


# Dietary Behaviors and Obesity of Children From Low-Income Households by Gender of Caregiver and Child

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## Abstract

**Purpose:** To investigate the empirical support for the Supplemental Nutrition Assistance Program-Education's (SNAP-Ed) focus on mothers versus fathers by examining children's risk and protective behaviors for obesity, and obesity status, by gender of primary caregiver and by caregiver-by-child gender dyads.

**Approach:** Cross-sectional survey.

**Setting:** Random sample of SNAP-Ed eligible households ( $\leq$  185% of the federal poverty level) across California.

**Participants:** 2,242 children and their caregivers (17.8% male): the adult who prepares the meals or buys the food for the children.

**Measures:** Cups of fruits and vegetables, water, sugar-sweetened beverages; teaspoons of added sugars; kilocalories; and food-only energy density, assessed through 24-hour dietary recall interviews. Dichotomous outcome was childhood obesity. Covariates were children's race/ethnicity and age, and caregivers' obesity status.

**Results:** Only one outcome was related to caregiver gender: male versus female caregivers' children consumed fewer kilocalories ( $P = 0.053$ ). Caregiver-by-child gender analyses revealed female caregivers' sons consumed more kilocalories overall ( $P_s < 0.02$ ), and added sugars than female caregivers' daughters ( $P = 0.001$ ) and male caregivers' sons ( $P = 0.018$ ). Female caregivers' daughters versus sons reported diets lower in food-only energy density ( $P = 0.004$ ) and were less likely to be obese (23.7% versus 28.7%; aOR = 0.78,  $P = 0.035$ ).

**Conclusion:** Our findings suggest that SNAP-Ed's focus on mothers rather than fathers is justified, but more effective childhood nutrition education and obesity prevention efforts should target families with female caregivers of male children.

## Keywords

SNAP-Ed, caregiver gender, children's eating behaviors, ASA24, childhood obesity

## Purpose

The United States Department of Agriculture's (USDA) Supplemental Nutrition Assistance Program—Education (SNAP-Ed) is the nation's largest nutrition education and obesity prevention program.<sup>1</sup> In 2017, 33.1% of California's population (approximately 12.8 million persons), were eligible for SNAP-Ed,<sup>2</sup> defined as living in a household with an income  $\leq$  185% of the federal poverty level.

The guiding principle of SNAP-Ed has long been that the program has the greatest potential to improve the dietary behaviors of low-income families when it focuses on mothers.<sup>3</sup> However, this approach neglects children living in households with male caregivers, including households with single fathers, representing 8.3% of households in California.<sup>4</sup>

The California Family Health Study (CFHS) is an annual cross-sectional survey of SNAP-Ed eligible families. The 2018 CFHS identified the gender of the primary caregiver of

children. Children's intake of fruits and vegetables, water, sugar-sweetened beverages, added sugars, and kilocalories; food-only energy density; and body mass were assessed. We examined the support for SNAP-Ed's focus on mothers by comparing the 7 outcomes by gender of primary caregiver. We also investigated the risk and protective behaviors for obesity and obesity status by caregiver-by-child gender dyads to determine the importance of child gender when targeting interventions to reduce the risk of childhood obesity.

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**Table 1.** Adjusted Generalized Linear Model<sup>a</sup> for Children's Dietary Behaviors and Diet Quality by Caregiver-by-Child Gender Dyads, California Family Health Study, 2018.

|                                 | F    | P-value | Female caregivers' |                    | Male caregivers'    |                     |
|---------------------------------|------|---------|--------------------|--------------------|---------------------|---------------------|
|                                 |      |         | Sons               | Daughters          | Sons                | Daughters           |
| Fruits & vegetables, cups       | 2.06 | 0.104   | 2.17 <sub>a</sub>  | 2.33 <sub>a</sub>  | 2.00 <sub>a</sub>   | 2.38 <sub>a</sub>   |
| Water, cups                     | 1.82 | 0.142   | 4.47 <sub>a</sub>  | 4.17 <sub>a</sub>  | 4.52 <sub>a</sub>   | 4.71 <sub>a</sub>   |
| Sugar-sweetened beverages, cups | 1.56 | 0.197   | 0.98 <sub>a</sub>  | 0.90 <sub>a</sub>  | 0.99 <sub>a</sub>   | 0.82 <sub>a</sub>   |
| Added sugars, teaspoons         | 4.64 | 0.003   | 13.3 <sub>b</sub>  | 11.6 <sub>a</sub>  | 11.4 <sub>a</sub>   | 12.0 <sub>a,b</sub> |
| Kilocalories                    | 8.36 | <0.001  | 1,871 <sub>b</sub> | 1,712 <sub>a</sub> | 1,691 <sub>a</sub>  | 1,735 <sub>a</sub>  |
| Food-only energy density        | 3.41 | 0.017   | 1.71 <sub>b</sub>  | 1.64 <sub>a</sub>  | 1.71 <sub>a,b</sub> | 1.63 <sub>a,b</sub> |

Abbreviations: CI, confidence interval.

