2021 Summary of Advances Nominations

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Question 1: Screening and Diagnosis

Dena Gassner	Barger B, Benevides T, Riszk S, Rice C, Heiman H, Salmon A, Sanchez-Alvarez S. Race/ethnic inequities in conjoint monitoring and screening for U.S. children 3 and under: Disparities in Monitoring and Screening. Disabil Health J. 2021 Aug 13:101179. doi: 10.1016/j.dhjo.2021.101179. Epub ahead of print. [PMID: 34412986]
	Non-White children with developmental disabilities are frequently identified later than White children and therefore miss out on opportunities for early intervention (EI). Recent research indicates that conjoint monitoring and screening is more strongly associated with EI receipt than monitoring or screening alone.
NICHD	Chang Z, Di Martino JM, Aiello R, Baker J, Carpenter K, Compton S, Davis N, Eichner B, Espinosa S, Flowers J, Franz L, Harris A, Howard J, Perochon S, Perrin EM, Krishnappa Babu PR, Spanos M, Sullivan C, Walter BK, Kollins SH, Dawson G, Sapiro G. Computational Methods to Measure Patterns of Gaze in Toddlers With Autism Spectrum Disorder. JAMA Pediatr. 2021 Aug 1;175(8):827-836. doi: 10.1001/jamapediatrics.2021.0530. [PMID: 33900383]; PMCID: PMC8077044.
	This research team developed a prototype app for mobile devices that can screen children at risk for autism spectrum disorder (ASD). In the study, the app could distinguish toddlers diagnosed with ASD from typically developing toddlers by tracking their eye movements while watching videos. With more research, the app could one day screen infants and toddlers and refer them for early intervention, when chances for treatment success is greatest.
HRSA	Feinberg E, Augustyn M, Broder-Fingert S, Bennett A, Weitzman C, Kuhn J, Hickey E, Chu A, Levinson J, Sandler Eilenberg J, Silverstein M, Cabral HJ, Patts G, Diaz-Linhart Y, Fernandez-Pastrana I, Rosenberg J, Miller JS, Guevara JP, Fenick AM, Blum NJ. Effect of Family Navigation on Diagnostic Ascertainment Among Children at Risk for Autism: A Randomized Clinical Trial From DBPNet. JAMA Pediatr. 2021 Mar 1;175(3):243-250. doi: 10.1001/jamapediatrics.2020.5218. Erratum in: JAMA Pediatr. 2021 May 1;175(5):538. [PMID: 33427861]; PMCID: PMC7802008.
	Disparities exist in access to autism spectrum disorder (ASD) diagnostic and treatment services for low-income and racial/ethnic minority families. This study tested the efficacy of family navigation, an individually tailored, culturally informed care management strategy, to increase the likelihood of diagnosis among young children at risk for ASD. Family navigation improved the likelihood of diagnostic ascertainment among children from racial/ethnic minority, low-income families who were detected as at risk for ASD in primary care.
Alycia Halladay	Kaat AJ, Shui AM, Ghods SS, Farmer CA, Esler AN, Thurm A, Georgiades S, Kanne SM, Lord C, Kim YS, Bishop SL. Sex differences in scores on standardized measures of autism symptoms: a multisite integrative data analysis. J Child Psychol Psychiatry. 2021 Jan;62(1):97-106. doi: 10.1111/jcpp.13242. Epub 2020 Apr 20. [PMID: 32314393]; PMCID: PMC8115212.
	Concerns have been raised that scores on standard measures of autism spectrum disorder (ASD) symptoms may differ as a function of sex. However, these findings are hindered by small female samples studied thus far. The current study evaluated if, after accounting for age, IQ, and language level, sex affects ASD severity estimates from diagnostic measures among children with ASD. The authors found minimal differences due to sex beyond other known influences on ASD severity indicators. This suggests that severity estimates

	between boys and girls who receive an ASD diagnosis do not systematically differ to such an extent that sex-specific scoring procedures would be necessary.
SSA	Sicherman N, Law K, Lipkin PH, Loewenstein G, Marvin AR, Buxbaum JD. Information Avoidance and Information Seeking Among Parents of Children With ASD. Am J Intellect Dev Disabil. 2021 May 1;126(3):249-259. doi: 10.1352/1944-7558-126.3.249. [PMID: 33910239]
	This study explores how information avoidance and seeking among parents of children on the autism spectrum affected the age of diagnosis. Children of parents who self-reported that they had preferred "not to know" reported diagnoses around 3 months later than other children. Children of parents who raised concerns that they perceived as having been dealt with adequately reported diagnoses about 4 months earlier, but the children of parents who reported raising concerns repeatedly and felt that those concerns were dealt with inadequately were diagnosed over a year later. These findings suggest that failure of educational and healthcare professionals, in either substituting for parents who avoid information, or supporting those who seek information, can significantly delay the age of diagnosis. This paper addresses the degree to which parents' tendency to avoid or to seek out information plays a role in delayed diagnosis of ASD. Both of these phenomena – information avoidance and seeking – have been identified in anecdotal reports as potential determinants of age of diagnosis but have not previously been examined in quantitative empirical research. This is an important new lens to view delayed diagnosis of ASD.
NIDCD	Wetherby AM, Guthrie W, Hooker JL, Delehanty A, Day TN, Woods J, Pierce K, Manwaring SS, Thurm A, Ozonoff S, Petkova E, Lord C. The Early Screening for Autism and Communication Disorders: Field-testing an autism-specific screening tool for children 12 to 36 months of age. Autism. 2021 Oct;25(7):2112-2123. doi: 10.1177/13623613211012526. Epub 2021 May 7. [PMID: 33962531]; PMCID: PMC8418999.
	There is a critical need for accurate screening tools for autism spectrum disorder in very young children so families can access tailored intervention services as early as possible. A new autism-specific parent-report screening tool for children between 12 and 36 months of age was field-tested in five sites with 471 children screened for communication delays, with 30 items found to best discriminate autism spectrum disorder from the non-spectrum groups. Results provide preliminary support for the accuracy of the measure as an autism-specific screener in children 12-36 months with elevated risk of communication delay or autism spectrum disorder.
Alycia Halladay	Zwaigenbaum L, Bishop S, Stone WL, Ibanez L, Halladay A, Goldman S, Kelly A, Klaiman C, Lai MC, Miller M, Saulnier C, Siper P, Sohl K, Warren Z, Wetherby A. Rethinking autism spectrum disorder assessment for children during COVID-19 and beyond. Autism Res. 2021 Nov;14(11):2251-2259. doi: 10.1002/aur.2615. Epub 2021 Sep 22. [PMID: 34553489]; PMCID: PMC8646364.
	The pandemic has brought challenges for families not only receiving supports following a diagnosis, but has created confusion on the diagnostic process, since it was drastically changed during the pandemic. This paper summarized the current practices (pre pandemic), how they changed during the pandemic, and what a future of diagnosis using telehealth has taught researchers and how we need to prepare for these changes, take advantage of new changes in observational environment, and not rely solely on specific scientific instruments. The paper had a potential impact on the way school-based evaluations are conducted and how children are fit into the new educational system.

