

**Citation:**

O'Neil CE, Nicklas TA, Liu Y, Franklin FA. Impact of dairy and sweetened beverage consumption on diet and weight of a multiethnic population of Head Start mothers. *J Am Diet Assoc.* 2009 May; 109(5): 874-882.

**PubMed ID:** [19394474](#)

**Study Design:**

Cross-Sectional Study

**Class:**

D - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

 POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To assess the association of milk and sweetened beverage consumption with nutrient intake, dietary adequacy and weight in a multiethnic population of Head Start mothers.

**Inclusion Criteria:**

- Non-pregnant women
- 20 to 50 years of age
- Those having a child enrolled in Head Start in his or her first year of participation
- Those having an income at or below 100% of the poverty index
- Those self-identifying race/ethnicity as African American, Hispanic or white.

**Exclusion Criteria:**

- Those with reported mean energy intakes less than 600 calories (N=6) or more than 4,000 calories (N=4)
- Those consuming more than 20 servings of sweetened beverages (N=1).

**Description of Study Protocol:****Recruitment**

This study was a secondary analysis of data collected for a cross-sectional assessment of mother-child dyads in Head Start families recruited from 57 Head Start centers in three geographical areas in northern rural Alabama, northern urban Alabama and southeastern urban Texas.

**Design**

Cross-sectional study, secondary analysis of collected data.

**Dietary Intake/Dietary Assessment Methodology**

- Heights, weights and demographic data were collected during a two-week period
- Three 24-hour dietary recalls were collected using the multiple-pass method and food models that describe portion sizes
- Heights and weights were measured twice on each participant. Body mass index (BMI) was calculated as  $\text{kg}/\text{m}^2$  from these values
- Dietary intake data were analyzed using Nutrient Data System for Research software (version 5.0, University of Minnesota, Minneapolis)
- Nutrient intakes from foods and beverages were determined from the averages of three days of dietary recalls.

**Statistical Analysis**

Statistical analyses were conducted using the Statistical Analysis Software (version 9.1.3., 2006, SAS Institute Inc, Cary, NC)

- BMI was calculated as  $\text{kg}/\text{m}^2$
- Mean three-day, 24-hour intakes of milk and sweetened beverage were categorized into four consumption patterns: Low-milk/low-sweetened beverages; low-milk/high-sweetened beverages; high-milk/low-sweetened beverages; and high-milk/high-sweetened beverages
- Low-milk/high-milk categories were defined: Less than or equal to or more than median (0.312) of total milk servings per day, respectively
- Low-sweetened beverages/high-sweetened beverage categories were defined as: Less than or equal to or more than median (1.354) of sweetened beverage servings per day, respectively
- Mean  $\pm$  standard error and frequency distributions of participant characteristics were calculated
- Analysis of variance was conducted for detecting differences in milk or sweetened beverage consumption groups for continuous variables and  $\chi^2$  was used for categorical variables
- A P-value less than 0.05 was considered statistically significant
- Analysis of covariance was used for calculating the least-squares means of dependent variables using the SAS procedure PROC GLM

- Covariates were age, ethnicity and energy intake. Because multiple comparisons were done in the post-hoc analysis, the Bonferroni correction was used to decrease the probability of a type I error; the effective probability level was less than 0.0125.

## Data Collection Summary:

### Timing of Measurements

- Heights, weights and demographic data were collected during a two-week period
- Three 24-hour dietary recalls were collected, including two non-consecutive days and a weekend
- Heights and weights were measured twice on each participant.

### Variables

- Milk consumption, sweetened beverage consumption, nutrient intake and food group intake were determined using three, 24-hour food recalls
- Height, weight and BMI were determined using on each participant without shoes and dressed in light clothing. Weight was measured to the closest 0.1kg on a digital platform scale accurate to 500kg within  $\pm 0.05$ kg. Height was measured to the closest 0.1cm using the Shorr Adult Height Measuring Board. Body mass index (BMI) was calculated as  $\text{kg}/\text{m}^2$ .
- Mean Adequacy Ratio (MAR) of eight key nutrients was calculated as an indicator of overall dietary adequacy for consumption of fruit, vegetables, milk, whole grains, dietary fiber, vitamins A and C, folate, calcium, iron, zinc and potassium
- The nutrient adequacy ratio, or percentage of the Recommended Dietary Allowances consumed, was calculated for each nutrient and the resulting value truncated at 100 before averaging, so those consuming large amounts of food were not unfairly advantaged. MAR equals the sum of nutrient adequacy ratios divided by the number of nutrients considered. A score of 85 was selected as the cut-point for adequacy and was close to the Estimated Adequate Intake for most nutrients.

### Control Variables

- Age
- Race/ethnicity
- Education
- Marital status
- Household members.

## Description of Actual Data Sample:

- *Initial N*: 620 women; response rate was 80%
- *Attrition (final N)*: 609 women
- *Mean age*:  $30.0 \pm 0.2$  years (Mean  $\pm$  SEM)
- *Ethnicity*: The sample distribution by location and race/ethnicity was:
  - 33% Hispanic from Texas
  - 43% African American from Texas and Alabama
  - 24% white from Alabama
- *Other relevant demographics*:
  - Education completed:
    - High school or less: 58%
    - Some college/technical school: 33%
    - College graduate and higher: 9%
  - Marital status:
    - Married: 46%
    - Divorced/widowed/separated: 19%
    - Never married: 28%
    - Other: 7%
- *Anthropometrics*: BMI =  $30.8 \pm 0.3 \text{kg}/\text{m}^2$  (Mean  $\pm$  SEM)
- *Location*:
  - Surveyed areas: Northern rural Alabama, northern urban Alabama and southeastern urban Texas
  - Data analyzed and interpreted at the Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, Texas.

