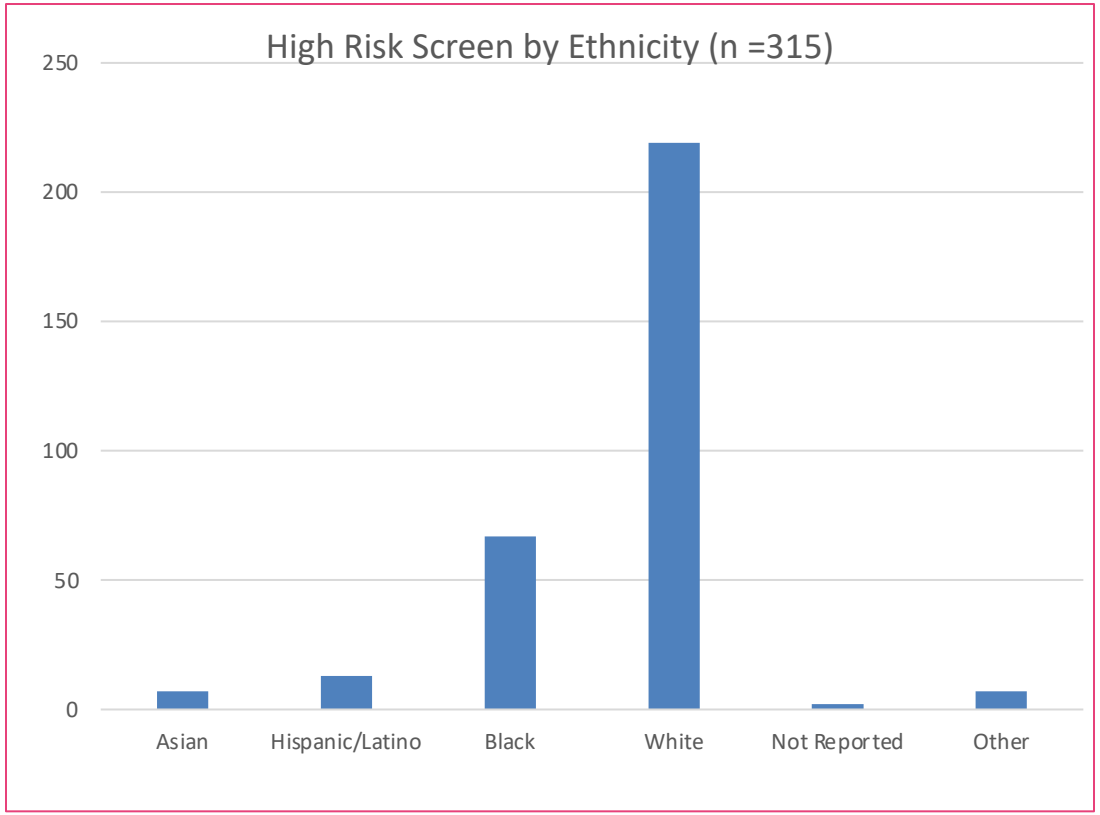
Ethnicity Data (Total Screened)