Question 2: Biology

NIDCD	Bradshaw J, McCracken C, Pileggi M, Brane N, Delehanty A, Day T, Federico A, Klaiman C, Saulnier C, Klin A, Wetherby A. Early social communication development in infants with autism spectrum disorder. Child Dev. 2021 Nov;92(6):2224-2234. doi: 10.1111/cdev.13683. [PMID: 34786700]
	Social-communication differences are a robust and defining feature of autism spectrum disorder (ASD), but identifying early points of divergence in infancy has been a challenge. The current study examines social communication in 9- to 12-month-old infants who develop ASD compared to typically developing (TD) infants. Results demonstrate that infants later diagnosed with ASD were already exhibiting fewer social-communication skills using eye gaze, facial expression, gestures, and sounds at 9 months. Additionally, three unique patterns of change across distinct social-communication skills were observed within the ASD group. This study documents that observable social-communication differences for infants with ASD are unfolding by 9 months, pointing to a critical window for targeted intervention.
NICHD	Cárdenas-de-la-Parra A, Lewis JD, Fonov VS, Botteron KN, McKinstry RC, Gerig G, Pruett JR Jr, Dager SR, Elison JT, Styner MA, Evans AC, Piven J, Collins DL; IBIS Network. A voxel-wise assessment of growth differences in infants developing autism spectrum disorder. Neuroimage Clin. 2021;29:102551. doi: 10.1016/j.nicl.2020.102551. Epub 2020 Dec 29. [PMID: 33421871]; PMCID: PMC7806791.
	The Infant Brain Imaging Study (IBIS) Network consists of a team of investigators, conducting a prospective, longitudinal imaging and behavioral assessment in individuals at high and low familial risk (HR, LR) for development of autism spectrum disorders (ASD) from infancy through school age. In this study, they compared magnetic resonance imaging (MRI) scans of HR and LR at 6, 12 and 24 months of age using a technique that allows for investigation of growth patterns in different brain regions. The regions that showed group differences have been implicated in the core symptoms of ASD.
NIDCD	Choi B, Shah P, Rowe ML, Nelson CA, Tager-Flusberg H. A Longitudinal Study of Parent Gestures, Infant Responsiveness, and Vocabulary Development in Infants at Risk for Autism Spectrum Disorder. J Autism Dev Disord. 2021 Nov;51(11):3946-3958. doi: 10.1007/s10803-020-04855-z. Epub 2021 Jan 8. [PMID: 33420647]
	This study investigated gestures used by parents with infants at high or low risk for ASD, how infants responded to these gestures, and how these gestures relate to vocabulary development. Parents of three groups gestured in similar frequencies and proportions while parents who gestured more at 12 months had children with better vocabulary at 36 months than parents who gestured less. These findings highlight the importance of examining parent gestures when predicting language development.
Alycia Halladay	Gordon A, Yoon SJ, Tran SS, Makinson CD, Park JY, Andersen J, Valencia AM, Horvath S, Xiao X, Huguenard JR, Pașca SP, Geschwind DH. Long-term maturation of human cortical organoids matches key early postnatal transitions. Nat Neurosci. 2021 Mar;24(3):331-342. doi: 10.1038/s41593-021-00802-y. Epub 2021 Feb 22. [PMID: 33619405]; PMCID: PMC8109149.
	Using six different induced pluripotent cell lines from 5 individuals across different genetic disorders, this paper was able to perform functional genomic assays to validate the use of organoid systems to better understand the developing brain, as it develops in real time, and how processes may differentiate and how they may be corrected. They showed they

	were able to mature, and switch from prenatal to then postnatal features, and found that they do not develop along the same trajectory, they have their own distinct trajectories in terms of when cells are born, how they form connections and how they become different cell types. They offer a new preclinical model of disease.
Helen Tager-Flusberg	Hammill C, Lerch JP, Taylor MJ, Ameis SH, Chakravarty MM, Szatmari P, Anagnostou E, Lai MC. Quantitative and Qualitative Sex Modulations in the Brain Anatomy of Autism. Biol Psychiatry Cogn Neurosci Neuroimaging. 2021 Sep;6(9):898-909. doi: 10.1016/j.bpsc.2021.03.001. Epub 2021 Mar 10. [PMID: 33713843]
	This study investigated sex differences in brain anatomy using MRIs collected in a large Canadian sample of autistic individuals and non-autistic controls. There were significant sex differences in both quantitative measures of brain regions/neural circuitry and qualitatively in cortical curvature and subcortical volumes.
Alycia Halladay	Havdahl A, Farmer C, Schjølberg S, Øyen AS, Surén P, Reichborn-Kjennerud T, Magnus P, Bresnahan M, Hornig M, Susser E, Lipkin WI, Lord C, Stoltenberg C, Thurm A, Bishop S. Age of walking and intellectual ability in autism spectrum disorder and other neurodevelopmental disorders: a population-based study. J Child Psychol Psychiatry. 2021 Sep;62(9):1070-1078. doi: 10.1111/jcpp.13369. Epub 2020 Dec 28. [PMID: 33369747]; PMCID: PMC8236490.
	This was one of the first studies to look at a population-based approach to understand how age at walking predicts not only an ASD diagnosis but also other symptoms or comorbidities of ASD. In fact, across the ABC sub cohort of the MoBa study in Norway, delayed age of walking was a predictor of later lower IQ in children with ASD compared to those without ASD. In some children with ASD, this delay in early milestones may also lead to a cascading effect such that major motor skills and lack of learning my increase the "delayed onset" of intellectual impairments. Age of walking should be considered an early risk marker of ASD with intellectual disability.
NIDCD	Plate S, Yankowitz L, Resorla L, Swanson MR, Meera SS, Estes A, Marrus N, Cola M, Petrulla V, Faggen A, Pandey J, Paterson S, Pruett JR Jr, Hazlett H, Dager S, St John T, Botteron K, Zwaigenbaum L, Piven J, Schultz RT, Parish-Morris J; IBIS Network. Infant vocalizing and phenotypic outcomes in autism: Evidence from the first 2 years. Child Dev. 2021 Oct 28. doi: 10.1111/cdev.13697. Epub ahead of print. [PMID: 34708871]
	Infant vocalizations are early-emerging communicative markers shown to be atypical in autism spectrum disorder (ASD), but few longitudinal, prospective studies exist. In this study, 23,850 infant vocalizations from infants at low (LR)- and high (HR)-risk for ASD were analyzed at 6, 12, and 24 months. At 12 months, HR infants who develop ASD (HR-ASD) produced fewer vocalizations than HR infants who do not go on to develop ASD (HR-Neg). From 6 to 24 months, HR-Neg infants demonstrated steeper vocalization growth compared to HR-ASD and LR infants. Finally, among HR infants, vocalizing at 12 months was associated with language, social phenotype, and diagnosis at age 2. Infant vocalizing is an objective behavioral marker that could facilitate earlier detection of ASD.
NIDCD	Prescott KE, Ellis Weismer S. Children with ASD and Communication Regression: Examining Pre-Loss Skills and Later Language Outcomes Through the Preschool Years. J Autism Dev Disord. 2021 Jun 1:10.1007/s10803-021-05098-2. doi: 10.1007/s10803-021-05098-2. Epub ahead of print. [PMID: 34061309]; PMCID: PMC8633200.
	This study investigated if loss of language and preverbal communication in toddlers with ASD was predictive of language outcomes. The results indicate small and relatively transient differences in the language ability of preschool-age children with ASD with and without loss of language, and these differences disappear by the end of the preschool

