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**Application of  
Adult-Based Dietary  
Guidelines to Children:  
Evidence, Knowledge  
Gaps, and Policy  
Implications**

*Final Report*

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## EXECUTIVE SUMMARY

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Recommendations to promote healthy living, such as the *Dietary Guidelines for Americans*, are intended to translate scientific knowledge into everyday practice. The science base to support the dietary guidance for children ages 2 to 18 years is known to be limited, and the extent to which it has grown over the past five years has not been documented. To address the science base supporting dietary guidance for children, Mathematica Policy Research, Inc. conducted a study for the Department of Health and Human Services' Office of the Assistant Secretary for Planning and Evaluation. The study had four primary objectives:

1. To examine the literature supporting major dietary guidance statements that target children, using the 2005 Dietary Guidelines for Americans as a foundation but also including other contemporary guidance statements, and to determine whether the guidance draws from research done with children or is adapted from research done with adults.
2. To identify and describe new evidence in support of child-focused dietary guidance.
3. To identify knowledge gaps in the science base related to dietary guidance for children.
4. To assess the implications of the science base in supporting dietary guidance for children that will promote health in childhood and beyond.

### STUDY APPROACH

The study involved a systematic approach to assess the evidence base for child-focused dietary guidance. First, we examined the literature cited in the 2000 and 2005 *Dietary Guidelines* and in 11 other contemporary guidance statements by authoritative organizations. Then, we identified and reviewed evidence published in the peer-reviewed literature between 2004 (the year that the Dietary Guidelines Advisory Committee completed its work) and February 2008 by searching electronic databases, bibliographies of contemporary guidance statements and scientific nutrition reviews, and tables of contents of relevant nutrition and

health journals not covered in the electronic databases. We reviewed nearly 6,000 abstracts and determined whether studies met specific criteria for further review (that is, relevant to one of the dietary guidelines topics, conducted with children ages 2 to 18 years, published in English, applicable to populations living in developed countries, and involving study outcomes that were direct measures of health or nutrition status, biologic outcomes, or dietary-related behaviors).

For the 104 “primary research” articles that met the criteria, we reviewed the full articles and classified studies by the following *Dietary Guideline* topic areas: adequate nutrients within calorie needs; weight management; fats; fruits and vegetables; whole grains; dairy and calcium; carbohydrates; sodium and potassium; and tracking (that is, studies that measured behaviors and/or biologic or health outcomes at more than one time from early to later childhood or from childhood to adulthood). Within each topic area, we cataloged the research studies by type (tracking studies, systematic reviews or meta-analyses, controlled trials, or observational studies), summarized the design and characteristics of each study, grouped the article summaries by outcome(s) measured, and summarized the evidence. A stand-alone companion report (Dodd et al. 2008), provides a synopsis. We also identified 142 articles that contain useful data on children’s dietary intake or behavior, risk factors, and related health outcomes; discuss methods pertinent to diet; or address other dietary guidance topics that were not the main focus of this review.

Next, we reviewed and summarized the science base for children’s dietary guidance, taking into consideration our review of the historical evidence and the 2004-2008 literature. We identified new evidence as well as topics where there are knowledge gaps for developing future guidance.

## MAIN FINDINGS

Since the completion of work on 2005 *Dietary Guidelines* (in 2004), the science base has grown in the areas of added sugars and weight, dairy foods/calcium and bone health and weight, and to some extent for diet and weight as well as for sodium and blood pressure. Studies published in 2004-February 2008 that contributed most to the child-focused science base, based on their being systematic reviews or meta analyses often containing randomized controlled trials (RCTs), include:

- One systematic review including 13 RCTs (Lanou et al. 2005) and one other RCT on calcium, dairy food consumption, and bone health (Cheng et al. 2005)
- One systematic review of RCTs to prevent childhood obesity (Connelly et al. 2007) and one meta-analysis on weight and asthma among children (Flaherman and Rutherford 2006)
- Two systematic reviews of the consumption of sugar-sweetened beverages on weight (Malik et al. 2006; Vartanian et al. 2007); and one systematic review of their consumption on dental health including eight case control studies (Harris et al. 2004)

- One meta-analysis on salt intake and blood pressure (He and MacGregor 2006)
- Forty-five studies that provided some type of tracking data; nearly half on dietary patterns and weight, but also six studies each on bone health and cardiovascular health.

Organizing our findings by dietary guidance topic, the numbers and results of recent child-focused studies are summarized briefly below.

***Adequate nutrients within calorie needs.*** Twenty studies evaluated aspects of adequate nutrients (especially calcium) within calorie needs; intakes of the nutrients or foods studied tended to be weakly associated with the outcomes investigated.

***Weight management.*** Eight studies examined dietary correlates of weight status; higher body mass index or overweight was associated with greater fast food consumption, higher protein intake, and less vigorous physical activity. Three studies of effects of weight management interventions on weight status found only modest and inconsistent success rates. One systematic review found that the primary factor distinguishing successful interventions was inclusion of a compulsory physical activity component.

***Fats.*** The 17 studies on dietary fat targeted many different outcomes including serum cholesterol and fatty acids, weight, asthma, cancer, insulin sensitivity, and others; results were mixed.

#### ***Food Groups to Encourage:***

- ***Fruits and Vegetables.*** The 14 studies of fruit and/or vegetable intake showed little or no favorable association with risk factors or health outcomes.
- ***Whole Grains.*** Two observational studies reported beneficial health effects of the consumption of whole grains on serum homocysteine and on folate and other B vitamins.
- ***Dairy Foods.*** Of the 21 studies related to consumption of dairy and calcium, seven focused on bone health and eight focused on weight. Most of the bone health studies showed a small benefit to bone health from a higher intake of milk products and/or calcium, but findings were mixed. Six studies investigated the intake of milk in relation to body mass index; three showed an inverse relationship, two showed no effect, and one showed a positive relationship.

***Carbohydrates.*** The body of evidence from 29 cross-sectional and longitudinal studies indicates that sugar-sweetened beverages and other items with added sugars (such as candy) are associated with increased body mass index and increased dental caries among children and adolescents. A meta-analysis of 88 studies of the effects of soft drinks concluded that consumption was linked to increased calorie intake and weight in children.

***Sodium and potassium.*** Three studies, including one meta-analysis study of 13 controlled trials, demonstrated that modest decreases in salt intake reduced blood pressure and pulse pressure in children and adolescents. No studies were found on children's intake of potassium and health outcomes.

***Knowledge gaps.*** Among studies that focused on a specific dietary area, there is little information on variety of intake within that food group, or on variety of intake in general. Only one study reported on children's dietary quality and adherence to the *Dietary Guidelines* and their body mass index. Other knowledge gaps include the behavioral determinants of eating patterns among children and the extent to which dietary behaviors track through childhood and into adulthood. Evidence is lacking in many areas, especially the health effects of children's consumption of whole grains, potassium, and specific fats.

***Data limitations.*** Our review of the evidence is limited to the information contained in published articles and the quality and characteristics of the research itself. The most serious limitation is the paucity of information across several of the dietary guidance topics of interest. Individual studies with children, especially those with clinical measures, were often limited by small sample sizes (restricting the power to detect associations), or they pertained only to a high-risk group (for example, children with asthma or diabetes); their findings may not be relevant to the general child population or to both sexes. Further, longer-term follow-up data were not available for many topics. In some areas, a lack of a valid biomarker for nutrient intake makes it difficult to draw conclusions based on self-reported dietary data.

***Conclusions.*** The body of evidence provided by the 2005 Dietary Guidelines Advisory Committee and by the expert groups that authored other contemporary guidance statements provides very limited direct support for dietary guidance for children. Relatively little growth of the science base has occurred since 2004, except on a few topics (added sugars and weight, dairy foods/calcium and bone health, and sodium and blood pressure). Because few 2004-2008 studies reported the dietary measure in a comparable way to the actual dietary recommendation, drawing evidence-based conclusions about children's short- or long-term health effects of following the *Dietary Guidelines* remains a challenge.

# CHAPTER I

## INTRODUCTION

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Recommendations to promote healthy living, such as the *Dietary Guidelines for Americans*, are intended to translate scientific knowledge into everyday practice. However, since much of the science is based on studies of adults, there is some uncertainty about the applicability of such guidelines for children ages 2 to 18, and whether the science base of dietary guidance for children is growing. In developing dietary guidance for children, it is important to understand how adherence to such guidance may affect children's ability to meet their unique energy and nutrient needs, as well as their long-term health and development (Dietary Guidelines Advisory Committee [DGAC] 2004). A systematic review of the science base for the dietary guidelines for children will inform the deliberations and decision making of the 2010 Dietary Guidelines Advisory Committee (DGAC) and provide a better understanding of the gaps in the science base relative to children.

To address these timely issues, Mathematica Policy Research, Inc. (MPR) conducted a review of the science base for dietary guidance for children (including the *Dietary Guidelines for Americans (DGA)* and other contemporary dietary guidance) for the Department of Health and Human Services' (HHS') Office of the Assistant Secretary for Planning and Evaluation (ASPE). The study had four primary objectives:

1. To examine the literature supporting major dietary guidance statements that target children, using the 2005 *Dietary Guidelines for Americans* as a foundation but also including other contemporary guidance statements, and to determine whether the guidance draws from research done with children or is adapted from research done with adults.
2. To identify and describe new evidence in support of child-focused dietary guidance.
3. To identify knowledge gaps in the science base related to dietary guidance for children.
4. To assess the implications of the science base in its support of dietary guidance for children that will promote health in childhood and beyond.

## A. STUDY APPROACH

The study included several components designed to assess the evidence base for child-focused dietary guidance. First, we inventoried and examined the literature cited in the 2000 and 2005 *Dietary Guidelines* and 11 other contemporary guidance statements by authoritative organizations. The purpose of this effort was twofold: (1) to identify the scope of the evidence cited in support of current dietary guidance, and (2) to determine whether the research cited to support dietary guidance statements for children was based on studies of children or extrapolated or adapted from studies of adults. Next, we identified and reviewed the evidence published in the peer-reviewed literature between 2004 and February 2008 that was not included in the 2005 *Dietary Guidelines*. To conduct this review, we searched electronic databases, bibliographies of contemporary guidance statements and scientific nutrition reviews, and did hand searches of tables of contents of relevant nutrition and health journals not covered in the electronic databases for the time period.

