Invited Editorial: The Importance of Dairy Foods in Helping Impoverished People in the United States¹

O. M. Palacios,*² J. Nicholls,* R. Green,† and G. D. Miller*

*National Dairy Council, Nutrition and Scientific Affairs, Rosemont, IL 60018-5616

†McLeod, Watkinson and Miller, Washington, DC 20001

INTRODUCTION

Poverty is a persistent problem in the United States and worldwide. In 2005, approximately 50 million people, or roughly 17% of the population, lived on less income than 125% of the federal poverty level in the United States (US Census Bureau; <http://www.census.gov>). Children were the poorest age group in the country—17.6% of all Americans under 18 were poor in 2005. But a much higher 42.8% of children living in a female-headed family with no husband present were poor. Poverty rates for African Americans (24.9%) and Hispanics (21.8%) were higher than for the population as a whole (US Census Bureau). Food insecurity and lack of appropriate nutrient intake are closely associated with poverty. (Food security is defined as access by all people at all times to enough food for an active, healthy lifestyle; persons who lack this access suffer from food insecurity.) According to a survey conducted in December 2004 by the USDA, 11.9% of US households experienced food insecurity sometime during the year preceding the survey (USDA, 2005). Of individuals experiencing food insecurity, 3.9% experienced food insecurity with hunger, although when food insecurity is accompanied by hunger in the United States, it is usually occasional or episodic, not chronic (USDA, 2005).

Hunger and Obesity

It seems paradoxical to speak of hunger and obesity occurring together, but that is often the reality. A study by Townsend et al. (2001) found that the likelihood of

women being overweight increased as food insecurity increased. Frongillo et al. (1997) found that women who faced food insecurity had a significantly greater body mass index than women who were food secure. Furthermore, Casey et al. (2006) found that the association between food insufficiency and overweight status or being at risk for overweight was evident in children, although other studies failed to show this relationship (Alaimo et al., 2001). Potential reasons for the paradox of food insecurity and excess weight may include the fact that energy-dense diets, primarily composed of refined grains, added sugars, or fat, are less costly than higher quality diets (Drewnowski and Specter, 2004). Food insecurity is thus associated with lower fruit and vegetable consumption and lower quality diets. Energy-dense diets are more affordable than diets rich in lean meats, fish, and fresh fruits and vegetables. Nutrient-rich dairy foods are more economical per calorie than most fresh fruits and vegetables, but still cost more per calorie than sugar and many fats and oils (Drewnowski and Darmon, 2005). Consumption of energy-dense diets may be increased due to the palatability of sugars and fats (Drewnowski and Specter, 2004). More importantly, individuals near or below the poverty line may lack access to stores stocked with nutritious foods and may have lower educational levels, further exacerbating the problem.

Federal Food and Nutrition Programs

One of the ways public policy seeks to alleviate food insecurity is through USDA Food and Nutrition Service nutrition assistance programs, including the Food Stamp Program, Special Supplemental Nutrition Program for Women, Infants and Children (**WIC**), the National School Lunch Program (**NSLP**), the School Breakfast Program (**SBP**), and the Child and Adult Care Food Program (Federal Food Programs, 2006). Low-income populations have inadequate intakes of important nutrients, and these nutrition programs seek to alleviate poverty and hunger while improving nutrient profiles and nutrition habits. Federal funding for the Food Stamp Program was close to \$29 billion in 2005

Received August 31, 2007.

Accepted September 10, 2007.

¹The Council of Science Editors (www.councilscienceeditors.org) has organized a Global Theme Issue on Poverty and Human Development for release in October 2007. Science journals throughout the world will simultaneously publish papers on this topic of worldwide interest to raise awareness, stimulate interest, and stimulate research into poverty and human development. The Global Theme Issue is an international collaboration of journals from developed and developing countries. This editorial represents our contribution to this important global effort.

