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Relationship Between Diet and Learning Differences in Children

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INTRODUCTION

There is growing recognition that learning disabilities are associated with a variety of factors, including diet. Prior research showed that children in need of special education services eat less home prepared meals and more non-home-prepared meals, which can lead to obesity, inadequate diet, and lethargy. Additional research along with parental health education to promote healthy nutritional decisions and skills for preparing meals is necessary.

OBJECTIVE

To test the relationship between diet, measured by eating only home prepared meals (Y/N), and the need for special education services, in individuals less than 19 years of age, using the NHANES 2013-2014 weighted survey.

METHODS

Research Question:

Is there an association between eating home prepared meals versus non-home prepared meals and the need for special education services?

Data:

2013-2014 National Health and Nutrition Examination Survey (NHANES), conducted by the Centers for Disease Control and Prevention's (CDC).

Sampling:

the NHANES 2013-2014 sample is representative of all of the U.S. noninstitutionalized residents. A complex multistage sampling design was used to estimate the prevalence as well as provide information for many public health factors (Johnson et al., 2014). The sample was weighted for analyses; the final sample size is N=12,417 children ages 5-19.

Statistical analyses:

1) descriptive statistics to identify group differences;
2) bivariate analysis to test the association between home prepared meals and whether or not participants receive special education services;
3) a multivariate regression was used to test the relationship between eating only home cooked meals and receiving special education services while controlling for gender, race, grade level, and family income to poverty ratio.

RESULTS

Table 1: Respondents' Characteristics

	Total *N = 6096*	Only Home Prepared Meals *N = 1248*	Out of Home Prepared Meals *N =4848*	χ^2/ t	p
Special Education Services (%)	10.1	14.6	8.9	31.654	<.001
Male (%)	51.1	51.4	51.1	.057	.811
Race (%)				19.382	.001
White	52.8	48.0	54.1		
African-American	13.9	15.6	13.5		
Asian	4.8	5.7	4.6		
Hispanic	23.4	26.3	22.6		
Other/Multiracial	5.1	4.5	5.2		
Age (years)	12.01 (4.3)	11.2 (4.1)	12.2 (4.32)	8.15	<.001
Grade level				16.9	<.001
Kindergarten	9.5	10.4	9.3		
Elementary	40.1	44.4	38.9		
Middle	23.5	22.3	23.8		
High school	26.9	22.9	28.0		
Health Condition				71.56	<.001
Excellent	40.2	34.8	41.6		
Very Good	29.1	24.9	30.2		
Good	25.2	34.1	22.9		
Fair	4.9	5.6	4.7		
Poor	0.6	0.6	0.6		
Family Income /Poverty Ratio	2.39 (1.65)	1.77 (1.46)	2.54 (1.65)	15.46	<.001

- Crosstabulation analyses were conducted to test the associations between receiving special education services (DV) and home meals (IV); and between DV and gender, race, grade level and physical health condition. Diet was significantly different across race, grade level and health conditions; Caucasians, younger children, and people in great health were more likely to eat out-of-home meals than their counterparts.
- T-tests were used to compare the group who ate only home prepared meals to other children, in terms of their age and their family income to poverty ratio. Those who eat out of home meals are slightly older t(2006.3) = 8.15, p<.001) and are from families who are at least 2.54 times over the poverty line.
- A logistic regression analysis was conducted to predict the likelihood that a child receives special education services by their diet measured by eating solely home cooked meals or not, while adjusting for race, gender, grade level, and the ratio of family income to poverty.

- The **unadjusted model** reported a significant relationship between receiving special education services and diet (χ^2 (1) = 22.6, p <.001) indicating that children who eat only home cooked meals were *more* likely to receive special education services.
- The **multivariable model** shows that children who eat *only* home cooked meals were 46% *more* likely to receive special education services after adjusting for gender, race, grade level, health condition, and socioeconomic status. **Reference group:** respondents who ate at least one meal out of home, females, white, at kindergarten level, and from families 100% below poverty level.
- African-American and other/multiracial groups were not different from Caucasians in their likelihood to receive special education services; the Asian and the Hispanic groups were 3 times and respectively 1.3 times *less* likely than the Caucasians to receive special education services.
- As children age, they are more likely to receive special education services: there was no difference between elementary and kindergarten levels, but middle and high school children were 1.7 and respectively 2.8 times more likely to receive special education services.
- **Goodness-of-Fit:** The model explained 7.1% (Nagelkereke R^2) of the variation of receiving early intervention/special education services, and correctly classified 89.5% of cases.

Table 2: ORs (95% CI) for Special Education Services

	Unadjusted				Adjusted			
Variables	OR	Lower	Upper	p	OR	Lower	Upper	p
Home Meals	1.757	1.441	2.141	<.001	1.460	1.170	1.821	.001
Male					1.853	1.516	2.267	<.001
White (ref)								.001
African-American					.781	.583	1.047	.098
Asian					.344	.168	.706	.004
Hispanic					.750	.582	.967	.026
Other/Multiracial					1.397	.939	2.078	.099
Kindergarten (ref)								<.001
Elementary					.761	.568	1.019	.067
Middle					.599	.433	.830	.002
High School					.358	.246	.521	<.001
Family income/Poverty					.808	.755	.865	<.001
Constant	0.097			<.001	.207			<.001

Key Findings:

- Children who eat *only* home prepared meals are 75.7% *more* likely to receive early intervention/special education services than those who eat at least one meal per week outside the home.
- About 66% of those who receive special education services are males; but, there was no significant difference in the proportion of males and females who ate only home cooked meals.
- Caucasians, African Americans and people of other/multiracial race were more likely to receive special education services than Asian or Hispanic children.
- Ratio of family income to poverty was statistically significant indicating that with every unit increase in the family income ratio to poverty the likelihood to have an intellectual disability increased by 13.8%.

CONCLUSIONS

The results of statistical analyses support the premise that home prepared meals are associated with the need for special education services; these results are the exact opposite of what we expected.

Based on a large nationally representative sample of individuals less than 19 years of age, we found that those who eat only home prepared meals are in fact more likely to receive special education services. Although not all statistical tests were significant, the overall trend between diet and ID was apparent while controlling for demographics.

Gender differences in learning disabilities should be taken into consideration when developing special education programs; however, gender was not associated with the type of diet. This indicates that the association between diet and learning disability services may be a spurious effect that needs to be further explored. Females are just as likely to likely to eat home prepared meals as males, yet males are almost twice as likely to have a special education plan.

Race differences were also surprising; Asian and Hispanic children are less likely to receive special education services, while children in the Caucasian, African American and other/multiracial groups were not different in their likelihood to receive special education services.

Children in higher income families were less likely to receive special education services.

This study shows that the relationship between diet and the need for special education might be explained by other factors such as lifestyle and types of foods children eat, regardless of whether they are cooked in the home or out of home. Moreover, the variable measured the number of meals prepared at home, not the types of meals prepared at home. Further research is needed to test the types of prepared foods, the interaction effects between race and home cooked meals, and identify other confounding factors.

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