Means with differing superscripts are significantly different at  $p < 0.05$ .

<sup>a</sup>Covariates were children's race/ethnicity and age, and caregivers' obesity status.

## Methods

The 2018 CFHS was a cross-sectional telephone survey approved by the California Health and Human Services Agency, Committee for the Protection of Human Subjects; verbal consent and assent were documented for all participants.

### Sample

To obtain a representative sample of SNAP-Ed eligible families across California, households with incomes  $\leq 185\%$  of the federal poverty level with children (5-12 years) and a male and/or female adult were randomly selected from the Medi-Cal Eligibility Data System (MEDS). Households received an introductory letter in English or Spanish, followed by a call from bilingual staff to identify a child (randomly selected in multi-child households) and his or her primary caregiver, screened as the adult who "assumes the responsibility in caring for the health and well-being of the child(ren)" and "who prepares the meals or buys food for the child(ren)." Households with male or female caregivers were given equal probability of selection. A \$15 incentive was offered to the caregiver and child. Telephone numbers for these initial calls came from the MEDS; the "best" phone numbers to subsequently reach caregivers, as identified during the screening and recruitment calls, were used to conduct the telephone interviews.

During the telephone interviews, all food and beverage items consumed by children during the previous day were recorded using the Automated Self-administered 24-Hour Dietary Assessment Tool (ASA24).<sup>5</sup> Children and/or caregivers, depending on child's age and availability, were asked to refer to a study-supplied portion-size booklet or measuring cups and spoons to assess the quantity and size of each reported item.

### Measures

Six ASA24-derived dietary variables were examined: cups of fruits and vegetables, water, sugar-sweetened beverages (SSBs), teaspoons of added sugars, kilocalories, and food-only energy density (kilocalories/weight in grams). Lower food-only energy density diets equate to a greater

quantity of foods with fewer kilocalories, and therefore higher quality diets. Weight and height for caregivers and children were assessed by, "How much do (you/does CHILD'S NAME) weigh without (your/his/her) shoes on?" and "How tall are (you/is CHILD'S NAME) without (your/his/her) shoes on?"

### Analysis

A SAS macro provided by the CDC<sup>6</sup> was used with height, weight, gender, and age in months to calculate body mass index (BMI)-for-age categories and classify children as obese ( $\geq 95$ th percentile) consistent with the CDC Clinical Growth Charts.<sup>7</sup> Caregivers' obesity status is an established predictor of childhood obesity and was considered to be an important covariate. Caregivers' obesity was defined as BMI  $\geq 30$ .

Linear regression analyses examined by caregiver gender the 6 dietary outcomes; comparisons for the caregiver-by-child gender dyads were made using general linear model analyses with Fisher's least significant difference (LSD) tests for post-hoc mean comparisons. Logistic regression analyses examined obesity by caregiver gender and across the caregiver-by-child gender dyads. All models included as covariates children's race/ethnicity and age (centered on the mean), and caregivers' obesity status.

Excluded from all analyses were responses from 21 children with incomplete interviews. Omitted from the childhood obesity analyses were 214 children without valid height or weight values and 139 records based on extreme BMI-for-age values (CDC flag variable "\_bivbmi").<sup>6</sup>

## Results

A total of 2,242 children provided valid dietary data (response rate = 75.2%). Children were 68.5% Latino, 14.7% white, and 12.4% African American; 50.9% were male. Mean age was 8.36 years. Caregivers were 17.8% male. The caregiver-by-child gender dyads were 41.7% sons of female caregivers, 40.5% daughters of female caregivers, 9.2% sons of male caregivers, and 8.6% daughters of male caregivers. Adult females and males were equally likely to be the primary caregiver of boys or girls ( $\chi^2 = 0.13, P = 0.719$ ).