²Corresponding author: Omezei@RoseDMI.com

with more than 25 million monthly participants averaging a benefit of \$92.60 each month (Federal Food Programs, 2006). The WIC program, benefiting eligible individuals including women who are pregnant, postpartum, or lactating, and infants and children under the age of 5 had nearly 8 million participants each month in 2006 for a total of \$4.8 billion dollars of federal funding (Federal Food Programs, 2006). The NSLP serves 29 million students daily, 17 million of whom receive free or reduced-price lunches in nearly 100,000 schools (Federal Food Programs, 2006). The SBP serves more than 9 million students daily, 7.5 million of whom receive free or reduced-priced breakfasts in over 80,000 schools (Federal Food Programs, 2006). The NSLP and the SBP cost \$6.9 billion and \$1.9 billion, respectively, in the 2004–2005 academic year (Federal Food Programs, 2006). The Child and Adult Care Food Program benefits eligible child care and adult care centers, and it received \$1.9 billion in federal funds and had nearly 900,000 children participating daily in 2005 (Federal Food Programs, 2006).

The Role of Dairy Foods

Choosing the most nutritious and economical foods is an integral part of federal food programs. Dairy foods (milk and milk products) in particular have an outstanding nutritional profile in relation to their cost, making them an important component of federal food programs. A study on the nutrient contribution of school lunch found that milk was the most economical and greatest source of calcium in both planned and served menus (Shanklin and Wie, 2001). Furthermore, milk components as well as the entrée contributed the most protein per calorie compared with other components measured including fruits, vegetables, and whole grains. Lastly, foods that fell into the miscellaneous category, including ketchup, mustard, and margarine, accounted for the majority of sodium, total fat, and saturated fat consumed per calorie (Shanklin and Wie, 2001).

Another study calculated the mean cost to absorb the amount of calcium contained in a glass of milk and in different foods and supplements. The study took into account serving size, calcium per serving, fractional absorption, mean cost, and mean cost to absorb 300 mg of calcium (Keller et al., 2002). Milk was found to have the lowest cost for a natural food source of calcium. Regional, packaging, and other pricing issues could alter these findings, but the data show that of the main calcium sources, milk is one of the least expensive ways to get calcium (plus the full complement of dairy nutrients), whereas green vegetables are more variable in cost (in addition to calcium content and availability);

the mean cost to absorb calcium from soy products is more than 3 times that of milk.

Dairy foods are an economical source of nutrients such as calcium, and federal nutrition assistance programs annually distribute billions of pounds of dairy products. The majority of these distributions occur through school meal programs, but other channels are also important. For fiscal year 2005, the government distributed about 4.5 billion pounds of fluid milk through the NSLP (2.7 billion pounds), the Child and Adult Care Food Program (0.99 billion pounds), the SBP (0.86 billion pounds), the Summer Program (0.06 billion pounds), and the Special Milk Program (0.05 billion pounds). These total distributions of fluid milk equate to 540 million gallons (National Milk Producers Federation, 2007). In 2005, the government distributed other dairy products including 125.9 million pounds of cheese, primarily through schools and institutions as well as a small amount through programs for the needy and prisons, and 150.2 million pounds of nonfat dry milk, primarily through schools and institutions with a smaller but significant component through programs for the needy and prisons (National Milk Producers Federation, 2007).

Two other federal programs are important sources of dairy products for low-income Americans. The USDA estimates that 12% of expenditures under the Food Stamp Program are used to purchase dairy products (USDA Food and Nutrition Service, 2005). This implies that of total Food Stamp benefits in fiscal 2005 of about \$28.5 billion, about \$3.4 billion was spent on dairy products (USDA Food and Nutrition Service, 2007). It seems likely that fluid milk and cheese would account for the bulk of the expenditures, although data to determine whether this is accurate are not available. Finally, WIC provides vouchers to clients for specific commodities, including fluid milk and cheese. For fiscal year 2003, WIC vouchers were used to purchase an estimated 304 million gallons of fluid milk and 116 million pounds of cheese (National Milk Producers Federation, 2006). Milk and other dairy foods are major components of food assistance programs.

