TASK 5

Preschool Children's Preschool Participation, Home Learning Environments, and Cognitive Development: Change and Continuity from 1999 to 2016

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Introduction and Summary of Findings

The past few decades have seen much greater attention to preschool education and the learning and development of young children. Parents and policy makers have become much more aware of the importance of the early years. Public funding for early care and education has grown. The digital revolution has changed the types of media available to young children and aps on tablets and phones targeting preschoolers have become ubiquitous. Yet, how much has the care and education of young children changed, and have there been any discernable changes in their learning and development? NIEER has investigated these questions by constructing a unique data set for children ages 3 and 4 and their families from 1999 to 2016. We examined change and continuity in three broad areas:

- Nonparental education and care
- Home learning activities and environment
- Cognitive development

To obtain adequate sample size for detecting changes over time, we combined data from 1999 with 2000 for the initial anchor point and data from 2012 with 2016 for the end point. All financial information was adjusted for inflation to 2016 dollars.

Key findings were as follows:

- Age 3 center-based preschool participation increased from 44% to 50%
- Age 4 center-based preschool participation changed little if at all from 68% to 69%
- Participation patterns in center-based preschools differed by family background.
    - Hispanics had the lowest participation rates but experienced the greatest increases.
    - African-Americans had the highest participation rates but these changed little.
    - There is little income inequality in participation except that families with the highest incomes have much higher participation rates than others.
    - Children in western states are less likely to attend a preschool center

- The percentage of families paying fees for center-based preschool decreased at both ages 3 and 4 and across all income categories, with the biggest decrease for the lowest-income families.
- Although fees paid by those reporting a fee increased, the increase in the percentage of families paying no fee was so strong that the median payment was zero for families with incomes below $30,000 per year at age 3 and for families with incomes below $40,000 per year at age 4.
- There was a large increase over time in fees paid per hour by the highest spending families with the highest incomes.
- Parent-reported home learning activities overall increased over time with the largest improvements at the lowest income levels, substantially reducing inequality. However, one home learning activity decreased overtime across all income levels, the length of time parents spent reading to the child in each reading session.
- Despite improvements, one key measure of the home learning environment—the number of books a child has—are highly unequal. White preschoolers had twice as many books as their Black and Hispanic peers, and this did not improve with time. Also, huge differences remain even after adjusting for education and income.
- Parents who paid higher fees per hour for preschool centers also reported higher levels of home learning activities but home learning activities did not vary by family income per se.
- Parent ratings of children's cognitive abilities increased at both ages across all family backgrounds with the largest gains for African-American and Hispanic children.
- Children's reported cognitive abilities were higher for those attending preschool centers and for those with higher levels of home learning activities.

Methodology

Data were obtained from the National Household Education Survey (NHES) which has been conducted periodically since 1991. As all surveys repeated over many years, the administration changed over the years, but substantial effort was made to ensure continuity, as well. In compliance with the overall study goal that NIEER proposed for the PNC Grow Up Great Initiative, we set the combined NHES 1999 and 2001 administrations as the starting point, and the combined NHES 2012 and 2016 administrations as the end point. The NHES 1999 and 2001 were conducted through the telephone surveys using random-digit-dialing methods by Westat. Due to changes in phone use by families, the NHES 2012 and 2016 were conducted mainly through mail surveys using a two-phase sampling method by the U.S. Census Bureau.

The Early Childhood Program Participation (ECPP) Survey from the NHES provided the information for this study. The ECPP survey gathered information from families with children under age 6 on nonparental care arrangements and educational program participation of preschool age children, including care by relatives, care by persons to whom they were not related, and participation in day care centers and preschool programs including Head Start.

Our study focused on families with children ages 3 and 4, and selected items that were administered at both the starting (1991&2001) and ending (i.e. 2012&2016) points. We first conducted descriptive analyses for each outcome variable of interests with consideration of sampling weights. (The weighting methods that NHES developed carefully balanced the bias reductions against the potential increases in variance, which allows us making more reliable inference for the targeted population.) General linear and logistic regression models were then applied to answer the proposed research questions in depth. A set of independent variables were entered into all the models consistently based on the research literature. The independent variable set included child's age (ranging from 3 to 5), time (1999&2001 vs. 2012&2016), gender, race/ethnicity (Black, Hispanic, Other, and White), household income ($0 to $10,000, $10,001 to $20,000, $20,001 to $30,000, $30,001 to $40,000, $40,001 to $50,000, $50,001 to $75,000, $75,000 or above), parent or guardians' highest education level (less than high school, high school or equivalent, vocational-technical degree or some college, and college graduate vs. graduate and professional school), and census region (Northeast, South, and Midwest vs. West). Hereafter, the findings are presented and organized by research questions.

Findings

1. *To what extent did preschool participation of children aged 3 and 4 (defined as enrollment in early care and education centers) change from 2000 to 2016? What explains any changes?*

Our first question concerns overall participation in any type of center-based program. The NHES asked parents/guardians if the child attended any day care center, preschool, or prekindergarten not in a private home. Table 1 presents the percentages participating and the percentage of families paying any fee by age at both time points. Participation at age 3 increased from 44% to 50%. Participation at age 4 changed hardly at all, estimated at 68% rising to 69%. These results also are depicted in Figure 1. We present estimates disaggregated by ethnicity in Table 2 and Figure 2. The disaggregated estimates indicate that participation at ages 3 and 4 increased for White-non-Hispanics and for Hispanics, but not for African-Americans or for others. The increases were larger at age 3. Figure 3 displays participation rates by income at each age. Participation rates vary little at lower income levels, but rise sharply at higher income levels. However, this is no clear pattern of change over time in the effects of income except that the sharp upturn in participation rates at higher income levels is limited to higher income levels at the later time.

To further investigate the sources of differences over time, we estimate changes over time in preschool participation controlling for ethnicity, geographic region, parental education, and income. We find no significant effect of time, suggesting that changes over time largely can be explained by changes in population including increases in parental education and income.

Table 1. The changes of center based child care participation and fee charges for children age 3 and 4 based on NHES 1999-2016 data.

CHILD'S AGE	TIME POINT	PERCENT IN CENTERS	PERCENT PAY FEE
3	1999-2001	44.30%	85.00%
	2012-2016	50.10%	75.10%
4	1999-2001	67.70%	77.20%
	2012-2016	68.80%	65.70%

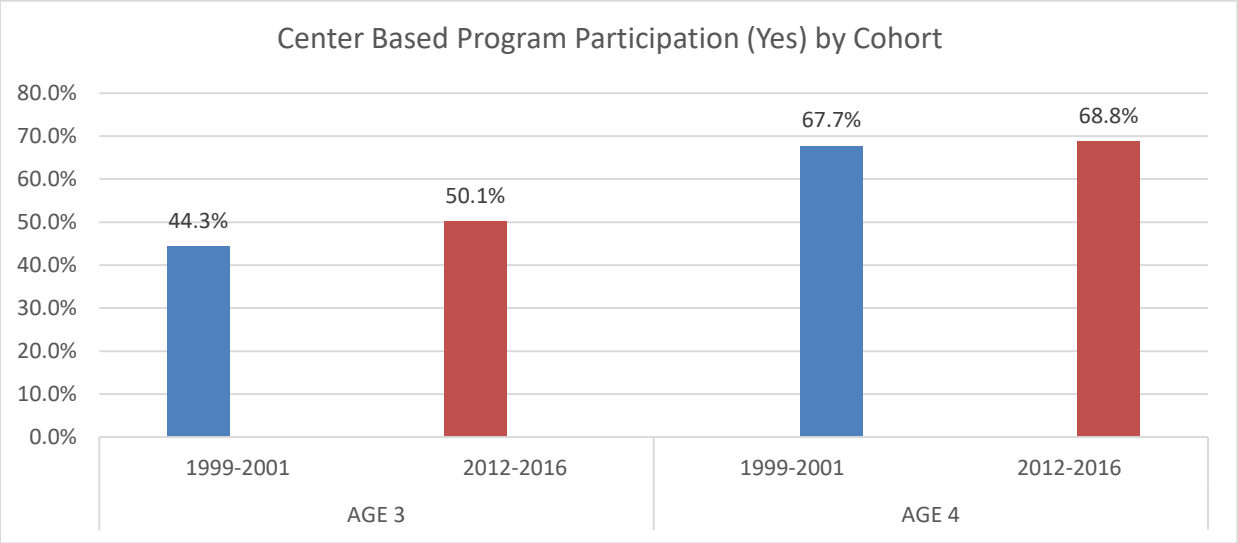

Figure 1. The changes of center based child care participation for children age 3&4 based on weighted NHES 1999-2016 data.

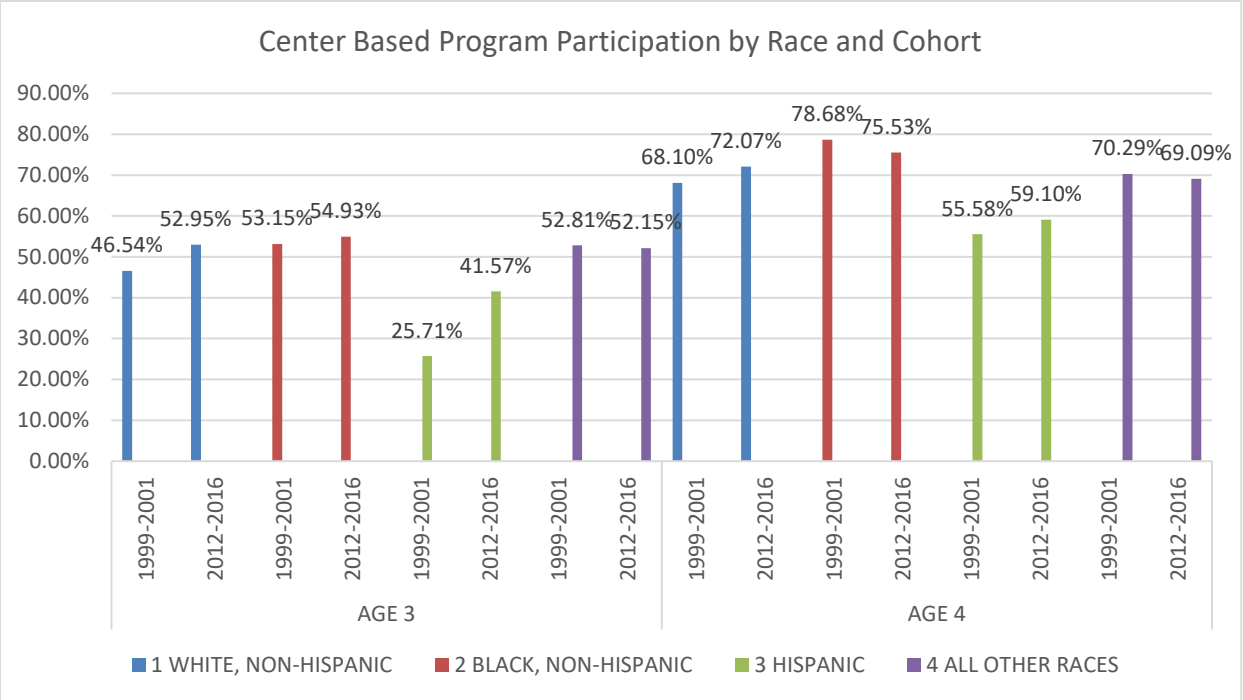

Figure 2. Center based program participation by age, time, and race/ethnicity based on weighted NHES 1999-2016 data

