Adult Fat Intake Associated with the Presence of Children in Households: Findings from NHANES III

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Background: **Increasing prevalence of obesity and lifestyle related chronic disease is fundamentally tied to Americans' poor eating habits. Family environment, including the presence of children, may affect adults' diet behavior.**

Objective: **To compare dietary fat intake between adults with and without minor children in the home.**

Design: **Secondary analysis of cross-sectional survey data from the National Health and Nutrition Examination Survey III (NHANES III) public use dataset.**

Subjects: **Adults aged 17 to 65 years with and without children younger than 17 years old in the home.**

Outcome variables: **Intake of total fat, saturated fat, and kilocalories based on a 24-hour dietary recall and a selection of high-fat foods from a food frequency questionnaire.**

Methods: **Linear and logistic regression, accounting for the sample weights and complex survey design.**

Results: **The presence of children in the household was associated with significantly higher adjusted total fat consumption for adults (4.9 g/24 hours [95% CI: 0.8, 9.1]) and significantly higher adjusted saturated fat consumption (1.7 g/24 hours [0.3, 3.3]). Adults with children ate many high-fat foods more frequently than adults without children, including salty snacks, pizza, cheese, beef, ice cream, cakes/cookies, bacon/sausage/processed meats, and peanuts.**

Conclusions: **The presence of children in the home may affect adults' diets. Providers should emphasize dietary discretion for the entire family. (J Am Board Fam Med 2007;20:9–15.)**

The epidemic of obesity and lifestyle-related chronic diseases is fundamentally tied to Americans' poor eating habits. As measured in the National Health and Nutition Examination Survey (NHANES), the percentage of calories from fat decreased from 36% to 33% and saturated fat from 13% to 11% from 1971 to 2000. However, mean average total food intake increased over the same period, so that total fat and total saturated fat remained stable or increased.[1]

Overall, Americans remain above guidelines for consumption of saturated fat and total fat. The US Department of Agriculture (USDA) Dietary Guidelines for Americans 2005 recommends that adults maintain their total fat intake between 20% and 35% of caloric intake and saturated fat consumption below 10% of caloric intake (<20 g saturated fat for a 2000-kcal diet).[2] Cross-sectional data from NHANES III shows little variation in percentage of total and saturated fat by age except for somewhat lower percentage consumed among those >60 years of age. However, total caloric intake generally increases with age in childhood, peaking at 16 to 19 in boys and 12 to 15 in girls, then decreasing somewhat in later adulthood. Therefore, total fat consumption is highest among teenagers,[3,4] and intake of fast food (generally high in fat) is highest among children, teenagers and young adults[5]

Multiple factors influence individuals' food choices, including their home environments.

This article was externally peer reviewed.

Submitted 22 May 2006; revised 4 October 2006; accepted 16 October 2006.

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Funding: This research was supported by the Robert Wood Johnson Clinical Scholars Program and by the National Institute of Child Health and Human Development (T32 HD007534 to HHL).

Disclaimer: This material is the result of work supported with resources and the use of facilities at the Iowa Veterans Affairs Medical Center. The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

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Within families, there are correlations between the fat intake of spouses[6,7] and between adults' and children's diets.[8,9] This finding has been interpreted as parental influence on children's diets, but may also signify a reciprocal influence of children on adults. The impact of children on adults' dietary behavior is poorly understood. Previous investigators have postulated that having children in the household might increase fat intake,[10] but this hypothesis has not been tested in a national sample.

In this study, we examine diet patterns of 2 groups of adults, those with minor children in the household versus those without, using a nationally representative sample from NHANES III.

Methods

Study Sample

The NHANES III survey was conducted from 1988 to 1994. A sample representative of the US noninstitutionalized population aged 2 months and older was drawn from 89 sites using a complex, stratified, multistage probability cluster design.[11] Mexican Americans, African Americans, and adults >60 years of age were oversampled. Race/ethnicity was self-reported and categorized into non-Hispanic white, non-Hispanic black, Mexican American, and other.[12] Interviews took place in the respondents' homes and then respondents were invited to the Mobile Examination Centers (MEC) for further examination and data collection (including the 24-hour dietary recall). The overall weighted response rates were 82% for the interview and 73% for the MEC examination.[11,12]

From the NHANES public-use data set, we identified adults aged 17 to 65 years living in households with and without children. Families with children were identified through eligibility for questions that were only asked of families with children younger than 17 years of age relating to food insecurity. Families were coded by NHANES as yes, no, eligible but missing, and missing (defined as not eligible ie, not having children under 17). This allowed us to identify families with children less than 17 years old but did not allow for further information to be collected about the children (ie, age, sex, and number of children were not available). Analysis was limited to the second phase of NHANES III, for the years 1991 to 1994, as the questions used to identify adults with children were not part of the questionnaire in phase 1 (1988 to 1990).

