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Parent Beliefs about the Causes of Learning and Developmental Problems among Children with Autism Spectrum Disorder: Results from a National Survey

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Abstract

This study aimed to assess variation in parent beliefs about causes of learning and developmental problems in U.S. children with autism spectrum disorder, using data from a nationally-representative survey. Results showed that beliefs about a genetic/hereditary cause of learning/developmental problems were most common, but nearly as many parents believed in exposure causes. 40% of parents had no definite causal beliefs. On multivariate analysis, parents who were non-white, publicly-insured or poor were more likely than other parents to endorse exposure causes, or less likely to endorse genetic causes, compared to other parents. Further research should assess how these beliefs modify health care quality or services utilization.

Keywords

Autism Spectrum Disorder; Causes; Parent Beliefs; Socioeconomic Factors

Introduction

Autism spectrum disorders (ASDs) are common childhood developmental disorders associated with difficulties in social communication and interaction, as well as restricted and repetitive behaviors (American Psychological Association, 2013). While the cause or causes of ASD is a topic of great speculation among both the scientific and lay press, no definitive agents have yet been identified. While a small portion of children are born with a known genetic susceptibility to ASD, most experts believe that ASD is largely multifactorial in origin, with both genetic and environmental influences on the developing brain playing a

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role (Johnson, Myers, & American Academy of Pediatrics Council on Children with Disabilities, 2007; Lai, Lombardo, & Baron-Cohen, 2014).

Little is known about what parents of affected children believe about the causes of ASD in their children. However, parental beliefs regarding the cause of pediatric conditions are relevant, as these beliefs may affect how parents communicate with providers. For instance, if parents do not see ASD as a medical condition, they may be less likely to view the child's diagnosis in a medical context, and therefore be less likely to raise it with medical staff (Zuckerman et al., 2014). Parental beliefs might also alter how parents view their child overall as well as their own personal roles or responsibilities for his/her condition. For instance, as noted in a review by Hebert, parents who view ASD as a punishment might be less likely to engage in ASD therapy for their child (Hebert & Koulouglioti, 2010). Understanding parents' etiologic beliefs may also be important in terms of understanding the type of therapy that families prefer. For example, one study found that parents who viewed their child's mental health condition as a result of trauma or physical causes were more likely to pursue mental health services compared to families with other beliefs (Yeh et al., 2005). Another study found a greater likelihood of use of metabolic treatments among parents who viewed their child's ASD as hereditary (Al Anbar, Dardennes, Prado-Netto, Kaye, & Contejean, 2010). Parent beliefs may particularly influence treatment choice in ASD, since multiple treatment approaches, including some non-evidence-based or potentially harmful treatments, are available and used by providers and families (Levy & Hyman, 2003; Warren et al., 2011). Finally, parents' etiologic understanding may also influence their future family planning decisions: for example, parents who firmly believe in a genetic basis for ASD may be more reluctant to have additional children due to concerns about recurrence (Hebert & Koulouglioti, 2010).

Several small prior studies (Al Anbar et al., 2010; Dardennes et al., 2011; Goin-Kochel, Mire, & Dempsey, 2015; Gray, 1995; Harrington, Patrick, Edwards, & Brand, 2006; Mercer, Creighton, Holden, & Lewis, 2006; Selkirk, McCarthy Veach, Lian, Schimmenti, & LeRoy, 2009) suggest that parents' beliefs about the cause(s) of ASD vary greatly, and that parents often hold several causal beliefs simultaneously. Some of these studies were reviewed by Hebert in 2010 (Hebert & Koulouglioti, 2010). In prior reports, the most commonly held parent beliefs were that ASD is caused by genetic factors (Al Anbar et al., 2010; Dardennes et al., 2011; Goin-Kochel et al., 2015; Harrington et al., 2006; Mercer et al., 2006; Selkirk et al., 2009), brain structure or brain abnormalities (Al Anbar et al., 2010; Dardennes et al., 2011; Goin-Kochel et al., 2015; Selkirk et al., 2009), and early childhood trauma, illness, or injury (Dardennes et al., 2011; Goin-Kochel et al., 2015; Gray, 1995; Harrington et al., 2006; Selkirk et al., 2009). Despite significant scientific evidence that vaccines are not causes of ASD (Gerber & Offit, 2009), studies suggest that many parents believe that vaccines contribute to their child's ASD (Dale, Jahoda, & Knott, 2006; Freed, Clark, Butchart, Singer, & Davis, 2010; Goin-Kochel et al., 2015; Harrington et al., 2006; Mercer et al., 2006; Selkirk et al., 2009).

