

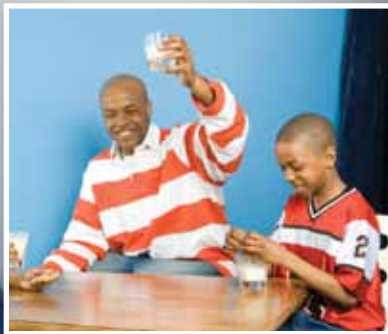
JOURNAL OF THE

National  
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# Lactose Intolerance and African Americans:

Implications for  
the Consumption  
of Appropriate  
Intake Levels of  
Key Nutrients



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**Keywords:** African Americans ■ nutrition recommendations ■ dairy foods ■ food consumption expenditures ■ calcium recommendations ■ lactose maldigestion ■ lactose non-persistence ■ osteoporosis ■ obesity ■ hypertension ■ colon cancer ■ milk ■ cheese ■ yogurt

*J Natl Med Assoc.* 2009;101:1S-24S

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## INTRODUCTION

### About the National Medical Association

The National Medical Association (NMA), a leader in African-American health issues, represents the collective interests of over 30,000 African-American physicians and health professionals and the patients they serve. The NMA has historically taken an active role in addressing the myriad factors underlying racial disparities. Through its membership, professional development, community health education, advocacy, research, and its efforts with federal and private agencies and corporations, the NMA is committed to improving the health status and outcomes of minority and disadvantaged people. The NMA's primary disease research program targets include: (1) asthma, (2) cardiovascular disease and stroke, (3) cancer, (4) diabetes, (5) chronic kidney disease and end stage renal disease, (6) HIV/AIDS, and (7) obesity. NMA also seeks to identify the role that nutrition plays in the development and progression of each of these diseases.

### Statement of the Problem

An increasing body of research now documents the intricate and expansive linkages between nutritional deficits and the etiology of selected health conditions. While a multiplicity of nutrients is present in a range of food products, dairy products embody an exceptionally large pool of those vitamins, minerals, and other nutritional elements required for the optimization of health. However, some evidence exists that African Americans may be at risk of nutrient deficits as a result of the under-consumption of dairy products because of lactose intolerance. This paper outlines key risks associated with lactose intolerance and makes recommendations regarding their amelioration.

### Purpose

The purpose of this paper is that of addressing several key questions regarding African Americans and lactose intolerance. These questions are:

- What is lactose intolerance and how prevalent is it among African Americans?
- Is the under-consumption of dairy products by African Americans associated with dietary deficits in nutrients such as calcium, vitamin D, protein, magnesium, potassium, and phosphorus?
- If so, what health risks may be associated with dairy nutrients deficits among African Americans?
- What strategies can be recommended to African-American physicians to address ongoing and/or anticipated dairy nutrients deficits in this population?

### Methodology

Utilizing secondary data and research, the National Medical Association prepared a preliminary review of literature and identified key issues that can further inform recommendations regarding African Americans, lactose intolerance, and possible nutrient deficits due to the under-consumption of dairy products by African Americans. The National Medical Association then reviewed the draft statement. Data from the Department of Labor, Consumer Expenditures Survey, were analyzed. This paper reports these findings.

### Findings

Research reveals that dairy milk alone supplies key nutrients. The nine essential nutrients found in milk that are found in good or excellent levels include protein, vitamin A, vitamin D, vitamin B12, riboflavin, niacin, calcium, potassium, and phosphorus. Yet, African Americans and other minorities under-consume milk and other dairy products. While Caucasians spend a mean of \$408.96 per household on dairy products, African Americans only spend an average of \$253.41 per household annually. Asian Americans spend slightly more – a mean of \$362.42 per year. These lower levels of expenditures can be explained, in part, by the existence of lactose intolerance among African Americans and other ethnic groups. This condition can lead to nutritional deficits that increase vulnerability to key chronic diseases. While some variation exists in the estimated prevalence of intolerance,<sup>1a-b</sup> all researchers acknowledge that African Americans, Native Americans and Asians are disproportionately affected by this condition. It is important to note that many of these estimated prevalence rates may be inflated because they are based on earlier studies using a large 50g bolus of lactose, which is far greater than the amount of lactose that is likely to be consumed in any one meal. More recently, researchers have estimated that approximately 1/3 to 1/5 of individuals with limited lactase activity will actually have digestive symptoms.<sup>2</sup> However, in a 2004 study the

NMA found that 24 percent of African Americans reported themselves as being lactose intolerant. Yet, of those who reported symptoms of the condition, 85 percent said they would add more milk and dairy products to their diet if they could avoid the symptoms.<sup>3</sup>

## Recommendations

Based upon these findings, several recommendations are made for preventing the transformation of lactose intolerance into dairy products-related nutrient deficits.

**Know and Understand the Roles and Sources of Needed Nutrients.** Despite the continual reference to daily dietary guides, anecdotal data suggest that many African Americans remain unaware of the suggested minimum servings associated with the major food groups. Even fewer consumers are aware of the nutrients that are potentially contributed to one's body by each food group. Moreover, a third missing area of knowledge is the role that various nutrients play in sustaining health. Thus, physicians and other health care providers may wish to disseminate dietary guides to African Americans that educate them regarding the critical role that three daily servings of dairy products — milk, yogurt, or cheese — can play in ensuring a sufficiency of calcium, riboflavin, protein, potassium, and/or other nutrients.

**Encourage Patients to be Formally Tested for Lactose Intolerance.** The consumption of a number of foods such as broccoli or legumes can create the symptoms associated with lactose intolerance. Other conditions including irritable bowel syndrome has similar symptoms. Thus, lactose intolerance self-diagnosis must be addressed. Physicians and providers can do much to reduce dairy nutrients deficiencies by including the question of lactose tolerance as a core question when medical data for African Americans are collected. Persons who check the “yes” box can then be tested for lactose intolerance levels using the standard Lactose Tolerance Test, the Hydrogen Breath Test, the Stool Acidity Test, or one of the emerging methods of testing.

**Gradually Increase Use of Lactose.** Even before beginning a treatment program for lactose intolerance in those with a confirmed problem, it may be important to

seek to gradually increase tolerance levels. Pribila, et al (2000)<sup>4</sup>, found that a sample of African-American girls were able to better digest lactose through a program of gradual introduction. The findings from this study are consistent with a more recent study by Zhong (2006).<sup>5</sup> These researchers introduced yogurt during the latter phases of a study that gradually increased exposure to lactose. Additionally, there are documented strategies that may be used to increase tolerance levels. Specifically, the National Dairy Council's DAIRY strategies from its *Tips for Keeping Dairy in Your Diet* may be helpful in performing this task.

- **Drink milk with food.**
- **Aged cheeses like Cheddar and Swiss are low in lactose.**
- **Introduce dairy slowly.** Gradually increase the amount.
- **Reduce it.** Enjoy lactose-reduced milk and milk products.
- **Yogurt with live and active cultures helps digest lactose.**

**Provide Health Education Regarding the Role That Dairy Nutrients Can Play in Hypertension, Obesity, Diabetes, and Other Chronic Illnesses.** An intensive description of chronic illnesses with high prevalence rates among African Americans is presented. Physicians and other providers may wish to disseminate information to their patients with chronic illnesses regarding these relationships. The widespread dissemination of such information may have an impact upon the prevalence and manifestation of conditions such as hypertension, obesity and/or diabetes.

**Use Milk-Substitute Products.** Milk-substitute products may be used in order to reduce the risks of nutritional deficits. While multiple options are available, the use of yogurt, lactose-reduced milk and/or other products that are in the milk food group will generate reliable benefits. Additionally, some evidence exists that the consumption of lactase before using a milk product will reduce the typical symptoms of lactose intolerance.

# Lactose Intolerance and African Americans: Implications for the Consumption of Appropriate Intake Levels of Key Nutrients

## INTRODUCTION AND STATEMENT OF THE PROBLEM

The linkages between dietary intake and the etiology and progression of selected health conditions have been well documented. Chronic conditions such as cardiovascular disease, including hypertension, are associated with the intake of foods high in saturated fat and cholesterol.<sup>6</sup> Diets deficient in vitamin K have been associated with defects in the body's blood clotting mechanisms.<sup>7</sup> Insufficient consumption of a trace element such as zinc may lead to difficulties in wound healing and temporary and permanent impairment of the senses of taste and smell.<sup>8</sup>

Nutrients from all of the food groups contribute to the maintenance of the body's key systems. Because of its nutrient-rich package, the consumption of dairy products may play a unique role in preventing many illnesses and disease states.<sup>9-14</sup> Indeed, through the consumption of at least three servings of low-fat dairy products on a daily basis, a number of health benefits can occur. This recommended daily allowance for dairy is included in the 2005 Dietary Guidelines for Americans (DGA). It is also supported by the Institute of Medicine's report on nutrition standards for foods in schools and is part of the dietary strategy outlined in the Dietary Approaches to Stop Hypertension (DASH) diet. However, achieving this recommendation, and hence securing vital daily nutrients, may be hampered for many African Americans and others due to lactose malabsorption, which many be referred to as "lactose intolerance." Table 1 describes some of the health outcomes that are associated with different intake levels of dairy products.