The integral role of dairy foods in these programs reflects the importance of milk and milk products and their nutrient contributions to the total American diet. Dairy products are safe, reasonably priced, readily available products that are processed and distributed within a well-established market network. These characteristics of dairy foods assure program administrators and participants that fresh dairy foods are available in essentially all locations and areas of the country. In addition, dairy products deliver a known amount of nutrients and can be used easily by participants. Consistent products ease the administrative burden at

the state level and the shopping process at the individual level. Dairy foods deliver a consistent nutrient package, whereas products that attempt to imitate dairy often do not have the same reliability.

Nutrition and Health Benefits of Dairy Foods

Dairy foods have been a part of the diet since the agricultural revolution, but only in the past half-century has nutrition research started to aggressively study the health attributes of milk (Huth et al., 2006). Research during the past decades has shown that milk, milk products, and calcium may reduce the risk of disorders including osteoporosis, hypertension, excess body weight and fat, and colorectal and breast cancer (Nicklas, 2003; Huth et al., 2006; Miller et al., 2007). Milk is one of the best natural sources of calcium, offering high calcium content and bioavailability at a relatively low cost in relation to its nutritive value (Miller et al., 2001; Nicklas, 2003). Milk and milk products provide other essential nutrients including phosphorus, potassium, riboflavin, vitamin B₁₂, vitamin A, vitamin D, protein, and niacin (niacin equivalents). In fact, milk is an excellent source of calcium, phosphorus, vitamin D, and riboflavin, providing at least 20% of the recommended daily values of these nutrients per reference amount. Milk is also a good source of potassium, protein, vitamin A, vitamin B₁₂, and niacin (niacin equivalents), providing at least 10% of the daily value of these nutrients per reference amount. Cow's milk and other dairy foods are the largest dietary source of calcium for Americans, providing more than 70% of the daily dietary calcium consumed by individuals (Huth et al., 2006; Miller et al., 2007). Dairy foods also make significant contributions of other important nutrients to America's diet including 32% of phosphorus intake, 26% of riboflavin intake, 21% of vitamin B₁₂ intake, 19% of protein intake, 18.9% of potassium intake, 16% of zinc intake, 16% of magnesium intake, and 15% of vitamin D intake. Fluid milk is fortified with vitamin D to a level of 400 IU per quart and many yogurts are now fortified as well (Gerrior and Bente, 2002; Nicklas, 2003; Huth et al., 2006; Miller et al., 2007).

Optimal health of the body and its physiological systems depend on the concerted actions of many nutrients. For example, bone matrix formation is not dependent on a single nutrient such as calcium. Bone is a complex matrix that is continuously evolving and relies on a constant supply of nutrients including calcium, vitamin D, proteins, and phosphorus (Huth et al., 2006). Dairy foods supply many of the nutrients necessary for the maintenance and health of the bone matrix, making these foods an ideal choice for optimizing bone health.