We reviewed abstracts and determined whether studies met our criteria for further review (i.e., relevant to one of the dietary guidelines topics, conducted with children ages 2 to 18 years, applicable to populations living in developed countries, and involving study outcomes that are direct measures of health or nutrition status, biologic outcomes, or behavioral outcomes intermediate to health or biologic outcomes). Articles were further classified as “primary” or “background.” For “primary research” citations, we summarized the study design, characteristics, and size of the study population; data collection and statistical methods; and findings. We cataloged and summarized the primary research studies by dietary guideline topic and type of “tracking” study (tracking of behaviors and/or biologic or health outcomes over time; and tracking from early to later childhood, or from childhood to adulthood). Articles classified as “background” included citations that contained useful data on children’s dietary intake or behavior or risk factors related to health outcomes; discussed methods pertinent to diet (e.g., the measurement of diet quality or energy density); or addressed other dietary guidance topics (food safety, alcohol) that were not the main focus of this review.

We synthesized the available *recent* literature within and across the current major dietary guideline topic areas (adequate nutrients within calorie needs; weight management;<sup>1</sup> fats; food groups to encourage—fruits/vegetables, whole grains, dairy and calcium; carbohydrates; and sodium and potassium). Combining our review of dietary guidance statements and their stated evidence with the breadth and findings of relevant studies published since 2004, we identified gaps in the science base for dietary guidance for children. Based on this review, we assessed the implications of these gaps for developing future dietary guidance for children.

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<sup>1</sup>Our review focuses on diet and weight management, not physical activity per se. Since HHS has conducted a review of the evidence of physical activity on health outcomes in children, we restricted our attention on this factor to recording whether the primary citations we reviewed included physical activity data or findings in their reporting of associations between diet and weight (Physical Activity Guidelines Advisory Committee 2008).

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## B. STUDY AND DATA LIMITATIONS

Our review of the information in the 2000 and 2005 *Dietary Guidelines* and contemporary guidance statements was limited by the extent to which methods and scientific evidence are documented in available supporting published reports (U.S. Department of Agriculture [USDA] and HHS 2000; HHS and USDA 2005). However, the direct involvement and experience of one of the co-authors (CS) in the work of the 2000 and 2005 *DGA* Committees provided a useful perspective on the process used by the committee beyond our objective review of published documents. Our systematic review of the post-2004 literature was limited by the extent to which the design, methods, and findings for studies were accurately and adequately documented. Our final review does not include articles published after February 2008, nor does it cover all possible sources that might have been searched. Updates or additional searching on special topics may be warranted before the next DGAC makes its recommendations for 2010. Finally, the most important data limitation is the lack of primary research citations for children in general. For some topics, there were too few research articles to synthesize.

This report is organized into five chapters. Chapter II provides a review of the evidence supporting the 2000 and 2005 *Dietary Guidelines* and other contemporary guidance statements. Chapter III describes the literature review methodology and synthesizes the recent evidence for children by dietary guideline topic. (The complete literature review summaries can be found in Dodd et al. 2008.) Chapter IV contains an analysis of the science base for children, and Chapter V concludes the report with a description of data gaps and research needs, and implications of these for revising dietary guidance for children. The appendices contain complete bibliographies for the guidance statements, the primary and background articles, and summary evidence tables for the primary citations.

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## CHAPTER II

### CONTEMPORARY DIETARY GUIDANCE FOR CHILDREN

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For more than 25 years, the *Dietary Guidelines for Americans* has provided science-based advice about dietary practices to promote health and reduce risk of chronic disease. The intent of the *Dietary Guidelines*, which is updated every five years, is to summarize and synthesize current knowledge about the relationship between diet and disease into recommendations for a pattern of eating that can be adopted by the public (HHS and U.S. Department of Agriculture [USDA] 2005). The *Dietary Guidelines*, which is intended for individuals 2 years and older, forms the basis of federal nutrition policy—it establishes the direction for all government nutrition programs, including research, education, food assistance and labeling, as well as health promotion and nutrition monitoring efforts, such as USDA’s *MyPyramid* food guidance system and HHS’s *Healthy People 2010* nutrition objectives (Britten et al. 2006; HHS 2005; Office of Disease Prevention and Health Promotion 2007; USDA 2005).

The *Dietary Guidelines* also serve as a major source of information for dietary guidance issued by nongovernmental associations and organizations, such as the American Academy of Pediatrics (AAP), the American Heart Association (AHA), and the American Dietetic Association (ADA). This chapter provides a review and assessment of the process used by federal agencies, their advisory committees, and other scientific organizations to develop contemporary dietary guidance for children, and the breadth and depth of the science base for children underlying these statements. This information is used in Chapter IV to describe and interpret whether and how the science base for children’s dietary guidance has changed since the 2005 *Dietary Guidelines* considering the review of evidence published since these guidelines (described next in Chapter III).

#### A. HISTORICAL PERSPECTIVE ON ESTABLISHING DIETARY GUIDANCE FOR CHILDREN

This section provides (1) an overview of the approaches used by the expert committees for the 2000 and 2005 *DGAs*; (2) their documentation of the child-focused research supporting their recommendations; and (3) the research gaps they identified at the time of the recommendations.

## 1. Approaches Used by the 2000 and 2005 Dietary Guidelines Advisory Committees

With the exception of the processing of information from invited experts and other interested members of the public, the approaches used by the 2000 and 2005 DGACs to address the evidence in support of dietary guidance for Americans ages two years and older differed substantially. In particular, the literature search and analysis of the published literature was much more extensive in 2005 than in 2000, as described below.

**2000.** The 2000 DGAC reviewed the 1995 (fourth) edition of *Dietary Guidelines for Americans* (HHS and USDA 1995) and determined that, on the basis of current scientific and medical knowledge, revisions were warranted. The committee focused on making appropriate changes using then-current scientific literature rather than re-examining literature used to prepare earlier editions of the guidelines. The method of searching the current literature was not documented. The committee proposed text for the fifth edition of *Dietary Guidelines*, presented its rationale for the proposed changes in the 25-page section called “Discussion of Proposed Changes,” and included references when applicable.

Relevant proposed changes focusing on children addressed encouraging healthy weight in children, higher needs for some nutrients, the applicability to children of adult guidelines for fat intake, and concerns about high intake of added sugars by adolescents. The recommendation for a new guideline on physical activity also included special attention to children.

**2005.** The 2005 DGAC determined that advances in scientific and medical knowledge called for revision of the 2000 (fifth) edition of *Dietary Guidelines for Americans*. The committee then used a new approach to revising the guidelines. Members posed many research questions and refined and prioritized them. Then, in consultation with subcommittee members, staff members developed literature search strategies based on those questions, conducted the searches and shared potentially relevant results with subcommittee members for their consideration. In addition, the committee relied on the Dietary Reference Intake reports (Institute of Medicine [IOM] 1997, 1998, 2000, 2001, 2002/2005, 2005) and other publications of expert groups. Subcommittee members used scientific judgment in their review of evidence related to their topics, the subcommittees requested special analyses, and the entire committee deliberated on the findings. The committee focused its efforts on topics that were slightly broader than those highlighted in the 2000 *Dietary Guidelines*: meeting recommended nutrient intakes; physical activity; energy balance; relationships of fats, carbohydrates, selected food groups, sodium, and alcohol with health; and consumer aspects of food safety (see Appendix A for key recommendations and specific recommendations for children and adolescents by focus area). A committee member with expertise in maternal and child nutrition helped to guide the search for and the review of evidence related to child nutrition.

In “Part B, Introduction” of the 2005 *DGA* report, the committee provided background information on various factors related to diet and identified populations that “posed special challenges regarding dietary guidance” (p. 14). The first subsection, “Children,” began by acknowledging that few studies address the role of diet and physical activity in promoting the health of children. That subsection cited 19 studies on the

development of eating patterns, most of which gave evidence of a moderate degree of tracking (consistency) of the behaviors or intakes from childhood into older ages. The subsection also introduced puberty as the period for peak bone development and childhood and adolescence as the critical periods for developing the antecedents for chronic diseases (i.e., hypertension, atherosclerosis, type 2 diabetes, and heart disease); these topics were not referenced, however.

In “Part D, Science Base,” eight sections spanning nearly 200 pages presented the research questions for each topic, the conclusions reached by the committee, the rationale for the conclusions, and the references cited. Relevant sections of Part D gave special attention to children:

- *Aiming to meet recommended intake of nutrients:* nutrients of concern for children, fruit juice intake by children, iron and folic acid for adolescent females, and serum 25-hydroxyvitamin D values for adolescents.
- *Energy:* association of energy intake and/or body weight or breakfast consumption of children with portion size, dietary energy density, and energy regulation.
- *Fats:* total fat and health, explicit statements that data are lacking on relationships of other types of fat with children’s health.
- *Carbohydrates:* carbohydrates and dental caries in young children, added sugars and energy intake and/or weight gain in children, fiber and constipation in children.
- *Selected food groups:* milk product intake of children and (1) bone health, (2) fatness.

## 2. Examination of Evidence Used to Support Dietary Guidance for Children

This examination of the evidence considers the numbers and types of articles cited by the *DGACs* that authored the 2000 and 2005 reports (USDA and HHS 2000; HHS and USDA 2005). It is based on citations found in those reports that are specific to children.

**2000.** The 2000 DGAC provided few references that were specific to children. A summary of these references appears in Figure II.1, organized by dietary guideline. Some of the references appeared in the reference list but were not cited in the text.

Compared with the dietary recommendations, the 2000 DGAC provided more extensive documentation of the evidence in support of its proposed new guideline “Be physically active each day.” Twelve statements related to physical activity for children were referenced, but much of the cited evidence supported the applicability of the new guideline for Americans of all ages and did not reference children or adolescents specifically.

**Figure II.1. Child-focused Evidence Cited in Support of the 2000 Dietary Guidelines**

*Aim for a healthy weight:* eight references, six of which were research articles; most of these addressed parent-child relationships relative to weight of the child. None addressed the health effects of overweight or obesity in children.

*Let the pyramid guide your food choices:* no references specific to children.

*Choose a variety of grains daily:* no references specific to children.

*Choose a variety of fruits and vegetables daily:* no references specific to children.

*Choose a diet that is low in saturated fat and cholesterol and moderate in total fat:* five research references, three of which reported on randomized controlled trials using hypercholesterolemic children as subjects, another randomized trial followed the growth of young children.

*Choose beverages and foods that limit your intake of sugars:* 10 references, only three of which were research articles that addressed one or more health effects of sugars. The meta-analysis showed no effect on behavior or cognition. Other references addressed intake, diet quality, and dietary methods.