Given the breadth of physiological functions linked with dairy food products, it is less than surprising that deficiencies in the minerals, vitamins, and trace substances found in dairy and other food products can be associated with disease and illness. For example, researchers McCullough, et al (2003),<sup>26</sup> in a study of over 60,000 individuals, found an association between colon cancer and dietary calcium deficits. Likewise, Cho, et al (2004),<sup>27</sup> in a study of 10 cohort studies across five countries, discovered that the higher consumption of milk and calcium is associated with a lower risk of colorectal cancer. Moreover, Wang, et al (2008),<sup>28</sup> found

that insufficient calcium may be linked with hypertension. Similar findings have resulted from studies of inadequate intake of phosphorus, potassium, protein, and other of the nutrients that are present in dairy products.

Such trends are far from benign. Indeed, only half of African Americans eat one or more servings of dairy foods a day.<sup>29</sup> Of particular concern, African-American children only consume between 0.8 and 1.0 servings of milk per day<sup>30</sup> — a deficiency that can lead to serious future health problems. Mean expenditures of African Americans for dairy products equaled .7 percent (0.7%) of disposable income in 2007 relative to mean expenditures for dairy products among Caucasians of .8 percent (0.8%).<sup>31</sup> Such findings are contrary to both groups. As mentioned, a number of studies have suggested that the nutrients in dairy products intermediate hypertension, obesity, and other medical conditions with high prevalence rates among Americans in general, and African Americans in particular.

One causative factor that is advanced in explanation of the under-consumption of dairy products among African Americans is the presence of lactose intolerance.<sup>32</sup> The purpose of this paper is that of answering several questions:

- What is lactose intolerance and how prevalent is it amongst African Americans?
- Is the under-consumption of dairy products by African Americans associated with dietary deficits in nutrients such as calcium, vitamin D, protein, potassium, and phosphorus?
- If so, what health risks may be associated with dairy nutrients deficits among African Americans?
- What strategies can be recommended to African-American physicians to address ongoing and/or anticipated dairy nutrients deficits in this population?

The subsections that follow utilize secondary research and data to answer these key questions.

## ABOUT THE NATIONAL MEDICAL ASSOCIATION

The National Medical Association (NMA), a leader in African-American health issues, represents the col-

lective interests of over 30,000 African-American physicians and health professionals and the patients they serve. The NMA has historically taken an active role in addressing the myriad factors underlying racial disparities in major health conditions. Through its membership, professional development, community health education, advocacy, research, and its efforts with federal and private agencies and corporations, the NMA is committed to improving the health status and outcomes of minority and disadvantaged people. The NMA's primary disease research program targets include: (1) asthma, (2) cardiovascular disease and stroke, (3) cancer, (4) diabetes, (5) chronic kidney disease and end stage renal disease, (6) HIV/AIDS, and (7) obesity. This report explores the implications of lactose intolerance as a risk factor for several of these chronic diseases.

## METHODOLOGY

A review of literature was completed. This review focused on: (1) recent findings on proper nutrition as it relates to dairy products in the United States and literature on food expenditures by minorities, the underserved, and the poor; (2) relevant legislation and policies; and (3) public and private-sector initiatives providing research, education, and medical services designed to improve the quality of nutrition for African Americans. In selecting studies for inclusion in this report, several criteria were used. First, studies were selected that introduced unique findings regarding lactose intolerance. Second, both current and classic studies that have served as frameworks for understanding the nature of this issue were included. Third, research that can assist in supporting dairy consumption among African Americans was cited.

## LACTOSE INTOLERANCE AND AFRICAN AMERICANS

A number of responses can occur among African Americans and other groups when dairy products are

consumed. At the first level, the dairy product may be acted upon by an enzyme known as lactase. As a result, the dairy product will separate into two less complex forms, glucose and galactose. As a part of the digestive process, glucose and galactose will then enter the blood stream. When insufficient lactase, and/or no lactase is present, symptoms of maldigestion occur that have come to be called lactose intolerance. In order to understand lactose intolerance, it is necessary to first define several key terms. These definitions have been included in the subsection below.

- Lactose — A disaccharide (sugar) found in milk that is hydrolyzed to galactose and glucose by the intestinal enzyme lactase. Lactose is the principle carbohydrate found in human and animal milk.
- Lactase Nonpersistence — This term refers to the normal age-related decline in lactase activity in the lining of the small intestine. However, it is often used incorrectly to refer to lactose maldigestion.<sup>33</sup>
- Lactose Maldigestion — Also referred to as lactose nonpersistence, lactose maldigestion occurs when digestion of lactose is reduced due to low activity of the enzyme, lactase. Symptoms may not be present unless the amount of lactose consumed exceeds the available lactase. Lactase breaks down milk sugar into two simpler forms of sugar, glucose and galactose, which are then absorbed into the bloodstream from the small intestine.<sup>33</sup>
- Lactose Intolerance — This term refers to the occurrence of gastrointestinal symptoms resulting from the incomplete digestion of lactose, a carbohydrate. It is caused by a shortage of the enzyme, lactase. There are three basic types:
  - » Primary lactose intolerance is the most common form and is genetically determined. Symptoms do not usually become apparent until late adolescence or early adulthood.

**Table 1.** Dairy Product Consumption and Key Health Benefits

- Vitamin A, a nutrient included in cream, butter, and whole milk, as well as other food groups, can prevent night blindness, growth failure, and reproductive failure.<sup>15-17</sup>
- Vitamin D, a substance found in fortified milk and margarine, is associated with calcium and phosphorus absorption. Deficiency can lead to diseases such as rickets and/or osteomalacia<sup>18,19</sup> (softening of the bone).
- Riboflavin, a B-complex vitamin found in milk, facilitates general metabolism. Pantothenic acid, and cobalamin, two other vitamin substances found in milk, are also associated with metabolic functioning.<sup>20</sup>
- Milk and cheese also provide calcium, a mineral associated with the health of teeth and bones, blood clotting, nerve transmission,<sup>21</sup> and other physiological functions.
- Phosphorus, a mineral that adults require approximately 800 mg of on a daily basis to facilitate the absorption of glucose, is also found in milk and cheese.<sup>22</sup>
- Magnesium, a mineral found in milk and cheese, supports general metabolism, smooth muscle action, and other functions.<sup>23</sup>
- Sodium, another mineral found in milk and cheese, supports fluid and water balance<sup>24</sup> and the absorption of glucose.
- Sulfur, a mineral which is normally associated with protein, can also be found in milk and cheese.<sup>25</sup>

- » Secondary lactose intolerance occurs as a result of disease, surgery, radiation, or medications. Lactase activity is restored when the underlying condition resolves.
- » Congenital lactose intolerance, a lifelong complete absence of lactase, is a rare condition.
- Milk Allergy — This term references a reaction to the protein found in milk that is triggered by the immune system. It requires the complete avoidance of milk and milk products.

Lactose intolerance, as described in the listed definitions, occurs when the enzyme lactase is insufficient or absent. As a result, when dairy products are consumed, gastrointestinal problems of different degrees of severity result. In a now classic study, Scrimshaw and Murray (1988)<sup>34</sup> argue that the enzyme lactase is only maintained at or near its original levels in persons of Northern European and/or Mediterranean ancestry. As a result, Hertzler, et al (1996),<sup>35</sup> suggest that only 25 percent of the population across the globe is “lactose persistent.”

Estimates of the prevalence rates of lactose intolerance differ across researchers. Rusynyk and Still (2001),<sup>36</sup> for example, suggest that within the United States, 90 percent of African Americans, 95 percent to 100 percent of Native Americans, 80 percent to 90 percent of Asians, Mediterraneans, and Jewish Americans; and 52 percent of persons from Central and/or Northern Europe are lactose intolerant. Other researchers (1994)<sup>37</sup> have estimated lactose maldigestion as 80 percent in African Americans and 90 percent in Asian Americans.

In contrast, Boyle and Long (2007)<sup>38</sup> suggest that lactose intolerance prevalence rates are 90 to 95 percent for Asians, 15 to 25 percent for Caucasians; 70 percent for persons of African descent; 50 to 55 percent for Latinos; 95 percent for Native Americans and 60 percent for persons of Jewish ancestry. M.E. Posthauer (2007)<sup>39</sup> describes lactose intolerance prevalence rates as approaching 80 percent for African Americans. Findings from research by Norman Kretchmer (1972)<sup>40</sup> and augmented by research completed by the National Institutes of Diabetes and Digestive and Kidney Diseases (NIDDK) suggested that 75 percent of African Americans, 100 percent of Native Americans, 12 percent of Caucasians, and 93 percent of Chinese Americans are lactose intolerant.

While estimates of the exact prevalence rates for lactose intolerance differ, all researchers agree that the rate is very high among African Americans and other minority populations. The focus of this paper, however, is specifically on lactose intolerance and the role that it can play in creating deficits in nutrients in African Americans.

Such a discussion is important because the chemistry of dairy milk is a complex one that is also nutrients-rich. It contains units of fat, protein membranes, and multiple types of other protein molecules including whey and calcium phosphate. Of these multiple ingredients, the

term lactose references, as mentioned, the dual sugars — glucose and galactose. Data from the United States Department of Agriculture (USDA), Nutrient Database indicates that dairy milk contains the key nutrients listed in Table 2.