Even with all of the nutrients and health benefits that dairy foods have to offer for bone and whole-body health, many people fail to consume adequate amounts of dairy foods. The 2005 Dietary Guidelines for Americans (DGA; USDA-Department of Health and Human Services, 2005) recommend that adults and children ≥ 9 yr old consume 3 servings of low-fat or fat-free milk or equivalent milk products, and that children age 2 to 8 yr consume 2 servings of these foods. Total milk, cheese, and yogurt intake based on data collected from the 1999–2002 National Health and Nutrition Examination Survey (NHANES) was 1.7 servings for all ages of male and female Americans surveyed (National Dairy Council, unpublished data). Males consumed 1.9 daily servings, whereas females consumed 1.4 daily servings. Recommended milk consumption gradually decreases with increasing age; for example, children age 2 to 3 yr consume 2.2 servings compared with the recommended 2 servings, whereas adolescents aged 9 to 19 yr consume 2.1 servings and adults aged 20 to 50 yr consume 1.6 servings of milk, cheese, or yogurt each day compared with the recommended 3 servings for these groups (National Dairy Council, unpublished data). The American Academy of Pediatrics also reports that the number of children who meet the recommended daily calcium intake declines dramatically after the second year of life into adolescence (Greer and Krebs, 2006). The DGA state that milk product consumption is associated with overall diet quality and adequacy of nutrient intake for many nutrients. Furthermore, the DGA state, “studies specifically on milk and other milk products, such as yogurt and cheese, showed a positive relationship between the intake of milk and milk products and bone mineral content or bone mineral density in one or more skeletal sites.” Despite these benefits, 81% of all individuals surveyed in the 1999–2002 NHANES study (National Dairy Council, unpublished data) did not meet their dairy food (milk, cheese, and yogurt) intake recommendations. Specifically, more than 50% of children age 2 to 8 yr, 77% of preadolescents and adolescents (9 to 19 yr), and close to 90% of adults 20 to 50 yr in this study did not meet their recommendations for intake of dairy foods (National Dairy Council, unpublished data).

The NSLP requires that lunch provide at least one-third of key nutrients, including calcium, whereas the SBP requires that the breakfast offered provide at least one-fourth of these nutrients. Therefore, children participating in the NSLP may be receiving about half of their dairy food servings from this program, and children participating in both the NSLP and the SBP may be receiving the majority of their dairy servings from foods offered through these programs (NSLP and SBP, 2007). This is important because children who consume

more milk also have diets with better nutrition quality (Miller et al., 2007). In fact, participation in programs such as the NSLP and SBP results in increased intake of a range of nutrients including calcium, phosphorus, riboflavin, and protein (Gleason and Sutor, 2001). Specifically, participants of the NSLP had increased dairy food consumption resulting in increased calcium, vitamin D, vitamin A, and magnesium consumption (Gleason and Sutor, 2001; Nicklas, 2003). Moreover, participants in the SBP had greater consumption rates of milk and nutrients including calcium, phosphorus, magnesium, protein, thiamin, and riboflavin both at breakfast and over a 24-h period compared with children who did not participate (Gleason and Sutor, 2001; Nicklas, 2003). For this reason, programs such as the NSLP and SBP are critical for diet and health in children.

Dairy Foods in WIC

The WIC program (<http://www.fns.usda.gov/wic>) provides nutritious foods to supplement the diets of low-income women, infants, and children up to 5 yr of age who may be at nutritional risk. The WIC program also provides nutrition education and counseling for their participants to help women and children make better food choices and incorporate better nutrition into their lives. The WIC program has recently proposed revisions to its program to provide greater consistency with the DGA and current infant feeding practices recommended by the American Academy of Pediatrics to better establish successful long-term breastfeeding. The new revisions also address the public health issue of obesity and reinforce the importance of nutrition education messages and products that appeal to a variety of individuals and cultures. The proposed revisions to the WIC program food packages reflect recommendations made by an Institute of Medicine (2006) report. According to this report, priority nutrients for children in the program were identified as vitamin E, fiber, and potassium, and priority nutrients for participating women were identified as calcium, magnesium, vitamin E, potassium, and fiber (Institute of Medicine, 2006). Interestingly, participating women and children had deficient intakes of these priority nutrients, but they also had excessive caloric intake—they were essentially overfed, but undernourished. This problem mirrors not only the current state of Americans today (individuals are consuming more calories than ever, but not obtaining key essential nutrients), but also illustrates the problem among America's poorer populations, in which being overweight or obese is often accompanied by nutrient insufficiencies and deficiencies. Intake of whole grain foods, vegetables (excluding potatoes and other starchy vegetables), fruits, milk and milk products, and

meat were all lower than the recommended average by the DGA among WIC participants (Institute of Medicine, 2006). The report recommended that infant formula, juice, milk, cheese, and eggs be reduced from the current allowances. Reductions in dairy foods were recommended to meet the DGA recommendations because the current allowances exceeded these recommendations in some cases.