	years. These results suggest that language loss does not have a negative impact on language skill at school entry, and parents should be reassured that communication skill loss is a common pattern of early development in ASD and is not detrimental beyond a short-term period.
NIDCD	Romeo RR, Choi B, Gabard-Durnam LJ, Wilkinson CL, Levin AR, Rowe ML, Tager-Flusberg H, Nelson CA 3rd. Parental Language Input Predicts Neuroscillatory Patterns Associated with Language Development in Toddlers at Risk of Autism. J Autism Dev Disord. 2021 Jun 29. doi: 10.1007/s10803-021-05024-6. Epub ahead of print. [PMID: 34185234]
	This paper explores how the way parents speak with toddlers at risk for ASD is associated with the toddler's language skills, ASD diagnosis, and brain activity. The results show that the diversity, grammatical complexity, and number of words spoken by the parent at 18-months of age predicted the toddler's language skills at 24-months of age. High-risk toddlers showed stronger relationships between parental language use and later language skills than low-risk toddlers, with high-risk toddlers who received an ASD diagnosis showing the strongest relationship. These associations were explained by frontal and temporal brain activity, but only for toddlers who received ASD diagnoses. Taken together, these results indicate that high-risk toddlers are cognitively and neurally more sensitive to their language environments, which has implications for early intervention.
Alycia Halladay	Rosen NE, McCauley JB, Lord C. Influence of siblings on adaptive behavior trajectories in autism spectrum disorder. Autism. 2022 Jan;26(1):135-145. doi: 10.1177/13623613211024096. Epub 2021 Jun 12. [PMID: 34120483]; PMCID: PMC8665947.
	Siblings are sometimes the focus on research studies, but their influence on the development of their brother/sister with autism. This study took advantage of a large longitudinal cohort to look at whether having a brother or sister improved adaptive function across the lifespan. There were some small differences based on f/f or m/f or m/m siblings, with a slightly increased difference in those from black households. This shows the important role a sibling can have, without even measuring what activities were involved, in the overall functioning of a person with ASD.
Alycia Halladay	Tran XA, McDonald N, Dickinson A, Scheffler A, Frohlich J, Marin A, Kure Liu C, Nosco E, Şentürk D, Dapretto M, Spurling Jeste S. Functional connectivity during language processing in 3-month-old infants at familial risk for autism spectrum disorder. Eur J Neurosci. 2021 Mar;53(5):1621-1637. doi: 10.1111/ejn.15005. Epub 2020 Nov 3. [PMID: 33043498]
	While behavioral features of ASD do not emerge until 18-24 months of age, more research is finding that some subtle measures of brain activity under different circumstances can identify children as young as infancy who show biological features. This year, a group at UCLA observed brain activity in language networks and found that reduced connectivity at 2 months helped determine a later diagnosis at 18 months, and a different marker of connectivity also predicted increased word production at 18 months. While an autism – specific diagnosis was not able to be predicted, brain activity in areas involved in language can be detected as young as 3 months and may serve as markers of resilience for neurodevelopmental disorders.
Alycia Halladay	Wickstrom J, Farmer C, Green Snyder L, Mitz AR, Sanders SJ, Bishop S, Thurm A. Patterns of delay in early gross motor and expressive language milestone attainment in probands with genetic conditions versus idiopathic ASD from SFARI registries. J Child Psychol Psychiatry. 2021 Nov;62(11):1297-1307. doi: 10.1111/jcpp.13492. Epub 2021 Aug 12. [PMID: 34382689]

	This study expands the Havdahl findings to demonstrate that in two different cohorts (SPARK which is made up of idiopathic cases and Searchlight which includes only those with a rare genetic disease, the developmental milestones of kids with rare genetic disorders included not just delay of walking, but higher ASD Severity and more delays that idiopathic ASD in motor skills. The risk for delay in crawling and walking were several times higher in those with rare genetic disorders compared to those with a no known genetic cause.
Joseph Piven	Willsey HR, Exner CRT, Xu Y, Everitt A, Sun N, Wang B, Dea J, Schmunk G, Zaltsman Y, Teerikorpi N, Kim A, Anderson AS, Shin D, Seyler M, Nowakowski TJ, Harland RM, Willsey AJ, State MW. Parallel in vivo analysis of large-effect autism genes implicates cortical neurogenesis and estrogen in risk and resilience. Neuron. 2021 Mar 3;109(5):788-804.e8. doi: 10.1016/j.neuron.2021.01.002. Epub 2021 Jan 25. Erratum in: Neuron. 2021 Apr 21;109(8):1409. [PMID: 33497602]; PMCID: PMC8132462.
	This study used a model organism to study ten genes with strong associations with ASD. The results show that all ten genes are important during neurogenesis and regulate the ratio of immature neuronal cells to mature neurons. In addition, the authors found that estrogen can rescue defects caused by mutations in these genes. These results confirm a central role of increased neurogenesis in autism, and the finding that estrogen suppresses changes associated with mutations in these genes may be associated with the higher male prevalence of ASD diagnosis.

