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Socioeconomic disadvantage and developmental delay among US children aged 18 months to 5 years

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Abstract

Background—Few studies have examined the relationship between sociodemographic factors and a population-based measure of developmental delay in US children. We identify sociodemographic factors associated with unlikely, probable and possible developmental delay in preschool US children using nationally representative data.

Methods—All children aged 18 months to 5 years in the 2007 National Survey of Children's Health were categorised into three groups based on the likelihood of developmental delay (unlikely delay, possible delay and probable delay) using a modified survey version of the Parents' Evaluation of Developmental Status questionnaire. Bivariate and multivariate multinomial logistic regressions were used to assess relations between sociodemographic variables and risk of developmental delay.

Results—Children had increased odds of probable delay (compared with unlikely delay) if they were older (adjusted OR (aOR)=1.41/additional year above the youngest age group (18 months–2 years), p<0.001), male (aOR=1.55, p<0.001), low birth weight (aOR=2.08, p<0.001), non-Hispanic black (aOR=1.50, p<0.01) or Hispanic in a non-English-speaking household (aOR=2.53, p<0.001) versus non-Hispanic white, had lower household income (aOR=1.33 for each decreasing category of poverty level, p<0.001), or received >10 h/week of care at another family's home (aOR=1.71, p<0.05). Only four characteristics (being older, male, low birth weight and Hispanic living in a non-English-speaking household) were associated with increased odds of possible delay compared with unlikely delay.

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Conclusions—Multiple factors, including demographic characteristics and indicators of social disadvantage, distinguish children with probable developmental delay from those unlikely to have developmental delay. Fewer factors identify children with possible delay.

INTRODUCTION

Developmental delay is a common problem in childhood, and national data have shown that more than 14% of children at 24 months of age have developmental delay in the USA.[1] Early detection of delay and timely intervention, however, can improve later outcomes.[2] The American Academy of Pediatrics recommends that developmental surveillance be conducted during all routine well-child preventive care visits, and standardised screening tools be used for all children at the 9-month, 18-month and 30-month visits.[3] However, universal screening using standardised screening tools is often not conducted by paediatricians as recommended[4] and even among children who do have well-child visits, many children who have developmental delays are not identified.[5] As a result, understanding the characteristics of children and their families which are associated with a higher risk of delay may be of great importance to public health and education officials, who are required to identify and evaluate all children with disabilities in need of early intervention or special education services.[6]

Past studies exploring the relationship between child sociodemographic characteristics and developmental delay have left areas requiring further investigation. Most of the existing research on the correlates of developmental delay is based on small clinical or community-based studies. Research using large, nationally representative data may be of particular importance, as reviews of past community and regional studies have suggested that factors associated with delay may not be stable across studies,[7] possibly due to the small sample sizes. Further, national data describing factors associated with developmental delay may provide the most relevant information for guiding national policies. Some existing studies based on nationally representative data have relied on parental reports of physician-diagnosed delay.[8 9] While these studies are important, research has shown that many physicians frequently fail to diagnose developmental delay.[4 10] Additionally, for some children, lack of access to paediatric care may be a barrier to timely diagnosis of delay. A better approach to measuring developmental delay and identifying risk factors for delay may be to use population-based survey measures of development that are not dependent on physician diagnosis.[1 11–14]

Only a few US studies have examined the relationship between children's sociodemographic characteristics and developmental delay using population-based survey questions and screening instruments. Using data from the 2001 to 2004 Early Childhood Longitudinal Study, Birth Cohort, Rosenberg *et al*[1] found increased rates of delay among children aged 24 months and living in households below the poverty level. Simpson *et al*[11] used the 1994–1995 National Health Interview Survey on Disability to show that diagnosis of developmental delay was associated with each of the following factors: being male, older, poor, having parents of lower education and being from a single mother family, controlling for each of the other factors and race/ethnicity. Stevens,[12] using data from the 2000 National Survey of Early Childhood Health, found that children aged 4–35 months were at higher risk

for developmental delay if they were African-American, of lower social class, uninsured or had mothers of poor mental health. Also, he found a much higher risk of delay in children with more than one of these factors. Zuckerman *et al*[13] examined the 2003 National Survey of Children's Health (NSCH) and found that children in households where the primary language was Spanish had a lower risk for developmental delay. Finally, Coker *et al*,[14] using the 2007 NSCH, reported differences in risk of delay by race/ethnicity, age, poverty level, highest level of parental education, household language and insurance of children, although no multivariate analysis was conducted.