Found in milk and milk products and in a very limited number of tropical shrubs and forsythia flowers, lactose can, as mentioned, only be digested when acted upon by the enzyme lactase. However, the quantity of lactase declines over the human life cycle. Lee, et al (1997),<sup>41</sup> first observed the relationship between age and declining levels of lactase in a cross-sectional study of rats at age 3, 12, and 24 months. Rats 24 months of age had levels of sucrase activities that were 38 percent lower than the levels found in their 3-month-old counterparts.

Continuing their research, Lee, et al (2009),<sup>42</sup> based upon multiple years of study, confirm that a decline in lactose production does occur in most individuals over the course of their lifetime. They argue that this decline often leads to the avoidance of dairy products and ultimately, to reduced calcium intake and/or absorption.

Ingram, et al (2009),<sup>43</sup> building on such findings, traces the source of human adult onset lactose decline and/or persistence to a group of single nucleotide polymorphisms that are disproportionately present in persons of Northern Europe descent but not in persons of African descent. As a result, human adult-onset lactase decline may actually begin in early childhood in African Americans resulting in the risks of nutrient deficits that can accompany the avoidance of dairy foods due to lowered and/or absent lactase.

Despite the genetic processes that shape lactose persistence and attrition, however, Eadala, et al (2008),<sup>44</sup> argue that lactose intolerance is a condition that is prevalent among 70 percent of the 6.7 billion persons who now comprise the global community. These researchers also analyzed the lactose content of medications used in the treatment of gastrointestinal disorders by using high performance liquid chromatography — an approach that involves the separation and analysis of the dissolved chemical components of milk. The research team found that medications used to treat the flatulence, bloating, and stomach cramps that may accompany the consumption of dairy foods in persons with lactose maldigestion problems, may exaggerate the problem because they contain lactose.<sup>44</sup> As is known, symptoms of lactose maldigestion are very “dosage” sensitive. That is, symptom manifestation occurs in direct proportion to the quantity of dairy product consumed in most individuals. Thus, African Americans who utilize medications to reduce lactose maldigestion problems may inadvertently aggravate their condition. Such an outcome can further reduce the willingness of African Americans to consume dairy products.

### Other Nutritional Deficits Among African Americans

The existence of nutritional disparities across different racial and ethnic groups is well known. Such disparities are especially apparent when income status is included. The U.S. Government's many nutritional programs are designed to help ameliorate such disparities. However, low-income African Americans are more prone to nutritional deficits due to their ethnicity and financial status. Cox, Carpenter, Bruce, Poole and Gaylord (2004)<sup>45</sup> conducted a study involving 196 participants with type 2 diabetes. Of the group, 51 percent were African American. It was also found that of the total participant pool, over 75 percent had received diet and exercise counseling. Yet, less than half of the participants followed the dietary recommendations learned. For example, approximately 25 percent did not engage in proper exercise. Such behaviors can, of course, place these individuals at risk of nutritional deficits.

Similarly, Sharkey and Schoenberg (2002)<sup>46</sup> also found a direct link between income, race, age and nutritional vulnerability. In a study of 729 older women, these researchers found that having an income equal to

or below 125 percent of the federal poverty level, being African American, living alone and being a senior between the ages of 60 to 74 years old were all factors associated with nutritional risk. The nutritional risks experienced by these participants were either moderately high or very high. The African-American women in the study also tended to have inadequate dietary intake. These findings also demonstrate a link between nutritional risk and social determinants of health.

In another study, Miller, et al (1996),<sup>47</sup> in a survey of urban African-American seniors, found that these individuals were also at high nutritional risk. Two study groups were compared against a primarily Caucasian comparison group from New England. The two African-American groups were 115 public housing residents aged 50 and over from North St. Louis, and 115 public housing residents aged 50 and over from East St. Louis. The study areas had high levels of poverty. The Nutritional Screening Initiative Checklist was used to measure nutritional risk among the participants. Approximately 48 percent of the North St. Louis sample and 66 percent of the East St. Louis sample scored high on the checklist. Compared to the Caucasian comparison group, these

**Table 2.** Milk, Reduced Fat, Fluid, 2% Milkfat, Protein Fortified, With Added Vitamin A

Nutrient	Units	Value per 100 grams	Number of Data Points	Std. Error	1.00 X 1 cup
					----- 246g
Proximates					
Water	g	87.71	119	0.021	215.77
Energy	kcal	56	0	0	138
Protein	g	3.95	104	0.009	9.72
Total lipid (fat)	g	1.98	114	0.01	4.87
Ash	g	0.87	0	0	2.14
Carbohydrate, by difference	g	5.49	0	0	13.51
Fiber, total dietary	g	0.0	0	0	0.0
Sugars, total	g	5.26	0	0	12.94
Minerals					
Calcium, Ca	mg	143	0	0	352
Iron, Fe	mg	0.06	0	0	0.15
Magnesium, Mg	mg	16	0	0	39
Phosphorus, P	mg	112	0	0	276
Potassium, K	mg	182	0	0	448
Sodium, Na	mg	59	0	0	145
Zinc, Zn	mg	0.45	0	0	1.11
Copper, Cu	mg	0.008	0	0	0.020
Manganese, Mn	mg	0.002	0	0	0.005
Selenium, Se	mcg	2.6	0	0	6.4
Vitamins					
Vitamin C, total ascorbic acid	mg	1.1	0	0	2.7
Thiamin	mg	0.045	0	0	0.111
Riboflavin	mg	0.194	0	0	0.477
Niacin	mg	0.101	0	0	0.248
Pantothenic acid	mg	0.376	0	0	0.925
Vitamin B-6	mg	0.051	0	0	0.125
Folate, total	mcg	6	0	0	15
Folic acid	mcg	0	0	0	0
Folate, food	mcg	6	0	0	15
Folate, DFE	mcg_DFE	6	0	0	15

participants experienced a limited intake of healthy foods such as fruit, vegetables and, important to the focus of this paper, milk. The St. Louis participants were found to have more dental problems; lack of money for food; and an inability to shop, cook or feed on their own. They were also inclined to be alone and exhibit general depressive symptoms as well as poor general health.

Gans, Burkholder, Risica and Lasater (2003)<sup>48</sup> conducted an NIH-sponsored study that included cholesterol screening and education in New England. From a pool of 9,803 participants, 561 of whom were African American, it was found that the African-American participants scored the highest on the Food Habits Questionnaire (indicating a higher fat diet). In fact, African Americans were found to be more likely to fry food and less likely to eat vegetarian meals.

Other nutritional differences have also been identified. Kronsberg, Obarzanek, et al (2003),<sup>49</sup> in the NHLBI Growth and Health Study, found that increased fat and cholesterol and decreased carbohydrate intake were behaviors associated with level of parental education. Further, the study showed that African-American girls were more likely than their Caucasian counterparts to

have higher saturated fat intakes at age 19 (10.4% for Caucasian girls and 11.7% for African-American girls).

Receiving the proper nutrients is essential to normal maintenance of the human body. However, when the human body is undergoing other challenges such as disease and distress, proper nutrition becomes even more important. This is because nutrition can have an effect on the course of certain diseases. Reusser, DiRienzo, Miller and McCarron (2003)<sup>50</sup> found that cardiovascular disease risk can be lowered in African Americans through adequate nutrient intake. When the diets of the persons in the study included an adequate intake of *dairy products*, risks such as hypertension, insulin resistance syndrome, and obesity were positively affected.

Dairy products are also important for new mothers and pregnant women. Researchers Harville, Schramm, et al (2004),<sup>51</sup> found that African-American pregnant women were slightly more apt to have a lower intake of calcium than their Caucasian counterparts (5% versus 8%).

Deficiencies of other nutrients can also affect the health of African Americans. In a sample of U.S. adults, dietary magnesium was analyzed. Ford and Mokdad (2003)<sup>52</sup> found that while minimal group disparities in

**Table 2.** Milk, Reduced Fat, Fluid, 2% Milkfat, Protein Fortified, With Added Vitamin A (contd)

Nutrient	Units	Value per 100 grams	Number of Data Points	Std. Error	1.00 X 1 cup
					----- 246g
Vitamin B-12	mcg	0.43	0	0	1.06
Vitamin A, RAE	mcg_RAE	0	0	0	0
Carotene, beta	mcg	3	0	0	7
Carotene, alpha	mcg	0	0	0	0
Cryptoxanthin, beta	mcg	0	0	0	0
Vitamin A, IU	IU	5	0	0	12
Lycopene	mcg	0	0	0	0
Lutein + zeaxanthin	mcg	0	0	0	0
Vitamin E (alpha-tocopherol)	mg	0.04	0	0	0.10
Vitamin D	IU	40	0	0	98
Vitamin K (phylloquinone)	mcg	0.1	0	0	0.2
Amino acids					
Tryptophan	g	0.056	0	0	0.138
Threonine	g	0.178	0	0	0.438
Isoleucine	g	0.239	0	0	0.588
Leucine	g	0.387	0	0	0.952
Lysine	g	0.313	0	0	0.770
Methionine	g	0.099	0	0	0.244
Cystine	g	0.037	0	0	0.091
Phenylalanine	g	0.191	0	0	0.470
Tyrosine	g	0.191	0	0	0.470
Valine	g	0.264	0	0	0.649
Arginine	g	0.143	0	0	0.352
Histidine	g	0.107	0	0	0.263
Alanine	g	0.136	0	0	0.335
Aspartic acid	g	0.300	0	0	0.738
Glutamic acid	g	0.827	0	0	2.034
Glycine	g	0.084	0	0	0.207
Proline	g	0.383	0	0	0.942
Serine	g	0.215	0	0	0.529