*Choose and prepare foods with less salt:* one research article addressed urinary sodium in relation to bone mass.

**2005.** Compared with the 2000 committee, the 2005 DGAC cited a larger body of references specific to children. This committee provided a supplement to the report in the form of tables that summarized the literature search conducted by staff using the Internet (DGAC 2004).<sup>1</sup> Columns in the tables provided the full citation; design, duration, and objective; population studied; methods; outcome measures; results; and statistics, conclusions, and comments. However, in many cases, articles that appeared in those tables were not cited in the report.

The summary of references cited to support the 2005 that appears below is organized by topic rather than by guideline. Some of the articles are counted more than once because they were cited under more than one topic (Figure II.2). Because there was nearly 100 percent overlap for the topics “added sugars” and “sweetened beverages,” those two topics have been combined. The topics appear in the order of their first occurrence in the 2005 guidelines. The guideline(s) to which the topic applies appears in parentheses.

<sup>1</sup> Available at: [http://www.health.gov/dietaryguidelines/dga2005/report/PDF/G3\\_SummaryTables.pdf](http://www.health.gov/dietaryguidelines/dga2005/report/PDF/G3_SummaryTables.pdf).

**Figure II.2. Child-focused Evidence Cited in Support of the 2005 Dietary Guidelines**

*Food and/or nutrient intake:* four research articles cited in the text addressed intake or laboratory evidence of nutrient status (adequate nutrients within calorie needs).

*Added sugars and sweetened beverages:* 24 references were identified, 20 of which were cited in the text—all but 2 of which were research articles. Most of these references addressed either relationships of added sugars and/or sweetened beverages with overweight or obesity, or with nutrient intake. Findings were mixed and the quality of the evidence differed (adequate nutrients within calorie needs, carbohydrates).

*Nutrient density:* 10 research articles were identified. The three cited in the text address the nutrient density of foods consumed (adequate nutrients within calorie needs, weight management).

*Overweight and obesity:* four research articles cited in the text addressed prevalence and/or trends but not health effects of overweight and obesity (adequate nutrients within calorie needs, weight management).

*Dairy products:* 29 references were identified, 20 of which were cited in the text, and 2 of which provided only background information. Many of these research articles related the intake of dairy products to skeletal status, nutrient intake, and body weight and fatness. Findings were mixed but the quality of the evidence differed (adequate nutrients within calorie needs, food groups to encourage).

*Breakfast and body mass index (BMI):* four research articles cited in the text addressed breakfast habits in relation to weight and/or nutrient intake (weight management).

*Portion size and energy intake:* three research articles cited in the text reported associations between portion size and energy intake (weight management).

*Diet and dental caries:* eight research articles were cited in the text. Most of these also addressed dental hygiene (carbohydrates).

*Fat and children's health:* six references were cited in the text, four of which were research articles. The topics of the research articles included intake, impact on diet quality, and the safety of a low-fat diet (fats).

*Fiber:* nine references were cited in the text, two of which were review articles. All of them addressed constipation and/or fiber intake (carbohydrates).

*Fruit and/or vegetable intake:* two articles were cited in the text, one of which was a research article that addressed associations of intake with BMI (food groups to encourage).

*Whole grains:* one research article on intake was cited (food groups to encourage).

**Figure II. 2 (continued)**

*Sodium:* two research articles on salt taste preference were cited (sodium and potassium).

*Macronutrient content of the diet and weight status:* two research articles, which appeared only in the appendix (weight management).

As was the case in the 2000 committee, the 2005 DGAC provided relatively extensive child-related evidence for the physical activity guideline: 13 articles concerning effects of physical activity on the skeleton and/or weight of children, and 19 articles (15 research articles) concerning TV watching (with an emphasis on physical activity) and weight.

### **3. Research Gaps Identified by the 2000 and 2005 Committees**

**2000.** The *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2000* (USDA and HHS 2000) contained a section called “Recommendations,” which included recommendations for “filling information gaps” related to diet and health outcomes, monitoring the effectiveness of the *Dietary Guidelines*, and the design of educational tools to improve the implementation of the *Dietary Guidelines*. That section specifically mentioned children in only three instances, for which excerpts appear below in quotes. In addition, the text implies that four other recommendations apply to children. (That content is paraphrased after the quotes.)

#### **Specific Mention of Children:**

- Data to determine whether limiting the intake of beverages and foods high in added sugars would increase the consumption of more nutrient-rich foods and beverages. “. . . if children drink fewer soft drinks, will that necessarily result in increased milk consumption?” (p. 64).
- “Studies . . . to clarify the relevance of children’s sodium intakes to their long-term health status” (p. 64).
- Monitoring of “the health outcomes and effectiveness of school physical education classes and community programs designed to engage children, adolescents, and adults in physical activity” (p. 65).

#### **Relevance to Children is Implied:**

- An enhanced database to allow better assessment of associations between obesity or overweight and health risks in specific age, gender, racial and ethnic groups; and roles of physical activity, food portion sizes, energy density of the diet, and specific dietary components in the development of obesity.

- Population studies to assess health outcomes related to the intake of different levels, types, and sources of dietary carbohydrates; the reporting of both total and added sugars using consistent definitions; and determination of the best statistical methods for analyzing food consumption data to identify nutrient displacement (e.g., the displacement of nutrient-rich beverages by beverages and foods high in added sugars).
- Investigation of what motivates Americans to adopt recommended behaviors, such as food choice behaviors related to dietary sodium intake, including stratification of consumers by age, income, and other factors.
- Investigation of the etiology of the rising prevalence of obesity among children.<sup>2</sup>

**2005.** In contrast to the 2000 committee report, *The Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2005* (DGAC 2004) acknowledges that Dietary Guidelines are primarily adult-based. In a section called “Research Recommendations,” the first overarching research recommendation focuses on children:

- “1. Investigate the impact of following adult-based dietary guidelines on nutrient intake and health or metabolic effects in children and later in life. Determine the impact of establishing dietary guidelines in childhood on dietary intakes and patterns later in life.

Rationale: Research on the effectiveness of using adult-based dietary guidelines for children is limited. (p. 267)”

One other overarching recommendation and two related specific recommendations explicitly identify children as a target population:

- Overarching. “5. . . . studies to determine the barriers for complying with the Dietary Guidelines among children, low income populations, and various ethnic groups.” (p. 267)
- Specific. “4. . . . Long-term studies and, if possible, dose-response trials . . . to better understand the relationship between added sugar consumption and health in adults and children” (p. 268) and “15. [Comparison of] the effects of foods and beverages that contain added sugars and those that naturally contain sugar on body adiposity and other indicators of health in children and adults” (p. 268).

Because of the subject matter, two additional specific knowledge gaps can be inferred as applying to children: “14. . . . implications of the intake of bottled water on fluoride intake and on health outcomes (especially oral health)” (p. 269), and “conduct trials that test

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<sup>2</sup> Review of the section “Discussion of Proposed Changes” makes it clear that the committee recognized this gap (DGAC 2004).

whether increased potassium intake or potassium-rich foods increase bone mineral density” (p. 270).

**Summary.** Both the 2000 and 2005 *DGA* Committees highlighted knowledge gaps related to the health effects of added sugars and factors that influence the adoption of *Dietary Guidelines*. Only the 2005 report made it clear that there is a dearth of studies conducted with children and adolescents on which to base dietary guidance for those age groups.

## **B. OTHER CONTEMPORARY GUIDANCE STATEMENTS**

Although *Dietary Guidelines for Americans* is the leading source of dietary guidance for children in the United States, authoritative health and nutrition organizations have issued dietary guidance as important components of their overall strategies for preventing chronic disease. We examined the guidance statements and scientific evidence cited by these organizations in support of their dietary recommendations for children to determine (1) the extent to which the evidence cited was based on studies of children; and (2) the types of references used (e.g., original research, review(s), or the *Dietary Guidelines* or other authoritative sources). These organizations’ recommendations are published in the form of guidelines; recommendations; or position, consensus, or scientific statements. For this report, we refer to the documents containing dietary guidance as “guidance statements.” A complete reference list of the guidance statements can be viewed in Appendix B.

### **1. Selection of Dietary Guidance Statements**

The organizations that issued the guidance statements we reviewed include the AAP, the American Cancer Society (ACS), the ADA, the AHA, the IOM, the National Cholesterol Education Program (NCEP), and the National Institute of Health’s National Heart, Lung, and Blood Institute (NHLBI). These organizations were selected because they published guidelines that either specifically target children or the general population (including children), and because they address health outcomes of interest (e.g., general health, cardiovascular health, and obesity). Although we considered statements and publications released by other organizations, we excluded them from our review because they contained limited dietary guidance for children.<sup>3</sup>

Our discussion of contemporary guidance statements focuses on the evidence used to support the dietary recommendations. However, a visual representation of the specific recommendations contained in each guidance statement provides important context for our discussion. Table II.1 lists the specific dietary recommendations included in 11 authoritative

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<sup>3</sup> For example, the American Diabetes Association recommends that children with type 1 and 2 diabetes follow the same dietary recommendations as children without diabetes, since they have the same nutrient requirements (American Diabetes Association 2002). The American Dental Association recommends that children consume fluoride supplements and offers a general recommendation to follow the *Dietary Guidelines* (American Dental Association 2000 and 2006).



guidance statements in comparison to the 2005 *Dietary Guidelines for Americans*. The table is organized using the 2005 dietary guidelines focus areas and the following headings that indicate the primary focus of each guidance statement: general health, obesity prevention, cancer prevention, and cardiovascular health. This organizational method facilitates the identification of similarities and differences in the dietary recommendations of organizations that address similar aspects of health promotion and chronic disease prevention.<sup>4</sup> It also provides a means of viewing changes in specific dietary recommendations over time.

## 2. Evidence Used in Guidance Statements to Support Dietary Recommendations

In this section, we provide (a) an overview of the types of evidence used by leading organizations to make their dietary recommendations, and (b) a contextual review of the evidence used to support the recommendations. The overview provides a broad sense of the types of evidence used to inform the child-related dietary recommendations of contemporary guidance statements in terms of the proportion of studies on children and high-risk groups and the nature of the evidence provided (e.g., citing other leading organizations' guidelines, original research studies, or both). The contextual review of evidence is organized by health outcome so as to (1) help detect themes in how the available research supports dietary guidance pertaining to a particular health outcome, and (2) identify which organizations issue recommendations on the same topic. To the extent possible for each health outcome, we describe how organizations develop and update recommendations, the type of evidence they use (e.g., the proportion of child-based and high-risk studies), and the conclusions they draw concerning the lack of relevant research available.