Prior studies about parents' causal beliefs have been limited by small sample sizes ($n = 33-255$) and non-representative sampling of parents (Al Anbar et al., 2010; Dardennes et al., 2011; Goin-Kochel et al., 2015; Gray, 1995; Harrington et al., 2006; Mercer et al., 2006;

Selkirk et al., 2009), making results difficult to generalize. Furthermore, there has been no prior analysis regarding how parents' causal beliefs might vary by family socio-demographic circumstances. However, sociodemographic factors have been shown to be important in terms of parents' causal beliefs about mental health conditions in general (Bussing, Schoenberg, Rogers, Zima, & Angus, 1998; Yeh, Hough, McCabe, Lau, & Garland, 2004), and studies have shown that families' socio-demographic and cultural background may be important in terms of treatment selection for ASD (Mandell & Novak, 2005). Finally, given that new information about possible genetic and environmental causes of ASD is constantly emerging (Connolly & Hakonarson, 2014; Rossignol, Genuis, & Frye, 2014; Talkowski, Minikel, & Gusella, 2014), parents' causal beliefs about developmental problems may have changed since prior reports.

As a result, in this project we put forth a descriptive portrait of parent beliefs about the causes of learning and developmental problems among children with ASD, using a large, nationally-representative dataset. Our main objectives were to quantify (1) How frequent different types of causal beliefs were among parents of children with ASD, (2) How many parents endorsed multiple simultaneous causal beliefs, and (3) how child and parent sociodemographic characteristics were associated with particular belief patterns.

Methods

Data Source

We utilized data from the 2011 Survey of Pathways to Diagnosis and Services (herein called Pathways Survey), a nationally-representative, parent-reported survey. Households were included in the Pathways Survey if they have a child who was ever diagnosed with ASD, intellectual disability, and/or developmental delay, and who qualified as a child with special health care needs (CSHCN). CSHCN are defined by the Maternal Child Health Bureau as those who "have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related service of a type or amount beyond that required by children generally" (McPherson et al., 1998). The CSHCN Screener, a validated measure, is used to determine special health care need status (Bethell et al., 2002).

The Pathways Survey was funded by the National Institute of Mental Health (NIMH) with funds from the 2009 American Recovery and Reinvestment Act and is a follow-back survey to the 2009/10 National Survey of CSHCN (NS-CSHCN). Parents or guardians (herein called "parents") were re-contacted in 2011 to participate in the Pathways Survey if they had previously completed the NS-CSHCN in 2009–2010 and reported in that survey that their child was ever diagnosed with ASD, intellectual disability, and/or developmental delay, and that their child was between 6 and 17 years old (an age range chosen by the NIMH) in 2011. 71% of parents who completed the 2009/10 NS-CSHCN were successfully re-contacted; of those, 87% ($n = 4,032$) agreed to participate (National Center for Health Statistics, b).

Sample

This analysis only includes data from parents of CSHCN who were determined to have current ASD in both the NS-CSHCN and the Pathways Survey (n=1420). Parents who answered “yes” to the following questions in the NS-CSHCN were re-contacted to participate in the Pathways Survey: “Has a doctor or other health care provider *ever* told you that your child had autism, Asperger's disorder, pervasive developmental disorder, or other autism spectrum disorder?” and “Does your child *currently* have autism or an autism spectrum disorder?” (National Center for Health Statistics, a). 4032 Pathways surveys were completed. The child's ASD status was confirmed during the Pathways Survey by asking if the child had current “autism, Asperger's disorder, pervasive developmental disorder, or other autism spectrum disorder.” Parents excluded from this analysis included those having children with intellectual disability and/or developmental delay (without ASD) (n = 2098), and those having children with past (but not current) diagnoses of ASD, intellectual disability or developmental delay (n = 514), leading to a total sample size of 1420. Verbal informed consent was obtained from all participants; the survey was approved by the National Center for Health Statistics' Institutional Review Board [IRB]. This analysis was deemed exempt from review by our institutional IRB.