Some of the proposed revisions will allow substitution of cheese for fluid milk and soy products for vegetarians and those with lactose intolerance. The proposed cheese substitutions were reduced to a maximum of 1 pound for 3 quarts of milk per month. Soy-based beverages and calcium-set tofu were also allowed, with proper medical documentation, as substitutions for milk in children's diets; however, such documentation is not required for women participants to make these substitutions.

This is of concern because soy beverages and cow's milk are not nutritionally equivalent, particularly as a calcium source. Cow's milk is a naturally rich source of highly bioavailable calcium, whereas the calcium found in soy beverages provided through fortification is often in the form of tricalcium phosphate or calcium carbonate (Heaney et al., 2005). Calcium fortification of foods such as soy beverages may result in excessive calcium precipitation to the bottom of the container that cannot be resuspended by manual shaking (Heaney et al., 2005). Furthermore, absorption of calcium from soy beverages was shown to be about 25% less than that from cow's milk (Heaney et al., 2005). As a result, allowing the equivalent substitution of soy beverages for cow's milk for women in the WIC program may have adverse consequences on calcium intake.

Dairy products are the best and easiest way to meet calcium recommendations. As pointed out in Healthy People 2010, "With current food selection practices, use of dairy products may constitute the difference between getting enough calcium in one's diet or not" (Healthy People 2010). In a study to evaluate how best to meet calcium daily reference intakes (DRI) through foods, researchers found that dairy foods were the most practical way to fill calcium requirements (Shaw et al., 2000). In that report, USDA researchers noted that, "... increasing servings of food groups other than milk to meet calcium and magnesium DRIs is less likely to be practical, at least in the near term." Fluid milk provides more calcium in the diet than any other food, and comes in a nutrient-dense package that is inexpensive and easily available.

Lactose Intolerance

Unfortunately, complications such as perceived lactose intolerance or lack of education about ways to ac-

commodate lactose intolerance may unnecessarily discourage many people, including participants in federal food programs, from consuming adequate dairy foods each day. Although lactose intolerance among populations such as African Americans is a barrier, prevalence rates may be lower than originally suggested (McBean and Miller, 1998; Jarvis and Miller, 2002). The National Medical Association Consensus Report (Wooten and Price, 2004) states that current estimates of lactose maldigestion may overestimate the number of people with lactose intolerance. Data published in this consensus report on a census-based population found that only 24% of African Americans actually reported being lactose intolerant (Wooten and Price, 2004). However, the African American diet is more likely to contain low amounts of certain vitamins and minerals, especially calcium, mainly because African Americans consume low amounts of dairy foods (Fulgoni et al., 2007). The low intake of calcium, potassium, and other nutrients increases the risk of hypertension. This risk may be reduced by following the Dietary Approaches to Stop Hypertension (DASH) diet, a diet rich in fruits, vegetables, and dairy foods. This diet pattern significantly reduces blood pressure and is twice as effective in African Americans as in Caucasians (Svetkey et al., 1999). The low intake of calcium-rich dairy foods and other nutrients by this population is of particular concern because, according to the US Census Bureau, about 25% of African Americans were at or below the poverty level in 2005. Furthermore, other ethnic groups including the Asian population have low dairy food and dietary calcium intakes, potentially contributing to bone loss and hypertension (Jarvis and Miller, 2002). Minority populations are over-represented among America's poor, and it is vital that federal food programs continue to provide not only nutritious foods including milk and milk products to participants, but also nutrition education, including how to address lactose intolerance.