### a. Overview of the Types of Evidence Cited

**Methods.** For each guidance statement, we quantified the evidence referenced<sup>5</sup> in each document (see Table II.1) by the type of evidence:

- Studies on children (estimated proportion of studies).
- Studies on high-risk children (estimated total number of studies).

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<sup>4</sup> We did not examine consistencies across organizations' respective dietary recommendations as a part of this report but took this aspect into consideration in our discussion and interpretation of the evolving science base (upcoming in Chapter IV).

<sup>5</sup> This quantitative summary factors in only references applicable to individual dietary recommendations. For instance, the multifaceted IOM 2005 "Preventing Childhood Obesity: Health in Balance" report contained hundreds of references from separate chapters that were not quantified here. Also, 72 articles from NHLBI were not relevant to dietary recommendations and were not quantified.

**Table II.1: Selected Contemporary Dietary Recommendations for Children and Adolescents**

Recommendation (✓if included)	General Health		Obesity Prevention	
	Dietary Guidelines for Americans, USDA/HHS 2005	Position of the ADA: Dietary Guidance for Health Children Ages 2 to 11 Years, ADA 2004a	Preventing Childhood Obesity: Health in the Balance, IOM 2005	Policy Statement: Prevention of Pediatric Overweight and Obesity, AAP 2003
Get adequate nutrients within calorie needs	✓	✓ Encourage foods high in iron	✓ Get adequate calcium intake; Limit high calorie, low nutrient dense foods and beverages	
Maintain a healthy body weight (Balance caloric intake with physical activity (PA))	✓		✓	
Engage in physical activity	≥ 60 minutes on most (if not all) days	≥ 60 minutes moderate activity daily	≥ 60 minutes moderate or vigorous PA (MVPA) daily	✓
Encourage fruits and vegetables	✓	5 or more servings/day	✓	✓ Limit juice and encourage whole fruit (AAP 2001)
Encourage whole grains	✓	✓	✓	✓
Encourage high fiber foods	✓	19 g/day (1-3 y/o) 25 g/day (4-8 y/o) 26-31 g/day (9-13 y/o)		
Select certain kinds of dairy foods	Fat-free or low-fat	2-3 servings/day of milk or dairy products		Low-fat
Moderate total fat (% kcal)	30-35% (2-3 y/o) 25-35% (4-18 y/o)	30-40% (1-3 y/o) 25-35% (4-18 y/o)	✓ Moderate	
Limit saturated fat	< 10%	As low as possible	✓	
Encourage unsaturated fat food sources	✓			
Limit trans fat	As low as possible	As low as possible		
Limit cholesterol	< 300 mg/day	As low as possible	✓	
Select certain kinds of meat/protein	Lean meats, poultry, beans, fish, nuts	Protein 5-20% (young children); 10-30% (older children)		
Select certain kinds of oil	Vegetable oils			
Limit added sugars	✓	≤ 25%; use sparingly	✓	
Limit sodium	<2,300 mg/day		✓	
Encourage potassium-rich foods	✓			
Abstain from alcoholic beverages	Abstain			
Take steps to maintain food safety	✓		Keep food safe to eat	

Table II.1 (*continued*)

Recommendation (✓if included)	Cancer Prevention		Cardiovascular Health	
	Guidelines on Nutrition and Physical Activity for Cancer Prevention, ACS 2006	Diet and Lifestyle Recommendations Revision, AHA 2006	Dietary Recommendations for Children and Adolescents: A Guide for Practitioners, AHA 2005	Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents, NHLBI 2004
Get adequate nutrients within calorie needs		✓	✓	Decrease consumption of energy-dense snacks
Maintain a healthy body weight (Balance caloric intake with PA)	✓	✓	✓	✓
Engage in physical activity	≥ 60 minutes MVPA ≥ 5 days/wk	≥ 60 minutes on most days	60 minutes MVPA daily	Control portion size 30-60 minutes moderate activity on most days
Encourage fruits and vegetables		✓	✓	✓
Encourage whole grains		At least ½ from whole grains	Limit juice intake	
Encourage high fiber foods	✓	✓	✓	✓
Select certain kinds of dairy foods		Fat-free or low-fat	Non-fat or low-fat daily	Low-fat
Moderate total fat		25-35%		
Limit saturated fat		<7%	✓	
Encourage unsaturated fat food sources		✓	✓	
Limit trans fat		<1%; minimize hydrogenated fats	Liberal unsaturated fats; adequate omega-3 fatty acids	
Limit cholesterol		<300 mg/day	✓	
Select certain kinds of meat/protein	Young children should not eat fish high in mercury	Lean meats or vegetable alternatives; fish twice a week	Fish twice a week; lean meats, beans, tofu	
Select certain kinds of oil				
Limit added sugars		✓	✓	Decrease consumption of sugar-containing beverages
			Limit sweetened and naturally sweet (juice) beverages to 4-6 oz/day for 1-6 y and 8-12 oz/day for 7-18 y	
Limit sodium		<2,300 mg/day	✓	✓
				Lower from current usual intake; refer to DRIs (IOM 2005)
Encourage potassium-rich foods		✓	✓	
Abstain from alcoholic beverages	Abstain	Moderate		Moderate
Take steps to maintain food safety				

Table II.1 (*continued*)

Recommendation (✓if included)	Cardiovascular Health			
	Guidelines for Primary Prevention of Atherosclerotic Cardiovascular Disease Beginning in Childhood, AHA 2003	Cardiovascular Health in Childhood: A Statement for Health Professionals from AHA/AHOY, 2002	Policy Statement: Cholesterol in Childhood, AAP 1998	Report of the Expert Panel on Blood Cholesterol levels in Children and Adolescents, NCEP 1992
Get adequate nutrients within calorie needs			✓ Encourage calcium-rich foods	✓
Maintain a healthy body weight (Balance caloric intake with physical activity)	✓	✓	✓	✓
Engage in physical activity	≥ 60 minutes MVPA daily; adolescents should combine resistance training with aerobic activity; limit sedentary activity	≥ 30 minutes moderate activity most days (preferably all days)		
Encourage fruits and vegetables		5 or more servings/day	✓	
Encourage whole grains		6 to 11 servings whole grain and other grain foods/day		
Encourage high fiber foods		Adequate dietary fiber (age +5 g/day)		
Select certain kinds of dairy foods	✓	Low-fat or fat-free	Low-fat	
Moderate total fat		20-30%	> 20% and ≤30%	< 30%
Limit saturated fat	< 10%	< 10%	< 10%	< 10%
Encourage unsaturated fat food sources		≤ 10% polyunsaturated	≤ 10% polyunsaturated	≤10% polyunsaturated; 10-15% monounsaturated
Limit trans fat	✓			
Limit cholesterol	< 300 mg/day	The lesser of < 300 mg/day or 100 mg cholesterol/ 1,000 kcal	< 300 mg/day	< 300 mg/day
Select certain kinds of meat/protein	Variety of fish, legumes, poultry, lean meat		Lean meats, beans, poultry, fish	
Select certain kinds of oil				
Limit added sugars	✓			
Limit sodium	<6 g/day	✓		
Encourage potassium-rich foods				
Abstain from alcoholic beverages				
Take steps to maintain food safety				

- Type of study (total number and percentage of studies in each category used to support dietary recommendations): statements from leading organizations (e.g., scientific, position, other guidelines), narrative and systematic reviews, original research, and background or prevalence studies.

Based on the title of the reference, we first determined whether each citation in the guidance statement pertained to children and adolescents (including tracking studies to adulthood), adults only, or both. We then provided an approximation of the proportion (e.g., three-fourths or more) of the number of studies based on children. This approach facilitated the making of comparisons across organizations and within various health outcomes. We also estimated, again based on reference titles, the total number of studies cited in each guidance statement that included a high-risk group (i.e., children with cardiovascular disease and/or cardiovascular risk factors, diabetes, or obesity). Finally, we examined the type of evidence used in each organization's statement, independent of the index population.

**Findings.** For all but the following three guidance statements, three-fourths or more of the supporting research was based on children. The guidance statements from the American Cancer Society (ACS 2006) and the American Heart Association (AHA 2006), which mainly cited adult-based research, made recommendations for the general population, including children. The recommendations for children in NHLBI's National High Blood Pressure Education Program's guidance statement (NHLBI 2004) were based on research concerning both children and adults.

Overall, the guidance statements included few studies based on high-risk groups. Most had the goal of promoting health to prevent chronic disease or obesity, or served the dual purpose of promoting health and reducing disease risk. However, the two most recent guidance statements targeting high-risk children exclusively cited very few studies on high-risk children. NHLBI's statement on high cholesterol levels (AAP 1998) cited four studies. The older National Cholesterol Education Program's statement (NCEP 1992) cited 58 studies on high-risk children, or about half of the total number of studies based on children.

A combination of types of evidence were cited by most organizations in support of their recommendations. Specific findings include:

- All of the guidance statements that were reviewed cited existing guidelines or scientific documents (either their own or those from one or more other organizations) to support or provide context for their dietary recommendations. The most frequently cited guidelines or scientific documents in support of organizations' own guidance statements were: the *Dietary Guidelines*, the Dietary Reference Intakes, and the USDA Food Guide Pyramid.<sup>6</sup> Relatively high

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<sup>6</sup> Other documents cited include the U.S. Surgeon General's *Report on Nutrition and Health* (1988), National Research Council's *Diet and Health* (1989), *Healthy People 2010* (HHS 2005), and international reports (World Health Organization 2002).

percentages of the citations used by the ADA, ACS, and the AHA were for other organizations' statements.

- With few exceptions, reviews represented a small proportion of the references cited. The ACS used reviews most extensively, citing 42 review studies to support its recommendations; none of those review studies were on children (ACS 2006).
- In five cases (AHA 2003; AHA 2006; AAP 1998; NCEP 1992; and NHLBI 2004), at least half of the references supporting guidance statements on cardiovascular health and related risk factors were to original research. More than half of the references supporting the guidance statement on cancer prevention (ACS 2006) were to original research. For the remaining five guidance statements (AAP 2003; ADA 2004a; AHA/AHOY 2002; AHA 2005; and IOM 2005), fewer than half of the references cited were to original research. Most of the references cited in pediatric obesity prevention statements (AAP 2003; IOM 2005) were background articles or prevalence studies.