After examining the distribution of kilocalories in our sample, we excluded outliers in the top and bottom 1% for total kilocalories per 24 hours based on the 24-hour dietary recall (<524 kcal, >5889 kcal; 135 observations) to create our final analytic sample. We excluded these extreme outliers based on the assumption that these kilocalorie values were unlikely to represent the participants' usual daily intake.

Outcome Measures

The principal outcome variables were total fat intake and total saturated fat intake (in grams), based on a 24-hour dietary recall. The secondary outcome was total kilocalorie consumption, also based on 24-hour dietary recall.

Given our findings regarding total fat intake, we also examined intake frequencies of individual foods reported by NHANES respondents. Analysis of individual food frequencies was based on the food frequency questionnaire[13] administered at home to all adults in the survey. Dependent variables included the number of times a particular food was consumed per month. In consultation with a nutritionist, high fat foods were chosen from among 60 available food frequencies to correspond to those identified by the USDA guidelines[2] as major sources of saturated fat in the American diet and other types of contrasting fats identified by the investigators. Specific high fat food groups analyzed were: ice cream, ice milk and milk shakes; salty snacks; cheese; pizza, calzones and lasagna; cheese dishes; bacon, sausage and luncheon meats; beef; chicken and turkey; eggs; cakes, cookies, brownies, pies, donuts and pastries; chocolate candy and fudge; margarine; butter; and mayonnaise, oil and vinegar, and salad dressings.

Independent Variables

The independent variable of chief interest was the presence or absence of one or more children in the home. Other independent variables included respondents' education, race/ethnicity, age, presence of a spouse or spouse equivalent in the home, poverty-income ratio, gender, foreign-born status, and body mass index (BMI). Simple imputation was used to impute missing values of poverty-income ratio based on a regression using race, age, sex, foreign born status, education, family size, and another separate income variable (491 observations imputed, 7.4% of sample). This method is appro-

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priate because the imputed values comprised less than 10% of the sample. Regressions were also analyzed with and without imputed values and with and without income variables, and there were no significant differences in conclusions, so analyses with imputation are presented.

Analyses of 24-hour Dietary Consumption Patterns

STATA 8.0 was used for all analyses (Stata Corp., College Station, TX). Commands used Taylor linearization for the variance estimation to account for the complex survey design using NHANES-assigned weights, population sampling units, and strata. All results presented are based on analyses with sample weights.

We used linear regression for all analyses of the principal and secondary outcomes, using log transformation to normalize the distributions. Independent variables described above that were found to be associated with total fat intake in bivariate analyses were included in all models; adult BMI and presence of spouse were not associated with fat intake. The Duan smearing technique for weighted, log-transformed data was used to obtain adjusted mean estimates.[14] Bootstrapping was used to estimate confidence intervals.

Analyses of Individual Food Frequencies

Logistic regression was used for food frequency analysis. Depending on the distribution of food frequencies for each food item, we dichotomized results as eating the food either more than once a week or daily and above versus those eating the food less frequently. For consistency we used the same independent variables as for the analyses of fat intake.

Sensitivity Analyses

Regressions for primary outcomes analyses were repeated for a subpopulation age 22 to 65 (excluding the 17 to 21 year olds). In several additional sensitivity analyses, we added 24-hour total kilocalorie consumption as a control variable. We could not control for number of children in the home. Because African Americans, Mexican Americans, and some adults of foreign birth typically have higher birth rates than non-Hispanic whites,[15] we also modeled interaction terms for race/ethnicity and child, and for foreign-born status and child. In addition, gender and child interactions were explored. None of these interaction terms were statistically significant, so all were excluded from the final model. Age was examined both as a continous variable (presented) and explored in secondary analyses as a categorical variable.

This study was approved as exempt by the University of Michigan Medical School Institutional Review Board.

Results

Sample Characteristics

The analytic sample included 6660 respondents; 48% of adult respondents reported one or more children in the household. African American and Mexican American households were disproportionately more likely to have children ($P < .001$) (Table 1).

Patterns of Total Fat, Saturated Fat, and Calorie Consumption

Overall, presence of children in the household was associated with significantly higher adjusted total fat consumption for adults: 4.9 g/24 hours (95% confidence interval [95% CI]: 0.8, 9.1) (Table 2). The presence of children in the household was also associated with significantly higher adjusted saturated fat consumption: 1.7 g/24 hours (0.3, 3.3) (Table 2). Interaction terms were not significant, suggesting no differential effect of children by race, foreign-born status, or gender of the adult. We also evaluated whether the effect of having children on fat consumption was modified by adult age group but found no statistically significant difference.

With inclusion of total kilocalories in the model, the associations of children with adult total fat intake and saturated fat intake showed the same trend but were no longer statistically significant ($P = .07$ and $P = .12$, respectively).