Health authorities recommend dairy foods as the preferred calcium source even for lactose-intolerant individuals, through strategies such as drinking smaller amounts with meals and consuming cheese or yogurt (Baker et al., 1999; Heyman, 2006). The 2005 DGA recommend consuming 3 servings of dairy foods per day to ensure adequate nutrient intakes; for individuals who may be lactose intolerant, milk products such as yogurt or lactose-free milk are recommended, as is utilizing the enzyme lactase before consumption of milk or milk products (USDA-Department of Health and Human Services, 2005). The National Medical Association Consensus Report (Wooten and Price, 2004) similarly recommends 3 to 4 servings of dairy per day for the African American population along with strategies to manage lactose intolerance. Furthermore, research has

shown that individuals who have trouble digesting lactose, including African Americans, may consume at least 1 cup of milk twice a day without experiencing symptoms, especially when consumed as part of a meal. Those individuals who have trouble digesting lactose can consider other alternatives such as yogurt or hard cheeses, which have lower lactose levels (Jackson and Savaiano, 2001; Jarvis and Miller, 2002; Byers and Savaiano, 2005). The American Academy of Pediatrics supports consuming dairy foods for the natural source of calcium and effects on bone health and growth to meet calcium needs for bone health and other health benefits (Heyman, 2006). The American Academy of Pediatrics recommends that lactose-intolerant children try other approaches to consume dairy foods such as the use of partially digested dairy products (yogurts, cheeses, products containing *Lactobacillus acidophilus*, and pretreated milk) or use oral lactase supplementation (Heyman, 2006). Children comprise the largest percentage of America's poor, so federal food programs have a great responsibility in establishing proper nutrient and dairy food intake habits among children. Furthermore, these programs need to educate parents about on how to nourish their children.

Health Costs of Inadequate Dairy Nutrient Consumption

Lack of proper nutrition may not only compromise health, it also contributes to the burden of increased healthcare costs in the United States. Adequate dairy food consumption could play an important role in reducing the healthcare cost burden. McCarron and Heaney (2004) assessed the available data for several medical conditions for which dairy food intake may lower the risk of disease development or improve disease outcome. They estimated the annual healthcare costs for these diseases, including obesity (\$61 billion), hypertension (\$34 billion), stroke (\$31 billion), coronary artery disease (\$58 billion), type 2 diabetes (\$44 billion), and osteoporosis (\$17 billion), and then estimated the potential healthcare savings if the population increased its dietary calcium intake to the equivalent of 3 to 4 servings of dairy each day (from 1,100 to 1,400 mg of calcium each day). They found that these increases in the US population's dairy food intake would lead to first-year savings of \$26 billion for the health conditions assessed, and cumulative 5-yr savings of \$209 billion (McCarron and Heaney, 2004). At present levels, federal nutrition programs that provide adequate dairy foods are most likely reducing disease incidence and healthcare costs below levels that would occur in the absence of the programs. Reducing or eliminating nutrient-dense dairy foods such as milk, cheese, and yogurt

may have devastating consequences, not only for the health of the nation's poor, but also for the nation's total healthcare costs.

CONCLUSIONS

Federal food programs enhance the health of Americans and provide nutritious foods for its participants to maintain health and reduce disease. The overweight, undernourished status of Americans, especially in high-risk populations, underscores the importance of providing nutrient-rich foods such as dairy foods to participants in federal food programs. The WIC program provides nutrition counseling for its participants as part of its program to aid in the development of good nutrition and eating habits. By allowing more Americans to obtain and afford nutritious foods such as dairy foods with their unique nutrient-rich package, federal nutrition programs not only help alleviate poverty and play an important role in delivering calcium and other vital nutrients to millions of Americans, they help reduce the disease burden and health care costs in the United States.

As federal programs expand and adjust to meet the needs of the poor in our society, they will likely focus on maximizing the nutrient density and nutritional balance supported in the programs. Clearly, dairy foods can play a prominent part in such a strategy.