Question 3: Risk Factors

Joseph Piven	Klei L, McClain LL, Mahjani B, Panayidou K, De Rubeis S, Grahnat AS, Karlsson G, Lu Y, Melhem N, Xu X, Reichenberg A, Sandin S, Hultman CM, Buxbaum JD, Roeder K, Devlin B. How rare and common risk variation jointly affect liability for autism spectrum disorder. Mol Autism. 2021 Oct 6;12(1):66. doi: 10.1186/s13229-021-00466-2. [PMID: 34615521]; PMCID: PMC8495987.
	There has been an emphasis over the last 15 years on identifying rare variant causes of autism. This paper provides insights into the more complex nature of the underlying genetic liability for autism by demonstrating the joint impact of rare and common variation. This paper examined genetic variations in two cohorts of ASD families and found that the effects of common and rare variants likely combine to determine individual-level risk for the development of ASD.
Alycia Halladay	Lawrence KE, Hernandez LM, Fuster E, Padgaonkar NT, Patterson G, Jung J, Okada NJ, Lowe JK, Hoekstra JN, Jack A, Aylward E, Gaab N, Van Horn JD, Bernier RA, McPartland JC, Webb SJ, Pelphrey KA, Green SA, Bookheimer SY, Geschwind DH, Dapretto M; GENDAAR Consortium. Impact of autism genetic risk on brain connectivity: a mechanism for the female protective effect. Brain. 2021 May 29:awab204. doi: 10.1093/brain/awab204. Epub ahead of print. [PMID: 34050743]
	There is a 4:1 disparity in males vs. females diagnosed with autism and investigators have searched for brain mechanisms which may explain these differences. For example, areas of the brain may turn on or turn off, or are even shaped differently, across sexes. This study used a large group of individuals with ASD, ensuring enough females were recruited. The investigators looked at connectivity in the area of the brain called the salience network which has been found to modulate attention to internal and external stimuli. That is, how you are feeling vs. what you see around you and has been linked to sensory responsiveness. They found that genetic risk (measured by common variation) affected

	connectivity in males but not females. This shows that ASD genes interact with sex, and contributes to the male bias in autism, and shows that what is seen in males cannot be generalized to females.
HRSA	Lee ASE, Ji Y, Raghavan R, Wang G, Hong X, Pearson C, Mirolli G, Bind E, Steffens A, Mukherjee J, Haltmeier D, Fan ZT, Wang X. Maternal prenatal selenium levels and child risk of neurodevelopmental disorders: A prospective birth cohort study. Autism Res. 2021 Dec;14(12):2533-2543. doi: 10.1002/aur.2617. Epub 2021 Sep 24. [PMID: 34558795]; PMCID: PMC8665097.
	Selenium (Se) is an essential nutrient for the health of the pregnant mother and her baby. While Se can readily cross the placenta from maternal to fetal circulation, little is known about maternal Se status on a child's neurodevelopmental outcomes. This study included over 1,500 mother-child dyads from birth to school age of the child. It found that babies born from mothers with high blood Se levels may be at increased risk of developing autism spectrum disorder or attention deficit hyperactivity disorder. Optimizing maternal prenatal Se levels may be necessary to maximize its health benefits while preventing undue risk.
Aisha Dickerson	Lee BK, Eyles DW, Magnusson C, Newschaffer CJ, McGrath JJ, Kvaskoff D, Ko P, Dalman C, Karlsson H, Gardner RM. Developmental vitamin D and autism spectrum disorders: findings from the Stockholm Youth Cohort. Mol Psychiatry. 2021 May;26(5):1578-1588. doi: 10.1038/s41380-019-0578-y. Epub 2019 Nov 6. [PMID: 31695167]; PMCID: PMC7200274.
	This study uses a neonatal sample with registry-based Nordic data to identify all ASD cases within Stockholm, Sweden. Exposures were measured from both maternal and neonatal blood, and all data were collected prospectively, establishing temporal windows. A sibling-match analysis was conducted to rule out the potential for familial confounding. Vitamin D is also an easily modifiable risk factors with the potential for feasible interventions. Results show that, in Nordic-born mothers, maternal vitamin D insufficiency at 11 weeks and low neonatal vitamin D levels were associated with higher odds of ASD. These results suggest that vitamin D concentrations in early life may be associated with increased risk of neurodevelopmental disorders, including ASD.
Paul Wang	Mitra I, Huang B, Mousavi N, Ma N, Lamkin M, Yanicky R, Shleizer-Burko S, Lohmueller KE, Gymrek M. Patterns of de novo tandem repeat mutations and their role in autism. Nature. 2021 Jan;589(7841):246-250. doi: 10.1038/s41586-020-03078-7. Epub 2021 Jan 13. [PMID: 33442040]; PMCID: PMC7810352.
	Deletions, insertions, substitutions, and copy number variations are among the types of genetic variation already known to be associated with the likelihood of autism. This paper provides evidence that another type of variation, known as tandem repeat mutations, also are associated with autism. These genetic differences may contribute to about 4% of non-familial cases of autism.
EPA	Modafferi S, Zhong X, Kleensang A, Murata Y, Fagiani F, Pamies D, Hogberg HT, Calabrese V, Lachman H, Hartung T, Smirnova L. Gene-Environment Interactions in Developmental Neurotoxicity: a Case Study of Synergy between Chlorpyrifos and CHD8 Knockout in Human BrainSpheres. Environ Health Perspect. 2021 Jul;129(7):77001. doi: 10.1289/EHP8580. Epub 2021 Jul 14. [PMID: 34259569]; PMCID: PMC8278985.
	The unique nature of ASD in humans has limited the use of animal models to study causes and therapies. Human cell–derived brain organoids have emerged as a promising alternative strategy to understand ASD. This study suggests these organoids may be suited to studying the gene–environment interactions that have long been suspected of increasing ASD risk.