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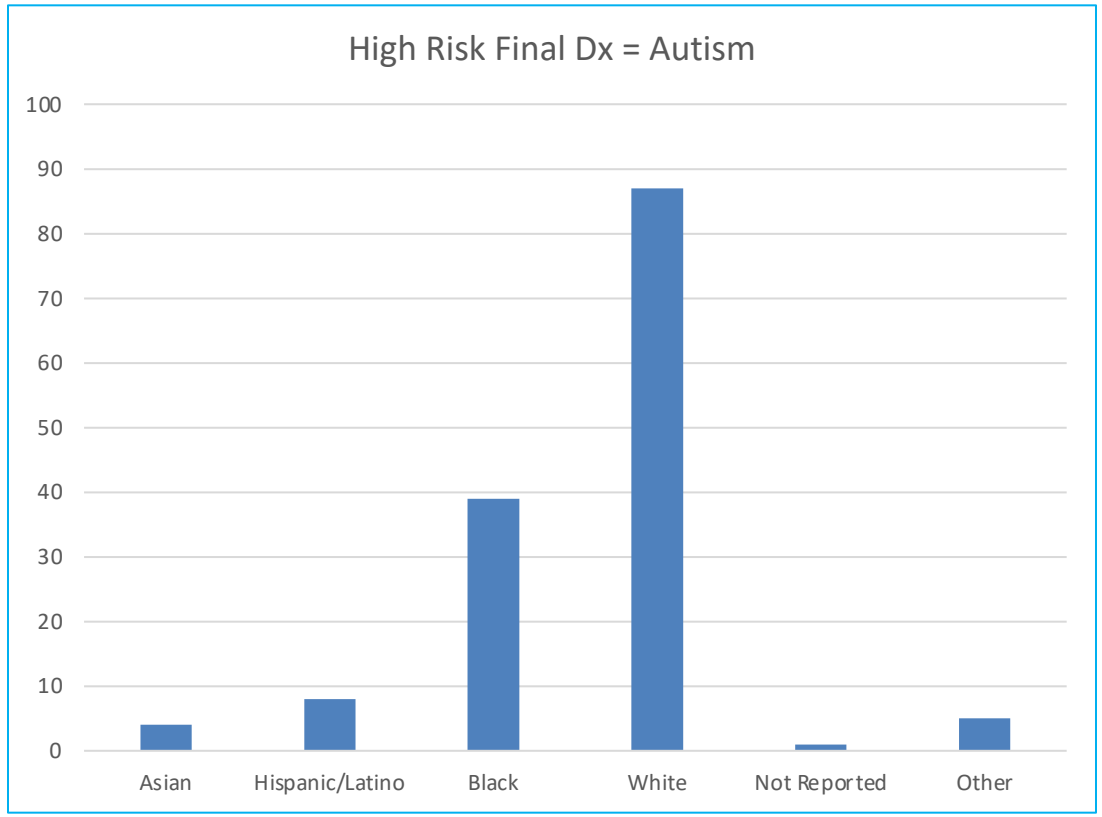
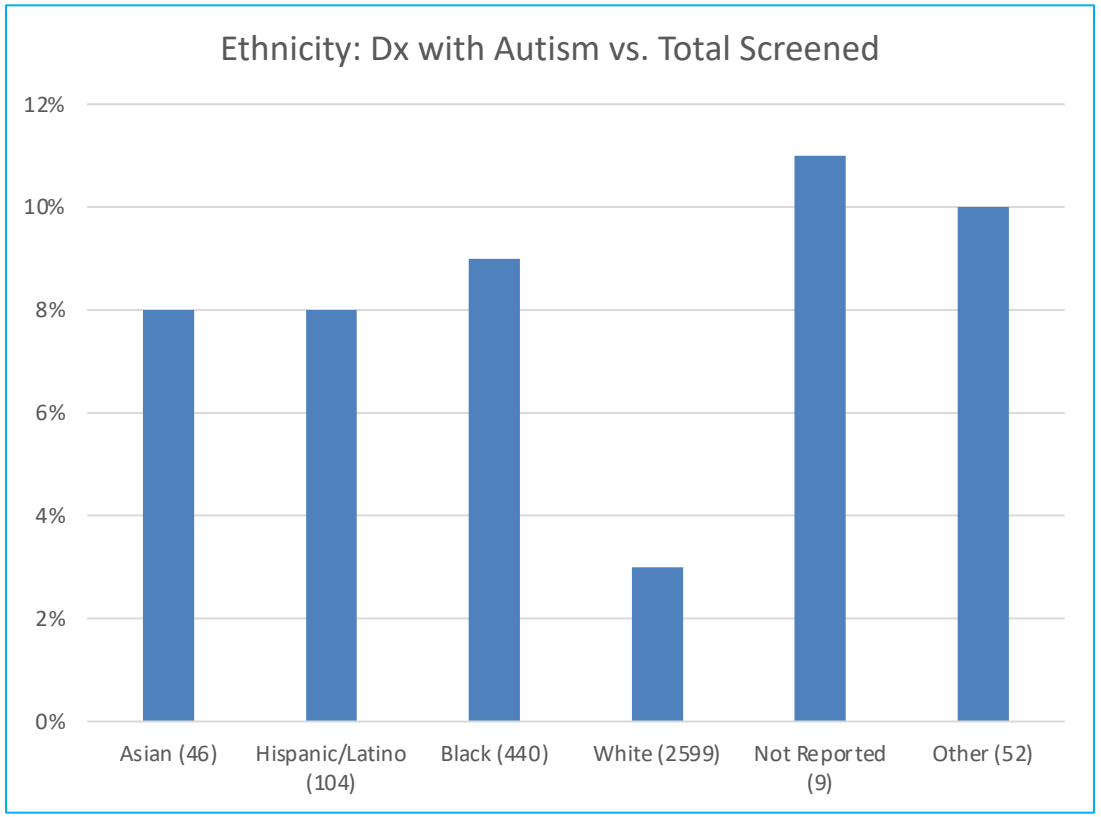
Ethnicity Data (Percentage Data with Dx of Autism)