Table 2. Pearson Chi-square tests on proportion of center based program participation by race and time

	AGE 3			AGE 4		
	Chi-square	df	p	Chi-square	df	p
WHITE, NON-HISPANIC	24.941***	1	**<0.000**	11.974**	1	**0.001**
BLACK, NON-HISPANIC	0.033	1	0.856	0.967	1	0.326
HISPANIC	35.726***	1	**<0.000**	7.372**	1	**0.007**
ALL OTHER RACES	0.879	1	0.348	0.083	1	0.773

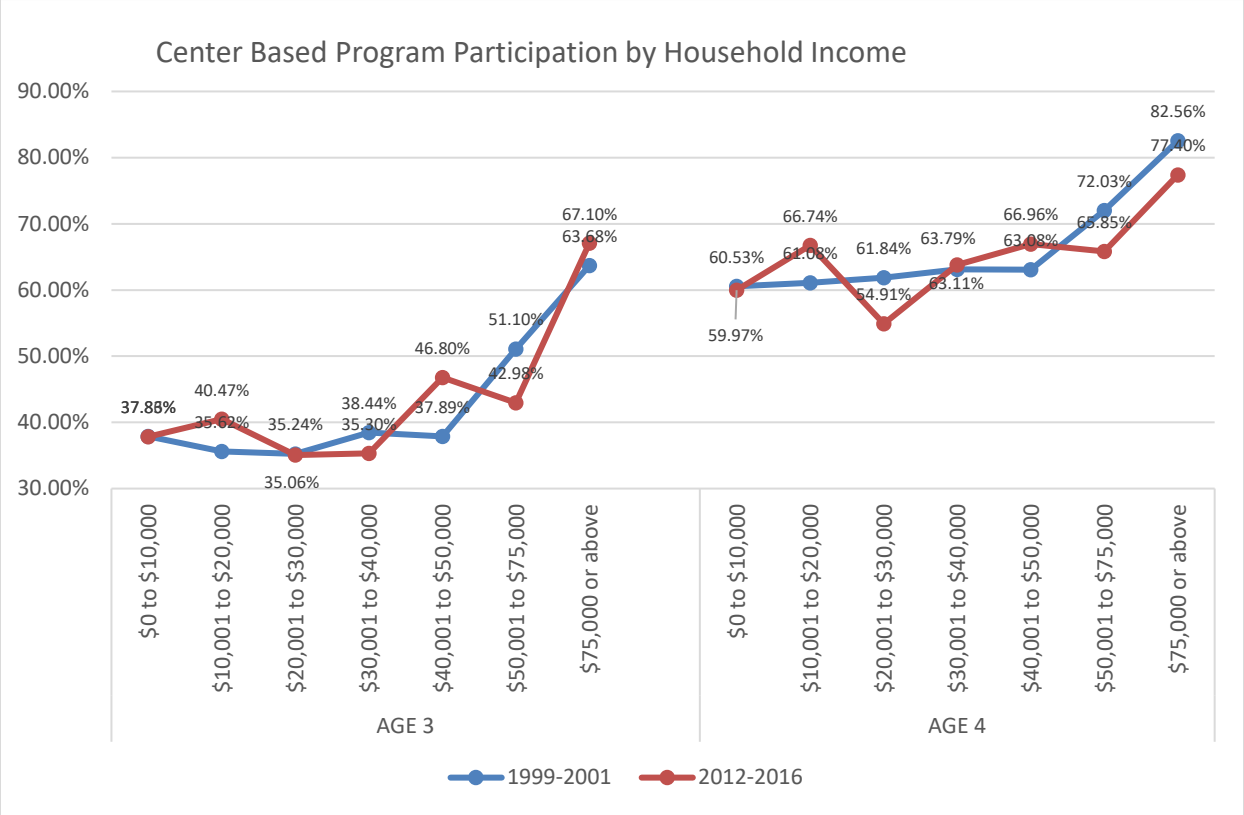

Figure 3. Center based program participation by age, time, and household income based on weighted NHES 1999-2016 data

Table 4. Logistic regression models of the changes of center based child care participation and fee-paying for children age 3-5 based on NHES 1999-2016 data.

	PARTICIPATION				ANY FEE	
	AGE 3		AGE 4		AGE 3&4	
	B	Exp(B)	B	Exp(B)	B	Exp(B)
TIME						
[2012&2016] vs. [1999&2001]	-0.223	0.800	0.062	1.063	-0.862**	0.422**
GENDER:						
[Boys] vs. [Girls]	-0.027	0.973	-0.098	0.907	-0.156*	0.856*
RACE/ETHNICITY:						
[Black]	0.385*	1.469*	0.342	1.408	-0.62***	0.538***
[Hispanic]	-0.208	0.812	-0.019	0.982	-1.214***	0.297***
[All Other]	0.023	1.023	-0.123	0.884	-0.267	0.766
CENSUS REGION:						
[Northeast]	0.538***	1.712***	0.947***	2.578***	0.036	1.037
[South]	0.359***	1.431***	0.436***	1.547***	-0.075	0.928
[Midwest]	0.170	1.185	0.308**	1.36**	-0.063	0.939
CHILD'S AGE	N/A	N/A	N/A	N/A	-0.571***	0.565***
PRNT/GUARD EDUCATION	0.399***	1.491***	0.304***	1.356***	0.431***	1.539***
HOUSEHOLD INCOME	0.136***	1.146***	0.094**	1.099**	0.309***	1.362***
INTERACTION						
TIME X [Black]	-0.319	0.727	-0.391	0.677	0.163	1.177
TIME X [Hispanic]	0.283	1.327	0.048	1.049	0.398*	1.489*
TIME X [All Other]	-0.238	0.788	-0.181	0.834	0.082	1.086
TIME X PRNT/GUARD EDUCATION	0.087	1.091	-0.013	0.987	-0.022	0.979
TIME X HOUSEHOLD INCOME	0.02	1.021	0.012	1.012	-0.017	0.983

2. *To what extent did whether parents paid any fees for the early care and education in centers of children ages 3 and 4 change from 2000 to 2016? What explains any changes?*

For both age groups, the proportion of families paying a fee for center-based programs decreased significantly from 1991&2001 to 2012&2016 (see Table 1). As displayed in Figure 4, at age 3 it dropped from 85% to 75%, and at age 4 it dropped from 77% to 66%. Disaggregated by ethnicity as shown in Figure 5 (with statistical tests presented in Table 3) the proportion paying fees at age 3 decreased significantly for White and Hispanic families, and the proportion paying a fee at age 4 decreased significantly for White and Black families.

Fee-paying declined for all ethnic (Figure 5) and income groups (Figure 6), though some ethnic groups and families in the middle income range benefitted most. The proportion paying any fees remains higher at age three than age four, especially for Hispanics. This is consistent with the emphasis of state-funded pre-K programs on 4-year-olds. The proportion of families paying a fee rises with income as would be expected because of means-tested public programs (see Figure 6). Some families in the highest income category may opt for private fee-paid programs even when free public programs are available.

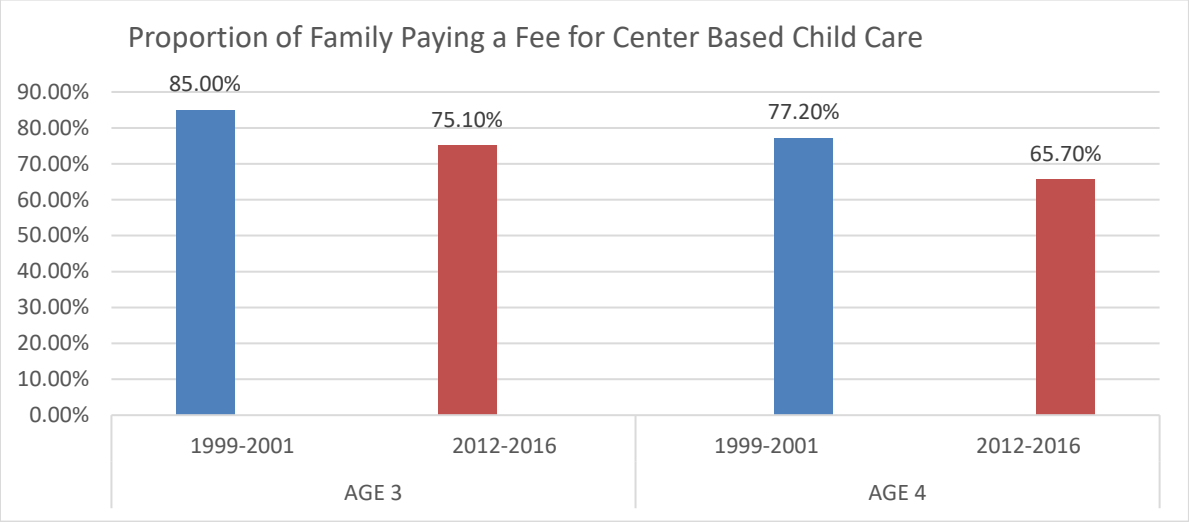

Figure 4. Percentage paying any fee for a child age 3 or 4 (weighted NHES 1999-2016).