Source: USDA National Nutrient Database for Standard Reference, Release 21 (2008)

magnesium intake do exist, the magnesium intake of the African-American male participants was 237 mg/d in relation to 326 mg/d for Caucasian males. The study also found that males generally have a higher magnesium intake than females, but that most Americans' magnesium intake is insufficient. Magnesium is also available through dairy products. However, recent research indicates that magnesium is deficient in the diets of many African-American males as well as females (Doheny, 2002).<sup>53</sup>

As is known, vitamin D intermediates the body's ability to use calcium. Ginde, et al (2009),<sup>54</sup> utilizing data from the 1988-1994 and 2001-2004 National Health and Nutrition Examination Surveys, sought to determine whether vitamin D insufficiency was increasing and/or decreasing in the U.S. population by assessing serum 25-hydroxyvitamin D levels over the two time periods. These authors found that a significant decrease in mean serum 25-hydroxyvitamin D levels did occur across the two time periods. Specifically, the mean level dropped from 30 to 24 ng/mL during this time period. However, the percent of the sample with serum 25-hydroxyvitamin D levels that were insufficient as measured by a level below 10 ng/mL actually increased by 200 percent (from 2% to 6%) over the period of the study.

When the data were disaggregated by race/ethnicity, the study revealed that both baseline and new levels of vitamin D insufficiency were significantly higher in African Americans than for the sample as a whole. During the base periods, nine percent (9%) of African Americans relative to two percent (2%) of the overall sample were characterized by vitamin insufficiency. Thus, African Americans were 350 percent more likely to have a vitamin D insufficiency.

However, by the latter time period, the percentage of African Americans in the sample with vitamin D insufficiency had increased to 29 percent. This represented a 222 percent increase. Moreover, it represented an increase in the racial/ethnic disparity rate for vitamin D insufficiency. Specifically, in the latter period, African Americans were 383 percent more likely to have a vitamin D insufficiency than was the case with the 18,883 sample participants in general. This documented level of vitamin D insufficiency may be directly related to lactose intolerance in African Americans.

As mentioned, vitamin D insufficiency in African

Americans may combine with other nutritional deficits in this population. For example, Vitolins, et al (2007),<sup>55</sup> calculated Healthy Eating Index scores for older African Americans, Native Americans, and Caucasians in the South. The national dietary guidelines contained in the Department of Agriculture's Food Pyramid were also used as part of the assessment. This study had a number of findings. Table 3 summarizes the findings.

McCabe, et al (2007),<sup>56</sup> also used the Healthy Eating Index (HEI) to assess the diet quality of African Americans and Caucasians in the Lower Mississippi Delta. Despite the fact that the Mississippi Delta is an agricultural area, the diets of the African Americans in the study had significantly lower scores in terms of grain, vegetables, and dairy food consumption.

Robinson and Hunter (2001)<sup>57</sup> used subject recall techniques to evaluate the foods most frequently purchased by African Americans in Milwaukee, Wisconsin. This study found that 42.9 percent of all calories in the diet of a group of low-income patients from two urban health centers accrued from the consumption of fat. These researchers also discovered that the diets contained 150 percent of the daily recommended level of sodium. Yet, the diets included only 30 percent of the recommended dietary intake of fiber. The investigators triangulated the study by analyzing point-of-purchase data taken from register receipts.

As mentioned earlier, additional research is also needed to determine how African Americans can increase the level of calcium, potassium, and magnesium in their diet without aggravating the condition of obesity. This is particularly important for persons with hypertension. For example, Jarvis and Miller (2002)<sup>58</sup> utilizing a double-blind clinical trial, discovered that even lactose-intolerant African Americans can achieve needed levels of dairy products by following key guidelines. These guidelines include: consuming small portions of milk, eating low-fat cheese and yogurt, and using lactose digestive aids, when required. Importantly, Jarvis and Miller (2002)<sup>58</sup> also identified communication with patients about nutrition in general as critical to the effort to decrease calcium-based morbidity. Thus, new interventions are needed on the effectiveness of programs to improve calcium nutrition among lactose-intolerant African Americans.

As the literature cited thus far indicates, an abundance of research supports the fact that the under-con-

**Table 3.** Nutritional Deficits Among Older African Americans and Other Adults

- Most African Americans and other study participants failed to meet the Food Guide Pyramid recommendations for fruits, vegetables, grains, and, directly relevant to this study, dairy servings.
- Overall, the HEI scores revealed that 24 percent of the sample had diets that would be classified as poor.
- A mere 1% of the sample had good diets.

Source: Table constructed from data found in Vitolins MS, Tooze JA, Golden SL, et al. Older adults in the rural south are not meeting healthful eating guidelines. *Journal of American Dietary Association*. 2007 Feb; 107(2):265-272.

sumption of dairy products may serve as a factor that further confounds the dietary patterns of African Americans. For example, Harris (2006)<sup>59</sup> indicates that young, healthy, African Americans are America's primary group that experiences vitamin D insufficiency. This outcome is, according to Harris, related to the fact that even with exposure to the sun, the higher levels of pigmentation in African-American skin decreases the level of vitamin D produced. As is known, vitamin D adequacy has been associated with a decreased risk of diabetes, cardiovascular disease, and selected cancers.

Indeed, Reis, et al (2008)<sup>60</sup> using cross-sectional data for 2,987 Caucasians and 866 African Americans age 40 or older, sought to determine whether Vitamin D status was linked with the disproportionately higher rates of lower-extremity peripheral arterial disease in African Americans. Peripheral arterial disease normally affects only two percent (2%) of persons age 37 to 69 and ten percent (10%) of individuals age seventy (70) and over. However, this condition has a higher prevalence rate among African Americans. An analysis of data from the 2001-2004 National Health and Nutrition Examination Survey, using logistic regression, demonstrated that approximately one-third of the higher prevalence rate of peripheral arterial disease in African Americans is directly attributable to lower vitamin D status.

Johnson, et al (2008),<sup>61</sup> in a study of 158 seniors from Georgia (31 percent of whom were African American), discovered that despite participating in a food program and receiving a multivitamin supplement, both calcium and vitamin D insufficiency existed. While the deficits were lower among those who received a supplement, the calcium and vitamin D deficits were not fully remediated. Again, inadequate milk intake was one of the factors associated with these circumstances. Other covariates included depression, dementia, anti-anxiety medication use, low sunlight exposure, and receiving meals at home.

## HEALTH RISKS THAT MAY BE ASSOCIATED WITH DAIRY NUTRIENT DEFICITS

An affluence of research confirms that the dairy consumption patterns of African Americans may create vulnerability to other illnesses and diseases. The subsections below provide detailed overviews of major diseases among African Americans that may be affected by the presence or absence of dairy nutrients. These chronic conditions include hypertension, obesity, cancer, and diabetes.

### Hypertension in African Americans and Dairy Nutrients

An abundance of research now confirms that hypertension is associated with the genesis of a wide range of other forms of cardiovascular disease. Additionally, hypertensive Americans are far more likely than their normotensive friends and family members to experience

strokes, ischemic heart disease, peripheral vascular disease and, of course, renal impairment.<sup>62</sup> It is, therefore, extremely important to briefly review treatment options for hypertension in order to determine whether dairy products can play a role in its remediation.

**Problems that Confound the Treatment of Hypertension.** Whether through dairy products or pharmacological treatment modalities, a number of problems confound the treatment of hypertension. At the first level, because hypertensive patients are often asymptomatic,<sup>63</sup> Americans in general are not catalyzed to seek treatment. Second, even when those with health insurance are scheduled for routine checkups, the sheer magnitude of hypertension as a primary or secondary condition can lead some physicians to "miss an opportunity" to provide information that can elevate treatment options. Third, when hypertension is identified, the severity of the side effects of anti-hypertensive medications may impact treatment choices.

Thus, in spite of the potential impact of hypertension upon the cardiovascular and renal systems, a number of factors confound the processes of diagnoses and treatment. While physicians no longer withhold anti-hypertensive treatments until diagnosed patients exhibit the stigmata of hypertension and/or a major cardiovascular complication occurs, the issue of hypertension is equally divided between practitioners who treat hypertension, and public health educators who seek to apply "best practices" in its prevention. In particular, young, mildly hypertensive patients whose cardiovascular systems have not yet been traumatized by hypertension and whose renal systems remain undamaged can gain much from exposure to public education campaigns that promote exercise, sound nutrition, weight management, and other lifestyle changes. Likewise, those with more serious elevations of blood pressure and objective symptoms of cardiovascular damage, such as angina, claudication, transient ischemic attacks, and/or decreased renal function can reduce their risk of heart attack, stroke, and/or renal failure through frequent monitoring and improved medication compliance. Such issues have, however, been repeatedly addressed by researchers whose inquiries involve the disparate incidence of hypertension amongst African Americans.