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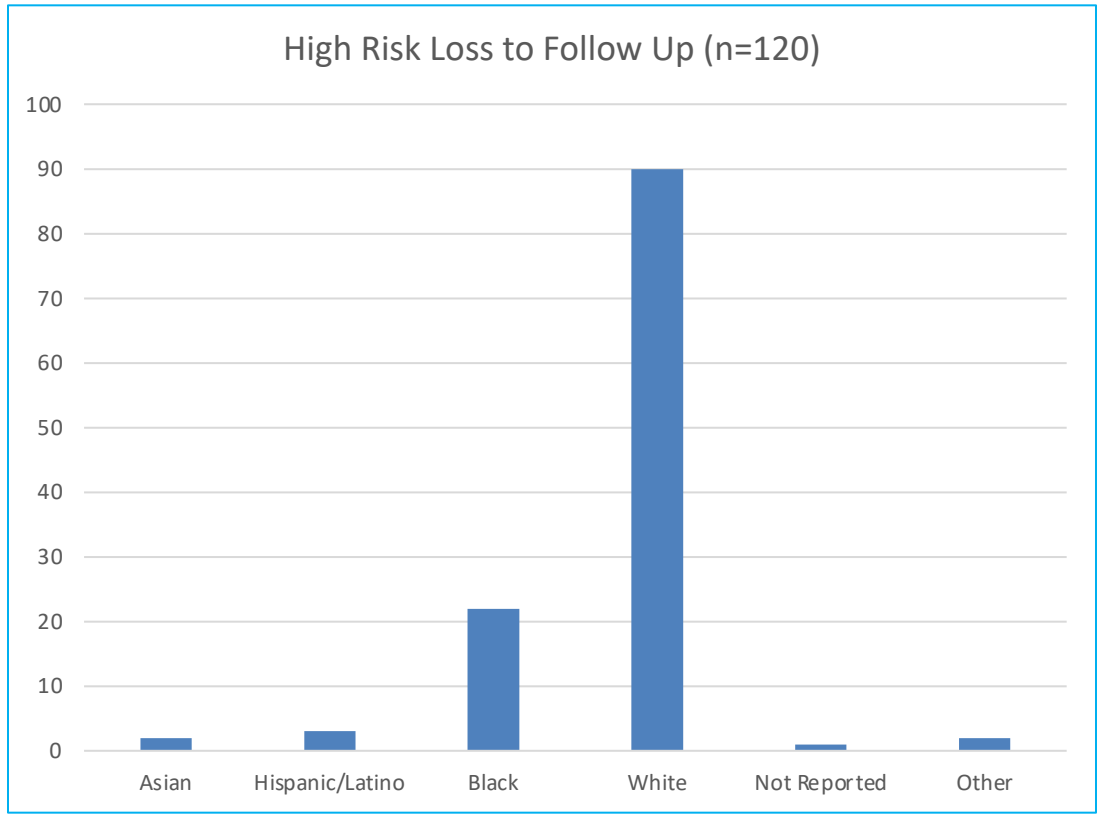
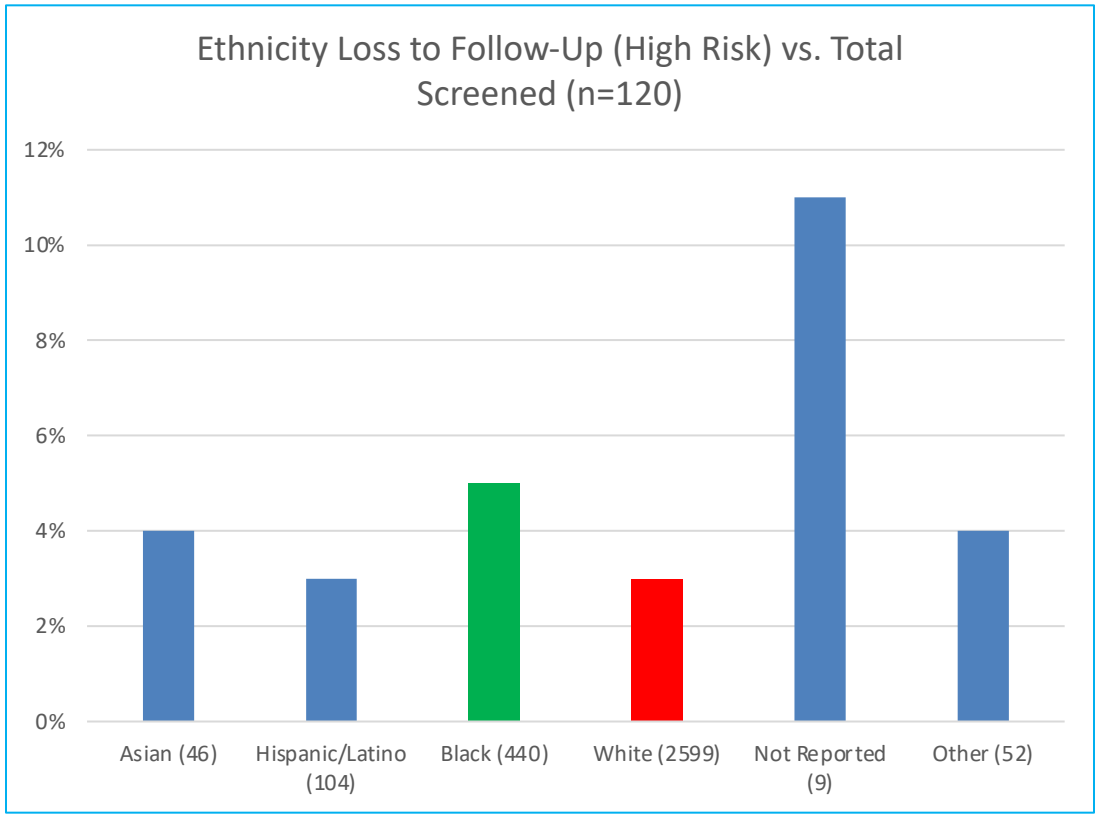
Ethnicity Data: Loss to Follow-Up