REFERENCES

- Alaimo, K., C. M. Olson, and E. A. Frongillo Jr. 2001. Low family income and food insufficiency in relation to overweight in US children: Is there a paradox? *Arch. Pediatr. Adolesc. Med.* 155:1161–1167.
- Baker, S. S., W. J. Cochran, C. A. Flores, M. K. Georgieff, M. S. Jacobson, T. Jaksic, and N. F. Krebs. 1999. American Academy of Pediatrics Committee on Nutrition: Calcium requirements of infants, children, and adolescents. *Pediatrics* 104:1152–1157.
- Byers, K. G., and D. A. Savaiano. 2005. The myth of increased lactose intolerance in African-Americans. *J. Am. Coll. Nutr.* 24(6 Suppl.):569S–573S.
- Casey, P. H., P. M. Simpson, J. M. Gossett, L. M. Bogle, C. M. Champagne, C. Connell, D. Harsha, B. McCabe-Sellers, J. M. Robbins, J. E. Stuff, and J. Weber. 2006. The association of child and household food insecurity with childhood overweight status. *Pediatrics* 118:1406–1413.
- Drewnowski, A., and N. Darmon. 2005. Food choices and diet costs: An economic analysis. *J. Nutr.* 135:900–904.
- Drewnowski, A., and S. E. Specter. 2004. Poverty and obesity: The role of energy density and energy costs. *Am. J. Clin. Nutr.* 79:6–16.
- Federal Food Programs. 2006. http://www.frac.org/State_Of_States/2006/states/US.pdf Accessed Aug. 20, 2007.
- Frongillo, E. A., Jr., C. M. Olson, B. S. Rauschenbach, and A. Kendall. 1997. Nutritional consequences of food insecurity in a rural New York state county. Discussion Paper no. 1120–97. Institute for Research on Poverty, University of Wisconsin-Madison, Madison.
- Fulgoni, V., 3rd, J. Nicholls, A. Reed, R. Buckley, K. Kafer, P. Huth, D. DiRienzo, and G. D. Miller. 2007. Dairy consumption and related nutrient intake in African-American adults and children in the United States: Continuing survey of food intakes by individuals 1994–1996, 1998, and the National Health and Nutrition Examination Survey 1999–2000. *J. Am. Diet. Assoc.* 107:256–264.
- Gerrior, S., and L. Bente. 2002. Nutrient content of the US food supply, 1909–1999: A summary report. USDA Center for Nutrition Policy and Promotion, Washington, DC.
- Gleason, P., and C. Suitor. 2001. Children's diets in the mid-1990s: Dietary intake and its relationship with school meal participation. Nutrition Assistance Programs Report Series, Report No. CN-01-CD1; www.fns.usda.gov/oane.
- Greer, F. R., and N. F. Krebs. 2006. American Academy of Pediatrics, Committee on Nutrition. Optimizing bone health and calcium intakes of infants, children, and adolescents. *Pediatrics* 117:578–585.
- Healthy People 2010. 2000. Vol. 2. Understanding and Improving Health, Objectives for Improving Health (Part B: Focus Areas 15–28). www.healthypeople.gov/Document/tableofcontents.htm
- Heaney, R. P., K. Rafferty, and J. Bierman. 2005. Not all calcium-fortified beverages are equal. *Nutr. Today* 40:39–44.
- Heyman, M. B. 2006. Lactose intolerance in infants, children, and adolescents. *Pediatrics* 118:1279–1286.
- Huth, P., D. DiRienzo, and G. Miller. 2006. Major scientific advances with dairy foods in nutrition and health. *J. Dairy Sci.* 89:1207–1221.
- Institute of Medicine. 2006. WIC food packages: Time for a change. National Academy Press, Washington, DC.
- Jackson, K. A., and D. A. Savaiano. 2001. Lactose maldigestion, calcium intake and osteoporosis in African-, Asian-, and Hispanic-Americans. *J. Am. Coll. Nutr.* 20(2 Suppl.):198S–207S.
- Jarvis, J. K., and G. D. Miller. 2002. Overcoming the barrier of lactose intolerance to reduce health disparities. *J. Natl. Med. Assoc.* 94:55–66.
- Keller, J. L., A. J. Lanou, and N. D. Barnard. 2002. The consumer cost of calcium from food and supplements. *J. Am. Diet. Assoc.* 102:1669–1671.
- McBean, L. D., and G. D. Miller. 1998. Allaying fears and fallacies about lactose intolerance. *J. Am. Diet. Assoc.* 98:671–676.
- McCarron, D. A., and R. P. Heaney. 2004. Estimated healthcare savings associated with adequate dairy food intake. *Am. J. Hypertens.* 17:88–97.
- Miller, G. D., J. K. Jarvis, and L. D. McBean. 2001. The importance of meeting calcium needs with foods. *J. Am. Coll. Nutr.* 20(2 Suppl.):168S–185S.
- Miller, G. D., J. K. Jarvis, and L. D. McBean. 2007. *The Handbook of Dairy Foods and Nutrition*. 3rd ed. CRC Press, Boca Raton, FL.
- National Dairy Council. Dairy DGA comparisons: Unpublished data based on the National Health and Nutrition Survey (NHANES), 1999–2002.
- National Milk Producers Federation. 2006. Economic impact of the IOM recommendations on the WIC Program on the US dairy industry and the federal budget. Unpublished analysis. NMPF, Arlington, VA.
- National Milk Producers Federation. 2007. Dairy Producer Highlights, Table 44: Domestic distribution programs, utilization of milk and dairy products; Selected fiscal years. http://www.nmpf.org/highlights/DairyPrdcerHghlghtsGrphs_files/book3.htm Accessed Aug. 8, 2007. NMPF, Arlington, VA.
- National School Lunch Program. 2007. http://www.frac.org/html/federal_food_programs/programs/nsplp.html Accessed Aug. 20, 2007.
- Nicklas, T. 2003. Calcium intake trends and health consequences from childhood through adulthood. *J. Am. Coll. Nutr.* 22:340–356.
- School Breakfast Program. 2007. http://www.frac.org/html/federal_food_programs/programs/sbp.html Accessed Aug. 20, 2007.
- Shanklin, C., and S. Wie. 2001. Nutrient contribution per 100 kcal and per penny for the 5 meal components in school lunch: Entrée, milk, vegetable/fruit, bread/grain, and miscellaneous. *J. Am. Diet. Assoc.* 101:1358–1361.
- Shaw, A. M., A. J. Escobar, and C. A. Davis. 2000. Reassessing the food guide pyramid: Decision-making framework. *J. Nutr. Educ.* 32:111–118.
- Svetkey, L. P., D. Simons-Morton, W. M. Vollmer, L. J. Appel, P. R. Conlin, D. H. Ryan, J. Ard, and B. M. Kennedy. 1999. Effects of dietary patterns on blood pressure: Subgroup analysis of the