## **b. Contextual Review of the Evidence Supporting Dietary Recommendations for Children**

To facilitate comparisons between the evidence available in the 2000 and 2005 *Dietary Guidelines for Americans*, in contemporary dietary guidance statements from organizations, and in the recent body of research that we identified (see Chapter III), we have described organizations' guidance statements in terms of health outcomes. For each health outcome, we address the process and/or rationale for releasing the statements, as well as any updates and any explicit mention of reports used to inform them. The purpose of the guidance statement, the type of evidence used to support its recommendations, and the organizations' conclusions as to whether research gaps exist are summarized briefly below (see Table II.2 for complete details).

**General Health of Children.** The ADA published a 2004 position statement with dietary recommendations for children ages 2 to 11 years.<sup>7</sup> The statement was targeted towards caregivers, health professionals, and the food industry. It contained dietary recommendations for healthy children that focused on optimal development, maintaining a healthy weight, and reducing the risk of chronic disease. The statement included citations for nine studies on high-risk (primarily obese) children. The authors noted that more research is needed in specific areas, such as the relationship between calcium intake and bone density, and between alternative food-related parenting styles and eating habits of children over the long term.

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<sup>7</sup> The 2004 position statement was reissued with minor updates in June 2008 (after the February 2008 publication cutoff for the study) (ADA 2008).

**Table II.2: Child-Focused Evidence and Research Gaps Cited in Contemporary Guidance Statements**

Guidance statement	Statement of purpose or goals	Estimated total proportion of studies on children	Estimated total number of studies on high-risk <sup>a</sup> children	Type of evidence used: Number (percent)				Process or methods used by organization to form guidance	Research gaps identified by organization
				Organizations' statements, guidelines, etc.	Narrative and/or systematic reviews	Original research	Other (e.g., background and prevalence data)		
GENERAL HEALTH									
ADA 2004a. "Dietary Guidance for Healthy Children Aged 2 to 11 Years."	"...children ages 2 to 11 years should achieve optimal physical and cognitive development, attain a healthy weight, enjoy food, and reduce the risk of chronic disease through appropriate eating habits and participation in regular physical activity."	>75%	9	26 (11%)	10 (4%)	114 (49%)	85 (36%)	Not documented	More research is needed on the relationships between: (1) eating breakfast and school performance; (2) calcium intake above RDA levels and increased bone density; and (3) alternative food-related parenting styles and healthier eating habits of children in the short-term and long-term.
OBESITY PREVENTION									
IOM 2005. "Preventing Childhood Obesity: Health in the Balance."	"... develop a prevention-focused action plan to decrease the prevalence of obesity in children and youth .... examining the behavioral and cultural factors, social constructs, and other broad environmental factors involved in childhood obesity and identifying promising approaches for prevention efforts. The plan consists of... explicit goals for preventing obesity in children and youth and a set of recommendations, all geared toward achieving those goals, for different segments of society."	>75%	3	8 (5%)	3 (2%)	32 (21%)	107 (72%)	AN IOM committee of 19 experts developed a prevention-focused action plan to decrease the prevalence of obesity in children and youth in the U.S.	Methodological limitations for studies linking reduced soft drink consumption and changes in obesity prevalence.  More research is needed on: the neural and physiological underpinnings of hunger and satiety and the regulation of food intake and energy balance; the timing of snacks and meals influence eating and weight status; and long-term studies on the effects of portion size on weight gain.

Guidance statement	Statement of purpose or goals	Estimated total proportion of studies on children	Estimated total number of studies on high-risk <sup>a</sup> children	Type of evidence used: Number (percent)				Process or methods used by organization to form guidance	Research gaps identified by organization
				Organizations' statements, guidelines, etc.	Narrative and/or systematic reviews	Original research	Other (e.g., background and prevalence data)		
AAP 2003. "Prevention of Pediatric Overweight and Obesity."	"The intent of this statement is to propose strategies to foster prevention and early identification of overweight and obesity in children."	>75%	5	6 (7%)	0	4 (4%)	78 (89%)	Not documented	There are too few studies on obesity prevention.
<b>CANCER PREVENTION</b>									
ACS 2006. "Guidelines on Nutrition and Physical Activity for Cancer Prevention: Reducing the Risk of Cancer with Healthy Food Choices and Physical Activity."	"The ACS publishes Nutrition and Physical Activity Guidelines to advise health care professionals and the general public about dietary and other lifestyle practices that reduce cancer risk."	<5%	0	27 (14%)	42 (22%)	106 (54%)	20 (10%)	A national panel of experts in cancer research, prevention, epidemiology, public health, and policy develop guidelines to be published every 5 years.	None specifically for children.
<b>CARDIOVASCULAR HEALTH</b>									
AHA 2006. "Diet and Lifestyle Recommendations Revision 2006."	"[these] are one component of a comprehensive plan to achieve specific goals for cardiovascular risk reduction...the recommendations... are appropriate for the general public, including adults and children over 2 years of age."	5% children	1	13 (13%)	5 (5%)	48 (50%)	31 (32%)	Drew from authoritative documents including previous AHA scientific statements, other evidence-based reviews, seminal studies and national surveys.	None specifically for children.
AHA 2005. "Dietary Recommendations for Children and Adolescents. A Guide for Practitioners: Consensus Statement From the American Heart Association."	"...provide dietary and physical activity recommendations for healthy children; discusses the current content of children's diets; reviews the adverse health consequences of increased intakes of calories (relative to energy expenditure), saturated and trans fat, and cholesterol; and provide	>75%	3	14 (8%)	17 (10%)	83 (46%)	65 (36%)	Revised the 1982 document and built on the 2000 AHA dietary guidelines consensus statement.	None



Guidance statement	Statement of purpose or goals	Estimated total proportion of studies on children	Estimated total number of studies on high-risk <sup>a</sup> children	Type of evidence used: Number (percent)				Process or methods used by organization to form guidance	Research gaps identified by organization
				Organizations' statements, guidelines, etc.	Narrative and/or systematic reviews	Original research	Other (e.g., background and prevalence data)		
	age-specific guidelines for implementation of the recommended diet, including the period from before birth to 2 years of age."								
NHLBI, NHBEP, 2004. "The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents."	"The purpose of this report is to update clinicians on the latest scientific evidence regarding BP in children and to provide recommendations for diagnosis, evaluation, and treatment of hypertension based on available evidence and consensus expert opinion of the working group when evidence was lacking."	50%	7	6 (9%)	4 (6%)	50 (76%)	6 (9%)	<p>The 1996 "Update the 1987 Task Force Report on High Blood Pressure in Children and Adolescents" was updated using critical new information.</p> <p>Scholars and clinicians wrote background articles synthesizing new issues related to kids and hypertension.</p>	<p>Lack firm evidence about dietary interventions in hypertensive children and the benefit from increases in fresh vegetables, fresh fruits, fiber, and nonfat dairy as well as a reduction of sodium.</p> <p>Too little evidence to support a clinical recommendation for calcium supplements to lower blood pressure.</p> <p>Associations between lowered blood pressure and increased intake of potassium, magnesium, folic acid, unsaturated fat, fiber, and lower intake of total fat.</p>
AHA 2003. "Guidelines for Primary Prevention of Atherosclerotic Cardiovascular Disease Beginning in Childhood."	"...guidelines represent a practical approach to cardiovascular health promotion and identification and management of known risk factors for cardiovascular disease in children and young adults."	>75%	13	7 (29%)	1 (4%)	13 (54%)	3 (13%)	An expert writing group used the 1992 NCEP Pediatric Panel Report, the 1987 NHLBI 2nd Task Force report on the diagnosis and management of hypertension and childhood, and other publications.	No controlled trials exist comparing the effect of risk reductions beginning in childhood on the subsequent development of atherosclerotic disease.
AHA/AHOY 2002, "Cardiovascular Health	"... provide strategies for promoting cardiovascular	>75%	5	4 (4%)	2 (2%)	14 (12%)	92 (82%)	Not documented	Unknown significance of elevated triglyceride levels

Guidance statement	Statement of purpose or goals	Estimated total proportion of studies on children	Estimated total number of studies on high-risk <sup>a</sup> children	Type of evidence used: Number (percent)				Process or methods used by organization to form guidance	Research gaps identified by organization
				Organizations' statements, guidelines, etc.	Narrative and/or systematic reviews	Original research	Other (e.g., background and prevalence data)		
in Childhood."	health that can be integrated into the comprehensive pediatric care of children...rather than labeling specific children as abnormal, strategies are directed toward promoting optimal cardiovascular health for all children."								measured in childhood for cardiovascular risk in adulthood. Unclear role between the components of the insulin resistance syndrome and its role as a predictor of adult CVD and type II diabetes.
AAP 1998. "Cholesterol in Childhood."	"Material in this statement is adapted from the Report of the Expert Panel on Blood Cholesterol in Children and Adolescents of the NCEP. It has been modified to reflect additional considerations of the Committee on Nutrition of the American Academy of Pediatrics."	>75%	4	3 (6%)	3 (6%)	36 (69%)	10 (19%)	Materials from the 1992 NCEP were adapted and modified to reflect AAP Committee on Nutrition considerations to be 'in concert' with other statements, experts, and expert panels.	No long-term studies of the relationship of blood cholesterol levels measured in children to coronary heart disease in later life.
NCEP 1992. "Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents."	"...reviews the evidence that atherosclerosis or its precursors begin in young people; that elevated cholesterol levels early in life play a role in the development of adult atherosclerosis; that eating patterns and genetics affect blood cholesterol levels and CHD risk; and that lowering levels in children and adolescents will be beneficial."	48%	58	17 (7%)	6 (3%)	152 (66%)	55 (24%)	Representatives of over 40 organizations served on the Coordinating Committee.	None related to dietary guidelines.

<sup>a</sup> Children with cardiovascular disease, cardiovascular risk factors, diabetes, or obesity were considered "high-risk".

## II: Contemporary Dietary Guidance for Children

**Obesity Prevention.** AAP released a statement in 2003 proposing strategies for medical practitioners to promote the prevention and identification of childhood overweight and obesity. The statement did not update prior statements issued on childhood obesity. Instead, it responded to the dramatic increase in the prevalence of childhood overweight and its resultant comorbidities. Dietary recommendations addressed both healthy and overweight/obese children. Most of the research cited in the document was on children, and a few of the studies were on high-risk children.

The IOM assembled a 19-member committee in response to a congressional request to provide a prevention-focused national action plan to decrease the prevalence of childhood obesity. Its report, published in 2005, was multifaceted, focusing on several levels of prevention (e.g., community, schools, industry). Embedded in the report were individual-level dietary recommendations for children that were applicable to families, practitioners, and the broader community. Most studies supporting the dietary recommendations were on healthy children; however, very few studies linked diet to health outcomes.