Aisha Dickerson	Oh J, Bennett DH, Calafat AM, Tancredi D, Roa DL, Schmidt RJ, Hertz-Picciotto I, Shin HM. Prenatal exposure to per- and polyfluoroalkyl substances in association with autism spectrum disorder in the MARBLES study. Environ Int. 2021 Feb;147:106328. doi: 10.1016/j.envint.2020.106328. Epub 2020 Dec 30. [PMID: 33387879]; PMCID: PMC7856021.
	This study investigates exposures to novel chemicals of recent interests to stakeholders: per- and polyfluoroalkyl substances (PFAS). This was accomplished using data from a high-risk ASD cohort. Specifically, the exposures were measures through prenatal serum concentrations and evaluated both alone and as a co-occurring mixture. The results showed PFAS exposure led to increased risk for ASD in children from a high-risk ASD cohort, and further studies should be conducted in the general population.
Aisha Dickerson	Patti MA, Li N, Eliot M, Newschaffer C, Yolton K, Khoury J, Chen A, Lanphear BP, Lyall K, Hertz-Picciotto I, Fallin MD, Croen LA, Braun JM. Association between self-reported caffeine intake during pregnancy and social responsiveness scores in childhood: The EARLI and HOME studies. PLoS One. 2021 Jan 15;16(1):e0245079. doi: 10.1371/journal.pone.0245079. [PMID: 33449933]; PMCID: PMC7810310.
	This study used two multisite cohort studies to assess the potential impact of caffeine intake during pregnancy on child behavioral traits related to ASD. Self-reported caffeine intake during pregnancy was positively associated with more ASD-related behaviors. These findings suggest that gestational caffeine intake may represent a marker of vulnerability to childhood ASD-related behaviors.
Aisha Dickerson	Patti MA, Newschaffer C, Eliot M, Hamra GB, Chen A, Croen LA, Fallin MD, Hertz-Picciotto I, Kalloo G, Khoury JC, Lanphear BP, Lyall K, Yolton K, Braun JM. Gestational Exposure to Phthalates and Social Responsiveness Scores in Children Using Quantile Regression: The EARLI and HOME Studies. Int J Environ Res Public Health. 2021 Jan 30;18(3):1254. doi: 10.3390/ijerph18031254. [PMID: 33573264]; PMCID: PMC7908417.
	This study uses compiled data from two multisite cohort studies to investigate associations between gestational phthalate concentrations and ASD symptomology using Social Responsiveness Scale (SRS) scales. These results suggest associations between phthalate concentrations and SRS scores may be stronger in individuals with higher SRS scores, which brings attention to an exposure that has been of interests to many stakeholders. This study used a robust analysis to optimize the prospective data and establish temporal associations.
Helen Tager-Flusberg	Yoon S, Munoz A, Yamrom B, Lee YH, Andrews P, Marks S, Wang Z, Reeves C, Winterkorn L, Krieger AM, Buja A, Pradhan K, Ronemus M, Baldwin KK, Levy D, Wigler M, Iossifov I. Rates of contributory de novo mutation in high and low-risk autism families. Commun Biol. 2021 Sep 1;4(1):1026. doi: 10.1038/s42003-021-02533-z. [PMID: 34471188]; PMCID: PMC8410909.
	Whole genome sequencing carried out on families in the Simons Simplex Collection and the Autism Genetic Resource Exchange found that in simplex families new uninherited genetic mutations account for 52-67% cases and 30-39% cases overall. These figures are higher than had been previously reported in earlier studies on the role of genes in autism.
	Question 4: Treatments and Interventions
NIDCD	Brady NC, Kosirog C, Fleming K, Williams L. Predicting progress in word learning for children with autism and minimal verbal skills. J Neurodev Disord. 2021 Sep 15;13(1):36. doi: 10.1186/s11689-021-09386-x. [PMID: 34525947]; PMCID: PMC8441036.

	This clinical trial investigated the relationship between speech sound measures obtained from the early phases of treatment and later outcomes in children with autism and minimal verbal skills in 23 children (18 boys) between 5 and 9 years of age. Phonemes are sounds that can distinguish one word from another in a particular language, and phonemic awareness is the ability to identify and manipulate those sounds in spoken words. Children in this study participated in 4 weekly sessions and were asked to vocalize words. The sessions were recorded, and the children's vocalization were scored using a phonemic scoring system for accuracy as compared to the target word. The authors found that phonemic scores at week 4 accounted for more unique changes in outcomes than the number of words passed (score of at least 6 with the initial consonant produced correctly). These results suggest phonemic scoring may be a useful measure to determine subtle gains in a spoken word learning intervention which will be particularly helpful when trying to decide if the current course of intervention should be maintained or altered.
HRSA	Curtin C, Bowling AB, Boutelle KN, Broder-Fingert S, Dittrich GA, Ptomey LT, Stanish HI, Boas DD, Fleming RK, Kral TVE, Bandini LG. Chapter Eight - Lifestyle intervention adaptations to promote healthy eating and physical activity of youth with intellectual and developmental disabilities. International Review of Research in Developmental Disabilities. 2021:223-261. doi: 10.1016/bs.irrdd.2021.07.001
	Children and youth with intellectual disabilities and other developmental disabilities including but not limited to ASD, ADHD, and cerebral palsy face several barriers that increase the complexity of developing interventions to improve health behaviors and long-term outcomes. Multi-level adaptations can be made to interventions for youth in this population. This publication illustrates the importance of using established theoretical frameworks and best practices to guide intervention design and adaptation decisions.
HRSA	Rast JE, Anderson KA, Roux AM, Shattuck PT. Medication Use in Youth With Autism and Attention-Deficit/Hyperactivity Disorder. Acad Pediatr. 2021 Mar;21(2):272-279. doi: 10.1016/j.acap.2020.05.015. Epub 2020 May 31. [PMID: 32492579]
	Prescribing guidelines and research for medication use to treat an array of behaviors and health conditions, including co-occurring conditions in children and youth with ASD are lacking. Using data from the 2016 and 2017 National Survey of Children's Health, the authors of this study found that children and youth with co-occurring ASD and ADHD were taking more medication than children and youth with only ASD. Additionally, youth with co-occurring ASD and ADHD were more likely to be taking medication for emotion, concentration, or behavior than youth with only ADHD, and nearly half of youth with co-occurring ASD and ADHD took ASD-specific medication. This study adds to the literature on medication use in children and youth with ASD, presenting recent, nationally representative estimates of high prevalence of psychotropic drug use among children with ASD and ADHD.
Sam Crane	Sikich L, Kolevzon A, King BH, McDougle CJ, Sanders KB, Kim SJ, Spanos M, Chandrasekhar T, Trelles MDP, Rockhill CM, Palumbo ML, Witters Cundiff A, Montgomery A, Siper P, Minjarez M, Nowinski LA, Marler S, Shuffrey LC, Alderman C, Weissman J, Zappone B, Mullett JE, Crosson H, Hong N, Siecinski SK, Giamberardino SN, Luo S, She L, Bhapkar M, Dean R, Scheer A, Johnson JL, Gregory SG, Veenstra-VanderWeele J. Intranasal Oxytocin in Children and Adolescents with Autism Spectrum Disorder. N Engl J Med. 2021 Oct 14;385(16):1462-1473. doi: 10.1056/NEJMoa2103583. [PMID: 34644471]
	This study found that oxytocin was not effective to treat autism in children. Oxytocin is a chemical produced by the body. It has been found to affect how people act and feel in social situations. This study gave oxytocin to 139 children. 138 children did not get