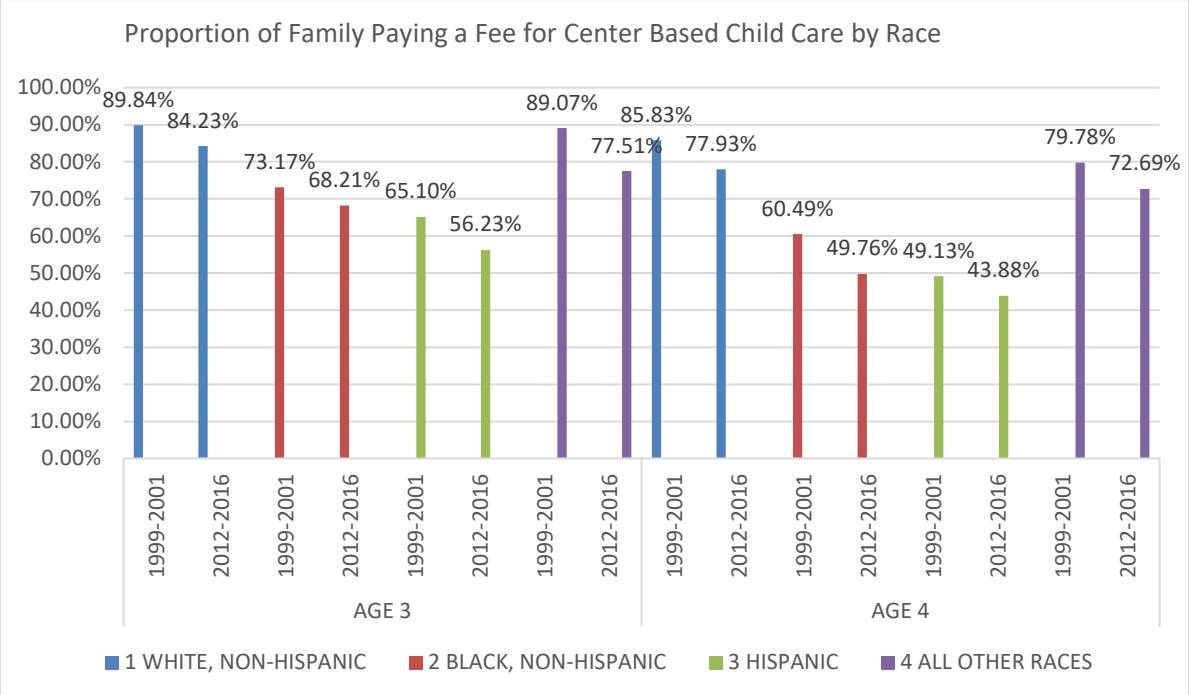

Figure 5. Proportion of families paying a fee by age, time, and race/ethnicity (weighted NHES 1999-2016).

Table 3. Pearson Chi-square tests on family paying a fee for center based child care

	AGE 3			AGE 4		
	Chi-square	df	p	Chi-square	df	p
WHITE, NON-HISPANIC	19.03	1	**<.000**	24.951	1	**<.000**
BLACK, NON-HISPANIC	2.589	1	0.108	5.508	1	**0.019**
HISPANIC	5.194	1	**0.023**	0.153	1	0.696
ALL OTHER RACES	1.712	1	0.191	1.969	1	0.161

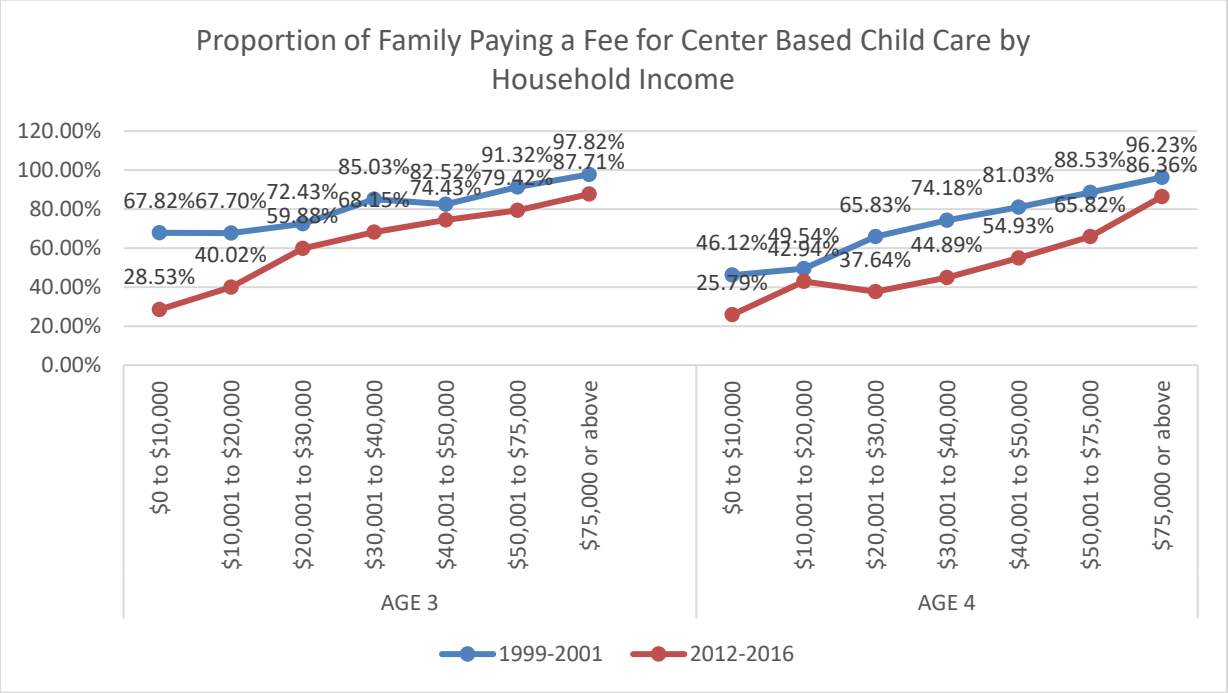

Figure 6. Proportion of family paying a fee for center based child care by household income based on weighted NHES 1999-2016 data

We investigated the determinants of whether or not families paid any fee using logistic regression modeling that controlled for child and family demographic variables, as well as region and time. As shown in Table 4, families were less likely to pay a fee for center-based early childhood programs in the latter period even after adjusting all the other background independent variables. Families are more likely to pay a fee at age three than age four, and families with higher levels of education and income are more likely to pay a fee. Families are less likely to pay a fee for boys than for girls (one possible contributor is that boys are more likely to be identified as having a disability qualifying them for free public services). Black and Hispanic

families are less likely to pay a fee than whites. In addition, the interaction term on Time X (Hispanic v. White) was significant, which indicated that the decrease in fee paying over time was greater for Hispanic families.

3. *How much do families spend per hour on center-based programs, how does this vary among families, and how has the amount paid changed over time?*

We calculated the fee paid per hour of center-based early care and education in NHES 1999, 2001, 2012, and 2016 for children who attended a program at least once a week. We included families who reported no fee in our analyses of average fees and change over time. Table 5 reports the average amount paid in 2016 dollars (adjusting earlier figures for inflation) and standard deviations (a measure of how much spending per hour varies among families). Mean spending per hour increased from 1999-2001 to 2012-2016 at both ages (see Figure 7). However, median spending per hour (indicating what was spent by families a the 50th percentile) fell at age four while rising at age three. This may reflect the increase in state funded pre-K which increased the percentage of parents paying no fee over a wide range of family income. Average spending per hour is higher at age three than age four in both time periods. The standard deviation roughly doubled between the two time periods indicating a very large increase in the variation in spending per hour. As we discuss below, this reflects both an increase in the percentage of children who participate for free and a large increase in hourly spending by families with the highest incomes.

Table 5. Average fee per hour paid for center-based programs

		Family Spending per Hour		
CHILD'S AGE	TIME	Mean	SD	Median
3	1999&2001	$3.29	$3.34	$2.87
	2012&2016	$4.70	$6.37	$3.30
4	1999&2001	$2.77	$3.06	$2.51
	2012&2016	$3.96	$6.42	$2.37

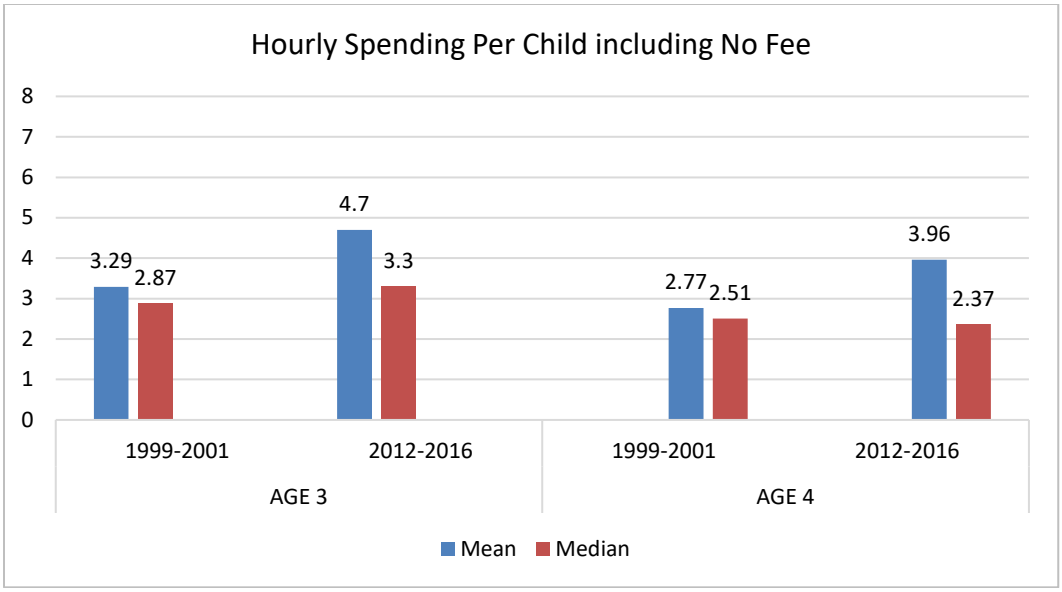

Figure 7. Hourly spending per child including no fee based on weighted NHES 1999-2016 data

As illustrated in Figure 8, the overall patterns described above apply to all major ethnic groups. Hourly spending increased over time, and spending per hour is higher at age three than age four (with one exception). It is particularly noteworthy that median spending per hour at age four fell to zero for Black and Hispanic families.

Figure 9 shows how hourly spending per child varies with household income at each age for each time period. The most notable time trend is the expansion of free services to families at lower income levels so that the typical (median) payment is zero for families with incomes below $30,000 per year for age three and $40,000 per year for age four. Indeed, even families reporting $40-50,000 per year had a median payment of just 40 cents per hour for center-based programs at age four. In contrast, median payments per hour changed little over time for the rest of the income distribution, while mean spending increased over time for those in the top four income categories for age three and top two income categories at age four. The increased mean spending per hour for the highest income families is quite large, about $2.00 an hour for children at age 4.