Both the AAP 2003 and IOM 2005 statements included comments on the scarcity of research addressing childhood obesity prevention. The IOM 2005 committee noted, in particular, the lack of methodologically sound studies linking childhood obesity to soft drinks and portion sizes, and the lack of research on hunger and satiety mechanisms and meal and snack timing.

**Cancer Prevention.** The ACS published nutrition and physical activity guidelines for the general population in 2006, updating the 2002 guidelines. About once every five years, a national panel of experts in cancer research and other fields provides an updated report with the most current scientific evidence relating diet and physical activity to the risk of cancer. Its 2006 report made recommendations for healthy individuals; several of the recommendations were child-specific. Most studies were conducted on adults, and few studies were on high-risk groups. The authors did not report child-focused gaps in research.

**Cardiovascular Health of Children.** The AHA issued four guidance statements between 2002 and 2006 that included research-based dietary recommendations for children. Reasons for these guidance statements included: committee priorities for targeting children in the prevention of cardiovascular disease after the release of adult-based statements in 2002 (AHA 2003); the growing obesity epidemic (AHA 2005); and the incorporation of new scientific evidence available after the release of the 2000 AHA dietary guidelines for health care professionals (Krauss et al. 2000; AHA 2006). The most recent AHA statements (2003, 2005, 2006) explicitly referred to their use of previous reports and scientific statements to make recommendations. The earlier statement (AHA/AHOY 2002) did not document the use of previous reports.

All of the AHA guidance statements are intended to assist medical practitioners in providing dietary recommendations that will promote optimal cardiovascular health and/or prevent atherosclerosis disease in healthy children. In three statements (AHA 2002, 2003, 2005), the AHA based the majority of its recommendations on child-based research. One AHA statement (2006), targeted to the general public, presented recommendations based on research on adults, but the authors asserted that the recommendations were appropriate for

children over 2 years of age and referenced the AHA 2005 statement, which made parallel recommendations for children. Two AHA guidance statements (2002 and 2003) included comments on the lack of available research tracking childhood cardiovascular risk factors and adult cardiovascular risk.

In 2004, the NHLBP's National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents updated the 1996 publication, *Update on the 1987 Task Force Report on High Blood Pressure in Children and Adolescents*. The purpose of the 2004 statement was to provide clinicians with more recent scientific evidence regarding blood pressure in children. This guidance statement included dietary recommendations and other strategies to treat hypertensive children—a high-risk group. However, approximately half of the cited studies relevant to dietary recommendations were on adults, and fewer than 10 studies were on high-risk children. The authors noted the lack of evidence relating hypertension in childhood to various dietary factors, including the intake of fresh fruits and vegetables, fiber, nonfat dairy products, sodium, calcium supplements, potassium, magnesium, folic acid, unsaturated fat, and total fat. Rigorous studies on adults were used to bolster the small body of research and the generally weak studies on children.

The AAP's Committee on Nutrition published a statement in 1998 in concert with the expert panels issuing the 1992 NCEP report, as well as reports from AHA, USDA & HHS, the U.S. Surgeon General, the National Research Council, and the National Cancer Institute. That statement was adapted from the 1992 NCEP report and included modifications to reflect considerations of the AAP Committee on Nutrition. Recommendations were provided for both healthy children (population approach) and high-risk children (individualized approach). Most of the research supporting the dietary recommendations was on healthy rather than high-risk children. Similar to the AHA, the AAP commented on the lack of available research that tracked childhood cardiovascular risk factors and cardiovascular risk in adulthood.

One of the most frequently cited guidance statements for lowering blood cholesterol levels in children and adolescents is the 1992 *National Cholesterol Education Program (NCEP) Expert Panel Report* (NCEP 1991 and 1992). This document, geared towards health professionals, recommended an individualized approach to preventing high blood cholesterol levels in children at risk for atherosclerosis and a population approach to prevention in healthy children. About half of the research cited in this report was based on children, of which half (or one-quarter of the total) was based on high-risk children with conditions such as atherosclerosis and hypercholesterolemia.

## **C. CONCLUSION**

The body of evidence provided by the 2005 Dietary Guidelines Advisory Committee and by the expert groups that authored other contemporary guidance statements provides very limited direct support for dietary guidance for children. In at least some cases, expert groups developing recommendations appear to have taken the position that evidence supporting adult dietary recommendations provides a basis for similar recommendations for children as long as the recommendations are consistent with nutrient adequacy and normal

growth and development. In other cases, expert groups cited research on children to support their recommendations for dietary guidance for children, but the groups did not document the extent to which they gave systematic consideration to such factors as study design, sample size, and methods or their method for determining that they had sufficient evidence on which to base a recommendation.

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## CHAPTER III

### RECENT EVIDENCE SINCE THE 2005 DIETARY GUIDELINES FOR AMERICANS

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The goal of the literature search was to identify “recent” literature, defined as relevant, evidence-based research articles related to children published in the peer-reviewed literature since the *2005 Dietary Guidelines for Americans* (HHS and USDA 2005) through February 2008. The search resulted in 246 citations related to 11 dietary guideline topic areas, including background information.

The first section of this chapter summarizes our approach to the literature search, including inclusion criteria, search sources, electronic database search techniques, and the abstract review process. The second section summarizes the results of our search, including the number of articles found in relation to each dietary guideline topic area.

#### A. LITERATURE SEARCH APPROACH

We searched for literature in three ways to ensure comprehensive coverage of the recent body of peer-reviewed articles:

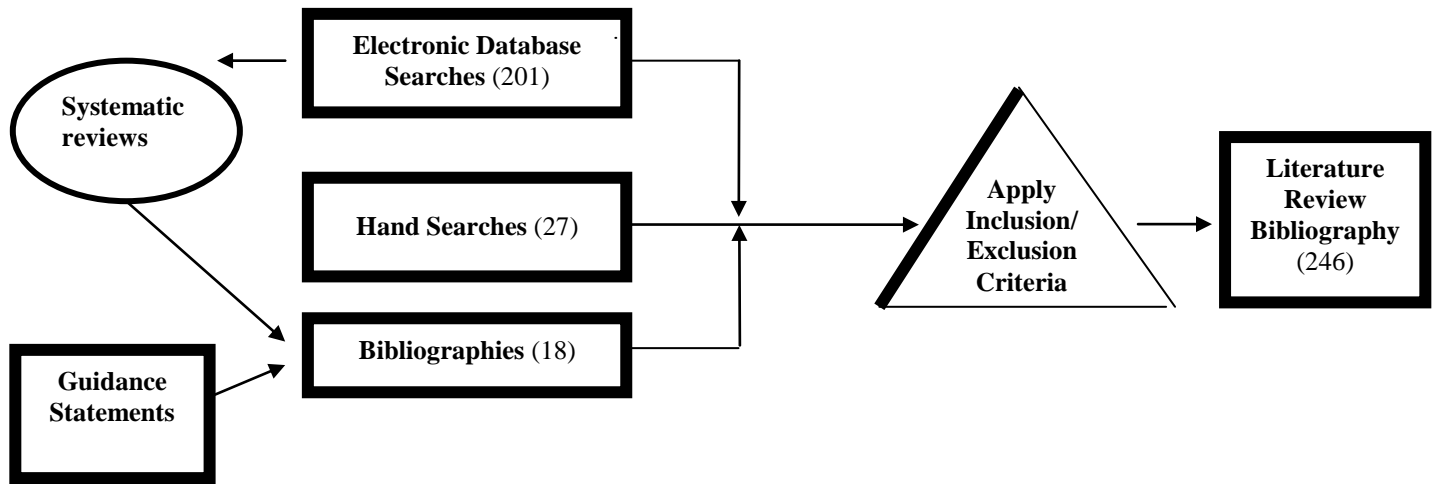
1. Searched electronic databases for journal articles
2. Searched for articles “by hand”
3. Reviewed bibliographies of
  - contemporary guidance statements<sup>1</sup> from leading organizations, and
  - systematic reviews found through electronic database searches

Figure III.1 provides a visual overview of the search for recent literature. “Recent literature” was defined as articles published from 2004 to February 2008 that were not already cited in the *2005 Dietary Guidelines*.

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<sup>1</sup> Guidance statements refer to leading health organizations’ recommendations published in the form of guidelines; recommendations; or position, consensus, or scientific statements.

Figure III.1. Overview of the Search for Recent Literature



**Search Sources.** Table III.1 provides a list of the sources covered in the electronic databases, the bibliography search (which mainly focused on guidance statements), and the hand searches. Each stream of searching covered a rich collection of published journals, reports, book chapters, and other sources. ASPE and members of the study team identified the selected book chapters and reports from key organizations that were assessed as part of the hand searches, such as Agency for Healthcare Research and Quality reports, and reports from key organizations such as the American Dietetic Association and the American Heart Association.

The majority of citations were found in the targeted searches using electronic databases (201 of 246 total citations). Nearly 6,000 abstracts from the electronic data base searches were reviewed. The study team’s independent hand searches yielded 27 additional citations. A review of the bibliographies of the contemporary guidance statements and the systematic reviews found during the electronic database search yielded an additional 18 citations (nine from guidance statements and nine from systematic reviews).

**Electronic Database Searches.** The majority of articles in the recent literature were identified through electronic database searching by applying search techniques to specific topic areas from the *2005 Dietary Guidelines* chapters. Each topic area search included specifications for the research librarian to ensure the comprehensive coverage of that topic, including:

- Key search terms<sup>2</sup> (see Figure III.2 for a list of examples)
- Key references on children listed in the *2005 Dietary Guidelines* to identify relevant search terms to find similar articles

<sup>2</sup> Search terms include MeSH terms, key words in titles and abstracts, and article descriptors.