- Dietary Approaches to Stop Hypertension (DASH) randomized clinical trial. *Arch. Intern. Med.* 159:285–293.
- Townsend, M. S., J. Peerson, B. Love, C. Achterberg, and S. P. Murphy. 2001. Food insecurity is positively related to overweight in women. *J. Nutr.* 131:1738–1745.
- USDA. 2005. Household Food Security in the United States, 2004; <http://www.ers.usda.gov/Publications/err11/> Accessed Aug. 20, 2007.
- USDA, US Department of Health and Human Services. 2005. Dietary Guidelines for Americans; <http://www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005.pdf> Accessed Aug. 22, 2007.
- USDA Food and Nutrition Service. 2005. Making America Stronger: A Profile of the Food Stamp Program. Office of Analysis, Nutrition and Evaluation, USDA Food and Nutrition Service, Washington, DC.
- USDA Food and Nutrition Service. 2007. Food Stamp Program Participation and Costs. <http://www.fns.usda.gov/pd/fssummar.htm> Accessed Aug. 8, 2007. USDA Food and Nutrition Service, Washington, DC.
- Wooten, W. J., and W. Price. 2004. Consensus report of the National Medical Association. The role of dairy and dairy nutrients in the diet of African Americans. *J. Natl. Med. Assoc.* 96(12 Suppl.):5S–31S.