Measures

Parental perceptions—The Pathways Survey contains multiple items assessing parent beliefs about “the child's learning and developmental conditions.” The items used in the survey were adapted from the Revised Illness-Perception Questionnaire, Revised for Autism (IPQ-RA), a previously-validated scale measuring health beliefs among parents of children with ASD (Al Anbar et al., 2010). However, since children assessed in the Pathways Survey could have multiple developmental diagnoses, the survey items did not ask about causal beliefs pertaining to ASD specifically. Unlike the IPQ-RA, Pathways items instead asked about causal beliefs regarding the child's “learning and developmental conditions.” We analyzed responses from the four available items assessing beliefs about illness causality: (1) [child]'s condition is genetic or hereditary, (2) child's condition was caused by something [he/she] was exposed to in utero, that is, before [he/she] was born, (3) child's condition was caused by something [he/she] was exposed to after [he/she] was born and (4) [child] experienced any accident, injury, or illness that had an effect on [his/her] behavior or development. Parents answered questions 1–3 on a four-point Likert scale (Definitely Agree, Somewhat Agree, Somewhat Disagree, Definitely Disagree) and question 4 on a binary response scale (Yes or No). Since we were interested in the degree to which parents held particular beliefs, for some analyses we divided the scale into Disagree/Somewhat Agree/Definitely Agree.

Socio-demographic characteristics and functional limitations status—To assess socio-demographic variation in parent beliefs, we assessed both child- and family-level factors, which we hypothesized, based on prior literature (Flores & Committee On Pediatric Research, 2010; Knapp et al., 2012; Yeh et al., 2004), might modify beliefs. Child-level factors included: age, gender, race/ethnicity, health insurance status, and presence of functional limitations. Child race/ethnicity was measured in the NS-CSHCN and coded as Latino, white non-Latino, African-American non-Latino, and other/multi-racial non-Latino.

To measure health insurance status, we classified children as having private insurance (with or without public insurance) or public insurance only. 35 children were uninsured; they were included in descriptive analyses but eliminated from multivariate analyses to reduce relative standard errors and improve model fit. As level of disability might modify parents' causal beliefs, we measured presence of child functional limitations, using three binary items derived from the CSHCN Screener (Bethell et al., 2002), "Is your child limited or prevented in any way in his/her ability to do the things most children of the same age do" due to any "medical, behavioral, or other health condition" that "has lasted or is expected to last 12 months or longer?"

Family-level factors included household income, measured in the NS-CSHCN as a percent of the federal poverty level (FPL), which was \$22,050 for a family of four in 2010 (U.S. Department of Health and Human Services, 2010). Factors also included U.S. region of residence, parent educational attainment, defined as the highest level of education of any parent living with the child, and family structure, defined by the survey as 2 parent biological/adopted, single mother, or other family structure. The National Center for Health Statistics imputed any missing values for parent education and household income. Since only 43 parents had less than a high school education, for most analyses, parent education was classified as high school graduate or less versus > high school. All parents were English speaking, as the Pathways Survey was only offered in English.

Statistical Analyses—We computed sample characteristics (Table 1), the frequency of each causal belief (Figure 1), and the percent of parents holding multiple causal beliefs (Figure 2), using descriptive statistics. We assessed the association between the four causal beliefs using Kendall's tau correlation. We then used weighted chi-square tests to assess whether each child or family factor was associated with each "somewhat" or "definite" belief (Supplemental Table 1). Finally, we examined how "somewhat" and "definite" causal beliefs varied by child and family characteristics, using multinomial and binary logistic regression (Table 3). For the multinomial logistic regression models, each belief was the dependent variable, and had three levels, "disagree" or "somewhat disagree" (base), "somewhat agree" and "definitely agree." In the binary logistic regression model, "no" was the referent. To reduce the likelihood of Type 1 error, we performed a backward elimination procedure to select independent variables from the list of child and family factors previously assessed. Factors that did not maintain a statistical association with the dependent variable at the $p < 0.10$ level were removed in fitting the model. SPSS version 22 (Armonk, NY) was used to perform all analyses and the Complex Samples module was utilized to weight data and account for the sampling structure of the Pathways survey.