Only kilocalorie intake was related to caregiver gender, with male caregivers' children consuming 80 fewer kilocalories than female caregivers' children ( $P = 0.053$ ). No differences were observed for consumption of fruits and vegetables ( $F = 2.06$ ,  $P = 0.104$ ), water ( $F = 1.82$ ,  $P = 0.142$ ), and SSBs ( $F = 1.56$ ,  $P = 0.197$ ); daily intake of added sugars ( $F = 4.64$ ,  $P = 0.003$ ) and kilocalories ( $F = 8.36$ ,  $P < 0.001$ ), and food only energy density scores ( $F = 3.41$ ,  $P = 0.017$ ), across the caregiver-by-child gender dyads were significant (Table 1). Post hoc analyses revealed female caregivers' sons consumed more teaspoons of added sugars than female caregivers' daughters ( $P = 0.001$ ) and male caregivers' sons ( $P = 0.018$ ). Female caregivers' sons consumed more kilocalories than children from the other caregiver-by-child gender dyads ( $P$ s  $< 0.02$ ). Among female caregivers, sons reported more energy dense diets than daughters ( $P = 0.004$ ). Across the sample, 25.9% of children from SNAP-Ed eligible households were obese. The proportion of female caregivers' sons classified as obese was significantly greater than daughters ( $P = 0.035$ ; Table 2).

## Discussion

Among an ethnically diverse, probability-based sample of children from low-income households, we found equivalence in daily intake of fruits and vegetables, SSBs, and added sugars by caregiver gender. These findings mirror those from another population-based survey of California adult caregivers.<sup>8</sup> Children also had similar levels of overall diet quality and obesity by caregiver gender.

In contrast, marked differences were found when examining the outcomes by child gender for male versus female caregivers, with the findings of potentially the greatest public health importance observed for female caregivers' sons compared with daughters. Sons of female caregivers ate more added sugars and consumed more kilocalories than daughters. Female caregivers' sons, compared with daughters, had higher food-only energy density scores. Prior studies have documented a positive relationship between food-only energy density scores and childhood obesity.<sup>9</sup> Accordingly, for the current study, the obesity rate for sons of female caregivers was greater than for female caregivers' daughters.

Limitations of our study include self-reported data and potential confounding variables not included in our analyses. Past research has shown that mothers are more accurate in their assessment of daughters' than sons' weight,<sup>10</sup> thus female caregivers participating in the current study may have overestimated their sons' weight. We do not know to what extent the 25% non-response affects our results. Our findings are limited to SNAP-Ed eligible households within California. Finally, our analyses included unequal cell sizes, as a result of fewer fathers than mothers recruited, yet we do not believe this to be a substantial limitation. Our key findings rely on comparing groups that were of roughly equivalent size, female caregivers' sons versus daughters.

**Table 2.** Adjusted Logistic Regression<sup>a</sup> for Children's Obesity Status ( $n = 1,889$ ) by Caregiver-by-Child Gender Dyads, California Family Health Study, 2018.

|   | Percent | Odds ratio<br>(95% CI) | P-value |
|---|---------|------------------------|---------|
| Child obese ( $\geq 95$ th percentile of BMI-for-age) |         |                        |         |
| Female Caregivers' Sons                               | 28.7    | Reference              |         |
| Female Caregivers' Daughters                          | 23.7    | 0.78 (0.62, 0.98)      | 0.035   |
| Male Caregivers' Sons                                 | 22.9    | 0.77 (0.52, 1.14)      | 0.185   |
| Male Caregivers' Daughters                            | 26.1    | 0.92 (0.63, 1.35)      | 0.670   |

Abbreviations: CI, confidence interval; BMI, body mass index.

<sup>a</sup>Covariates were children's race/ethnicity and age, and caregivers' obesity status.

Over one-in-four children from SNAP-Ed eligible households in California are obese. Our study confirms that the strategy to focus nutrition education and obesity prevention efforts on mothers rather than fathers is just, but only in cases where the mother is the children's primary caregiver. Increased nutrition education and obesity prevention efforts should be targeted to female caregivers with sons.

### So What?

#### *What is already known on this topic?*

The USDA's focus for SNAP-Ed interventions is mothers from low-income families.

#### *What does this article add?*

Female caregivers' sons versus daughters from SNAP-Ed households reported eating more sugar, poorer diet quality, and higher body mass.

#### *What are the implications for health promotion practice or research?*

The strategy to focus nutrition education and obesity prevention efforts on mothers is justified, but more effective interventions should specifically target families with female caregivers of male children.

### Authors' Note

F. Molitor and C. Doerr meet the criteria for authorship per ICMJE guidelines. F. Molitor was the primary author and conducted the inferential statistical analyses. F. Molitor and C. Doerr were principal investigators of the California Family Health Study; both contributed to the design and oversight of the study. This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the California Health and Human Services Agency, Committee for the Protection of Human Subjects (#2018-175-CSUS). Verbal informed consent and assent were obtained from all adult survey

participants. Verbal consent and assent were witnessed and formally recorded.

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### Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: F. Molitor and C. Doerr declare a conflict of interest because financial support for consulting services and salary support is obtained from the California Department of Social Services.

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