**Alternative Pharmacologic Approaches.** While more recent research has highlighted the fact that certain dietary practices that include dairy products can positively affect hypertension, the primary modalities used are pharmacological. Despite the existence of JNC7 guidelines,<sup>64</sup> researchers continue to investigate the boundaries and limitations of pharmacological agents as a central element for the management of hypertension.<sup>65,66</sup> (Such efforts are laudable given the array of factors that may impact the effectiveness of antihypertensive agents. Israili (2003),<sup>67</sup> for example, sought to determine whether elderly status contraindicates the use

of calcium channel blockers. His research indicates that physicians can safely use such agents with the elderly as long as heart failure is not present. However, providers can safely prescribe non-dihydropyridines. Additionally, independent of income status of the patient, the less expensive, but older, classes of calcium antagonists may be prescribed. Such findings are critical to the treatment of hypertension among African Americans — a group that is characterized by higher rates of heart failure.

It is also important that physicians treating patients with uncontrolled hypertension remain cognizant of the emergence of new anti-hypertensive agents. Contreras, et al (2003),<sup>68</sup> reports on the use of angiotensin II receptor type ARB blockers, a newer set of agents that reduce blood pressure while causing less cough, a prevailing side effect of older medication. MacGill, et al (2003), remind physicians that despite the introduction of new antihypertensive agents, the primary first line treatment modality for all patients, regardless of ethnicity, is diuretics.<sup>69</sup> However, if normalization of blood pressure does not occur, combination therapies can be instituted. Moreover, Fretheim, et al (2003),<sup>70</sup> have argued that patients in the United States can save some \$433.6 million per year by using thiazides alone for persons whose hypertension is classified as “uncomplicated.” However, despite the low-income status of many African Americans, such cost-savings may be unavailable because of the resistant nature of their disease. Indeed, the Hypertension in African Americans Working Group and the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC) encouraged physicians to apply combination rather than monotherapy in the treatment of patients with systolic blood pressure >15-20 mm/hg above goal.<sup>64</sup>

Weber (2007)<sup>71</sup> argues, however, that combination therapy should be used as first-line therapy for all hypertensives. He qualifies this position by suggesting that such combinations should be low-dose in order to bypass countervailing problems that lower treatment tolerability as manifested through dizziness, cough, loss of appetite, etc. Such complications are an even greater risk in African-American patients since they are more likely to have diabetes mellitus as a comorbid condition.

In African-American patients with comorbid conditions, anti-hypertensive agents adversely impact both glucose and lipids. Therefore, careful monitoring should be instituted.<sup>72</sup> Additionally, ongoing monitoring is particularly important since the number of adverse effects is negatively correlated with medication compliance in African Americans.<sup>73</sup> Fixed-dose, low-dose, combination therapy has also been found to be effective with elderly patients while reducing both costs and the incidence of adverse events.<sup>74</sup>

Physicians typically consider the fact that blood pressure levels differ when recorded in sitting, standing, and/or lying down positions. However, it is less clear whether

physicians take into account the time of administration in prescribing antihypertensive medication. Yet, research by Qiu, et al (2003), indicates that time of administration is germane to the prescribing practices and efficacy of the medication regimen.<sup>75</sup> Specifically, these authors found that hypertensive agents taken in the morning enhance blood pressure control as compared to PM regimens. Prescribing patterns may also impact the patient's quality of life. For example, diuretics administered in the PM will fragment sleep patterns leading to changes in sleep architecture and morning sleepiness. However, Qui's findings are not generally applicable since the study focused solely on amlodipine. Moreover, all 62 subjects had mild to moderate hypertension.

As one reviews the literature, it becomes clear that much has been written regarding the use of all classes of anti-hypertensives. However, an inadequate number of these studies have been designed to specifically assess the alternative impact of each agent upon African Americans. Nevertheless, current research has highlighted several treatment trends.

- It may be more difficult for physicians to control hypertension in African Americans using beta-blockers and angiotensin-converting enzyme (ACE) inhibitors than is the case with Caucasians. Yet, the responses of African Americans to these agents are definitely positive.
- Asian Americans respond favorably to calcium antagonists as opposed to ACE inhibitors.<sup>76</sup> However, diuretics and beta-blockers lead to responses that match those obtained through the use of calcium antagonists for this population.
- No data are presently available describing disproportionate responses among treatment modalities for Latinos.<sup>76</sup>

**The Role of Nutrition in the Treatment of Hypertension.** Given the problems that comprise the pharmacological treatment of hypertension in African Americans, it is very important to note that nonpharmacological approaches for the control of hypertension have been effective for African Americans. For example, the highly publicized DASH (Dietary Approaches to Stop Hypertension)<sup>77</sup> nutritional program has been particularly effective. This clinical trial utilized a randomized, multi-racial/multiethnic design in order to test the efficacy of alternative diet combinations upon blood pressure rates of 459 adult Americans with baseline blood pressure rates of <160 mm Hg systolic, and 80 to 95 mm Hg diastolic. Key control variables included body weight, salt intake, and level of physical activity. Using nutritional interventions that consisted of 1) diets low in fruits, vegetables, and dairy products, but with a normal fat level; 2) a diet rich in fruits and vegetables alone, or 3) a diet based upon fruits, vegetables, and *fat-reduced dairy*

products; the latter diet (#3) created the most significant reductions in blood pressure levels. *Blood pressure values among minorities responded even more favorably to dietary intervention as compared to non-minorities.*

As mentioned, *dairy products were a key item in this non-pharmacological approach.* African Americans with hypertension may also require community and group level interventions in order to understand the importance of dairy products in the management of their disease.

## Obesity and Overweight in African Americans and Dairy Nutrients

Obesity is another chronic disease that may be impacted by dairy nutrients. Thus, it becomes important to review obesity and its manifestation among African Americans. While overweight and obesity is a chronic health area that has been highly resistant to prevention and intervention efforts for all Americans, pre-empting, preventing, and treating obesity within the African-American community has been characterized by numerous identified and latent challenges. Moreover, this disease is more likely to manifest itself as Class II and/or Class III obesity within African-American female populations.<sup>78</sup> Thus, it becomes particularly relevant to determine whether direct and/or indirect linkages exist between weight loss and dairy consumption. First, however, it is necessary to review how overweight and obesity are manifested among African Americans.

**Overweight, Obesity, and Dairy Consumption: Is There a Relationship?** Some evidence exists that obesity may manifest itself differently in African Americans from a clinical perspective. For example, Buffington and Marema (2006)<sup>79</sup> found that Roux-en-Y gastric bypass (RYG-BP) leads to smaller decreases in body fat in African-American females. They also found that neither differences in caloric intake, types of foods consumed, current age, age when obesity began, level of stress; nor number of children could explain racial differences in the progression of weight loss after RYG-BP surgery.

Other differences in the causes, correlates, and manifestation of obesity have also been identified by researchers. For example, Blixen, et al,<sup>80</sup> in a 2006 study, concluded that both African-American and Caucasian women's perception of obesity was incorrect based on the definition of obesity (BMI  $\geq$  30).<sup>80</sup> Some of the women in the study, though clearly obese, described themselves as "overweight."<sup>80</sup>

In contrast, Weyer, et al (1997),<sup>81</sup> in a study on energy metabolism, found that African-American women have a lower metabolic rate than Caucasian women. The same study also revealed the likelihood that lower fat oxidation processes are operative in African-American men when compared to those of their Caucasian counterparts.<sup>81</sup>

However, several evidence-based interventions<sup>82-84</sup> have been successful with both Caucasian and African-

American populations. These interventions include the use of: 1) mass media and social marketing; and 2) nutrition and physical activities advocacy.

In addition to these core strategies, interventions that target disparity populations have added their approaches to include: a) the use of culturally-similar staff, b) culturally-based health communications, c) the greater inclusion of community-oriented strategies and, d) disproportionate emphasis upon the engagement and retention of participants. Yet, outcomes associated with these efforts have been modest. Indeed, taken collectively, overweight and obesity interventions have not created revolutionary decreases in the BMI of Americans in general, nor African Americans in particular.

Evidence does exist of the success of the public and private sector's efforts. For example, Cynthia Ogden, a Senior Researcher at the Centers for Disease Control and Prevention, based on a trend analysis of the National Center for Health Statistics, National Health and Nutrition Examination Survey, found that the continual growth in obesity prevalence rates that occurred over the last two and one-half decades has been contained.<sup>85</sup> While existing disparities remain, these data suggest that intensive efforts to extend and institutionalize culturally-modified, mainstream obesity interventions on an increased number of African-American communities can and will not only contain the increases in obesity and overweight, but may lead to absolute decreases in obesity prevalence rates and, over time, corresponding decreases in health disparities. As with changes in tobacco use outcomes over the past 30 years, changes in obesity rates will have the best results with policy and environmental changes based on the ecological model.