**Table III.1. Sources Used in Three Search Streams**

Electronic Database Searches	Bibliography Search*	Hand Searches
Ovid Medline	AAP 2003 "Prevention of Pediatric Overweight and Obesity."	Journal Table of Contents:
Ovid Healthstar	AAP 1998 "Cholesterol in Childhood."	AHA Circulation
Ovid Cumulative Index to Nursing & Allied Health Literature (CINAHL)	ACS 2006 "Guidelines on Nutrition and Physical Activity for Cancer Prevention: Reducing the Risk of Cancer with Healthy Food Choices and Physical Activity."	American Journal of Clinical Nutrition
Article First	ADA 2004a "Dietary Guidance for Healthy Children Aged 2 to 11 Years."	European Journal of Clinical Nutrition
Cochrane Reviews	AHA 2003 "Guidelines for Primary Prevention of Atherosclerotic "Cardiovascular Disease Beginning in Childhood."	International Journal of Obesity
AGRICOLA	AHA 2005 "Dietary Recommendations for Children and Adolescents. A Guide for Practitioners: Consensus Statement From the American Heart Association."	International Journal of Pediatric Obesity
Biological & Agricultural Index	AHA 2006 "Diet and Lifestyle Recommendations Revision 2006."	Journal of Adolescent Health
DIALOG Index (DIALINDEX)	AHA/AHOY 2002 "Cardiovascular Health in Childhood."	Journal of the American Dietetic Association
Wilson SelectPlus	IOM 2005 "Preventing Childhood Obesity: Health in the Balance."	Journal of the CardioMetabolic Syndrome
ERIC (Educational Resources Information Center)	NCEP 1992 "Report of the Expert Panel on Blood Cholesterol in Children and Adolescents."	Journal of Nutrition
FEDRIP (Federal Research in Progress)	NHLBI 2004 "The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents."	Journal of Pediatrics
Food Science & Technological Abstracts	Systematic reviews found during electronic database searches that met inclusion criteria	Obesity
Foodline		Pediatrics
Gale Group Health & Wellness Database		Public Health Nutrition
CDC's <i>Preventing Chronic Disease</i>		Press releases announcing new studies
EBSCO		Selected book chapters and reports

\*Full citations for guidance statements are found in Appendix B.

**Figure III.2. Examples of Search Terms Used for Specific and General Topic Area Searches**

Specific	Nutritional Requirement, Vitamin, Overweight, Obesity, Body Mass Index (BMI), Dairy products, Milk, Calcium, Meat, Fruits, Vegetables, Dietary Fats, Fatty Acid, Omega-6, Omega-3, Lipids, Lipoproteins, Cholesterol, Unsaturated, Added Sugar, Dietary Sucrose, Carbonated Beverages, Dietary Fiber, Cereal, Whole Grains, Potassium, Salt Content, Sodium Chloride, Alcohol, Alcohol Abuse, Food Safety, Food Contamination, Food Handling, Food Poisoning
General	Child, Adolescent, Teenagers, Nutrition, Child Nutrition, Child Health, Nutrition Assessment, Child Nutrition Physiology, Child Nutrition Disorders, Adolescent Nutrition Physiology, Nutrition Physiology, Nutrition Disorders, Nutrition Surveys, Dietary Guidelines

Using search specifications for each topic area, the librarian used a stepwise approach to conducting the electronic database searches. Initial searches involved (1) using the most relevant databases, such as Ovid, (2) using specific search terms for specific topics, and (3) repeating searches after refining search terms. Broad searches were conducted last to capture any remaining studies meeting our search criteria: the librarian used general Medical Subject Heading (MeSH) terms and less relevant electronic databases. Many of the broad searches yielded duplicate citations or did not meet the inclusion criteria, and as a result, yielded few additional articles.

The study team monitored the electronic database search progress closely. This involved checking the librarian's search techniques (for example, using appropriate combinations of search terms) and providing feedback on ways to bring in more articles (for example, refining or expanding search terms).

**Abstract Review Process.** For each recent citation found during the searches, we reviewed the article abstract against the inclusion and exclusion criteria listed in Figure III.3. Articles that met the inclusion criteria were later categorized into "primary" and "background" research. Citations identified through electronic database searches were screened at three stages before adding the studies to the bibliography. First, the librarian conducted an initial screen of nearly 6,000 citations (titles or abstracts) to assess adherence to the inclusion criteria and to detect and remove duplicate articles. Second, a study-team nutritionist (CC) reviewed abstracts provided by the librarian to assess whether the research met the inclusion criteria, and designated articles as "on target," "discarded," or "uncertain." Third, another study-team nutritionist (CS) reviewed these decisions and reclassified the uncertain articles as discarded or on-target. If we encountered challenges in justifying the inclusion or exclusion of articles, or if we questioned an article's utility to the evidence base, we discussed these questions with the project director. All citation abstracts identified through hand searches and bibliographies were reviewed by a study-team nutritionist and approved for inclusion by the project director.

**Figure III.3: Inclusion and Exclusion Criteria Applied to Article Abstracts**

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>• Peer-reviewed work published in 2004 or later:               <ul style="list-style-type: none"> <li>- Systematic reviews and meta-analyses</li> <li>- Experimental and observational studies of diet and health outcomes in US populations as well as Canada, the UK, Australia, New Zealand, Western European countries, China, and Japan</li> <li>- Narrative (non-systematic) reviews published in 2006 and later</li> <li>- Reference or background articles on US children's statistics (e.g., NHANES data on metabolic syndrome, type 2 diabetes, overweight and obesity, food and nutrient consumption, and dietary behaviors)</li> </ul> </li> <li>• Studies on children and/or adolescents ages 2-18 years old</li> <li>• Published in the English language</li> <li>• Relevant to one of the major dietary guidelines or to a DRI value that played a key role in the setting of a dietary guideline               <ul style="list-style-type: none"> <li>- Diet-physical activity if research includes relationship to health outcome (e.g., calcium intake and physical activity)</li> </ul> </li> <li>• Studies with outcomes that are direct measures of health or nutrition status, biologic outcomes, or are behavioral (i.e., intermediate factors thought to influence health status or biologic outcomes) nutrition interventions with a health outcome</li> </ul>	<ul style="list-style-type: none"> <li>• Non-primary research articles (i.e., not experimental or observational studies) with too few citations or insufficient detail               <ul style="list-style-type: none"> <li>- Letters to the Editor</li> <li>- Comments</li> <li>- Published abstracts lacking full articles</li> </ul> </li> <li>• Narrative (nonsystematic) reviews published between 2004 and 2005</li> <li>• Reviews of epidemiologic evidence for diet and cancer or diet and disease that focus on adults</li> <li>• Articles translating science for practitioners, parents, and patients</li> <li>• Physical activity behavior and health outcomes that were not linked to diet</li> <li>• Dietary linkages to low priority health outcomes (e.g., diarrhea, food allergies)</li> <li>• Dietary treatment of disease</li> <li>• Food taste and acceptability (e.g., soymilk and cow's milk)</li> <li>• Literature from developed countries besides US/Canada that only report dietary intake and/or prevalence of diet-related findings</li> <li>• Nutrition interventions with behavioral outcomes</li> <li>• Interventions during pregnancy (including adolescent mothers) and infant outcomes</li> <li>• Infant nutrition (e.g., breastfeeding) and risk of diabetes or other conditions</li> <li>• Effects of parental eating behavior, household food availability, and/or the food environment and children's diets</li> <li>• Cited by the DGAC for the 2005 <i>Dietary Guidelines</i></li> </ul>

## B. LITERATURE SEARCH RESULTS

The literature search resulted in 246 citations. We categorized these citations and the summary of the literature using the dietary guideline chapter topics from the *2005 Dietary Guidelines*, with a few notable differences. The first relates only to the organization of information. We created separate sections for the sub-topic areas mentioned within chapter 5, “Food Groups to Encourage,” in the *Dietary Guidelines*—“Fruits and Vegetables,” “Whole Grains,” and “Milk and Milk Products”—and included calcium in the dairy section.

Other changes reflect differences in the areas summarized in the literature review. Of noteworthy importance, we did not search for recent studies focusing on physical activity alone (chapter 4 in the *Dietary Guidelines*). The exclusion of studies that pertained only to physical activity was a collaborative decision made with ASPE in light of the recently released Physical Activity Guidelines Committee report and the anticipated HHS physical activity guidelines that will include children (Physical Activity Guidelines Advisory Committee 2008). However, studies focusing on dietary behaviors and physical activity together were included and categorized in terms of the dietary behavior.

In an effort to conserve resources for topics related to food and nutrient intake and weight management, the project officer and research team decided not to summarize the articles related to alcoholic beverages and food safety. Therefore, any articles that met the search criteria in these areas were considered background articles.

Finally, we added a section to highlight the findings of “tracking” articles. While the *2005 Dietary Guidelines* seems to use the term “tracking” to refer to one behavior tracked over time, we used a broader definition of “tracking”. We considered any article that measured study participants at more than one point in time to be tracking articles. We classified the tracking studies into three types: (1) behaviors tracked to a biologic or health outcome, (2) behaviors tracked to behaviors, and (3) biologic or health status tracked to biologic or health outcomes. We also noted the tracking age group in order to distinguish studies tracking from early to later childhood versus childhood to adulthood.

In addition to categorizing the 246 citations by dietary guideline topic area, we classified studies into two research tiers, including primary research studies (that is, experimental and observational studies) and background literature. This allowed us to focus our resources on studies that seemed most relevant to the dietary guidelines. For example, articles that focused primarily on the prevalence of outcomes were considered background articles. (References for the recent background literature are provided in Appendix C because they may be of interest to the 2010 Dietary Guidelines Advisory Committee and readers of this report.) Primary research articles were reviewed and summarized. Primary research study citations are listed in Appendix D. Table III.2 displays the 2005 *DGA* chapters, the dietary guideline topic areas used for our evaluation, and the total number of citations that fall into the primary and background categories.

**Table III.2 Total Number of Primary and Background Citations by Topic Area, 2004-2008**

2005 <i>Dietary Guidelines</i> Chapter	Topic Areas for Evidence	Primary	Background	Total
Background	--	--	7	7
Adequate nutrients within calorie needs	Adequate nutrients within calorie needs	20	34	54
Weight management	Weight management	27	57	84
Physical activity <sup>a</sup>	--	--	--	--
Food groups to encourage:				
Fruits and vegetables	Fruits and vegetables	14	2	16
Whole grains	Whole grains	2	4	6
Milk and milk products	Dairy and calcium	21	0	21
Fats	Fats	17	4	21
Carbohydrates	Carbohydrates	32	12	44
Sodium and potassium	Sodium and Potassium	3	3	6
Alcoholic beverages <sup>b</sup>	Alcoholic beverages	0	10	10
Food safety <sup>b</sup>	Food safety	0	5	5
	Number of Unique Studies	104 <sup>c</sup>	142 <sup>c</sup>	246 <sup>c</sup>

<sup>a</sup> Not included in the search of evidence published in 2004-2008.

<sup>b</sup> Not included in review of evidence. Therefore, all articles in this area are categorized as background.