	oxytocin. The groups had no difference in irritability, interest in socializing, or other autism-related behavior. Before this study, it was not clear whether oxytocin helped autistic children. Some studies said that it did. Others said that it did not. Because this new study involved more children than earlier studies, it is very convincing. This gives us important information about whether oxytocin should be used for autistic children.
NICHD	Whitehouse AJO, Varcin KJ, Pillar S, Billingham W, Alvares GA, Barbaro J, Bent CA, Blenkley D, Boutrus M, Chee A, Chetcuti L, Clark A, Davidson E, Dimov S, Dissanayake C, Doyle J, Grant M, Green CC, Harrap M, Iacono T, Matys L, Maybery M, Pope DF, Renton M, Rowbottam C, Sadka N, Segal L, Slonims V, Smith J, Taylor C, Wakeling S, Wan MW, Wray J, Cooper MN, Green J, Hudry K. Effect of Preemptive Intervention on Developmental Outcomes Among Infants Showing Early Signs of Autism: A Randomized Clinical Trial of Outcomes to Diagnosis. JAMA Pediatr. 2021 Nov 1;175(11):e213298. doi: 10.1001/jamapediatrics.2021.3298. Epub 2021 Nov 1. [PMID: 34542577]; PMCID: PMC8453361.
	Although the age of onset of clinical features associated with ASD is variable, subtle signs may be detected in the first year of life. Currently, most children are not targeted for intervention until they receive a formal diagnosis. The goal of this study was to examine the efficacy of a parent-mediated intervention for ASD beginning at 9 months of age, before symptoms of ASD manifest. The study found that the intervention was effective at both reducing the severity of later ASD symptoms across early childhood and reducing the chances of an ASD diagnosis at 3 years of age.

Question 5: Services

SSA	Bhat A. Analysis of the SPARK study COVID-19 parent survey: Early impact of the pandemic on access to services, child/parent mental health, and benefits of online services. Autism Res. 2021 Nov;14(11):2454-2470. doi: 10.1002/aur.2618. Epub 2021 Sep 30. [PMID: 34591364]; PMCID: PMC8578426.
	The SPARK study impact survey shows that at the onset of the COVID-19 pandemic, parents reported significant service disruptions, negative impact on their child's ASD-related behaviors as well as their own mental health, and the impact was greater in families with younger children, children with greater ASD severity, and children from low-income families. The majority of families did not report significant benefits of online services, whereas some families did. Low-income families were hopeful about receiving benefits through future online services. Overall, these findings have important implications for future clinical care delivery and healthcare policies to ensure that healthcare services are not interrupted during a potential resurgence of COVID-19 or other pandemics. A combination of in-person and online healthcare and family support services must be implemented to prevent negative health impacts in the future. The SPARK study impact survey is one of the first studies to show the effects of the COVID-19 pandemic on children with ASD.
HRSA	Hammersmith KJ, Harlan TA, Fenning RM, Chan J, Stephenson KG, Macklin EA, Casamassimo PS, Townsend JA, Butter EM, Steinberg-Epstein RB. Correlates of oral health fatalism in caregivers of children with autism spectrum disorder. Spec Care Dentist. 2021 Mar;41(2):145-153. doi: 10.1111/scd.12564. Epub 2021 Jan 15. [PMID: 33449432]
	Children with ASD have more unmet dental needs than children without ASD. This multi-site RCT examined a parent training intervention supporting oral hygiene and dental visits among Medicaid-eligible families of children with ASD. Having a fatalistic perspective

	regarding dental care (believing that uncontrollable outside factors contributed to their oral health) was not associated with oral health behavior. Dentists' awareness of cultural values and beliefs can help better tailor treatment recommendations.
Helen Tager-Flusberg	Lord C, Charman T, Havdahl A, Carbone P, Anagnostou E, Boyd B, Carr T, de Vries PJ, Dissanayake C, Divan G, Freitag CM, Gotelli MM, Kasari C, Knapp M, Mundy P, Plank A, Scahill L, Servili C, Shattuck P, Simonoff E, Singer AT, Slonims V, Wang PP, Ysrraelit MC, Jellett R, Pickles A, Cusack J, Howlin P, Szatmari P, Holbrook A, Toolan C, McCauley JB. The Lancet Commission on the future of care and clinical research in autism. Lancet. 2021 Dec 6:S0140-6736(21)01541-5. doi: 10.1016/S0140-6736(21)01541-5. Epub ahead of print. [PMID: 34883054]
	The most significant commission held on autism, with important proposals for stepped care and personalized approaches to intervention. The commission introduces a new subcategory of ASD, profound autism, with clear definitions, to guide the unique clinical needs of this group of older autistic individuals. This report will have a transformative effect on clinical care and service provision for autism.
HRSA	Sturm A, Williams J, Kasari C. Who gains and who loses? Sociodemographic disparities in access to special education services among autistic students. Autism Res. 2021 Aug;14(8):1621-1632. doi: 10.1002/aur.2517. Epub 2021 Apr 26. [PMID: 33904253]
	This study examined the allocation of the quantity and type of special education services to students with autism compared to students with other primary learning differences (e.g., intellectual disability, specific learning disability) and identified differences in sociodemographic predictors (e.g., race, neighborhood income) of service allocation. Disparity in the quantity of special education services exists among autistic students across many sociodemographic factors. The most significant racial disparities in service allocation were observed among students served under autism eligibility. Greater allocation of services was seen in non-Hispanic, Latino, or Spanish, White American, European American, or Middle Eastern American students and students who do not receive free and reduced lunch. This study demonstrates the critical role of economic resources in the quantity and types of services received and the desirability of a public education for well-resourced families who are possibly best situated to navigate special education services.
Alycia Halladay	White LC, Law JK, Daniels AM, Toroney J, Vernoia B, Xiao S; SPARK Consortium, Feliciano P, Chung WK. Brief Report: Impact of COVID-19 on Individuals with ASD and Their Caregivers: A Perspective from the SPARK Cohort. J Autism Dev Disord. 2021 Jan 2:1–8. doi: 10.1007/s10803-020-04816-6. Epub ahead of print. [PMID: 33387233] PMCID: PMC7775834.
	The impact of the 2019 coronavirus pandemic (COVID-19) in the United States is unprecedented, with unknown implications for the autism community. 3,502 parents/caregivers of individuals with an autism spectrum disorder (ASD) enrolled in Simons Powering Autism Research for Knowledge (SPARK) were surveyed. The results showed that most individuals with ASD experienced significant, ongoing disruptions to therapies. While some services were adapted to telehealth format, most participants were not receiving such services at follow-up, and those who were reported minimal benefit. Children under age five had the most severely disrupted services and lowest reported benefit of telehealth adaptation. Caregivers also reported worsening ASD symptoms and moderate family distress. Strategies to support the ASD community should be immediately developed and implemented.
CDC	Zuvekas SH, Grosse SD, Lavelle TA, Maenner MJ, Dietz P, Ji X. Healthcare Costs of Pediatric Autism Spectrum Disorder in the United States, 2003-2015. J Autism Dev Disord. 2021