Results

Sample

1420 parents of CSHCN with ASD completed the survey. Consistent with U.S. national demographics of children with ASD (Kogan et al., 2008), the sample children were majority male (82.1%) and white non-Hispanic (66.2%). The age distribution of the children was

relatively even between age 6–17. Most families were at >200% of FPL and had either private insurance or both public and private insurance (Table 1).

Frequency of beliefs

Frequency of beliefs—Each of the four causal beliefs assessed was endorsed by substantial proportions of parents (Figure 1). Consistent with prior literature, the most consistent belief was that the child’s condition was genetic or hereditary, with 31.8% of parents saying this was “definitely” the case, and 66.3% saying this was “somewhat or definitely” the case. The least frequent belief was that the child’s condition may have been caused by an in utero exposure, which was about half as frequent as beliefs about a genetic cause-- 14.2% of families “definitely” held this belief and 35.4% “somewhat or definitely” held this belief. However, many parents did believe in some variety of environmental exposure: if both in-utero and post-natal exposures are combined, 28% of parents “definitely” believed in at least one exposure cause of their child’s condition, and 61.8% “somewhat or definitely” believed in an exposure. The “accident, illness, or injury cause” belief item had a different response scale than the other three items (i.e. yes/no versus 4-part agree/disagree scale), and was endorsed by 19.1% of parents.

Multiple beliefs—Overall, slightly more than half of parents “definitely” believed in at least one of the three causal beliefs or believed that an “accident, illness or injury might have had an effect on their child’s development,” while about 40% had no definite beliefs or did not believe in an accident, illness, or injury cause. Of those parents holding at least one definite belief, most had only 1 “definite” etiologic belief, but 20.5% had multiple definite beliefs (Figure 2). A majority of parents (60.4%) believed in one of the causes asked about at least “somewhat.” None of the beliefs were strongly correlated with each other. Pre- and post-natal exposure beliefs had a practically weak but statistically significant positive correlation with one another ($\tau = 0.10$, $P < .01$), and post-natal exposure belief was also weakly correlated with the belief “accident, illness, or injury might have had an effect on development” ($\tau = 0.11$, $P < .01$). Beliefs about a genetic or hereditary cause had a weak but significant inverse association with beliefs about a postnatal exposure ($\tau = -0.11$, $P < .01$; Table 2).

Socio-demographic associations with beliefs

Genetic or hereditary cause: On multivariate analysis, parents of Hispanic children were less likely than parents of white non-Hispanic children to “definitely” agree that their child’s condition was genetic or hereditary, even after controlling for other child and family factors. In addition, parents of children with any private insurance had twice the risk of somewhat agreeing (but not definitely agreeing) that the child’s condition was genetic or hereditary. In terms of family factors, parents of children from “other family structure” families (which included step-families), were significantly more likely to both “somewhat” and “definitely” agree in a genetic or hereditary cause compared to children in 2-parent biological/adopted families. It is also worthy of note that several other markers of lower socio-economic status (e.g. black and other race, high school education or less) were also associated with lower rates of agreement about a genetic/hereditary cause, but these were not significant on multivariate analysis.

In utero or postnatal exposure cause: In terms of child factors, parents of black children were more likely to “definitely” agree about a post-natal exposure cause. There was also an inverse association between income and post-natal exposure beliefs: lower income families were more likely to “definitely” endorse such beliefs. A similar bivariate pattern was seen in terms of income and beliefs about in utero exposure (e.g. 26.7% definite belief in families 0–99% FPL versus 9.4% definite belief in families >400% FPL); however these associations were not significant on multivariate analysis (Supplemental Table 1). Privately insured children were less likely than parents of publicly insured children to “definitely” believe their child’s condition was caused by an exposure after birth. Parents of children with functional limitations (versus no functional limitations) were more likely to “definitely” believe in a post-natal cause of their condition(s).