The present study uses data from a recent large national survey to examine relationships between specific sociodemographic factors and developmental delay using a population-based screening measure for children aged 18 months to 5 years. We build on the work of previous researchers in several ways. First, we use more recent data than other national studies,[1 11–13] with the exception of Coker *et al*.[14] This may be of importance, as relationships may change over time and several analyses are from the mid-1990s.[11] Second, we expand the age group for which we investigate correlates of developmental delay to include an older age group than studies such as those by Rosenberg[1] and Stevens.[12] Examination of older preschoolers is important because developmental delay may not become apparent until children are ready to enter kindergarten. Also, we investigate a broader range of factors potentially related to delay.[1 11 13] This may be relevant as identification of additional risk factors for delay may result in better identification of populations of children at higher risk of delay. Finally, some previous studies of factors related to delay did not include multivariate analyses to identify independent relationships of each factor to developmental delay,[1 14] and these may also be needed to better identify populations at higher risk of delay.

METHODS

The data source for this analysis is the 2007 NSCH, a nationally representative, random-digit-dial survey of US households with children. For each household selected, one single child was randomly selected, resulting in a sample of 91 642 children aged 0–17 years. A parent or guardian who lived in the child's household answered the survey questions about the health and healthcare of the selected child. The response rate for this survey was 46.7%. Analyses of this data set have not shown a large non-response bias.[15] Additionally, survey weights used to generate national estimates adjust for both non-response and non-coverage of children in households without landline telephones. Details of the survey methodology are available elsewhere.[16]

For children aged 18 months to 5 years (n=19 995), the likelihood of developmental delay was determined using questions in NSCH that are part of the Parents' Evaluation of Developmental Status (PEDS) questionnaire. The PEDS questionnaire uses parental concerns to identify children at different levels of risk for developmental delay.[17 18] Children aged 18 months to 5 years were chosen because parents of children younger than 18 months were not asked all questions from PEDS included in NSCH.

Eight questions from the PEDS were included in NSCH. This is similar to the clinical PEDS, but not identical since the two open-ended questions on the clinical PEDS have been omitted for ease of use in a large telephone survey. However, the NSCH version of the PEDS has been used in previous research,[12–14 19 20] and the clinical PEDS has been validated in a diverse racial, ethnic, socioeconomic and geographic population.[18 21 22] Of the eight questions from the PEDS included in NSCH, particular questions have been shown within each age group to be most predictive of which children have developmental delay[18] (table 1). Consistent with the scoring for the clinical PEDS, children whose parents had two predictive concerns were considered to be at high risk of developmental delay (for clarity, hereafter this group will be referred to as 'probable delay'). Children whose parents had a single predictive concern were considered to be at moderate risk of developmental delay (hereafter referred to as 'possible delay'); those children whose parents only had concerns that are not predictive of developmental delay were considered to be at low risk, and those children whose parents had no concerns were considered to be at no risk for developmental delay.[18] This method of categorisation is the same as that used in the clinical PEDS.[18] The low and no risk groups were combined and are hereafter referred to as 'unlikely delay'.[18]

We calculated the percentage of children with probable, possible and unlikely developmental delay within each category of each independent variable. Developmental delay for 51 children (0.26% of children aged 18 months–5 years) could not be determined due to missing responses to questions for predictive concerns. These observations were omitted from analyses. Missing rates for all independent variables were below 3%, with the exception of birth weight, which was missing for 5.1% of the probable delay group, 2.5% of the possible delay group and 3.3% of the unlikely delay group. Data for household income were missing for 8.5% of the children; multiply imputed values for these missing data provided by NCHS were included in the analyses. Otherwise, missing data for independent variables were included in models as missing categories to retain observations.

For both bivariate and multivariate analyses, multinomial logistic regression was used with dependent variables that separately compared the categories of probable delay and possible delay with the same reference category of unlikely delay. Independent variables were chosen that represented the characteristics of children and their households. Child characteristics included age, sex, race/ethnicity, household language and birth weight. For analytic purposes, race/ethnicity and language spoken at home were combined into a single independent variable. Because low birth weight is known to be related to both developmental delay and socioeconomic factors,[7] we examined regression models both with and without birth weight to determine whether estimates for other variables were affected by inclusion of low birth weight. Owing to the very similar results between the two models, the results for the model including birth weight are presented.