## Summary of Results:

- Mean BMI for the four beverage consumption groups was not different,  $30.8 \pm 0.3 \text{kg}/\text{m}^2$
- Women in the high-milk/low-sweetened beverage group had higher mean intakes of vitamins A, D and B<sub>6</sub>; riboflavin; thiamin; folate; phosphorus; calcium; iron; magnesium; and potassium ( $P < 0.0125$  for all) when compared with the other beverage consumption groups
- Mean Adequacy Ratio was highest in the high-milk/low-sweetened beverage ( $71.8 \pm 0.8$ ) and lowest in the low-milk/high-sweetened beverage ( $58.4 \pm 0.8$ ) consumption groups ( $P < 0.0125$ )
- Women in the high-milk/low-sweetened beverage group consumed more nutrient-dense foods
- Overall consumption of milk was low.

### Other Findings

#### Demographic Characteristics of a Multi-ethnic Population of Head Start Mothers Categorized by Milk and Sweetened Beverage Consumption

	Low-milk/High-sweetened Beverage (N=170)	High-milk/Low-sweetened Beverage (N=170)	Low-milk/Low-sweetened Beverage (N=134)	High-milk/High-sweetened Beverage (N=135)	Total (N=609)
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N (%)					
<b>Race/ethnicity</b>					
Texas Hispanic	23 (4) <sup>w</sup>	87 (14) <sup>x</sup>	27 (5) <sup>w</sup>	58 (10) <sup>x</sup>	195 (33)
African American	88 (15) <sup>w</sup>	56 (9) <sup>xz</sup>	84 (14) <sup>wx</sup>	32 (5) <sup>z</sup>	260 (43)
Alabama white	56 (9) <sup>w</sup>	26 (4) <sup>xy</sup>	20 (3) <sup>y</sup>	45 (8) <sup>wx</sup>	147 (24)
<b>Education completed</b>					
High school or less	94 (15)	99 (16)	66 (11)	97 (16)	356 (58)
Some college/technical	64 (10) <sup>w</sup>	54 (9) <sup>w</sup>	52 (9) <sup>w</sup>	30 (5) <sup>z</sup>	200 (33)
College graduate and higher	12 (2)	17 (3)	16 (3)	8 (1)	53 (9)
<b>Mean ± Standard Error</b>					
Age (year)	29.2±0.2 <sup>w</sup>	30.3±0.4 <sup>wy</sup>	31.4±0.6 <sup>y</sup>	29.0±0.5 <sup>w</sup>	30.0±0.2
BMI <sup>b</sup>	31.0±0.6	30.9±0.6	31.3±0.7	29.9±0.7	30.8±0.3
Household members (N)	4.4±0.1	4.5±0.1	4.5±0.1	4.4±0.1	4.4±0.1

<sup>a</sup> Low milk: Less and equal the median (0.312) of total milk servings per day; high milk: greater than the median of total milk servings per day. Low-sweetened beverage: Less and equal the median (1.354) of sweetened beverage servings per day. High-sweetened beverage: Greater than the median of total sweetened beverage servings per day.

<sup>b</sup> BMI=body mass index (calculated as kg/m<sup>2</sup>) adjusted for age, ethnicity and energy intake.

<sup>wxyz</sup> Values with same superscript letters do not differ significantly from one another according to Bonferroni with P<0.0125.

#### Author Conclusion:

- In a multiethnic, low-income population of women consumption of high-milk/low-sweetened beverages was associated with improved nutrient intake and more healthful food choices, including fruit, dark green and deep yellow vegetables and RTEC
- Although nutrient intake and dietary adequacy were improved with increased consumption of milk, overall milk intake and MAR were generally low in these women, indicating the need for improved diet in women in all four of the beverage consumption groups
- Culturally appropriate nutrition education addressing specific barriers to consuming a healthful diet, including increasing milk consumption and decreasing sweetened beverage consumption, should be designed and consumption of nutrient-dense foods should be encouraged.

#### Reviewer Comments:

- This was a well-conducted secondary analysis of collected data from a cross-sectional study
- Comments on the Research Design and Implementation Rating Checklist
  - 4.0. NO. 4.1. 4.4 Unclear: There was no information on the method used to handle withdrawals. Although this was a cross-sectional study, there was enough time for participants to withdraw from the study as the data collection relied on three dietary recalls. It is possible that participants only provided partial information to the data collectors. Thus, only partial data could have analyzed as intent to treat
  - 5.0, 5.3 Unclear: Blinding was not described. It is not known if data collectors and analyzers also participated in the interpretation of the results
  - 8.4 Unclear: It is not clear if intent to treat was used to incorporate potential missing values
  - 8.7. Unclear: Authors described corrections to avoid Type I error, but did not include sample power calculations, probably conducted by the designers of the initial cross-sectional study.

#### Research Design and Implementation Criteria Checklist: Primary Research

##### Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes

4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A
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Validity Questions		
<b>1.</b>	<b>Was the research question clearly stated?</b>	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
<b>2.</b>	<b>Was the selection of study subjects/patients free from bias?</b>	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
<b>3.</b>	<b>Were study groups comparable?</b>	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	No
4.1.	Were follow-up methods described and the same for all groups?	No
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	No
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	???
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	???
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	Yes

6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	<b>Yes</b>
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	<b>Yes</b>
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	???
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	<b>Yes</b>
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	<b>Yes</b>
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes