Research Article

Potential Population-Level Nutritional Impact of Replacing Whole and Reduced-Fat Milk With Low-Fat and Skim Milk Among US Children Aged 2–19 Years

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ABSTRACT

Objective: Dietary guidance emphasizes plain low-fat and skim milk over whole, reduced-fat, and flavored milk (milk eligible for replacement [MER]). The objective of this study was to evaluate the population-level impact of such a change on energy, macronutrient and nutrient intakes, and diet cost.

Design: Cross-sectional modeling study.

Setting: Data from the 2001–2002 and 2003–2004 National Health and Nutrition Examination Survey.

Participants: A total of 8,112 children aged 2–19 years.

Main Outcome Measures: Energy, macronutrient, and micronutrient intake before and after replacement of MER with low-fat or skim milk.

Analysis: Survey-weighted linear regression models.

Results: Milk eligible for replacement accounted for 46% of dairy servings. Among MER consumers, replacement with skim or low-fat milk would lead to a projected reduction in energy of 113 (95% confidence interval [CI], 107–119) and 77 (95% CI, 73–82) kcal/d and percent energy from saturated fat by an absolute value of 2.5% of total energy (95% CI, 2.4–2.6) and 1.4% (95% CI, 1.3–1.5), respectively. Replacement of MER does not change diet costs or calcium and potassium intake.

Conclusions: Substitution of MER has the potential to reduce energy and total and saturated fat intake with no impact on diet costs or micronutrient density. The feasibility of such replacement has not been examined and there may be negative consequences if replacement is done with non-nutrient–rich beverages.

Key Words: energy intake, obesity, diet, policy, dairy products, child (*J Nutr Educ Behav*. 2015;47:61-68.)

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INTRODUCTION

Milk and milk products are important components of a healthy diet and their consumption is recommended by numerous dietary guidelines and professional organizations.[1-3] Milk and dairy consumption during childhood is particularly important for achieving bone health later in life.[4,5] Milk is an important source of calcium, vitamin D, and potassium, all of which were identified as nutrients of concern by the 2010 *Dietary Guidelines for Americans* (DGA).[1,6,7] Although children aged 2–8 years generally consume adequate amounts of calcium, adolescents aged 9–18 years fail to meet calcium recommendations and no age group comes close to meeting the threshold for adequate potassium intake.[6,8,9]

Although milk consumption has a number of benefits, in light of the obesity epidemic, concerns regarding excess energy and fat intake have emerged. National dietary guidelines and recommendations from professional organizations, including the 2005 and 2010 DGA and the American Academy of Pediatrics, recommend that children aged ≥ 2 years (and adults) consume low-fat (1% fat) and skim milk (0% fat) rather than whole (3.25% to 4%) or reduced-fat (2% fat) milk.[1-3] Revisions to the Women, Infants, and Children standard food package finalized in March, 2014 allow whole milk for children aged < 2 years but only low-fat and skim for children aged ≥ 2 years and women.[10] Despite these recommendations and numerous policy changes, consumption of low-fat and skim milk is low among children and adolescents. Recent data from the 2007–2008 National Health and

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Nutrition Examination Survey (NHANES) revealed that only 20% of children and adolescents regularly consume low-fat and skim milk, and lower-income, non-Hispanic black and Hispanic children consume the least skim and low-fat milk.[11] Younger children (aged 2–5 years) were less likely to consume skim and low-fat milk than older children (aged 12–19 years).[11] Driving the higher consumption of higher-fat (and also flavored) milk is a strong preference for the higher fat content of unflavored milk (and the sweetness of flavored milk).[12-14] Because relatively few children currently consume low-fat and skim milk, evaluations should examine the maximum effect of recommendations to shift consumption from whole, reduced-fat, and flavored milk toward skim and low-fat milk, although it is unlikely that any intervention could entirely shift consumption toward the recommended milk.

The primary goal of this study was to provide quantitative information regarding the potential nutritional effects of substituting low-fat and skim milk for whole, reduced-fat, and flavored milk in the diets of children under current eating patterns. A secondary goal of this study was to determine whether such a substitution would increase diet costs, an unexplored dimension in most nutrition modeling studies. This study used data from NHANES to quantitatively examine the potential nutritional and economic impact of substituting low-fat and skim milk for whole, reduced-fat, and flavored milk in the diets of American children and adolescents from 2001 to 2004.

METHODS

Subjects

Analyses were based on dietary intake data from children and adolescents (aged 2–19 years) who completed a valid 24-hour recall during 2 cycles of the NHANES: 2001–2002 and 2003–2004. The authors used these cycles because of the availability of food price information, which was not available for later cycles. The NHANES includes in-depth demographic, health behavior, and health outcome questionnaires, along with standardized health measurements. The National Center for Health Statistics ethics review board approved the survey and the researchers obtained informed consent. The use of this existing, publicly available dataset was exempt from human subjects review by the University of Washington Institutional Review Board.

Dietary Assessment in NHANES

All examined survey participants were eligible to participate in the dietary interview component, which consisted of a single 24-hour dietary recall in which respondents reported all foods and beverages consumed the previous day, from midnight to midnight. The 24-hour recall data include the portion and description of each individual food and beverage consumed, based on the US Department of Agriculture food code. A set of standard measuring guides was available in the Mobile Examination Center to aid in estimating portion sizes. The NHANES staff monitored interviewers and developed criteria to determine the acceptability of each recall.[15] Administration of the dietary recall varies by age. For children under age 6 years, the interviews were conducted by proxy; if present, the child provided supplementary information. For children aged 6–8 years, the proxy was still the primary respondent but the child was generally present and often asked to provide information. For children aged 9–11 years, the child was the primary source of information but may have been assisted by an adult who had knowledge of the child's dietary intake. Dietary recalls for children aged ≥ 12 years did not have an adult present.[15] The examination protocol and data collection methods are fully documented elsewhere.[15] A second 24-hour recall was completed for a subset of 2003–2004 participants but was not used here to ensure comparability of data across study cycles.

Anthropometric Measures

To evaluate the impact of the substition models stratified by weight status, the authors used code provided by the Centers for Dieases Control to calculate BMI percentiles by age and gender.[16] Weight status was defined as follows: underweight (< 5th percentile), healthy weight (5th to 84.9th percentile), overweight (85th to 94.9th percentile), and obese (≥ 95th percentile). Valid data for height and weight were available for 7,841 of the 8,112 study participants.

Milk Classification

Milk was identified from the individual foods file. Whole-fat, reduced-fat, low-fat, and skim milk was identified based on the presence of these terms in the food descriptions. If these descriptors were not available, the fat content in the nutrient database was used for classification. Sweetened, flavored milk was identified as milk that contained added sugars. Cocoa and sugar mixtures, chocolate syrup with milk added and low-lactose and lactose-free milk was included in the analyses. In the case of lactose-free milk, replacement was done with non–lactose free milk, although this decision would not have altered results because the prices and nutrient values for low- and lactose-free milk were the same as for regular milk in this database. Milk shakes, smoothies, malted milk mixtures (eg, Ovaltine), soy milk, whey-based milk drinks, eggnog, buttermilk, and evaporated and condensed milk were not included in the analyses because there were not always clear lower-fat or non–sugar added alternatives to these beverages. Consumption of these items was reported 411 times compared with more than 8,500 reports of milk included in this analysis.

Diet Cost

Diet cost estimates were based on merging the dietary recalls from NHANES with nationally representative food prices in the Food Prices Database, released by the US Department of Agriculture Center for Nutrition Policy and Promotion.[17] In brief, diet cost, defined here as the monetary value of foods reported by each respondent, was computed from each individual's dietary recall in combination with the price database by multiplying the price per gram with the portion of each food consumed by the respondent and then summing these values for each participant. Diet cost was