The processes used in the dissemination of knowledge regarding evidence-based approaches that are effective in the "treatment" of obesity have their origins in clinical research findings. This research flows first to medical providers through practice guidelines, conference presentations, continuing medical education courses, and medical journals. Subsequently, community-based organizations and public health entities design interventions that seek to support and strengthen the clinical treatment of obesity. Generally, these interventions introduce new and/or unique ways to motivate and/or educate the targeted individuals to alter their behavior to reflect the advisement of their medical providers.

Such a pattern is identifiable in the area of obesity. An extensive pool of evidence-based research now guides physicians in the treatment of obesity. Table 4 describes current evidence-based approaches.<sup>86</sup>

Based upon the evidence-based approaches that are used by medical providers, public health interventions and clinical guidelines<sup>87</sup> have been created to support the behavioral modification and patient education that are vital to the maximization of the self-management efforts of individuals.<sup>88</sup> Based upon recommendations from the

Centers for Disease Prevention and Control and other agencies, evidence-based obesity reduction efforts<sup>89</sup> generally involve interventions that are designed to:

- Promote caloric balance and regular physical activity as the preferred methods for weight control;
- Develop and promote networks and collaborations within each targeted community;
- Promote breastfeeding as the nourishment of choice for babies;
- Promote obesity awareness as a public health issue;
- Mobilize families, schools, and communities to create opportunities for lifestyles that promote a healthful weight;
- Promote policy and environmental changes that support healthful eating habits and physical activity;
- Monitor obesity rates and obesity-related behaviors and health conditions for planning, evaluation, and dissemination activities; and
- Target health-disparate populations in obesity prevention efforts.

The research community further contributes to the implementation of evidence-based approaches through conceptual, theoretic, and empirical research that reports findings from public health interventions. For example, Bauman (2004) provides an expanded understanding of the nature and type of physical activity that effectively

addresses obesity. Using a review of literature published from 2000-2003, he found several studies that suggested that walking for women, seniors, and special populations is as effective as “vigorous activity.”<sup>90</sup> This finding is important to public health interventions since it addresses the belief that persons who cannot enroll in expensive spas or sports clubs cannot address their physical needs. However, one related gap that exists in the literature is why an obese person in an intervention may choose to cease engaging in other physical activity. Anderson (2003),<sup>91</sup> using a sample of 394 women age 17 to 54, found that females not only engage in lower levels of physical activity, they are also more likely to disengage in physical activity once they begin a program.

As this discussion reveals, the treatment of overweight and obesity is quite complex. *However, strong evidence now exists that the consumption of calcium via dairy products may be useful in the treatment of overweight and obesity.* Carruth (2001) documented such an outcome with children.<sup>92</sup> In contrast, Buchowski (2002)<sup>93</sup> reported such findings for African-American women. Zemel (2003)<sup>94</sup> also identified dairy products as including nutrients that can support weight loss and obesity reduction.

### Cancer in African Americans and Dairy Nutrients

It is projected that, in 2009, approximately 150,000 new cases of cancer will be identified among African

**Table 4.** Obesity Treatment

**Weight Loss Intervention**

Dietary Therapy

Low-calorie, very low calorie, and/or lower fat diets are recommended for weight loss in overweight and obese persons.

Physical Activity

Physical activity is recommended as part of comprehensive weight loss therapy and/or weight maintenance.

Combined Therapy (Diet and Physical Activity)

The combination of a reduced-calorie diet and increased physical activity is recommended since it produces weight loss, decreases abdominal fat, and increases cardio-respiratory fitness.

Behavior Therapy

The evidence reveals that behavioral therapy should be combined with other weight loss approaches in order to maximize effectiveness.

Pharmacotherapy

Weight loss drugs approved by the FDA may be used as part of a comprehensive weight loss program including diet and physical activity for patients with a BMI of  $\geq 30$  with no concomitant obesity-related risk factors or diseases, and for patients with a BMI of  $\geq 27$  with concomitant obesity-related risk factors or diseases. Drugs should never be used without concomitant lifestyle modification.

Weight Loss Surgery

Weight loss surgery is an option in carefully selected patients with clinically severe obesity (BMI  $\geq 40$  or  $\geq 35$  with comorbid conditions) when less invasive methods of weight loss have failed and the patient is at high risk for obesity-associated morbidity or mortality.

Americans.<sup>95</sup> Approximately 500.6 new cases of cancer per 100,000 persons will be diagnosed among African Americans and 475.3 will be identified among Caucasians.<sup>96</sup> Thus, African Americans experience cancers at a rate that is *not* statistically higher than Caucasians.<sup>97</sup>

Despite the high prevalence of cancer among African Americans and other citizenry, several studies have revealed that vitamin D and calcium intake lowers the risks associated with a number of cancers.<sup>98-100</sup> Researchers have linked dairy product nutrients with important disease-related outcomes for specific cancers.<sup>101</sup> For example, Barbone, et al (1993),<sup>101</sup> and Terry, et al (2002),<sup>102</sup> found such a relationship for endometrial cancer. Other investigators have identified linkages between dairy products, nutrient deficiencies, and other cancers.<sup>103,104</sup>

Epidemiological studies report either no risk or a reduced risk of some types of cancer in association with dairy consumption. Inverse associations exist between milk and other dairy foods, calcium, and endometrial cancer,<sup>102</sup> breast cancer,<sup>105-107</sup> pancreatic cancer,<sup>108</sup> renal cancer,<sup>109</sup> and colorectal cancer.<sup>110-112</sup> Two recent studies<sup>113,114</sup> noted weak positive relationships between high-fat dairy products and breast cancer risk. However, these and other studies<sup>111,112,115</sup> have failed to find a significant positive association with total fat intake and breast cancer. A large study of nurses saw no increased risk of breast cancer with higher saturated fat intakes and, in fact, showed that consumption of dairy foods, especially low-fat products and fat-free milk, was inversely associated with the risk of breast cancer.<sup>116</sup>

## Diabetes and Insulin Resistance Syndrome in African Americans and Dairy Nutrients

Within the United States, approximately 17.9 million Americans have been diagnosed with diabetes. Another 5.7 million have diabetes and do not know it. Thus, approximately 23.6 million persons in the United States can be counted among those who are estimated to have diabetes.<sup>117</sup> This number indicates that approximately 7.8 percent of Americans have this disease. The most recent data available from the *Early Release of Selected Estimates Based on Data* from the 2008 National Health Interview Survey, indicate that diabetes rates are higher among certain racial/ethnic subgroups.<sup>118</sup>

- African Americans (non-Hispanic) have a diabetes prevalence rate of 10.9 percent versus 6.9 percent for their Caucasian counterparts. This rate is 58 percent higher for African Americans than for Caucasians.<sup>118</sup>
- Hispanics have a diabetes rate of 10.7 percent. This rate is 57 percent higher than the 6.9 percent rate that exists for Caucasian populations.<sup>118</sup>
- In the age group 18 to 44 years, approximately 2.3 percent of persons have diabetes. For persons

age 45 to 54 years, the diabetes rate is 9.2 percent. However, in the age group 55 to 64, 15.3 percent of persons are diabetic. The diabetes rate for persons 65 years or older is 18.3 percent.<sup>118</sup>

Additionally, the 2007 National Health Interview Survey, the latest year for which data are available for the following statistics, indicate the following trends regarding diabetes prevalence.<sup>119</sup>

- American Indians/Alaska Natives have diabetes rates of 12.3 percent relative to 6.4 percent for White, non-Hispanic populations. (The Indian Health Service estimates that 16.5 percent of Native Americans are diabetic). Thus, a member of this former group is 92.2 percent more likely to be diabetic.<sup>119</sup>
- The percentage of the population with diabetes also differs by education. Approximately 13.2 percent of persons without a high school diploma have diabetes relative to 6.4 percent of those with a college degree for a 106.3 percent difference.<sup>119</sup>
- Diabetes prevalence rates also differ by income. Persons with family incomes of less than \$35,000 have rates of diabetes of 10.4 percent in comparison with 4.5 percent for persons with family incomes of \$100,000 or more — a 137.8 percent difference.<sup>119</sup>
- Married persons have a diabetes rate of 7.6 percent versus 9.2 percent for divorced or separated persons. This rate is 21% higher.<sup>119</sup>

**Other Diabetes Disparities.** As the above data indicate, the prevalence of diabetes differs significantly across various racial/ethnic groups. Table 5 provides a more detailed portrait of some of these differences.

However, researchers have also found that nutrients found in dairy products can also have a positive impact upon the onset and progression of this disease.<sup>127</sup> For example, Mennen (1999)<sup>128</sup> found that a single serving of dairy products per day reduced insulin problems in males in the study.

Given the above data sources in support of dairy and its nutrient-rich package as advantageous for reducing risks and/or prevalence of hypertension, obesity, cancer, and diabetes, it is important to consider how dairy products use can be enhanced within a population that is disproportionately lactose intolerant so that the potential benefits of these nutrients can be realized.

## DAIRY CONSUMPTION PATTERNS AMONG AFRICAN AMERICANS

Whether associated with lactose intolerance, cultural food preferences, and/or other factors, dietary practices of African Americans do include the under-consumption of dairy products. However, these differential patterns of consumption are not restricted to dairy products. Rather,

they reflect a range of cultural differences in the purchase and use of all food products.