Accident, illness, or injury cause: Similar to the other exposure causes, lower household income correlated with higher rates of endorsement of an accident, illness, or injury cause of the child’s condition. However, only FPL of 0–99% held a significant association on multivariate analysis (AOR 2.91[CI: 1.48–5.71]).

Of note, child gender, age, and region had no significant associations with any causal belief on either bivariate or multivariate analysis.

Discussion

In this analysis, we found that parents of children with ASD had quite variable beliefs about the causes of their child’s condition. Most parents (60%) at least “somewhat” believed in one of the causes asked about in the survey, but 40% endorsed none of them. On the other hand, 20% of parents had multiple definite causal beliefs. Consistent with prior literature, most frequent etiologic beliefs were related to a genetic cause, with a majority (66.3%) of parents believing that a genetic cause was “somewhat” or “definitely” likely. Though parents were about half as likely to endorse either an in-utero or an postnatal exposure cause compared to a genetic cause, when all types of exposure causes were put together, the overall rates of exposure beliefs was also high, around 60%. As Gray (1995) notes, diseases like ASD, which are a poor fit with the biomedical model because their etiology or prognosis is controversial, variable, and/or poorly understood, may be particularly likely to result in variable and multiple parent explanations of causation. In this way, parents are keeping pace with the scientific community in that no one clear cause of ASD is generally considered “most important”(Johnson et al., 2007; Lai et al., 2014).

Parent beliefs followed some intriguing socio-demographic trends. The most notable was that parents of lower socio-economic status generally (lower educational attainment, lower income, non-white race/ethnicity, publicly-insured) were more likely to endorse exposure causes of their child’s condition and/or less likely to endorse genetic causes. These findings invite a variety of possible interpretations. First, less economically-advantaged families experience more adverse environmental exposures, both before and after their child’s birth, due to poverty and adverse living conditions, which may alter risk for ASD and other developmental disorders. Some such risk factors, like prematurity or low birthweight, have known associations with ASD (Larsson et al., 2005; Schendel & Bhasin, 2008). Therefore,

parents' suspicions of an exposure cause of an ASD in these groups may be well-founded in some measure. It is also possible that disadvantaged families are more likely to recall more adverse exposures and are therefore more likely to attribute their child's condition to them. Another hypothesis may be that exposure etiologies are favored by lower socio-economic status families due to lack of information about other etiologies. In particular, families of lower socioeconomic status may know less about genetics, and/or health care and educational providers may also provide less information about genetics to these families when discussing ASD. Overall, our results support prior reports suggesting that family socioeconomic background may play an important role in how families interpret their child's developmental problems (Mandell & Novak, 2005; Zuckerman et al., 2014).

These results have significant implications for providers. Since a substantial number of parents overall believe their child's condition is genetic, it may also be helpful for providers to explore autistic-like traits among other family members. For instance, providers might ask parents if they have ever noted that other family members have difficulty with social communication or repetitive interests and/or behaviors. Parents may find discussion of this topic will help them understand more about why their child has ASD or what their child's future might be like. Likewise, genetic testing (such as Fragile X testing and/or a high-resolution karyotype) is frequently recommended for children who have both ASD and intellectual disability, in order to better understand prognosis and recurrence risk (Johnson et al., 2007). This study's results suggest that accounting for parental beliefs about the genetic basis for ASD may help providers decide if and how to offer these types of studies.

Since beliefs about exposure causes are more common among parents of lower socioeconomic status, providers should bear that in mind when discussing the origins of ASD in such families. Many parents report guilt about the cause of their child's ASD, particularly about their roles in adverse prenatal or postnatal events (Gray, 1995; Mercer et al., 2006), so it may be helpful for providers to explore prior adverse exposures in pregnancy and early childhood with families and let parents express their concerns. If a child's exposures are judged unlikely to be related to ASD, it may be helpful to reassure parents that their child's condition was not a direct result of any parental negligence or misfortune.

When providers approach parent views of causation in a non-judgmental way, they also may be more successful at dissuading parents from therapeutic behaviors that have no proven benefit, such as withholding vaccines, or pursuing unfounded dietary therapies. Based on a model provided by Kleinman (Kleinman, 1980), Levy (Levy & Hyman, 2003) and Mandell (Mandell & Novak, 2005) have suggested that asking parents about their etiologic beliefs may help facilitate shared-decision making. For instance asking parents questions such as "What did you call your child's problem before it was diagnosed? Why do you think it started when it did? What do you think autism does? How does it work?" may help providers and parents come together around common treatment goals.