Household characteristics included family structure, household poverty level, current insurance status of children, consistency of insurance in the past 12 months, highest level of parental education and the child's care arrangement by non-relatives outside of the home. Measures of family structure and indicators of socioeconomic status were included in our model because of the numerous studies documenting the association between these factors and developmental delay.[23] The child's care arrangement was included based on research

suggesting important differences in caregiver education between these settings,[24] and the fact that provider education may be an important factor affecting child development.[25]

Finally, two geographic variables were included which described the location of the child's household: US census region, and metropolitan statistical area status. These variables were included because of the possibility that some geographic areas or categories may have increased risks of delay.

Analyses were conducted in STATA V.12.1 SE, and data in all analyses were weighted and adjusted for the complex design of the survey using SVY commands. No adjustments for multiple comparisons were made and p values of <0.05 were considered to be statistically significant. Comparisons between coefficients for the probable and possible delay categories were conducted when a coefficient for a particular category was found to be significant for either probable or possible delay, but not both. These comparisons were examined using a Wald test when multiply imputed data were not used and an unrestricted FMI model test for multiply imputed data.

Concerns exist about the validity of the PEDS for children who live in households with Spanish-speaking adults. Therefore, a sensitivity analysis was conducted that excluded from the multivariate analysis children living in households in which the primary language was not English. Additionally, we conducted stratified analyses by age for children 18 months through 3 years and 4 and 5 years. Our analysis included multiple indicators of socioeconomic status: household poverty level, current insurance status of children, consistency of insurance in the past 12 months, and highest level of parental education. In multivariate analysis, only household poverty level was used to represent socioeconomic status, as all of the socioeconomic status variables were found to be highly correlated.

RESULTS

In 2007, approximately 12% (CI 10.9% to 13.1%) of children had probable delay and 16.3% (CI 15% to 17.7%) of children had possible delay. The distribution of probable, possible and unlikely delay by child characteristics is presented in table 2.

Findings from the multivariate analysis were as follows (shown as the adjusted odds in table 3). Being in an older age group was associated with increased odds of having possible delay (adjusted OR (aOR)=1.19/year of age above the 18-month to 2-year age group, p<0.001) and having probable delay (aOR=1.41/year of age above the 18-month to 2-year age group, p<0.001). Being male was associated with increased odds of having possible or probable delay (aOR=1.35, p<0.01 and aOR=1.55, p<0.001, respectively). Low birth weight was associated with increased odds of having both possible and probable delay (aOR=1.56, p<0.05 and aOR=2.08, p<0.001, respectively).

Being non-Hispanic black as compared with being non-Hispanic white was associated with increased odds of having probable delay (aOR=1.50, p<0.01), while being Hispanic in a non-English-speaking household was associated with increased odds of having possible (aOR=1.63, p<0.05) and probable (aOR=2.53, p<0.001) delay. Decreasing levels of household income (as a percentage of the poverty level) was associated with increased

odds of having probable delay (aOR=1.33 for each decreasing category of poverty level, p<0.001). Obtaining child care for more than 10 h/week at another family's home (as compared with <10 h/week of non-relative care outside the home) was associated with increased odds of having probable delay (aOR=1.71, p<0.05). Finally, living in the Midwest census region as compared with the Northeast was associated with decreased odds of having probable delay (aOR=0.71, p<0.05).

For five characteristics, either the odds of probable delay or the odds of possible delay, but not both, were found to be significant in multivariate analysis. These characteristics were non-Hispanic black race/ethnicity, non-Hispanic other race/ethnicity, poverty level, living in the Midwest and receiving >10 h of care per week at someone else's home. Statistical comparisons showed significant differences between the coefficients for the probable and possible groups in three of the five instances. These were as follows: first, poverty level had a significantly higher coefficient for probable than for possible delay (p<0.001). Second, the coefficient for living in the Midwest was significantly lower for those with probable delay than for those with possible delay (p<0.05). Third, the coefficients for the non-Hispanic other group were significantly higher in the probable delay group than in the possible delay group (p<0.01).