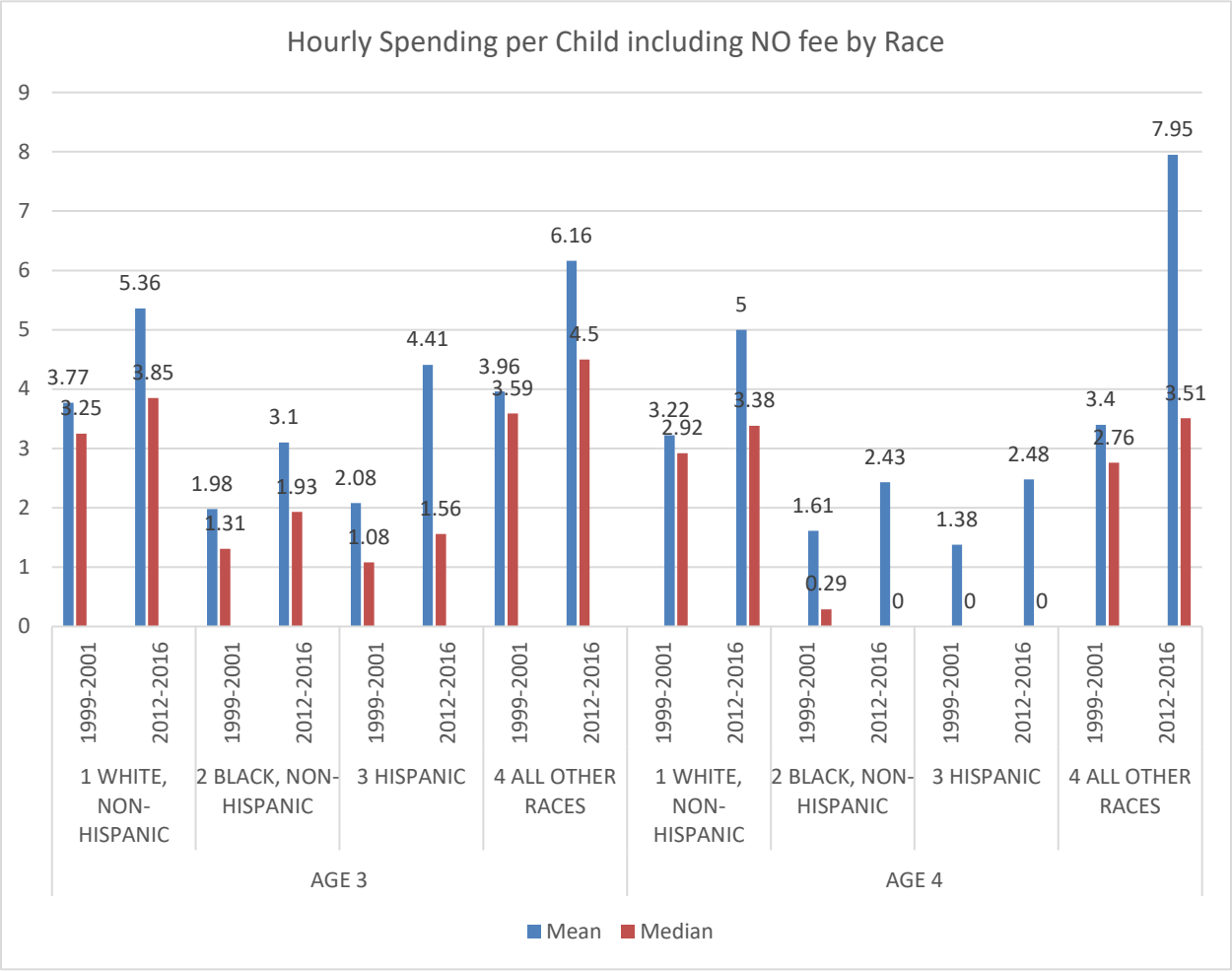

Figure 8. Hourly spending per child including no fee by age, time, and race/ethnicity based on weighted NHES 1999-2016 data

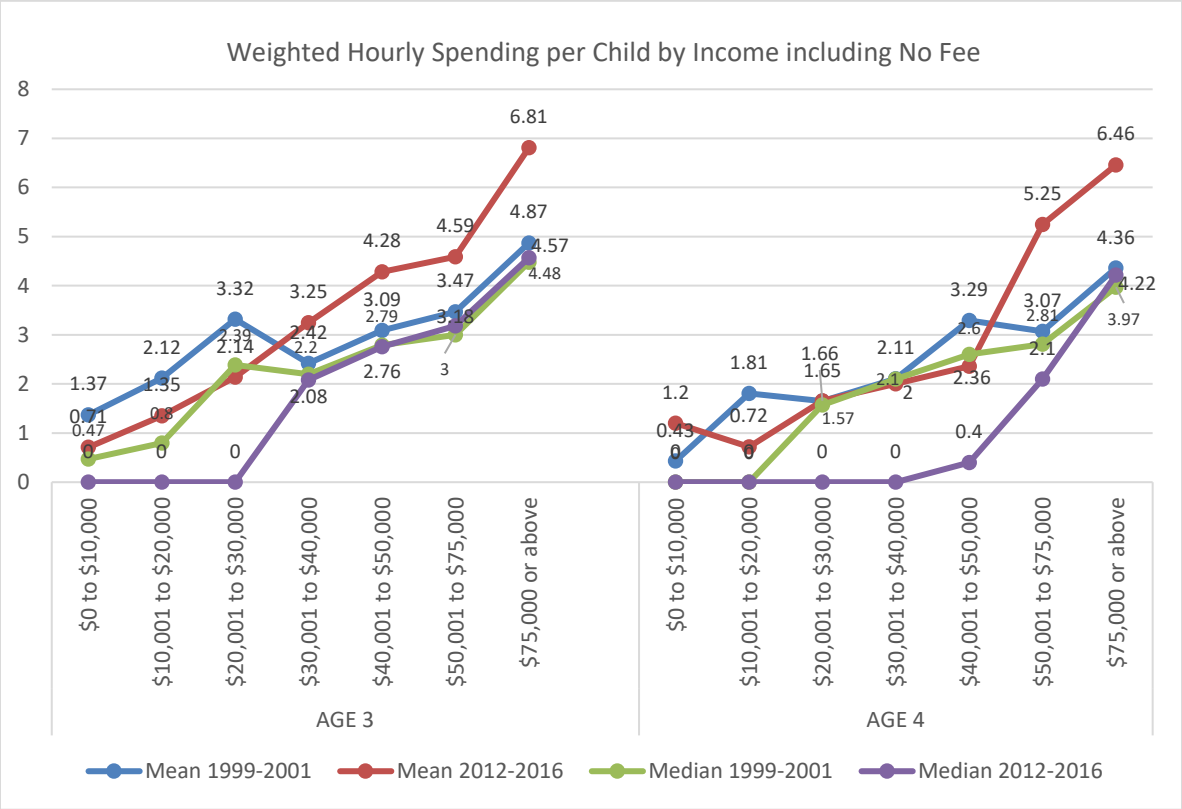

Figure 9. Hourly spending per child by income including no fee by age, time, and household income based on weighted NHES 1999-2016 data

We conducted a multivariate analysis to evaluate how family spending changed overtime controlling for demographic factors. As shown in Table 6, average spending per hour decreased over time controlling for family background, but this was mostly for lower income families, reflecting the increase in the percentage paying no fees. Spending per hour in both periods was higher at age 3, for higher income families, and for families with more educated parents (independent of income). Spending per hour was lower in the South and Midwest regions than in the West. Black and Hispanic families spent significantly less than White families. In addition, as reflected in the significant interaction term, the decrease in hourly spending over time was greater for Hispanic families than for White families. Also, hourly spending by higher income families and more educated parents increased relative to that for lower income families and less educated parents, which indicated an increased gap in spending per hour between low SES and higher SES families (keeping in mind that this reflects increased access to free public programs for those families).

Table 6. Maximum likelihood estimates for predicting the average family spending per child-hour at any center based child care based on NHES 1999-2016

	Beta	se
TIME	0.518	0.6022
[2012&2016] vs. [1999&2001]	-1.970***	0.4963
GENDER:		
[Boys] vs. [Girls]	0.031	0.1218
RACE/ETHNICITY:		
[Black] vs. [White]	-0.548*	0.2708
[Hispanic] vs. [White]	-0.945**	0.2706
[All Other] vs. [White]	0.330	0.3585
CENSUS REGION:		
[Northeast] vs. [West]	0.111	0.1912
[South] vs. [West]	-0.604***	0.17
[Midwest] vs. [West]	-0.765***	0.1933
CHILD'S AGE	-0.576***	0.1239
PRNT/GUARD EDUCATION	0.387***	0.0910
HOUSEHOLD INCOME	0.367***	0.0558
INTERACTION		
TIME X [Black vs. White]	0.284	0.407
TIME X [Hispanic vs. White]	0.786*	0.3584
TIME X [All Other vs. White]	0.532	0.4442
TIME X PRNT/GUARD EDUCATION	0.308*	0.1325
TIME X HOUSEHOLD INCOME	0.339***	0.0785

4. *How have the home learning environment and home learning activities changed from 1991 to 2016 for families with children aged 3 and 4?*

Home Learning Activity Index

We identified a set of family activity variables related to learning at home that were surveyed in NHES 1999, 2001, 2012, and 2016. To provide a uniform scale across the items and years we coded all of them as yes or no, based on whether a parent or someone else in the family completed an activity with the child in the past week. The items include: (1) reading to the child; (2) telling a story; (3) teaching letters, words, or numbers; (4) working on arts and crafts; and, (5) visiting a library. We created a home learning activity index by adding them up to summarize home learning activities that parents undertook in a week. All of the items tend to follow the same pattern so that results for individual items are quite similar.

As shown in Table 7 and Figure 10, for both age 3 and 4 groups, the average number of home learning activities a family engaged increased from 1999&2001 to 2012&2016. Hispanic families reported fewer home learning activities than other race/ethnicity groups, but this difference is quite small and decreased over time. Figure 12 shows the home learning activity index by household income levels. As shown there, the difference by income decreased over time, primarily because of increases in home learning activities at lower income levels.