The study has a number of limitations. First, the parent beliefs we studied were about the child's "learning and developmental conditions" rather than about ASD per se. As a result, some parents could have answered these questions about multiple conditions, or primarily about other developmental conditions the child might have (e.g. attention deficit

hyperactivity disorder or intellectual disability). However, >90% of children with ASD have other medical and developmental comorbidities (Child & Adolescent Health Measurement Initiative, 2013), so parents may frequently have complex views of the etiology of their child's condition(s). Another significant limitation is the content of the beliefs assessed. Our analysis was based on available survey items, and some of them (e.g. "child's condition was caused by something [he/she] was exposed to after [he/she] was born") were rather vague, plus the survey lacked specific questions about some more prevalent cause beliefs (e.g. the role of immunizations). As a result, parents may hold etiologic beliefs that the survey did not assess. There was also no opportunity to ask parents why they held certain beliefs. Other limitations included that all ASD diagnoses were obtained via parent report and were not verified. Parents' beliefs may also depend more strongly on factors we could not assess, such as media exposure and usage, social networks, or health literacy. Finally, the structure of the Pathways survey itself is problematic, since the population was generally higher-income, and the sample included English speakers only, which limits the generalizability of the Latino sample in particular.

Overall, future research is needed as to why parents hold different sets of beliefs, and what impact these beliefs may have on health care quality or services utilization. Understanding how parents move from beliefs about the causes of ASD to selection of treatment options will help providers design more family-centered and informed service interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Weighted Percentages and 95% Confidence Intervals of Etiologic Beliefs (Somewhat/Definitely Agree) among US children with ASD age 6–17 years

Note: Sample sizes differ slightly due to item-level non-response

Abbreviations: ASD, Autism Spectrum Disorder

*this item was scored on a scale with only “yes” and “no” response options.

Figure 2.
Weighted Proportion and 95% Confidence Intervals Showing Number of Causal Beliefs
Held by Parents of US Children with ASD age 6–17 years (N = 1420)

Table 1

Sociodemographic Characteristics of Children Age 6–17 years, with Current ASD

Variable	Number with ASD (total sample = 1420 ^b)	Percent with ASD ^a
Child Factors		
Age		
6–8 years	279	20.9%
9–11 years	443	33.7%
12–14 years	395	25.6%
15–17 years	303	19.7%
Gender		
Male	1155	82.1%
Female	264	17.9%
Race/Ethnicity		
Hispanic	118	13.0%
Black, Non-Hispanic	89	10.7%
Other Race, Non-Hispanic	145	10.1%
White, Non-Hispanic	1056	66.2%
Health Insurance Type		
Public Insurance Only	366	32.1%
Private Insurance or Both Public and Private	982	67.9%
Functional Limitations		
Yes	905	64.6%
No	515	35.4%
Family factors		
Region		
Northeast	277	21.4%
Midwest	338	24.5%
South	388	33.8%
West	417	20.3%
Household Income		
0%–99% FPL	198	16.9%
100%–199% FPL	277	20.5%
200%–399% FPL	475	32.7%
400% FPL	470	29.9%
Parental Educational Attainment		
High school or less	200	23.4%
More than high school	1220	76.6%
Family Structure		
Single mother	236	22.6%

Variable	Number with ASD (total sample = 1420 ^b)	Percent with ASD ^a
Other	221	16.9%
2 parent biological or adopted	953	60.5%

Abbreviations: ASD, Autism spectrum disorder; FPL, Federal poverty level.

^aWeighted to represent the non-institutionalized population of children with special health care needs age 6–17 years with current ASD in the US. The numbers do not add up to 100% of the full sample size due to missing values on some variables and/or rounding.