In sensitivity analyses which excluded children living in households in which the primary language was not English, multivariate results, as well as differences between coefficients between the probable and possible groups, were largely similar to those in the main analysis. Also, in stratified analyses by age, the results were generally similar to those found in the overall analyses, although some results lost significance, which was very likely due to the decreased statistical power.

DISCUSSION

This analysis suggests that children who were older, male, of low birth weight, non-Hispanic black or Hispanic in a non-English-speaking household, poor or receiving more than 10 h/week of care at someone else's home were at increased odds of probable delay. Fewer factors distinguished children with possible developmental delay from children with unlikely delay. Only four characteristics (being older, male, of low birth weight and Hispanic living in a non-English-speaking household) were associated with possible developmental delay. In general, effect sizes were modest for the factors associated with probable and possible delay.

Some differences between the probable and possible delay groups were found in that poor children had a greater risk of probable delay compared with possible delay. Poverty was selected to represent socioeconomic status in our models rather than parental education or insurance status. Therefore, we could not determine whether parental education or insurance status might also be associated with greater risks of probable delay compared with possible delay. As a result, we ran additional analyses using the highest level of parental education and current insurance status in the multivariate model rather than poverty. Indeed, using the highest level of parental education, high school education (OR=1.54, p<0.01) and less than high school (OR=2.18, p<0.01) were both associated with increased odds of having probable but not possible delay, and coefficients between the probable and possible delay categories

differed for both ($p<0.05$ for both). Using current insurance status, having Medicaid or SCHIP insurance was associated with increased odds of probable (OR=1.74, $p<0.001$) but not possible delay, and the coefficients for the probable and possible delay categories differed significantly ($p<0.01$). These results suggest that differences do exist between the socioeconomic characteristics of the probable and possible delay groups. These findings provide some support for the established protocol for the clinical PEDS by suggesting that the characteristics of those in the probable and possible groups may not be the same.[18] Therefore, it is very likely that the best approach for researchers analysing PEDS data may be to not combine probable and possible delay as has been done in past studies of PEDS data.[13 20]

We also noted differences between our findings for Hispanic children based on the 2007 NSCH and previously reported findings based on the 2003 NSCH. Using data from the 2003 NSCH, Zuckerman *et al*[13] found a lower risk of developmental delay among Hispanic children living in Spanish-speaking households compared with children living in English-speaking households. In contrast, our findings suggest that the odds of having probable or possible developmental delay were higher for Hispanic children in non-English-speaking households than for non-Hispanic white children. The differences in the findings may be attributed to the study population in Zuckerman's study, which was limited to children who received at least one preventive care visit in the past year. Changes in the effect associated with Hispanic subgroups may also be due to changes in the Spanish-language translation of PEDS between the 2003 and 2007 NSCH.[26 27] To the extent that our results for children in primarily non-English-speaking households are valid, these results may be of importance. The lower percentage of Hispanic children with diagnosed developmental delay reported in other studies[9] may reflect access to care and cultural barriers, which in turn may prevent proper diagnosis.

There are limitations to our study that should be noted. As discussed above, the PEDS has not been directly validated in the exact form used in this survey. Similarly, the PEDS was originally validated for clinical use, not as a telephone survey, although recent work has conducted validation work for its use as a telephone survey, albeit with the two open-ended questions.[28] The PEDS relies on parental concerns, which may have limitations in this less rigorously validated form. Some sociodemographic factors may be associated with parental concerns, but not with true developmental delay. Also, the strengths of the associations may differ. Finally, the cross-sectional nature of the survey limits our ability to determine the causal relationships among the variables in this analysis.

This study provides important insight into populations at increased risk for developmental delay. Studies of the association between social disadvantage and developmental delay alert health and education practitioners to subgroups of children who may require greater attention and monitoring.

Data sharing statement

All data from this study are available from the National Center for Health Statistics, Centers for Disease Control and Prevention. No additional unpublished data exist for this study.

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What is already known on this subject?

- Previous studies on developmental delay among US children using population measures have identified several socioeconomic factors that could be related to developmental delay. However, studies of risk factors associated with population measures of developmental delay in US children are rare, and tend to be older, bivariate in nature, for limited age groups or investigate a limited set of possible socioeconomic factors.

What this study adds?