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Questions….

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Case Study (23 month old female)

- **Medical History**
  - Normal pregnancy
  - No risk factors for sensorineural hearing loss
  - No family history of learning disabilities or global delays
  - No chronic ear infections
  - Passed newborn hearing screen

- **Developmental History**
  - Speech regression
    - Had a few words initially
    - Initial symptoms/concerns around 16 months of age
  - Intermittent awareness to name and sound
  - Normal gross & fine motor skills
  - Behavioral concerns were minimal until approx. 22 months of age.

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Case Study

- **Audiology In-Take:**
  - Age at evaluation: 23 months (self-referred)
  - Parent concerned for hearing loss; daughter does not respond to her name consistently and zones out
  - Speech regression and no progress in speech therapy
  - Extremely active and not doing well in daycare setting; difficulties with following directions and sleeping
  - Throws tantrums that appear unprovoked
  - **Positive MCHAT**

- **Audiology Test Results & Observations:**
  - Normal tympanograms
  - Present DPOAEs for one ear
  - Normal SAT to speech noise
  - Attempted tones but would not condition
  - Would not tolerate headphones
  - No interest to voice
  - Consistently rubbed her stuffed animal against her face
  - **Child referred to behavioral pediatrician due to concerns with autism with recommendation to try hearing test again in 6 months**

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Case Study

- **Behavioral Pediatrician Results:**
  - Age at evaluations (29-31 months)
  - Interdisciplinary evaluation revealed that child met criteria for an autism spectrum disorder
  - Referral for therapies & school supports

- **Behavioral Intervention Therapy**
  - Private speech therapy (began at 34 months)
  - Private occupational therapy (began at 35 months)
  - Applied Behavioral Analysis therapy (began at 34 months)
  - Transitioned to pre-school and provided speech & occupational therapy via the local school district (38 months of age)

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Case Study

- **Current Status (43 months of age):**
  - Has the ability to use two-three-word utterances with purpose but prefers augmentative communication
    - Uses picture boards and augmentative devices to communicate
  - Will answer Yes/No questions appropriately
  - Tantrums and hyperactive behaviors have reduced
  - Successfully completed potty training
  - Joint attention/focus has improved

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Case Study

- Initial Parental Concerns (16 months)
- Audiologic Evaluation & MCHAT (23 months)
- Behavioral Pediatrician Evaluation (31 months)
- Private Therapies (34-35 months)

Screening

Diagnosis

Intervention

***19 months to be diagnosed and receive appropriate therapies

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Conclusions

- Audiologists can play a crucial role in autism screening
- MCHAT is a sensitive screening tool
- Early Screening, Diagnosis, and Intervention equals better outcomes
- Don’t be afraid to open the discussion and say the “A” word
- Don’t ignore unusual behaviors and “pass the buck”

- Time for parents to process behavioral concerns and navigate the healthcare system can be lengthy
- Work to do:
  - Improving loss to follow-up
  - Decreasing time to go from screening to diagnosis & intervention
  - Partnering with community particularly marginalized communities that are likely not represented in this data.