^b numbers may not add up to 1420 due to item-level non-response

Table 2

Correlation of Causal Belief Items among Parents of Children with ASD: Kendall's Tau Coefficients (n=1420)

	Condition is genetic or hereditary	Condition may have been caused by in utero exposure	Condition may have been caused by exposure after birth	Accident, injury, or illness might have had an effect on development
Condition is genetic or hereditary	1.00			
Condition may have been caused by in utero exposure	0.10 **	1.00		
Condition may have been caused by exposure after birth	-0.11 **	0.10 **	1.00	
Accident, injury, or illness might have had an effect on development	-0.03	0.07 *	0.11 **	1.00

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Table 3
Adjusted Sociodemographic Associations with Causal Beliefs: Relative Risk or Odds Ratios (95% Confidence Intervals)^a

	Causality					
	Condition is genetic or hereditary		Condition may have been caused by in utero exposure		Condition may have been caused by exposure after birth	
	Some Agree	Def Agree	Some Agree	Def Agree	Some Agree	Def Agree
Child Factors						
Gender						
Male	—	—	—	—	—	1.10 (0.61–1.95)
Female	—	—	—	—	—	1.00
Race/Ethnicity						
Hispanic	0.91 (0.44–1.85)	0.18 (0.10–0.37)	—	—	1.37 (0.58–3.22)	2.19 (0.97–4.99)
Black, Non-Hispanic	0.57 (0.25–1.35)	0.65 (0.26–1.62)	—	—	0.88 (0.36–2.14)	2.66 (1.19–5.96)
Other, Race Non-Hispanic	0.65 (0.30–1.41)	0.62 (0.29–1.33)	—	—	1.08 (0.52–2.23)	1.48 (0.60–3.69)
White, Non-Hispanic	1.00	1.00	—	—	1.00	1.00
Functional Limitations						
Yes	0.76 (0.48–1.22)	0.90 (0.54–1.49)	—	—	1.12 (0.70–1.81)	1.85 (1.01–3.38)
No	1.00	1.00	—	—	1.00	1.00
Health Insurance Type						
Public Insurance Only	1.00	1.00	1.00	1.00	—	—
Private Insurance or Both Public and Private Insurance	2.00 (1.10–3.62)	1.10 (0.65–1.86)	1.20 (0.59–2.42)	0.45 (0.21–0.98)	—	—
Family Factors						
Household Income						

	Causality						
	Condition is genetic or hereditary		Condition may have been caused by in utero exposure		Condition may have been caused by exposure after birth		Accident, injury, or illness might have had an effect on development
	Some Agree	Def Agree	Some Agree	Def Agree	Some Agree	Def Agree	Yes
0%–99% FPL	—	—	0.78 (0.27–2.24)	2.28 (0.75–6.93)	1.30 (0.59–2.88)	2.68 (1.04–6.89)	2.91 (1.48 – 5.71)
100%–199% FPL	—	—	0.86 (0.40–1.89)	1.20 (0.44–3.29)	1.54 (0.78– 3.02)	2.53 (1.05–6.11)	1.25 (0.59 – 2.63)
200%–399% FPL	—	—	1.51 (0.86–2.65)	1.10 (0.45–2.73)	1.51 (0.89 – 2.56)	1.79 (0.84–3.83)	1.21 (0.66 – 2.23)
400% FPL	—	—	1.00	1.00	1.00	1.00	1.00
Parent Educational Attainment							
High school or less	0.54 (0.26–1.13)	0.78 (0.42– 1.44)	—	—	—	—	—
>High school	1.00	1.00	—	—	—	—	—
Family Structure							
Single Mother	1.08 (0.51–2.25)	1.59 (0.83–3.03)	1.24 (0.62–2.47)	0.57 (0.22–1.47)	—	—	—
Other Family Structure	2.81 (1.13–6.96)	2.72 (1.37–5.40)	0.79 (0.43–1.44)	1.17 (0.56–2.45)	—	—	—
2 Biological or Adoptive Parent	1.00	1.00	1.00	1.00	—	—	—

^aThe base category for the three multinomial models is definitely and somewhat disagree. Relative risk ratios were estimated for the three multinomial models, and odds ratios were estimated for the logistic regression model.

—Variables that did not maintain a statistically significant association with the dependent variable at the $p < .10$ level during a backwards elimination model were removed in fitting the model.