- This study uses a large, recent, national survey with a population measure of developmental delay to examine the relationship between developmental delay and a broad range of sociodemographic factors for US children aged 18 months to 5 years. We find that children who were older, male, of low birth weight, non-Hispanic black or Hispanic in a non-English-speaking household, poor or receiving more than 10 h/week of care at someone else's home were at increased odds of probable developmental delay. Fewer factors identified children with possible delay.

Table 1

Questions (predictive and non-predictive of developmental delay*) from the Parents' Evaluation of Developmental Status (PEDS) Questionnaire used in the National Survey of Children's Health, 2007, by age group and developmental domain

Domain	Question	Non-predictive	18 months–2 years old	3–4 years old	5 years old
Expressive language	Are you concerned about how he/she talks and makes speech sounds?		X	X	X
Receptive language	Are you concerned about how he/she understands what you say?		X	X	X
Gross motor	Are you concerned about how he/she uses his/her arms and legs?			X	X
Fine motor	Are you concerned about how he/she uses his/her hands and fingers to do things?				X
Preschool/school skills	Are you concerned about how he/she is learning pre-school or school skills?				X
Behaviour	Are you concerned about how he/she behaves?	X			
Social-emotional	Are you concerned about how he/she gets along with others?	X			
Self-help	Are you concerned about how he/she is learning to do things for himself/herself?	X			

Questions and scoring method are from the Parent's Evaluation of Developmental Status (PEDS) child development screening test. PEDS is protected by US and international copyright law. All rights are reserved by Frances Page Glascoe. Permission to use these items in NSCH has been granted by Dr Glascoe. Permission must be requested from the publisher (PO Box 23186, Washington, DC, 20026, http://www.forepath.org, support@forepath.org) before using these items for other purposes. Healthcare providers wishing to use PEDS in practice to assess risk status or to make decisions about developmental status for individual children must use the clinical version of the test, which can be obtained from Ellsworth and Vandermeer Press, LLC. The clinical version was not used for NSCH.

*Questions deemed predictive for each age group help to identify children at probable and possible developmental delay in that age group. These questions were established during previous validation studies of PEDS.[18 21]

Table 2

Percentage of children aged 18 months to 5 years with unlikely, possible and probable developmental delay, by selected characteristics

	Children with unlikely delay (n=14736)	Children with possible delay (n=3147)	Children with probable delay (n=2061)
	Weighted percentage (SE)		
Total	71.8 (0.8)	16.3 (0.7)	12.0 (0.6)
Child characteristics			
Age			
18 months—2 years	77.9 (1.2)	13.9 (0.9)	8.2 (0.9)
3 years	73.5 (1.6)	15.6 (1.4)	10.9 (1.0)
4 years	71.9 (1.6)	17.3 (1.4)	10.8 (0.9)
5 years	62.1 (2.0)	19.0 (1.8)	18.9 (1.6)
Sex			
Male	68.7 (1.1)	17.7 (0.9)	13.6 (0.9)
Female	75.1 (1.2)	14.8 (1.0)	10.2 (0.8)
Birth weight			
Normal	73.1 (0.8)	16.0 (0.7)	10.9 (0.6)
Low	59.5 (3.4)	20.7 (3.1)	19.8 (2.7)
Ethnicity, race and primary household language			
Non-Hispanic White	76.8 (0.9)	15.1 (0.7)	8.2 (0.5)
Non-Hispanic Black	66.5 (2.2)	18.1 (2.0)	15.4 (1.4)
Non-Hispanic Multiracial	74.6 (3.4)	15.6 (2.6)	9.8 (2.1)
Non-Hispanic Other	71.5 (3.0)	13.1 (2.0)	15.4 (2.4)
Hispanic—English-speaking household	69.2 (3.6)	17.8 (3.2)	13.0 (2.5)
Hispanic—non-English-speaking household	57.2 (3.4)	19.9 (2.7)	22.9 (2.8)
Household characteristics			
Household Income (% of poverty level)			
≤100	64.6 (2.0)	17.1 (1.6)	18.3 (1.6)
>100–200	67.5 (2.1)	17.4 (1.7)	15.1 (1.7)
>200–400	74.3 (1.3)	16.3 (1.1)	9.4 (0.9)
>400	77.8 (1.4)	14.7 (1.2)	7.5 (0.8)
Care arrangement			