Table 7. Descriptive statistics of the home learning activity index and minutes of reading per time

CHILD'S AGE	TIME	Home Learning Activity Index			Minutes of Reading per Time		
		Mean	SD	Valid N	Mean	SD	Valid N
3	1999&2001	3.81	1.02	2912	24	17	2814
	2012&2016	4.05	0.92	2662	18	11	2517
4	1999&2001	3.91	0.95	3034	23	16	2963
	2012&2016	4.15	0.88	2579	19	11	2456

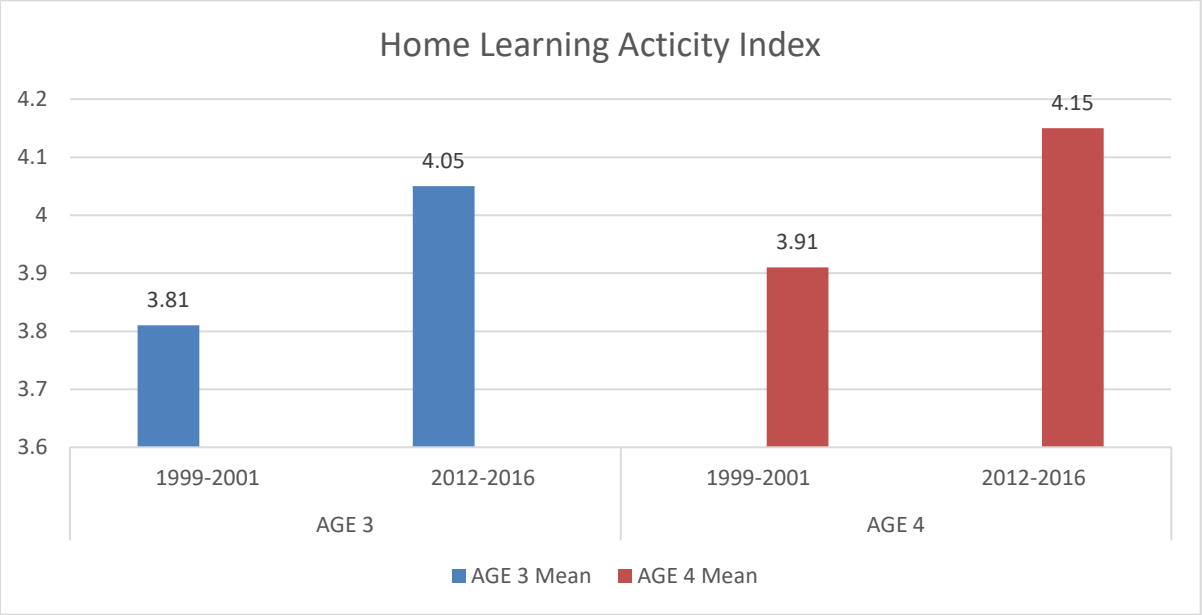

Figure 10. Means of the home learning activity index by age and time

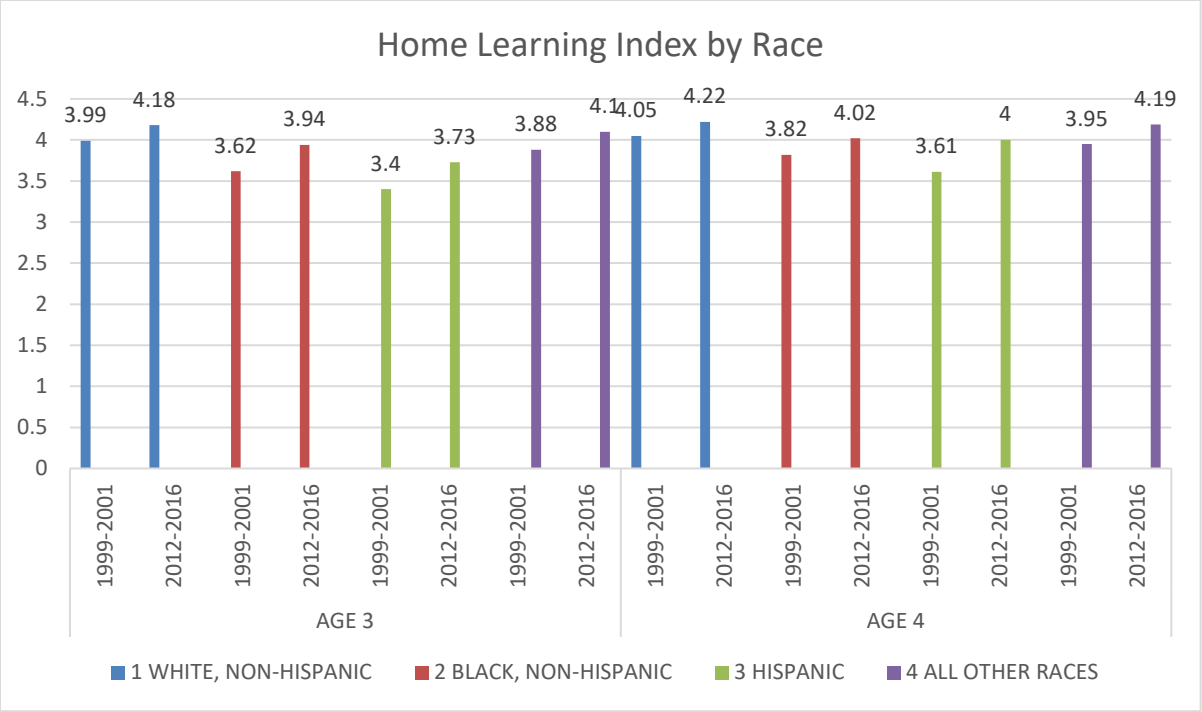

Figure 11. Means of the home learning activity index by age, time, and race/ethnicity

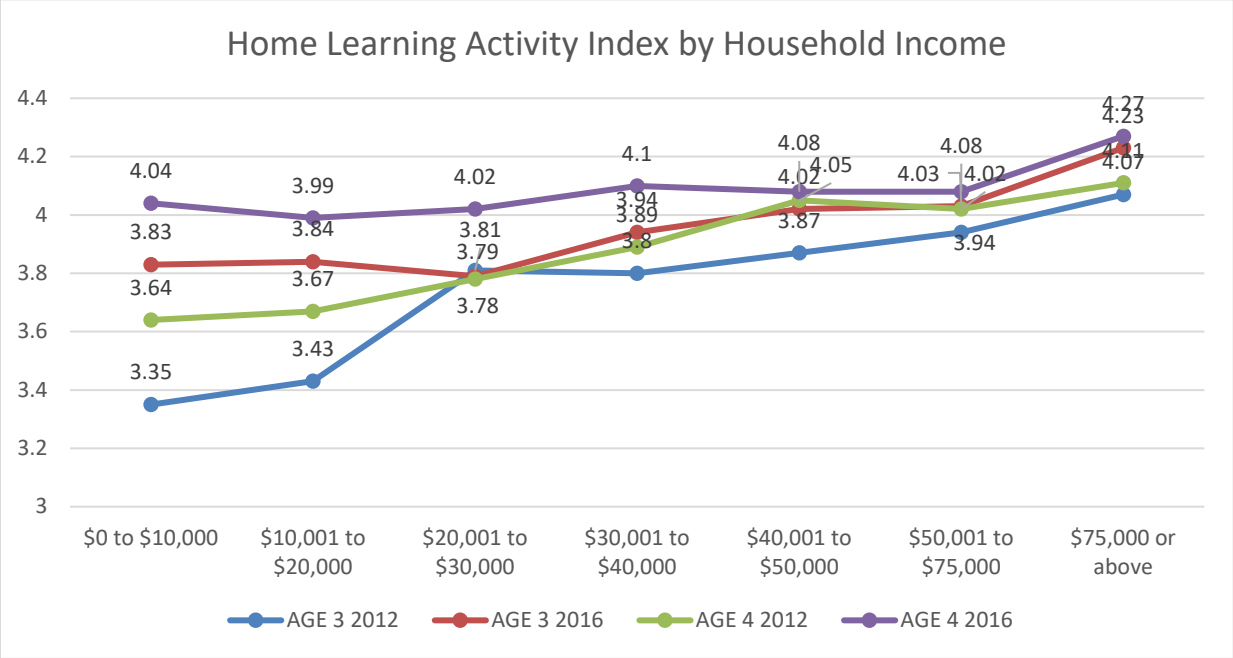

Figure 12. Means of the home learning activity index by age, time, and household income

Table 8 presents the results of a multivariate model looking at changes over time controlling for demographics. Almost all of the background variables have significant impacts on the home learning activity index, except for the household income. Home learning activities

are not related to income controlling for parent education, region and other characteristics. Parents engaged in more types of home learning actives in the latter time period, even controlling for background characteristics with their children than the parents in the initial time. Parents reported fewer home learning activities with boys than with girls. Both Black and Hispanic parents reported fewer home learning activities in a past week than White parents. Parents in Northeast reported more home learning activities than parents in the West, while parents in the South reported fewer home learning activities than parents in the West region. Parents in the Midwest and West regions reported similar levels of activity. Home learning activities were higher for children at age four than at three. In addition, hourly spending per child was also examined as an independent variable, and it was found to be positively associated with the home learning activity index. In other words, parents who spent more per hour on center-based programs also engaged in more home learning activities independent of income and education.

Table 8. Determinants of home learning activity index scores (maximum likelihood estimates with NHES 1999-2016 data).

	Beta	se
TIME		
[2012&2016] vs. [1999&2001]	0.186*	0.0869
GENDER:		
[Boys] vs. [Girls]	-0.099***	0.0213
RACE/ETHNICITY:		
[Black] vs. [White]	-0.115*	0.0474
[Hispanic] vs. [White]	-0.168***	0.0474
[All Other] vs. [White]	-0.026	0.0627
CENSUS REGION:		
[Northeast] vs. [West]	0.070*	0.0334
[South] vs. [West]	-0.076*	0.0297
[Midwest] vs. [West]	0.050	0.0338
CHILD'S AGE	0.086***	0.0217
PRNT/GUARD EDUCATION	0.093***	0.0159
HOUSEHOLD INCOME	0.016	0.0098
Hourly spending per child	0.005*	0.0018
INTERACTION		
TIME X [Black vs. White]	-0.097	0.0712
TIME X [Hispanic vs. White]	0.07	0.0627
TIME X [All Other vs. White]	0.019	0.0776
TIME X PRNT/GUARD EDUCATION	0.023	0.0232
TIME X HOUSEHOLD INCOME	-0.023	0.0138

Minutes of reading to child in a single reading session

We examined how long parents spent reading to young children, each time they read, as measured by minutes reading to a child in a single reading session. As shown in Table 7 and Figure 13, the average minute that parents read to their children each time decreased from 1999&2001 to 2012&2016. This trend was consistently found across all race/ethnicity groups (see Figure 14) and across all household income levels (see Figure 15).