	Aug;51(8):2950-2958. doi: 10.1007/s10803-020-04704-z. [PMID: 33113106] PMCID: PMC8079509.
	Published healthcare cost estimates for children with ASD vary widely. This study suggests that costs are less than estimated elsewhere and provides a grounded evidence-based estimate that can inform policy. Results found that the incremental annual per-child cost of ASD relative to no ASD diagnosis was $3,930 (2018 US dollars) using ASD case status from the National Health Interview Survey (NHIS) Child Core and $5,621 using current-year ASD case status from Medical Expenditure Panel Survey (MEPS). Both estimates are lower than some published estimates but still represent substantial costs to the US healthcare system.
	Question 6: Lifespan Issues
Alycia Halladay	Cost KT, Zaidman-Zait A, Mirenda P, Duku E, Zwaigenbaum L, Smith IM, Ungar WJ, Kerns C, Bennett T, Szatmari P, Georgiades S, Waddell C, Elsabbagh M, Vaillancourt T. "Best Things": Parents Describe Their Children with Autism Spectrum Disorder Over Time. J Autism Dev Disord. 2021 Dec;51(12):4560-4574. doi: 10.1007/s10803-021-04890-4. Epub 2021 Feb 2. Erratum in: J Autism Dev Disord. 2021 Jul 20;: [PMID: 33532881]
	Many self-advocates feel that parents are very harsh on their children, that they only recognize the challenges and not the strengths. In this study, as part of a longitudinal analysis in Canada that spanned 3 years (so far and counting), the investigators asked what they uniquely valued in their children and found unique and wonderful. The list was not short. Parents listed things like “loving”, “happy”, “kind” and “strong sense of humanity”. These are congruent with a neurodiversity perspective that emphasizes strengths and resilience
NICHD	Curry AE, Metzger KB, Carey ME, Sartin EB, Huang P, Yerys BE. Comparison of Motor Vehicle Crashes, Traffic Violations, and License Suspensions Between Autistic and Non-Autistic Adolescent and Young Adult Drivers. J Am Acad Child Adolesc Psychiatry. 2021 Jul;60(7):913-923. doi: 10.1016/j.jaac.2021.01.001. Epub 2021 Jan 13. [PMID: 33453361]
	The ability to safely drive a vehicle has great potential to increase independence for adolescents with autism spectrum disorders (ASD). In this study, researchers used a unique data source to examine adverse driving outcomes such as crashes and traffic violations. In contrast with prior studies with small sample sizes, this study found that newly licensed adolescent drivers with ASD have similar or lower rates of adverse driving outcomes compared with the control group without ASD. They also identified characteristics of real-world crashes that were different between the two groups, providing insights for additional training to augment safe driving for adolescents with ASD.
Joseph Piven	Geurts HM, McQuaid GA, Begeer S, Wallace GL. Self-reported parkinsonism features in older autistic adults: A descriptive study. Autism. 2021 Jun 21:13623613211020183. doi: 10.1177/13623613211020183. Epub ahead of print. [PMID: 34154378]
	This study used surveys from the Netherlands and the U.S. to determine how often autistic adults reported motor features such as tremors and stiffness in one’s legs, considered to be part of a complex of motor features called parkinsonism. The results found that 17% of the respondents from the Netherlands and 33% of respondents from the U.S. reported parkinsonism features.
HUD	Schott W, Nonnemacher S, Shea L. Service Use and Unmet Needs Among Adults with Autism Awaiting Home- and Community-Based Medicaid Services. J Autism Dev Disord. 2021 Apr;51(4):1188-1200. doi: 10.1007/s10803-020-04593-2. [PMID: 32671666]

	There are typically long waitlists for autistic adults in need of long-term services and supports through Medicaid. This study used data from a large statewide survey to examine the service needs reported by autistic individuals and their caregivers on a waiting list for Home and Community-Based Services (HCBS) in Pennsylvania. The authors found that the majority of those on the waitlist have unmet needs for functional skills services (63.6%), employment or vocational services (62.1%), and mental and behavioral health services (52.8%). These results highlight the needs of the autistic population waiting for services and help policymakers to plan how best to serve these individuals.
Helen Tager-Flusberg	Vivanti G, Tao S, Lyall K, Robins DL, Shea LL. The prevalence and incidence of early-onset dementia among adults with autism spectrum disorder. Autism Res. 2021 Oct;14(10):2189-2199. doi: 10.1002/aur.2590. Epub 2021 Aug 11. [PMID: 34378867]; PMCID: PMC8487995.
	A large-scale case-control analysis of people between the ages of 30 and 64 drawn from Medicaid records found that dementia was significantly higher among individuals with ASD, both with ID (5.2%) and without ID (4%), compared to people without either condition (~1%). This is the first, and very important, study on some of the health risks in older people with ASD.
ACL	Wong J, Coster WJ, Cohn ES, Orsmond GI. Identifying School-Based Factors that Predict Employment Outcomes for Transition-Age Youth with Autism Spectrum Disorder. J Autism Dev Disord. 2021 Jan;51(1):60-74. doi: 10.1007/s10803-020-04515-2. [PMID: 32356081]
	Appropriate services are needed to help students with autism transition to employment. This paper investigated what aspects of support should be prioritized when preparing autistic youth for employment by focusing on factors that can be changed during the transition process, such as parent participation, daily functioning skills, and school-based services, and the interactions between these factors. The results indicate that higher levels of parent participation in special education predicted better employment outcomes. Additionally, for students with higher levels of daily functioning skills, their level of academic performance predicted their employment success, whereas school-based transition supports played an important role in employment success for students with lower levels of daily functioning skills. These results can be helpful for determining how support should be prioritized for youth based on daily functioning skill levels.

Question 7: Infrastructure and Surveillance

Joseph Piven	Bottema-Beutel K, Crowley S, Sandbank M, Woynaroski TG. Research Review: Conflicts of Interest (COIs) in autism early intervention research - a meta-analysis of COI influences on intervention effects. J Child Psychol Psychiatry. 2021 Jan;62(1):5-15. doi: 10.1111/jcpp.13249. Epub 2020 Apr 30. [PMID: 32353179]; PMCID: PMC7606324.
	The presence, types, disclosure rates, and effects of conflicts of interest (COIs) on autism early intervention research have not previously been studied. This study is a secondary analysis of a comprehensive meta-analysis of all group-design, nonpharmacological early intervention autism research conducted between 1970 and 2018. Reports were examined for the presence/absence of COI statements, the types of COIs that were disclosed, and for 8 types of COIs. Conflicts of interest are prevalent but under-reported in autism early intervention research. Improved reporting practices are necessary for researcher transparency and would enable more robust examination of the effects of COIs on research outcomes.