The U.S. Department of Labor, Consumer Expenditure Survey 2007,<sup>129</sup> provides data regarding mean expenditures per household on key food products prepared at home. Table 6 demonstrates the differences in food expenditures by race/ethnicity in general and for dairy products in particular.

As mentioned, Table 6 reveals a number of trends regarding the dietary patterns of African Americans relative to other ethnic groups.

### African-American Food Consumption Patterns: Implications for the Consumption of Dairy Product Nutrients

African Americans have less access to all food products because the mean African-American disposable income (\$36,067) per household is only 70.5 percent as high as Caucasians and all other races (\$51,120) and 59.7 percent as high as Asian Americans (\$60,402). This trend contributes to nutrient differences in general.<sup>129</sup>

Despite the income differences, African Americans appear to value food products relatively more than their Caucasian and Asian counterparts. This conclusion is based on the fact that African Americans spend 12.8 percent of their disposable income on all food relative to 11.8 percent for Asians and 12.3 percent for Caucasians and other race and ethnic groups.

African Americans spend 7.8 percent of their disposable income on food consumed at home. This percentage exceeds the 6.1 percent of disposable income spent by Caucasians and other groups, and the 6.4 percent spent by Asians. Because African Americans do spend a greater proportion of their food dollars for goods consumed at home, this group has a greater opportunity for reconfiguring dollars so that nutritional deficits can be addressed.

Consistent with research,<sup>129</sup> African Americans spend a greater percentage of their food budget on cereals and bakery products than do Caucasians, Asians and other race and ethnic groups. However, because cereal and bakery products are complementary foods for consumption with milk and/or other dairy products, health mes-

**Table 5.** Other Racial/Ethnic Diabetes Disparities

#### Native Americans and Alaskan Natives and Diabetes

- There are approximately 3.3 million Native American/Alaskan Natives in the country.<sup>120</sup>
- Data from the Indian Health Service indicate that 16.3% of adult Native Americans and Alaskan Natives in the country have diabetes.<sup>121</sup>
- From 1994 to 2004, diabetes increased among Native Americans and Alaskan Natives age 25 to 34 years by 112%.<sup>122</sup>
- Native American diabetics experience kidney disease at a rate that is 250% higher than their Caucasian counterparts.
- Xu, et al (2008), found that the progression of diabetes to kidney disease in Native Americans can be significantly delayed and/or eliminated through blood pressure and glucose level control, smoking cessation, and through other measures.<sup>123</sup>
- Islam-Zwart and Cawstow (2008) in a study of 480 Native Americans/Alaskan Natives youth, found that a parental history of diabetes was a greater predictor of childhood Type 2 diabetes than overweight and obesity. This suggests that the self-management behaviors of older Native Americans may need to be extended to their children.<sup>124</sup>

#### Asian/Pacific Islanders and Diabetes

- Approximately 4.4% (13+ million) of America's 304 million residents are Asian/Pacific Islanders.<sup>119</sup>
- The category of Asian/Pacific Islanders includes a vast array of sub-populations as indicated below.<sup>125</sup>
  - **Asians**—Asian Indian, Bangladeshi, Bhutanese, Bornean, Cambodian, Celebesian, Ceram, Chinese, Filipino, Hmong, Indochinese, Indonesian, Iwo Jiman, Japanese, Javanese, Korean, Laotian, Malayan, Maldivian, Nepali, Okinawan, Pakistani, Sikkimese, Singaporean, Sri Lankan, Sumatran, Thai, and Vietnamese.
  - **Pacific Islanders**—Carolinian, Fijian, Guamanian, Hawaiian, Kosraean, Melanesian, Micronesian, Northern Mariana Islander, Palauan, Papua New Guinean, Ponapean, Polynesian, Samoan, Solomon Islander, Tahitian, Tarawa Islander, Tongan, Trukese (Chuukese), and Yapese.
- Diabetes mellitus manifests itself differently across different sub-categories of Asians/ Pacific Islanders.
- Estimates of the prevalence of diabetes among Asians differ based upon the source.
- The CDC, in its 2007 Diabetes Fact Sheet revealed that Whites had an age-adjusted diabetes prevalence rate of 6.6% in 2004 to 2006 versus 7.5% for Asians. Thus, Asians were 13.6% more likely to be diabetic based upon this source.<sup>117</sup>
- In general, researchers have found evidence that Chinese Americans, Japanese Americans, Filipino Americans, Asian Indians, Native Hawaiians, and Samoans are the Asian Pacific Islander groups who have the highest prevalence rates.<sup>126</sup>
- Research also indicates that the use of *traditional diets*, physical activity, social support groups with family involvements, and interventions between cultural beliefs/ customs can reduce the diabetes prevalence rate.

**Table 6.** African Americans and Other Consumer Expenditures for Dairy Products and Other Foods: 2007

Average Annual Expenditure for All Goods and Services	Caucasian and All Other Races (\$51,120)		Asian (\$60,402)		African American (\$36,067)	
	% of all annual expenditures per household	Mean \$ per household	% of all annual expenditures per household	Mean \$ per household	% of all annual expenditures per household	Mean \$ per household
<b>All Foods</b>	12.3	\$6287.76	11.8	\$3127.44	12.8	\$4616.58
Foods Consumed at Home	6.9	\$3527.28	6.4	\$3865.73	7.8	\$2813.23
Cereals and Bakery Products	.9	\$460.08	.8	\$483.22	1.0	\$360.67
Cereals and Cereal Products	.3	\$153.36	.3	\$181.21	.4	\$144.27
Bakery Products	.6	\$306.72	.5	\$302.01	.7	\$252.40
Meats, Poultry, Fish and Eggs	1.5	\$766.80	1.2	\$1026.83	2.3	\$829.54
Beef	.4	\$204.48	.4	\$241.61	.5	\$180.34
Pork	.3	\$153.36	.3	\$181.21	.5	\$180.34
Other Meats	.2	\$102.24	.2	\$120.80	.3	\$108.20
Poultry	.3	\$153.36	.3	\$181.21	.5	\$180.34
Fish and Seafood	.2	\$102.24	.5	\$302.01	.4	\$144.27
Eggs	.1	\$51.12	.1	\$60.40	.1	\$436.07
<b>Dairy Products</b>	<b>.8</b>	<b>\$408.96</b>	<b>.6</b>	<b>\$362.42</b>	<b>.7</b>	<b>\$252.41</b>
<b>Fresh Milk and Cream</b>	<b>.3</b>	<b>\$153.36</b>	<b>.3</b>	<b>\$181.21</b>	<b>.3</b>	<b>\$108.20</b>
<b>Other Dairy Products</b>	<b>.5</b>	<b>\$255.60</b>	<b>.3</b>	<b>\$181.21</b>	<b>.4</b>	<b>\$144.27</b>
Fruit and Vegetables	1.2	\$613.44	1.5	\$90.60	1.3	\$468.87
Fresh Fruits	.4	\$204.48	.5	\$302.01	.4	\$144.27
Fresh Vegetables	.4	\$204.48	.6	\$362.42	.4	\$144.27
Processed Fruits	.2	\$102.24	.2	\$120.80	.3	\$108.20
Processed Vegetables	.2	\$102.24	.2	\$120.80	.2	\$72.13
Other food At home	2.5	\$1278.00	1.9	\$60.40	2.5	\$901.68
Sugar and Other Sweets	.3	\$153.36	.2	\$120.80	.2	\$72.13
Fats and Oils	.2	\$102.24	.2	\$120.80	.2	\$72.13
Miscellaneous Foods	1.3	\$664.56	.9	\$543.62	1.3	\$468.87
Non-alcoholic Beverages	.7	\$357.84	.6	\$362.42	.8	\$288.54
Food Away From Home	6.4	\$3261.71	5.4	\$3261.71	4.9	\$1767.29
Alcoholic Beverages	1.0	\$51.12	.5	\$302.02	.5	\$180.34

<sup>130</sup> Calculated from data found in Table 2100. Race of reference person: Shares or average annual expenditures and sources of income, Consumer Expenditure Survey, 2007.

saging can be distributed to this health disparity population via grocery stores, bakeries, and cereal/bakery businesses that emphasize the health benefits of dairy products. Moreover, some evidence exists that combining dairy products with other food groups may reduce the impact of lactose intolerance.<sup>131</sup>

African-American households spend a disproportionate amount of their disposable income for beef (.6%), pork (.5%), poultry (.5%), fish and seafood (.4%), and other meats (.3%).<sup>129</sup> Thus, African Americans eat all meat products except fish and seafood at rates that exceed other groups. This suggests that African-American households may require additional education regarding the nutritional distribution of foods purchased.<sup>132</sup>

Finally, consistent with the theme of this paper, African Americans do spend less relatively and absolutely on dairy products. African Americans spend an average of .7% of their household disposable income on dairy products relative to the .8 percent spent by Caucasians.<sup>129</sup> Asians, a group with a higher prevalence rate of lactose intolerance than African Americans, spend only .6% of their disposable income on dairy food products.