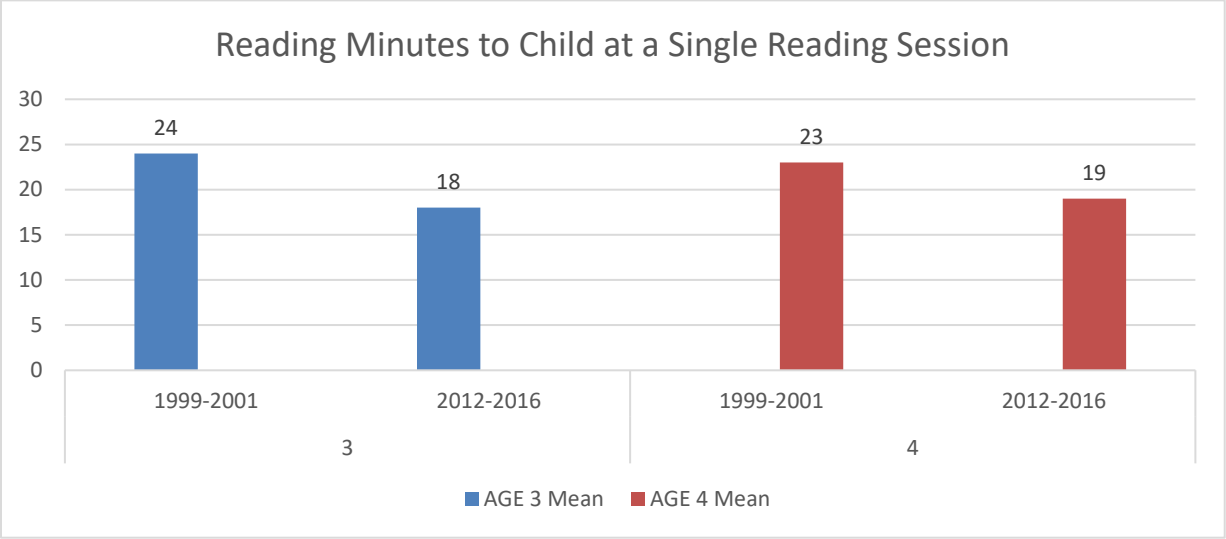

Figure 13. Minutes read to child at a single reading session in a past week by age and time

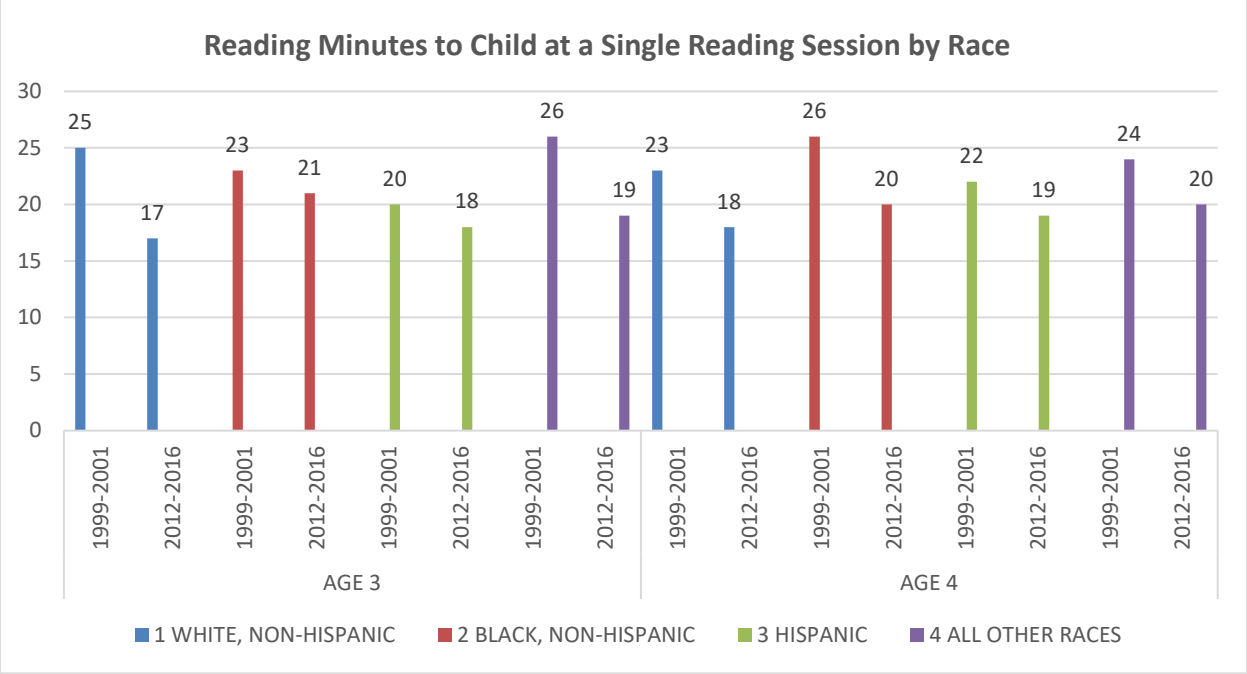

Figure 14. Minutes read to child each time in a past week by age, time, and race/ethnicity

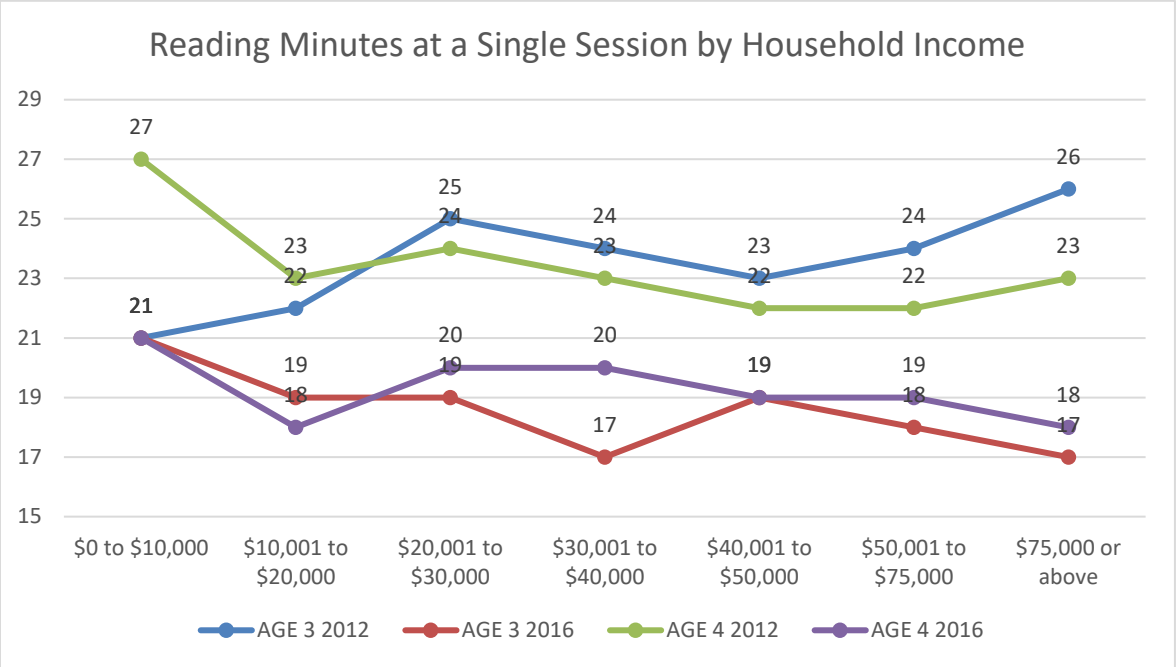

Figure 15. Minutes read to child each time in a past week by age, time, and household income

Table 9 presents the results of a multivariate analysis to examine changes over time and the independent effects of family demographic characteristics. No significant difference was found by ethnicity/race for reading duration. No significant association was found between reading duration and parents' education, and household income. Parents in the Northeast region read for a longer time than parents in the West in each reading session. Parents who spent more per hour on center-based programs reported longer durations of reading time. Other independent variables such as child's age and gender were not significant impactors on minutes of reading at a single session. The interaction term of parents' education level by time showed significant effects, so we visually examined the interaction in Figure 16. Parents with higher education levels spent more time in reading to their children in 1999&2001, but less time in reading to their children in 2012&2016.

Table 9. Maximum likelihood estimates for NHES 1999-2016 data predicting reading minutes per time.

	Beta	se
TIME		
[2012&2016] vs. [1999&2001]	-0.151	1.3476
GENDER:		
[Boys] vs. [Girls]	-0.089	0.3276
RACE/ETHNICITY:		
[Black] vs. [White]	1.374	0.7282
[Hispanic] vs. [White]	-1.309	0.7280
[All Other] vs. [White]	1.496	0.9617
CENSUS REGION:		
[Northeast] vs. [West]	1.488*	0.5129
[South] vs. [West]	0.449	0.4578
[Midwest] vs. [West]	0.251	0.52
CHILD'S AGE	-0.319	0.3336
PRNT/GUARD EDUCATION	0.425	0.2443
HOUSEHOLD INCOME	-0.187	0.1499
Hourly spending per child	0.111*	0.0277
INTERACTION		
TIME X [Black vs. White]	-0.571	1.1057
TIME X [Hispanic vs. White]	0.638	0.9706
TIME X [All Other vs. White]	-0.023	1.1957
TIME X PRNT/GUARD EDUCATION	-0.925*	0.3576
TIME X HOUSEHOLD INCOME	-0.264	0.2126

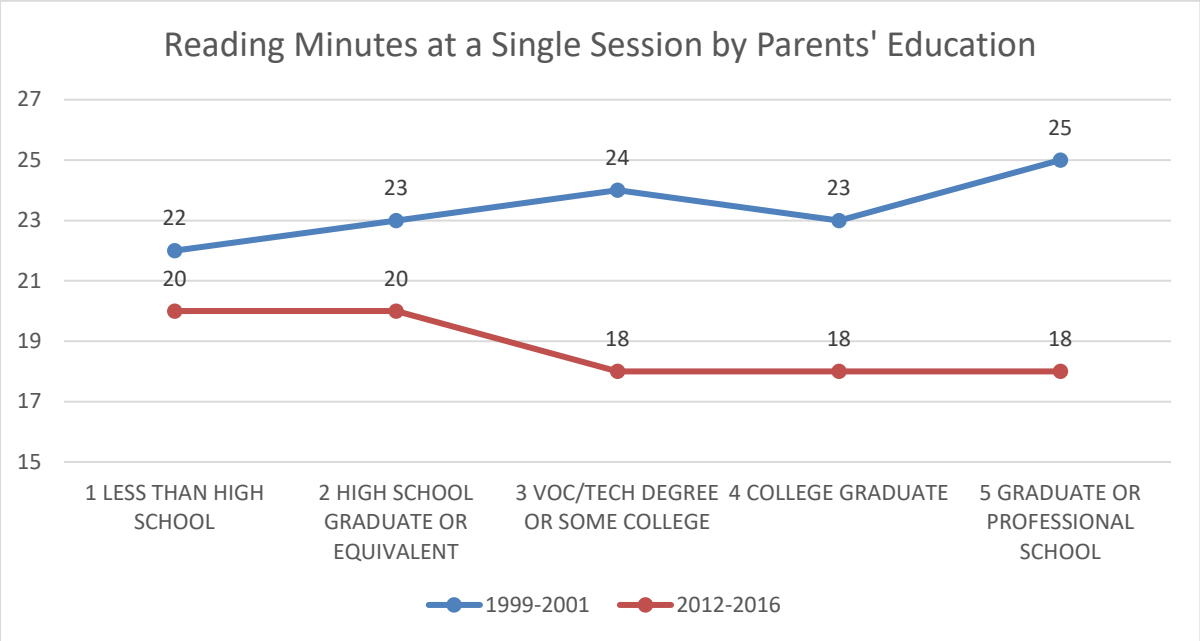

Figure 16. Minutes read to child each time in a past week by time and parents' education

Number of books in the home

The other home learning environment measure we examined is how many books of his/her own the child has, including those shared with brothers or sisters. This question was only available for 2012 and 2016 NHES, so we can only investigate change over time in this narrower window. As shown in Figure 17, the average number of books a child owned at home increased from 2012 to 2016; and this trend was consistently found across all race/ethnicity groups (see Figure 18). White families reported many more books than other race/ethnicity groups. Also, the number of books was positively associated with household income (see Figure 19).