Joseph Piven	Jiménez JA, Zylka MJ. Controlling litter effects to enhance rigor and reproducibility with rodent models of neurodevelopmental disorders. J Neurodev Disord. 2021 Jan 4;13(1):2. doi: 10.1186/s11689-020-09353-y. [PMID: 33397279]; PMCID: PMC7780384.
	This paper provides important insights into a critical methodological issue in interpreting studies of rodent models of autism that has not been routinely part of studies in the field. This work provides an important perspective on how to maximize the impact of preclinical studies of animal models and ensure increased reproducibility of findings relevant to understanding the biology of autism.
Alycia Halladay	Harrop C, Bal V, Carpenter K, Halladay A. A lost generation? The impact of the COVID-19 pandemic on early career ASD researchers. Autism Res. 2021 Jun;14(6):1078-1087. doi: 10.1002/aur.2503. Epub 2021 Mar 24. [PMID: 33759380]; PMCID: PMC8250334.
	There have been many studies that have examined the obvious impacts of the COVID-19 pandemic on individuals and their families, but very few that have examined the effects on autism scientists. A group of early career researchers were asked about their specific challenges, self-reported mental health, and caregiving responsibilities. Almost everyone reported their research had been negatively impacted, and 85% reported a reduction in productivity. The two biggest reasons were challenges in recruitment and an increase in home caregiving responsibilities. Compared to pre-pandemic, there was a 3 x increase in feeling burned out. This report calls for specific supports of early career scientists as the pandemic continues so they can continue to provide services to autism families.
SSA	Maenner MJ, Shaw KA, Bakian AV, Bilder DA, Durkin MS, Esler A, Furnier SM, Hallas L, Hall-Lande J, Hudson A, Hughes MM, Patrick M, Pierce K, Poynter JN, Salinas A, Shenouda J, Vehorn A, Warren Z, Constantino JN, DiRienzo M, Fitzgerald RT, Grzybowski A, Spivey MH, Pettygrove S, Zahorodny W, Ali A, Andrews JG, Baroud T, Gutierrez J, Hewitt A, Lee LC, Lopez M, Mancilla KC, McArthur D, Schwenk YD, Washington A, Williams S, Cogswell ME. Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years - Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2018. MMWR Surveill Summ. 2021 Dec 3;70(11):1-16. doi: 10.15585/mmwr.ss7011a1. [PMID: 34855725]; PMCID: PMC8639024.
	For 2018, across all 11 ADDM sites, the overall ASD prevalence was 23.0 per 1,000 (one in 44) children aged 8 years, with ASD 4.2 times as prevalent among boys as among girls. However, prevalence and median age of identification varied widely across sites. Whereas overall ASD prevalence was similar by race and ethnicity, at certain sites Hispanic children were less likely to be identified as having ASD than White or Black children. The higher proportion of Black children compared with White and Hispanic children classified as having intellectual disability was consistent with previous findings. The variability in ASD prevalence and community ASD identification practices among children with different racial, ethnic, and geographical characteristics highlights the importance of research into the causes of that variability and strategies to provide equitable access to developmental evaluations and services. These findings also underscore the need for enhanced infrastructure for diagnostic, treatment, and support services to meet the needs of all children.
Alycia Halladay	Maye M, Boyd BA, Martínez-Pedraza F, Halladay A, Thurm A, Mandell DS. Biases, Barriers, and Possible Solutions: Steps Towards Addressing Autism Researchers Under-Engagement with Racially, Ethnically, and Socioeconomically Diverse Communities. J Autism Dev Disord. 2021 Sep 16. doi: 10.1007/s10803-021-05250-y. Epub ahead of print. [PMID: 34529251]
	This paper summarized the existing challenges in identifying people of color in autism and then convincing them to participate in research studies. Without this, the findings that are

	discovered in some groups do not apply to other groups. Specific solutions are proposed such as enhanced community-based research participation involving potential modification of the research question and continual engagement in dissemination of research findings.
Alycia Halladay	Shaw KA, Maenner MJ, Bakian AV, Bilder DA, Durkin MS, Furnier SM, Hughes MM, Patrick M, Pierce K, Salinas A, Shenouda J, Vehorn A, Warren Z, Zahorodny W, Constantino JN, DiRienzo M, Esler A, Fitzgerald RT, Grzybowski A, Hudson A, Spivey MH, Ali A, Andrews JG, Baroud T, Gutierrez J, Hallas L, Hall-Lande J, Hewitt A, Lee LC, Lopez M, Mancilla KC, McArthur D, Pettygrove S, Poynter JN, Schwenk YD, Washington A, Williams S, Cogswell ME. Early Identification of Autism Spectrum Disorder Among Children Aged 4 Years - Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2018. MMWR Surveill Summ. 2021 Dec 3;70(10):1-14. doi: 10.15585/mmwr.ss7010a1. [PMID: 34855727]; PMCID: PMC8639027.
	In the companion piece to the MMWR report on 8-year-olds, Kelly Shaw led an ADDM study on children who were 4 years old (rather than 8 years old in the Maenner study) and found a prevalence of 1 in 59. Again, prevalence varied across states but was highest in California. In 4-year-olds, the male to female ratio was slightly lower, at 3:1, indicating that some sex differences don't appear until later in life. There was a higher incidence of diagnosis or eligibility compared to previous years, of those diagnosed by 4 years, 72% had their first evaluation before 36 months of age. Interestingly a higher diagnosis of ASD by 4 year was associated with a lower median household income. At some sites, prevalence in black and Hispanic children was actually higher than white children.
Alycia Halladay	Thurm A, Halladay A, Mandell D, Maye M, Ethridge S, Farmer C. Making Research Possible: Barriers and Solutions For Those With ASD and ID. J Autism Dev Disord. 2021 Oct 30. doi: 10.1007/s10803-021-05320-1. Epub ahead of print. [PMID: 34716842]
	People with intellectual disabilities are often left out of research studies for logistical reasons, to reduce heterogeneity, and worse, the intellectual disabilities of individuals in research studies are rarely reported. This study outlines the reasons why this is destructive to helping people across the spectrum and recommends that journal editors and some funding agencies require data on IDD in their research plan in order to improve generalizability.