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References

- Daniels, A. M., Halladay, A. K., Shih, A., Elder, L. M., & Dawson, G. (2014). Approaches to enhancing the early detection of autism spectrum disorders: A systematic review of the literature. Journal of the American Academy of Child & Adolescent Psychiatry, 53(2), 141–152. https://doi.org/10.1016/j.jaac.2013.11.002
- Dawson, G. (2008). Early behavioral intervention, brain plasticity, and the prevention of autism spectrum disorder. Development and Psychopathology, 20(3), 775–803. https://doi.org/10.1017/s0954579408000370
- Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., Donaldson, A., & Varley, J. (2010). Randomized, controlled trial of an intervention for toddlers with autism: The early start Denver Model. Pediatrics, 125(1). https://doi.org/10.1542/peds.2009-0958
- Durkin, M. S., Maenner, M. J., Baio, J., Christensen, D., Daniels, J., Fitzgerald, R., Imm, P., Lee, L.-C., Schieve, L. A., Van Naarden Braun, K., Wingate, M. S., & Yeargin-Allsopp, M. (2017). Autism spectrum disorder among us children (2002–2010): Socioeconomic, racial, and ethnic disparities. American Journal of Public Health, 107(11), 1818–1826. https://doi.org/10.2105/ajph.2017.304032
- Hyman, S. L., Levy, S. E., Myers, S. M., Kuo, D. Z., Apkon, S., Davidson, L. F., Ellerbeck, K. A., Foster, J. E. A., Noritz, G. H., Leppert, M. O., Saunders, B. S., Stille, C., Yin, L., Weitzman, C. C., Childers, D. O., Levine, J. M., Peralta-Carcelen, A. M., Poon, J. K., Smith, P. J., … Bridgemohan, C. (2020). Identification, evaluation, and management of children with autism spectrum disorder. Pediatrics, 145(1). https://doi.org/10.1542/peds.2019-3447
- Ozonoff, S., Heung, K., Byrd, R., Hansen, R., & Hertz-Picciotto, I. (2008). The onset of autism: Patterns of symptom emergence in the first years of life. Autism Research, 1(6), 320–328. https://doi.org/10.1002/aur.53 Pediatric audiologists: Partners in early diagnosis of autism - @ASHA. (n.d.). https://leader.pubs.asha.org/do/10.1044/leader.AEA.26042021.16/full/
- Robins, D. L., Fein, D., Barton, M. L., & Green, J. A. (2001). Modified checklist for autism in toddlers. Journal of Autism and Developmental Disorders , 31(2). https://doi.org/10.1037/t03999-000
- Zuckerman, K. E., Broder-Fingert, S., & Sheldrick, R. C. (2020). To reduce the average age of autism diagnosis, screen preschoolers in primary care. Autism, 25(2), 593–596. https://doi.org/10.1177/1362361320968974
- Zuckerman, K., Lindly, O. J., & Chavez, A. E. (2017). Timeliness of autism spectrum disorder diagnosis and use of services among U.S. Elementary School–Aged Children. Psychiatric Services, 68(1), 33–40. https://doi.org/10.1176/appi.ps.201500549
- Zwaigenbaum, L. (2010). Advances in the early detection of autism. Current Opinion in Neurology, 23(2), 97–102. https://doi.org/10.1097/wco.0b013e3283372430
- Okoye C, Obialo-Ibeawuchi CM, Obajeun OA, Sarwar S, Tawfik C, Waleed MS, Wasim AU, Mohamoud I, Afolayan AY, Mbaezue RN. Early Diagnosis of Autism Spectrum Disorder: A Review and Analysis of the Risks and Benefits. Cureus. 2023 Aug 9;15(8):e43226. doi: 10.7759/cureus.43226. PMID: 37692637; PMCID: PMC10491411.

Dr. Manning Ted Talk Link
https://youtu.be/LawBw9gbv_w?si=d2_mc6wLH23iAt0P

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- Why autism diagnoses keep climbing

- RFK Jr. expected to link use of Tylenol during pregnancy to autism

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