However, because the mean household disposable income of African Americans is lower, their annual expenditures per year on dairy products total approximately \$252.42 per household. Approximately \$108.20 of this amount is spent on fresh milk and cream and \$144.27 is spent on other dairy products.<sup>129</sup>

The significant role that dairy products can play in the health of African Americans suggests that there may be a need to reposition dairy products in the consciousness of African-American consumers so that dairy product expenditures are viewed as an investment in health rather than as merely a consumption good. However, to

do so requires that African-American consumers and physicians understand how lactose intolerance symptoms can be minimized and know the value of the nutrient-rich package embodied in dairy products.

## STRATEGIES TO INCREASE ACCESS TO DAIRY-BASED NUTRIENTS

A small but growing body of literature<sup>133,134</sup> addresses the issue of how lactose intolerance in African Americans and/or other groups can ensure the ingestion of all nutrients required for the prevention of illness and disease and the maintenance of sound health. Several recommendations can be made.

### Know and Understand the Roles and Sources of Needed Nutrients

Despite the continual reference to daily dietary guides,<sup>135</sup> anecdotal data suggest that many African Americans remain unaware of the suggested minimum servings associated with the major food groups. Even fewer consumers are aware of the nutrients that are potentially contributed to one's body by each food group. Moreover, a third missing area of knowledge is the role that various nutrients play in sustaining health. Thus, physicians and other health care providers should first educate themselves, as described in Table 7. Second, health professionals should disseminate dietary guidelines to African Americans that educate them regarding the critical role that at least three daily servings of dairy — milk, yogurt, or cheese — can play in ensuring a sufficiency of calcium, riboflavin, protein, potassium, zinc, and other key nutrients. Table 7 briefly summarizes strategies that may be applied.

In order to lend realism to these materials, narratives

**Table 7.** Strategies for Providers and Consumers to Manage Lactose Intolerance

#### GET INFORMED (Providers and Consumers):

- Consumers and physicians must understand how to minimize lactose intolerance symptoms.
- View dairy foods as an investment in human health and not just food consumption.
- Become educated on current guidelines.
- Follow DASH Diet Guidelines.
- Follow the 2005 and later Dietary Guidelines.
- Review the 2007 IOM Report (Nutrition Standards in Schools).

#### ASK (Providers):

- Include an inquiry about lactose intolerance as a core question when taking a medical history to help reduce dairy nutrient deficiencies.

#### ADVISE (Providers):

- Encourage patients to be formally tested for lactose intolerance, OR
- Provide guidance on the gradual introduction of dairy into the diet.

#### IDENTIFY THOSE AT RISK (Providers):

- Review positive linkages between dairy products and key disease status.
- Identify pregnant women, the elderly, hypertensives, diabetics, and/other risk groups whose health may be even marginally improved by protecting against nutrient insufficiency.

#### EDUCATE (Providers):

- Disseminate dietary guidelines and DASH Diet information to African-American patients to educate them regarding the critical role of consuming at least three (3) daily servings of milk, yogurt, or cheese and how this ensures a sufficiency of calcium, riboflavin, protein, potassium, and other nutrients.

can be used, based upon fictional and/or true stories that transmit knowledge of how nutrients found in dairy products can prevent and/or reduce the progression of some illnesses and diseases. Moreover, such educational materials must deliver the health messages using non-medical terms (e.g., appropriate health literacy level). However, additional research will be needed so that the most appropriate materials can be developed, tested, and made available to providers for dissemination.

### Encourage Patients to Be Formally Tested for Lactose Intolerance

A number of foods, such as broccoli or legumes, can create the symptoms associated with lactose intolerance. However, the labeling of “intolerance” has not been applied to these food products. Additionally, lactose intolerance self-diagnosis appears to have become more pronounced. Physicians and providers can do much to reduce dairy nutrients deficiencies by including the question of lactose tolerance as a core question when medical data for African Americans are collected. Persons who check the “yes” box can then be tested for lactose intolerance levels using the standard Lactose Tolerance Test, the Hydrogen Breath Test, the Stool Auditing Test, or one of the emerging methods of testing. For example, Waud JP, Matthews SB and Campbell AK (2008)<sup>136</sup> have advanced the argument that the Hydrogen Breath Test, when used in conjunction with breath methane and the presence of symptoms, may be the most accurate way of assessing intolerance. Even if a standard Hydrogen-Breath test is used, Argnani, et al (2008),<sup>137</sup> suggest always using a 25g lactose tolerance test because the 12.5g test is associated with more false negatives. Given the confirmed linkages between dairy products and key diseases common to African Americans, it may be important to test pregnant women, the elderly, hypertensives, diabetics, and/other risk groups whose health may be even marginally improved by protecting against nutrient insufficiency.

### Gradually Increase Use of Lactose

Even before recommending a treatment program for lactose intolerance in those with a confirmed problem, it may be important to gradually increase tolerance levels. Pribila, et al (2000)<sup>4</sup>, found that a sample of African-American girls were able to better digest lactose through a program of gradual introduction. Zhong (2006)<sup>5</sup> found similar results by introducing yogurt during the latter phases of a study that gradually increased exposure to lactose. The study found that yogurt did play an ameliorating role. This effort reflects the fact that yogurt can assist in lactose digestion. This is because probiotic dairy products contain live microorganisms that support digestion. However, the benefits of probiotic dairy products, including yogurt, are not always understood and accepted by the general public. For example, Haines

(2004)<sup>138</sup> found that probiotics and beneficial bacteria which can result in healthier digestive and immune systems are properties that are not generally known by the American public. Researchers de Vrese, et al (2001),<sup>139</sup> found that probiotic dairy products including yogurt do help to decrease or eliminate lactose intolerance symptoms. These researchers also found that yogurt cultures aided in lactose digestion at a more successful level than did other probiotic bacteria.

An additional strategy to address lactose intolerance is to include lactose-reduced milk as a dairy alternative. According to the Dietary Guidelines for Americans, if an individual considers milk substitute beverages because of lactose intolerance, the most reliable and easiest way to derive the health benefits associated with milk and milk product consumption is to choose alternatives such as yogurt or lactose-reduced products within the milk food group. These strategies and others are addressed in the National Dairy Council’s *Tips for Keeping Dairy in Your Diet*, as listed below.

- **Drink milk with food.**
- **Aged cheeses like Cheddar and Swiss are low in lactose.**
- **Introduce dairy slowly.** Gradually increase the amount.
- **Reduce it.** Enjoy lactose-reduced milk and milk products.
- **Yogurt with live and active cultures helps digest lactose.**

Another method involves consuming the enzyme, lactase, prior to the consumption of milk products. Of note, as it relates to children, the American Academy of Pediatrics recommends that the elimination of milk and other dairy products is not usually necessary.

### Provide Health Education Regarding the Role That Dairy Nutrients Can Play in Certain Chronic Diseases

An intensive description of chronic illnesses with high prevalence rates among African Americans has been presented. Physicians and other providers can disseminate information to their patients about these chronic conditions and the associated benefits related to consuming nutrients found in dairy products. The widespread distribution of such information may have an impact upon the prevalence and manifestation of conditions such as hypertension, obesity, cancer, and diabetes.

### Use Milk-Substitute Products

Milk substitute products may be used in order to reduce the risks of nutritional deficits. While multiple options are available, the use of yogurt, lactose-reduced milk and/or other products that are in the milk food group will generate reliable benefits. Additionally, some

evidence exists that the consumption of lactase *before* using the milk product will reduce the typical symptoms of lactose intolerance. It is documented that lactose-hydrolyzed milk or oral lactase enzyme replacement therapy provides beneficial results for individuals with lactose intolerance. For example, Moscovitz, et al (1987),<sup>140</sup> found that the oral enzyme replacement supplement Lactrase was successful in reversing lactose malabsorption. However, Ramirez, et al (1994),<sup>141</sup> found that while most lactase preparations do relieve symptoms of lactose malabsorption (including bloating and pain), these remedies are not all equal and that the product, Lactrase, eased the most symptoms. Other researchers have also found that enzyme replacement therapy for lactose malabsorption is successful in most cases.<sup>142</sup>

## SUMMARY

Lactose intolerance is a complex condition that is complicated by cultural beliefs and perceptions about the consumption of dairy products. These attitudes about dairy may contribute to inadequate intake of key nutrients that may impact conditions that contribute to health disparities in African Americans. While a complex health problem, lactose intolerance is easy to treat. However, no treatment can improve the body's ability to produce lactase. Yet, symptoms can be controlled through dietary strategies.

This position paper emphasizes the importance of using patient and provider-level strategies in order to reduce the risks to the health of African Americans that may accrue as a result of dairy nutrient deficiency. Evaluation and assessment of interventions tested is critical so that evidence-based approaches to addressing dairy nutrient deficiency and lactose intolerance can be created.

Lastly, it is essential for physicians to communicate key messages to their patients. Since dairy nutrients address important health concerns, the amelioration of lactose intolerance is an investment in health. Lactose intolerance is common, is easy to treat, and can be managed. It is possible to consume dairy even in the face of a history of maldigestion or lactose intolerant issues. Gradually increasing lactose in the diet — drinking small milk portions with food, eating yogurt, and consuming cheese — are effective strategies for managing lactose intolerance and meeting optimal dairy needs.

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