Adults aged 17 to 21 years are those most likely to represent a sibling rather than a parent or guardian. In sensitivity analyses for fat consumption excluding adults aged 17 to 21 years, the differences in fat consumption were even greater: 5.5 g of total fat ($P < .05$) and 2.0 g of saturated fat ($P = .01$).

Analysis of total caloric consumption showed no significant association with presence of children in the household (Table 2).

Patterns of Consumptions for Individual Foods

Food frequency data revealed that adults with children in the home have higher odds of drinking any

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Table 1. Sample Characteristics*

	Children (n = 3714)	No Children (n = 2946)	Total Sample (n = 6660)†
Age (mean)‡	41.0 years	35.1 years	38.1 years
Female§	54%	50%	52%
Race/ethnicity‡			
Caucasian	66%	78%	73%
African American	14%	10%	12%
Mexican American	9%	4%	6%
Other race	11%	8%	10%
Education			
Eighth grade or less	9%	7%	8%
Some high school	16%	13%	14%
High school graduate or some college	55%	57%	34%
College graduate or more	20%	23%	44%
Foreign born	17%	14%	15%
Poverty income ratio‡			
Below poverty level	18%	10%	14%
At poverty to 2× poverty level	23%	17%	20%
2× poverty level and up	59%	73%	66%

* All information except as noted is given in percentages using sample weights.
† n = 6163 for poverty ratios.
‡ $P \leq .001$ for comparison of proportion with and without children.
§ $P < .05$ for comparison of proportion with and without children.

milk versus no milk (odds ratio 1.28 (1.03, 1.59)) but do not have higher odds of frequently drinking milk (daily or greater) vs. some or none. They were not significantly more likely to drink whole milk. Adults with children had significantly higher odds of frequently eating pizza, cheese, beef, salty snacks, cakes and cookies, ice cream, bacon/sausage/processed meats and peanuts (Table 3).

Discussion

This study indicates, in a nationally representative sample, that the presence of children in the home is associated with higher total fat and saturated fat intake among adults. To put these differences in perspective, the approximately 2-g difference in saturated fat intake is the equivalent of one additional standard slice of pepperoni pizza every day, or almost one additional pizza per week.[16] This finding is consistent with a preliminary analysis by Emmons et al of a predominantly white sample (5253) of manufacturing employees[10] (also Emmons, personal communication, 2005). The results differ somewhat from a small study in one Australian community (405 subjects), which found higher caloric consumption among women with children versus women without, but no significant difference in fat consumption.[17]

The association of children with total fat consumption in the NHANES sample was attenuated by controlling for total caloric consumption. This

Table 2. 24-Hour Adult Fat and Calorie Intake for Households with versus without Children*

	With Children in Household (95% CI)	Without Children (95% CI)	Difference (95% CI)†
Adult total fat intake (g/24 hours)	91.4 (88.4, 94.4)	86.5 (83.8, 89.2)	4.9 (0.8, 9.0)
Adult saturated fat intake (g/24 hours)	29.9 (28.8, 31.0)	28.2 (27.2, 29.2)	1.7 (0.3, 3.1)
Adult calorie intake (kcal/24 hours)	2332 (2275, 2389)	2282 (2229, 2337)	50 (−26, 125)

* Adjusted for race/ethnicity, sex, age, education, foreign birth, and poverty income ratio.
† Positive differences indicate that adults with children consumed more fat and calories than adults without children; negative differences indicate that adults with children consumed less than adults without children.

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Table 3. Odds of Eating High-Fat Foods Frequently for Adults with Children in the Home versus Those without Children in the Home*

	Adjusted Odd Ratios of Eating the Food More Than Once a Week or Once a Day or More (95% CI)
Cheese, all types (day)†	1.39 (1.09, 1.79)
Pizza, calzone, lasagna (week)	1.37 (1.10, 1.71)
Cheese dishes (week)	1.50 (1.10, 2.04)
Beef (week)	1.65 (1.27, 2.13)
Milk (day)	1.02 (0.82, 1.26)
Ice cream, ice milk, milkshakes (week)	1.37 (1.11, 1.69)
Cookies, cakes, brownies, pies, doughnuts and pastries (week)	1.27 (1.09, 1.49)
Butter (day)	1.44 (0.89, 2.35)
Oil and vinegar, mayonnaise and salad dressings (day)	1.17 (0.91, 1.5)
Chicken and turkey (week)	1.25 (0.98, 1.60)
Margarine (day)	1.30 (0.98, 1.72)
Bacon/sausage/processed meats (week)	1.36 (1.14, 1.62)
Salty snacks (day)	1.69 (1.27, 2.26)
Eggs (week)	1.08 (0.89, 1.31)
Other fats	
Peanuts (week)	1.24 (1.03, 1.49)
Chocolate candy and fudge (week)	1.08 (0.88, 1.34)

* Foods are presented in order of most common sources of saturated fat in the American diet.
† Significant findings are in boldface type.

suggests that part of the association of children with fat consumption is mediated though overall greater caloric consumption, in addition to food choices with higher fat content. Consistent with this view, analysis of total caloric consumption for 24 hours found slightly higher (but not significantly higher) caloric intake for adults with children in the home.