	Children with unlikely delay (n=14736)	Children with possible delay (n=3147)	Children with probable delay (n=2061)
Out of home non-relative care arrangement			
<10 h/week of non-relative care	71.8 (1.1)	16.4 (1.0)	11.8 (0.8)
>10 h/week by daycare centre	72.5 (1.3)	16.1 (1.1)	11.4 (0.9)
>10 h/week at some other home	69.0 (2.9)	15.9 (1.7)	15.2 (3.0)
Current insurance status			
Non-public	75.8 (0.9)	15.6 (0.8)	8.6 (0.6)
Medicaid/SCHIP	65.1 (1.6)	17.6 (1.4)	17.3 (1.3)
Uninsured	71.2 (3.0)	15.6 (2.6)	13.2 (1.8)
Missing	68.7 (4.6)	15.8 (3.8)	15.5 (3.2)
Consistency of insurance			
Insured full year	72.0 (0.9)	16.2 (0.7)	11.8 (0.7)
Insured part year	72.3 (2.6)	16.5 (2.5)	11.2 (1.2)
Uninsured all year	63.9 (4.6)	17.9 (3.4)	18.2 (3.6)
Highest level of parent/guardian education			
More than high school	75.1 (0.9)	16.0 (0.8)	8.9 (0.5)
High school	68.8 (2.0)	15.6 (1.5)	15.6 (1.6)
Less than high school	56.4 (3.6)	20.0 (3.3)	23.6 (3.1)
Family structure			
Two parent biological/adopted	73.6 (0.9)	15.4 (0.7)	11.0 (0.7)
Two parent step-family	65.4 (6.0)	21.3 (6.09)	13.3 (2.6)
Single mother, no father present	66.1 (2.2)	19.0 (2.08)	14.9 (1.4)
Other	67.7 (3.6)	16.7 (3.2)	15.6 (2.2)
Geographic location			
US census region			
Northeast	71.2 (1.6)	14.7 (1.2)	14.1 (1.3)
Midwest	74.7 (1.1)	15.6 (0.9)	9.7 (0.7)
South	70.9 (1.2)	16.8 (1.0)	12.4 (0.8)
West	71.0 (2.4)	17.1 (2.0)	11.9 (1.7)
Metropolitan Statistical Area (MSA)			
MSA	71.3 (0.9)	16.3 (0.8)	12.3 (0.7)
Non-MSA	74.2 (1.3)	15.9 (1.1)	9.9 (0.8)

With the exception of 'Current insurance status,' missing categories are not presented. Many missing categories were unreliable due to sample sizes <30 or relative SEs>30%. n, unweighted observations.

Table 3

Unadjusted and adjusted ORs for having probable and possible developmental delay for children aged 18 months to 5 years old

	Unadjusted odds of possible vs unlikely developmental delay	Adjusted odds of possible vs unlikely developmental delay	Unadjusted odds of probable vs unlikely developmental delay	Adjusted odds of probable vs unlikely developmental delay
Child characteristics				
Age†	1.19 (1.09 to 1.30)***	1.19 (1.09 to 1.29)***	1.40 (1.26 to 1.55)***	1.41 (1.27 to 1.56)***
Sex				
Female‡	1.00	1.00	1.00	1.00
Male	1.31 (1.07 to 1.61)**	1.35 (1.11 to 1.64)**	1.46 (1.17 to 1.82)**	1.55 (1.23 to 1.94)***
Birth weight				
Normal‡	1.00	1.00	1.00	1.00
Low	1.59 (1.08 to 2.34)*	1.56 (1.05 to 2.30)*	2.22 (1.55 to 3.19)***	2.08 (1.49 to 2.90)***
Ethnicity, race and primary household language				
Non-Hispanic White‡	1.00	1.00	1.00	1.00
Non-Hispanic Black	1.39 (1.03 to 1.87)*	1.21 (0.88 to 1.67)	2.18 (1.68 to 2.83)***	1.50 (1.12 to 2.02)**
Hispanic—English-speaking household	1.31 (0.84 to 2.05)	1.21 (0.80 to 1.85)	1.77 (1.12 to 2.82)*	1.56 (0.98 to 2.49)
Hispanic—non-English-speaking household	1.77 (1.23 to 2.55)**	1.63 (1.13 to 2.35)**	3.78 (2.64 to 5.40)***	2.53 (1.75 to 3.66)***
Non-Hispanic Multiracial	1.06 (0.70 to 1.61)	1.06 (0.69 to 1.61)	1.23 (0.75 to 2.03)	1.13 (0.70 to 1.81)
Non-Hispanic Other	0.94(0.65 to 1.36)	0.97 (0.66 to 1.43)	2.03 (1.36 to 3.04)**	1.89 (1.27 to 2.82)**
Household characteristics				
Household income (decreasing % of poverty level)§	1.13 (1.03 to 1.24)*	1.03 (0.93 to 1.15)	1.46 (1.33 to 1.61)***	1.33 (1.19 to 1.49)***
Out of home, non-relative care arrangement				
<10 h/week of out-of-home care by non-relative‡	1.00	1.00	1.00	1.00
>10 h/week by daycare center	0.97 (0.78 to 1.20)	0.96 (0.77 to 1.21)	0.96 (0.77 to 1.20)	1.05 (0.84 to 1.33)
>10 h/week at some other home	1.00 (0.76 to 1.33)	1.10 (0.83 to 1.47)	1.34 (0.83 to 2.17)	1.71 (1.12 to 2.62)*
Current insurance Status¶				
Non-public‡	1.00	¶	1.00	¶
Medicaid/SCHIP	1.32 (1.05 to 1.64)*	¶	2.34 (1.85 to 2.96)***	¶