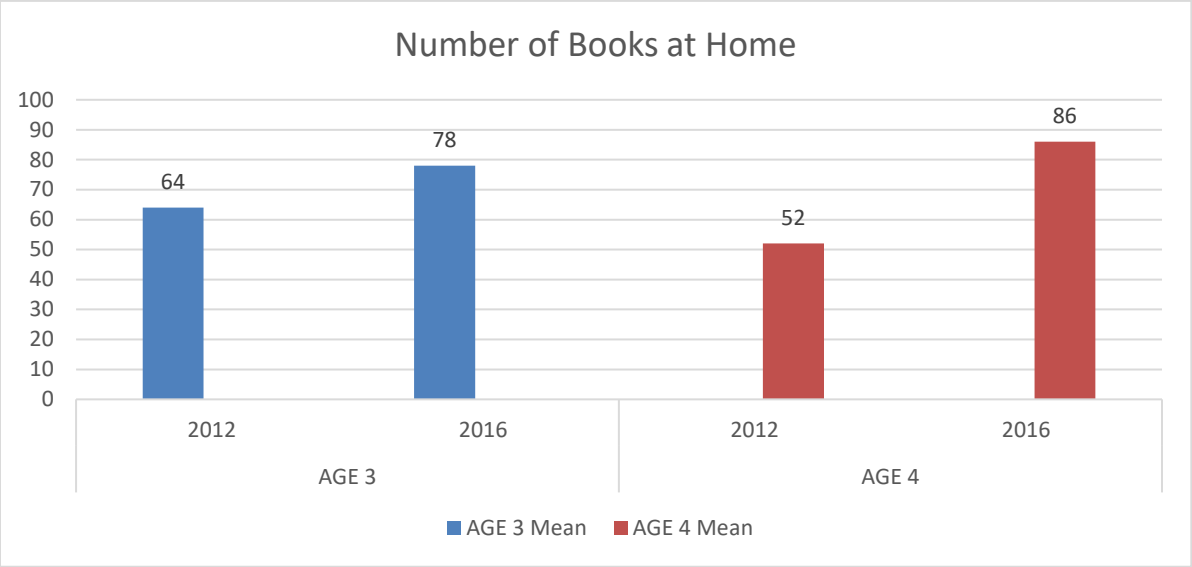

Figure 17. Number of books owned at home by age and time

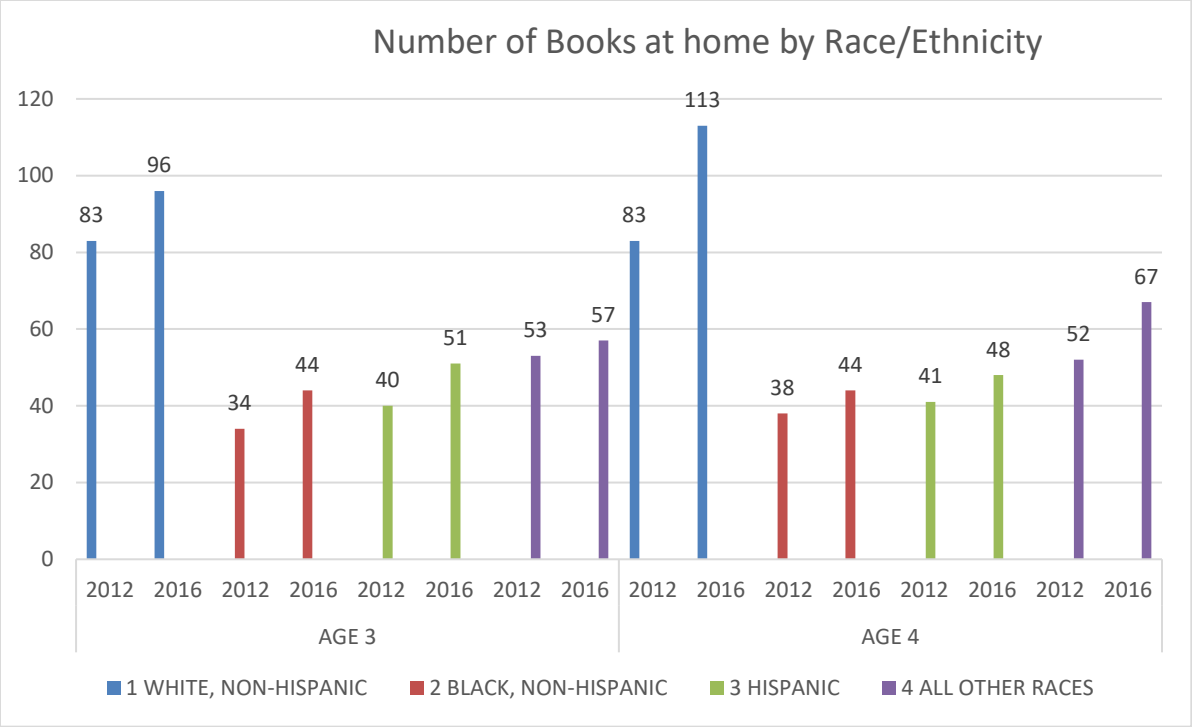

Figure 18. Number of books owned at home by age, time, and race

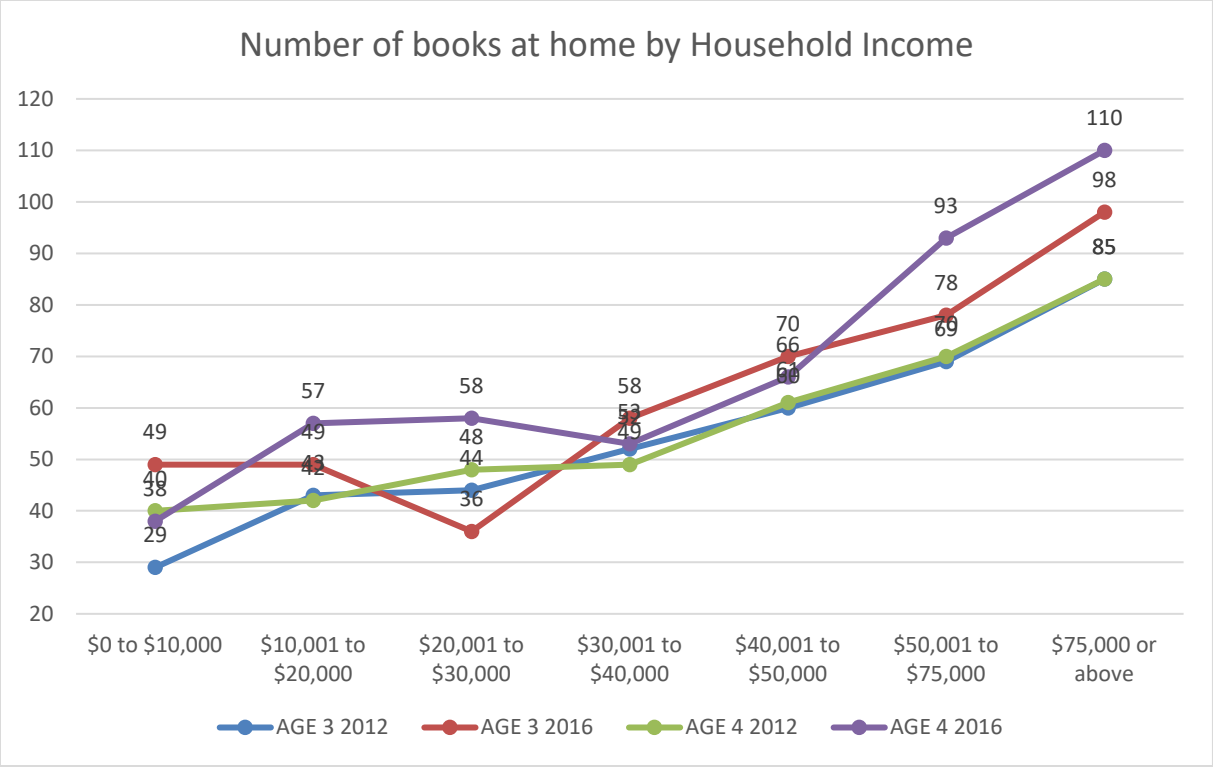

Figure 19. Number of books owned at home by age, time, and household income

Table 10 below presents the results of our multivariate analysis of the number of books owned at home. White families reported many more children's books at home than Black, Hispanic, and all other race/ethnicity families. Children in the South owned fewer books than those in the West. These results are controlling for child's age, parents 'education level, and household income level all of which were positively associated with the number of books at home. Holding all these factors constant there was no significant change over time, nor was the number of books related to hourly spending per child on center based child programs.

Table 10. Maximum likelihood estimates for NHES 2012-2016 data predicting number of books at home.

	Beta	se
TIME		
[2016] vs. [2012]	6.547	9.6492
GENDER:		
[Boys] vs. [Girls]	-2.102	2.2024
RACE/ETHNICITY:		
[Black] vs. [White]	-36.072***	4.9846
[Hispanic] vs. [White]	-27.407***	4.0382
[All Other] vs. [White]	-29.319***	4.5936
CENSUS REGION:		
[Northeast] vs. [West]	-3.680	3.4685
[South] vs. [West]	-11.082***	3.0586
[Midwest] vs. [West]	3.243	3.4514
CHILD'S AGE	4.672*	2.2227
PRNT/GUARD EDUCATION	10.497***	1.5886
HOUSEHOLD INCOME	3.442***	0.9160
Hourly spending per child	-0.158	0.1442
INTERACTION		
TIME X [Black vs. White]	-12.56	8.2313
TIME X [Hispanic vs. White]	-8.109	6.2803
TIME X [All Other vs. White]	-13.411	6.8745
TIME X PRNT/GUARD EDUCATION	3.32	2.5773
TIME X HOUSEHOLD INCOME	-0.211	1.4817

5. *Have there been changes in children's cognitive development (as reported by parents) from 1999 to 2016 for families with children aged 3 and 4?*

We created an index of child cognitive development based on five questions asked in the NHES 1999, 2001, 2012, and 2016 administrations. These questions asked if the child can: (1) identify the colors red, yellow, blue, and green by name; (2) recognize the letters of the alphabet; (3) count up to 5, 10, 20, 50, 100 or more; (4) write his/her first name, even if some of the letters are backwards; (5) read or pretend to read a book. As shown in Figure 20, the average cognitive development level increased from 1999&2001 to 2012&2016 for both age 3 and 4 groups. This trend was consistently found across all race/ethnicity groups (see Figure 21) and across all household income levels (see Figure 22).