Data from a limited food frequency questionnaire enabled us to examine some high-fat food choices. Adults with children ate many high-fat foods more frequently than adults without children in the home, including salty snacks, pizza, cheese, beef, ice cream, cakes and cookies, bacon/sausage/processed meats and peanuts. In particular, adults with children in the home had more frequent cheese intake along with increased fat intake. This pattern is consistent with previous research showing increased fat consumption among people eating the most cheese compared with no difference associated with overall dairy consumption.[18] Other analyses have indicated that dairy foods contribute 19% of fat and 32% of saturated fat to the American diet.[18]

Potential explanations for the above findings are related to time pressures and constraints among adults with children, children's preferences for high fat, high sugar foods[19] and parents' perceptions of what children are likely to eat. In response to time constraints, adults may purchase more restaurant, ready-to-eat, or snack foods, all which are likely to be higher in fat content. Parents may intentionally choose some higher-fat foods for their children such as non-skim milk products. Parents may also purchase foods they expect their children will eat, such as cheese. Although not specifically purchased for the adult, we hypothesize that adults will be more likely to consume these foods if present in the household, compared with adults without children who may not purchase these items as frequently.

Salty snacks, pizza, beef (in the form of hamburgers), ice cream, and cakes and cookies all represent convenience foods purchased for near-term consumption. Therefore, their higher intake among adults with children is consistent with the above time hypothesis. Why chocolate, a similar snack food, did not also show a difference is unclear. In addition, consumer studies have shown that "parents are 2 to 3 times more likely to name their child, not themselves, as the family expert for selection of fast food, snack foods, restaurants and new breakfast cereals"[20,21] and that almost "50% of parents believe that meal and grocery choices and restaurant selection are influenced by their chil-

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dren."[21] Parents with children are likely to be susceptible in their food choices to both the marketing of convenience in food choices as well as indirectly to the marketing directed at their children.

An alternative explanation for our finding is that adults with and without children differ in some way which was not measured but which also affects their diet choices. Even if this is the case, providers still may need to approach dietary counseling differently for adults with and without children in the household.

Limitations

This study's chief limitation is the inability to account for child variables such as the child's relationship to the adult and child age. The presence of children in the home may have a stronger effect on parents who are directly responsible for feeding their children. Thus, this limitation would be expected to attenuate the strength of the association as this analysis includes nonparental adults living in households with children. If we could isolate parents, we might find a stronger association.

The effect may also be different depending on the age of the child. In particular, older children may be more independent in their eating patterns and thus have less influence on adults' intake. In addition, it is possible that new parents may try to improve the health of their diets, as has been observed in one study regarding fruits and vegetable consumption, but such improvements may prove difficult to sustain.[22] This analysis is also limited by the availability of only one 24-hour dietary recall per individual and by the dataset's cross-sectional nature. Food frequency analysis was limited to questions available in the NHANES dataset and some groupings included options with variable fat content. Thus these findings must be interpreted with some caution.

An additional limitation, in terms of implications, is that the role of dietary fat in cardiovascular disease prevention for older women has recently come into question.[23] Nevertheless, the influence of dietary fat and saturated fat on younger adults' weight status and cardiovascular health remains a major concern of physicians and public health officials alike.

Conclusion

In response to these findings, health care providers should consider the potential influence of children in the home on adults' dietary behaviors. Counseling on dietary change should be aimed at both adults and children in the home. Providers should emphasize that children should also be eating healthy foods and that bringing less healthy foods into the home for the children may also have a negative impact on the adult's diet. Visits may include discussion of how to improve a family's diet, such as identifying healthier options available either as prepared foods or from restaurants and perhaps providing suggestions for quick, healthy recipes. Discussions should also include strategies for influencing and incorporating children's food preferences into a healthy diet.

In addition, parents should be encouraged to expose their children to healthier foods and reminded that the American Association of Pediatrics and American Heart Association recommend that children change to lower fat milk after the age of 2.[24] Cheese products, beef, snack food, and pizza–sources of additional fat intake for adults with children in the home in this national study–can be targeted for better dietary control.

In addition, these findings suggest that food advertising aimed at children may influence not only the child's diet but also indirectly affect parents' diets. Health care providers have the potential to improve adults' dietary behaviors and influence overall family health by acknowledging and addressing the reciprocal influences of adults' and children's dietary behaviors.

We acknowledge Amelia McCoy, MS RD, for help with confirming and identifying high-fat food choices within the food frequency questionnaire.

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