	Unadjusted odds of possible vs unlikely developmental delay	Adjusted odds of possible vs unlikely developmental delay	Unadjusted odds of probable vs unlikely developmental delay	Adjusted odds of probable vs unlikely developmental delay
Uninsured	1.07 (0.71 to 1.60)	¶	1.63 (1.14 to 2.33) **	¶
Consistency of insurance¶				
Insured all year‡	1.00	¶	1.00	¶
Insured part of year	1.02 (0.70 to 1.48)	¶	0.95 (0.72 to 1.25)	¶
Uninsured all year	1.24 (0.76 to 2.02)	¶	1.74 (1.05 to 2.88) *	¶
Highest level of parent/ guardian education¶				
More than high school‡	1.00	¶	1.00	¶
High school	1.06 (0.83 to 1.36)	¶	1.91 (1.46 to 2.50)	¶
Less than high school	1.67 (1.09 to 2.55) *	¶	3.52 (2.46 to 5.03) ***	¶
Family structure				
Two parent biological/adopted‡	1.00	1.00	1.00	1.00
Two parent step-family	1.55 (0.75 to 3.24)	1.34 (0.63 to 2.82)	1.37 (0.86 to 2.18)	0.97 (0.57 to 1.66)
Single mother, no father present	1.37 (1.02 to 1.83) *	1.24 (0.91 to 1.70)	1.52 (1.18 to 1.95) **	1.02 (0.76 to 1.36)
Other	1.17 (0.73 to 1.88)	1.20 (0.75 to 1.90)	1.55 (1.07 to 2.22) *	1.26 (0.82 to 1.83)
Geographic location				
US Census region				
Northeast‡	1.00	1.00	1.00	1.00
Midwest	1.01 (0.80 to 1.27)	1.03 (0.82 to 1.31)	0.65 (0.50 to 0.85) **	0.71 (0.53 to 0.94) *
South	1.14 (0.91 to 1.44)	1.11 (0.87 to 1.41)	0.88 (0.69 to 1.14)	0.86 (0.65 to 1.13)
West	1.16 (0.83 to 1.63)	1.09 (0.78 to 1.53)	0.85 (0.58 to 1.25)	0.72 (0.49 to 1.06)
Metropolitan statistical area (MSA)				
MSA‡	1.00	1.00	1.00	1.00
Non-MSA	0.94 (0.77 to 1.14)	0.95 (0.77 to 1.16)	0.77 (0.61 to 0.96) *	0.79 (0.62 to 1.02)

* p<0.05.

** p<0.01.

*** p<0.001.

† Age groups of 18 months–2 years, 3 years, 4 years and 5 years are treated continuously. Odds represent the odds per increase in age group.

‡Reference group.

§Household income (percentage of poverty level) groups of ≤100%, >100–200%, >200–400%, >400% of the poverty level were treated continuously, such that odds greater than 1 represent increased odds of probable or possible delay per decrease in household income group.

¶Not included in multivariate multinomial regression model.