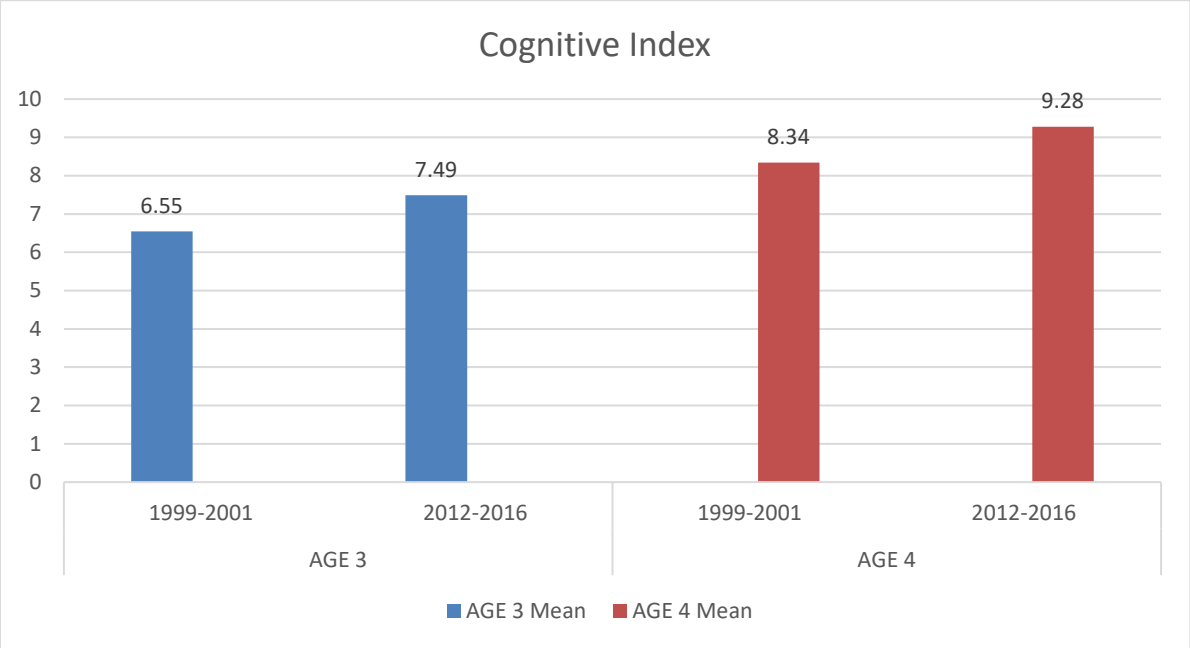

Figure 20. Average cognitive index for both times and age groups

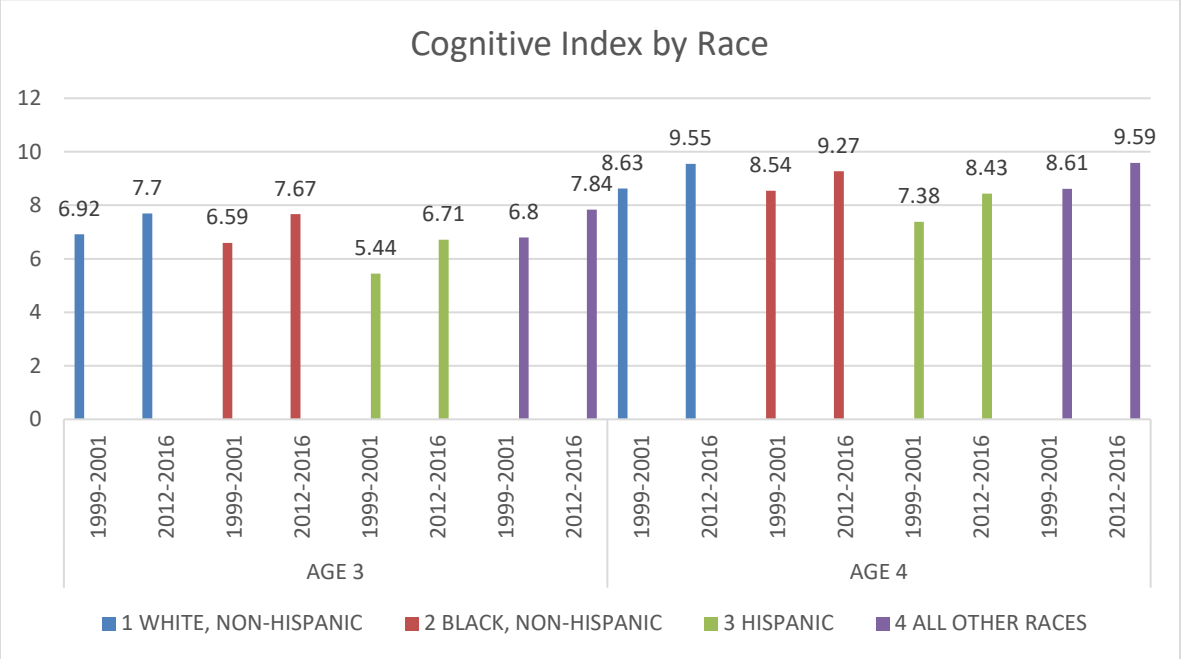

Figure 21. Average cognitive index by age, time, and race/ethnicity

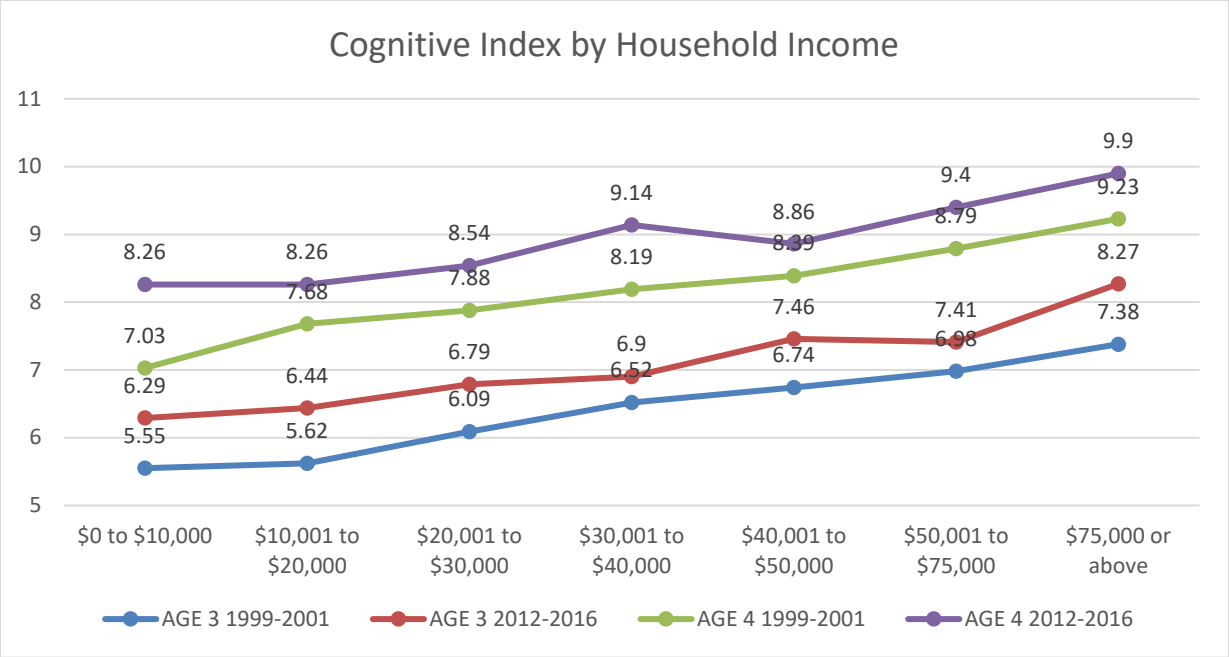

Figure 22. Average cognitive index by age, time, and household income

Table 11 presents the multivariate analysis results for the cognitive index. All independent variables we entered in the model showed significant main effects. Parents reported higher cognitive development levels for young children over time, even controlling for demographics, program participation, and home learning activities. Parents reported lower levels for boys than girls. Black children had higher index scores than White children and Hispanic children had lower scores, controlling for parental education and income, program participation, and the home learning activities index. Children in the Northeast and South generally had higher cognitive index scores than children in the West. Child's age was positively associated with the cognitive index as expected. Household income and parents/guardians' education level were both positively related to the index of children's cognitive development. In addition, children who participated center-based programs and had more reported home learning activities had higher index scores.

Table 11. Determinants of an index of parent report cognitive development for children ages 3&4 (maximum likelihood estimates for an index of skills surveyed in NHES 2012-2016).

	Beta	se
TIME		
[2012&2016] vs. [1999&2001]	0.404**	0.1353
GENDER:		
[Boys] vs. [Girls]	-0.334***	0.0358
RACE/ETHNICITY:		
[Black] vs. [White]	0.221***	0.0783
[Hispanic] vs. [White]	-0.484**	0.0678
[All Other] vs. [White]	0.045	0.1048
CENSUS REGION:		
[Northeast] vs. [West]	0.253***	0.0567
[South] vs. [West]	0.141**	0.0481
[Midwest] vs. [West]	-0.016	0.0550
CHILD'S AGE	1.578***	0.0367
PRNT/GUARD EDUCATION	0.275***	0.0251
HOUSEHOLD INCOME	0.135***	0.0154
Home Learning Activity Index	0.466***	0.0196
Center Based Child Care Participation [Yes] vs. [No]	0.792***	0.0394
INTERACTION		
TIME X [Black vs. White]	0.105	0.1232
TIME X [Hispanic vs. White]	0.167	0.0958
TIME X [All Other vs. White]	0.167	0.1323
TIME X PRNT/GUARD EDUCATION	0.009	0.0373
TIME X HOUSEHOLD INCOME	0.014	0.0221