<sup>c</sup> Some articles were analyzed under multiple topic areas so the sum of the articles listed in the column may exceed the total number of unique research articles.

### C. SUMMARY OF RECENT EVIDENCE

In Table III.3, we display the number of primary research studies reviewed for the evidence base within each topic area. We also depict the number of tracking studies, systematic reviews and meta-analyses, and other articles reviewed within the total number of studies reviewed in the evidence tables.

The recent evidence is summarized by topic area below. The goal of the summaries was to capture the recent evidence in a way that would enable readers to assess the state of the literature easily, but without judgment on the strength or importance of individual studies. Short summaries of each primary research article can be found in the *Summary of Published Evidence Related to the Dietary Guidelines for Children, 2004-2008* (Dodd et al. 2008). Summary tables list the article citation, the population studied, the study design, and, if applicable, the type of tracking research in the study (see Appendix E).

**Table III.3: Number of Primary Research Studies Reviewed for the Evidence Base Within Each Topic Area**

Dietary Guideline Topic Area	Evidence Tables				
	Number of Primary Research Studies <sup>a</sup>	Tracking Studies <sup>b</sup>	Systematic Reviews and Meta-Analyses	Controlled Trials	Observational Studies
Number of Unique Studies	104	45	7	12	85
Adequate Nutrients within Calorie Needs	20	10	1	4	15
Weight Management	27	17	2	2	23
Fats	17	5	0	5	12
Food Groups to Encourage					
Fruits and Vegetables	14	4	0	0	14
Whole Grains	2	0	0	0	2
Dairy and Calcium	21	7	1	2	18
Carbohydrates	32	12	3	3	26
Sodium and Potassium	3	0	1	0	2
Tracking	(45) <sup>b</sup>		(4)	(2)	(39)
Total	136	55	8	16	112

<sup>a</sup>Total number of unique primary research studies in the evidence tables is 104, but some articles were analyzed under multiple topic areas.

<sup>b</sup>Tracking studies are also included in the systematic reviews and meta-analyses, controlled trials, and observational studies columns.

### 1. Adequate Nutrients Within Calorie Needs

Twenty studies evaluated aspects of adequate nutrients within calorie needs. Eight of the studies focused on diet and bone health or calcium retention. Of the eight studies, four reported on bone mineral content (BMC) and/or bone mineral density (BMD), one focused on fracture history, and two focused on bone remodeling. One metabolic study provided updated information on calcium retention in young adolescent males. Most of the studies focused on calcium intake. Intakes of the nutrients or foods studied tended to be weakly associated with the outcomes investigated.

Eight studies addressed a variety of dietary factors that might influence BMI in children, such as beverage patterns, diet quality, and breakfast and cereal consumption. Of the seven studies that investigated calcium intake and/or dairy foods intake in relation to BMI, four studies showed no relationship, two showed an inverse relationship, and one showed a positive relationship; the single randomized controlled trial (RCT) showed no difference in BMI by calcium intake. Two longitudinal studies suggest that protein intake by children is associated with BMI, but associations appear weak despite statistical significance.

Only a few studies examined effects of children's dietary patterns and/or nutrient intake on health outcomes other than those related to body weight or bone health. Single

observational studies point to beneficial effects of fruit and of vitamins C and E on a few measures of respiratory health; lower risk of breast cancer with higher intake of vitamin E and vegetable fat; and higher C-reactive protein concentration with lower intake of magnesium. The RCT demonstrated that serum ferritin was maintained on low-fat diets regardless of whether they were rich in lean beef or in lean poultry and fish.

## 2. Weight Management

Different aspects of weight management were addressed in the 27 articles found in the recent literature. Weight management had the largest proportion of tracking articles. Three types of tracking studies were found in the weight management literature: (1) studies that measured whether weight status in childhood tracked to later childhood or adulthood, (2) studies that tracked the health impacts in later childhood or adulthood of being overweight or obese as a child, and (3) studies that tracked dietary behaviors and weight status. All nine of the studies that evaluated the tracking of weight status showed the persistence of overweight/obese status, both within childhood (three studies), and from childhood to adulthood (six studies). In addition, five of the studies found that the prevalence of overweight and obesity within the study populations increased with age.

Eight studies examined dietary correlates of weight status. Higher current weight (BMI) or overweight was associated with greater fast food consumption, higher protein intake, and less vigorous physical activity. Although two studies found a positive association between body fat or overweight and time watching TV or using the computer, one study found no association. A healthy weight (or less overweight) was associated with cereal consumption, consumption of fruits, vegetables, and milk, and eating breakfast. There were mixed results for associations between energy intake and BMI or overweight. One longitudinal study found that overweight adolescents were more likely to reduce total energy intake and snack food intake (presumably to lose weight) and one study found that energy intake and meal patterns were positively associated with BMI.

A subset of the weight management articles evaluated the association between overweight and obesity in childhood and subsequent health impacts. Nine studies found substantive long-term negative health impacts of overweight and obesity, including three studies with follow-ups later in childhood or adolescence, three studies with follow-ups into adulthood, and one study with follow-ups in both later childhood and adulthood. Two studies found elevated risk factors (such as blood pressure, dehydroepiandrosterone (DHEA), and lipids) in overweight children.

Three studies looked at weight management interventions on weight status. Overall, the studies reviewed found weight management interventions for children to have only modest and inconsistent success rates. The review study found that the primary factor distinguishing successful interventions was inclusion of a compulsory physical activity component. The RCT that compared diet-alone to diet-plus-exercise found that in the longer term, only those who continued participation in an exercise program were able to maintain improvements.

### **3. Fats**

Of the 17 studies on dietary fat, five focused on serum cholesterol and fatty acids, three focused on weight (BMI and percentage body fat gain), two focused on asthma, two focused on cancer, two focused on insulin sensitivity, and single articles focused respectively on Crohn's disease, arterial stiffness, and exercise-induced growth hormone. Mixed results were reported for the relationship between a low saturated fat/low cholesterol diet and lowered serum cholesterol; one 14-year study and one seven-year study showed a beneficial effect for boys only, but another 3-month study showed none. One study showed partial tracking with age for serum docosahexaenoic acid (DHA):alpha-linolenic acid but not for other fatty acids. Mixed results were reported on relationships between dietary fat intake and BMI and percent body fat gain, with two of three studies showing a positive association. Mixed results were reported on the relationship between asthma and fatty acid intake, such that omega-3 and omega-6 fatty acids were shown to have both detrimental and protective effects on the risk of asthma. Mixed results were reported for the risk of cancer and dietary fat intake, noting that studies used different methodologies and studied different fat sources. Findings were mixed on the relationship between fat intake levels and insulin sensitivity, yet studies were conducted for separate study populations (that is, obese vs. lean, white vs. black ethnicity). Single studies showed detrimental effects of high fat intake on the risk of Crohn's disease, arterial stiffness, and lower increases in exercise-induced growth hormone levels.

### **4. Fruits and Vegetables**

The 14 studies related to fruits and vegetables differed greatly in the variables and outcomes examined. Fruit and/or vegetable intake tended to be weakly associated with a moderately favorable effect or had no effect on risk factors or health outcomes. Four studies reported on fruit and/or vegetable intake and weight; two studies found a positive relationship between higher fruit juice intake and BMI, and one found an inverse relationship between vegetable consumption and BMI.

### **5. Whole Grains**

The two observational studies on whole grain consumption reported beneficial health effects of whole grains. One study found significantly lower serum homocysteine concentrations and higher serum folate concentrations among American adolescents ages 15 to 20 with greater intake of whole grains. The other study reported significantly lower asthma, wheeze, and bronchial hyperresponsiveness among Dutch children ages 8 to 13 with a high intake of whole grains. Serum folate was also positively associated with intake of refined grains.

### **6. Dairy and Calcium**

Of the 21 studies related to dairy and calcium intake, seven focused on outcomes related to bone health, eight focused on weight-related outcomes, two focused on cancer, one related to selected serum values, one focused on hypertension, one focused on type 1 diabetes, and one focused on dental caries. Most of the bone health studies showed a small



benefit to one or more outcomes from a higher intake of milk products and/or calcium, but reported findings were mixed. Six studies investigated intake of milk in relation to BMI (five studies) or fat mass (one study); three showed an inverse relationship, two showed no effect, and one showed a positive relationship. Three other studies focused on calcium intake; two found no effect of calcium intake on BMI and one found an inverse relationship with skinfold thickness. The two cancer studies found increased risk with higher intakes of milk products. Single studies showed that milk product intake was associated with a benefit for blood pressure and serum homocysteine value and reduced risk of type 1 diabetes and dental caries.

## **7. Carbohydrates**

The majority of studies related to carbohydrates (29 of 32 studies) examined added sugars and sugar-sweetened beverages in the diet. Of the 29 studies, most included one or more biologic or health measures, and some also reported on beverage intakes as behavioral outcomes. The evidence included one qualitative review and one meta-analysis of studies on the association between sugar-sweetened beverages or soft drinks and weight status, and one systematic review on sugar intake and caries and other oral health outcomes. Nineteen studies reported on weight or weight status (BMI, BMI z-score), six reported on oral health (dental caries), two reported on insulin sensitivity and glucose metabolism, one reported on serum lipids, and one reported on bone fractures. The body of evidence from cross-sectional and longitudinal studies indicates that sugar-sweetened beverages and items with added sugar (such as candy) are associated with increased BMI and increased caries among children and adolescents. One study found tracking of sugar-sweetened carbonated soft drink intake from adolescence to early adulthood. Findings from two studies of Latino children at high risk of diabetes (based on being overweight or having a family history of diabetes) found that total sugar intake was associated with a lower acute insulin response and decreased beta cell function. However, these studies also found that total sugar intake or total carbohydrate intake was not significantly associated with insulin sensitivity or insulin dynamics. In one cross-sectional study, overweight children were reported to have higher percent of added fructose from sweetened beverages and sweets than non-overweight children.

In three studies, researchers reported on the association between total carbohydrate intake and health outcomes among children and adolescents, all among very small sample sizes. Total carbohydrate intake was a negative predictor of BMI in a longitudinal study of young children and was negatively related to high density lipoprotein (HDL) level in a cross-sectional sample. Obese adolescents on a low-carbohydrate/high-fat diet showed increased gluconeogenesis, which may lead to hyperglycemia observed in type 2 diabetes.

## **8. Sodium and Potassium**

Only three studies in the recent literature evaluated sodium intake among children. One meta-analysis study of 13 controlled trials (12 randomized) from the 1980s and one cross-sectional study from 1997 demonstrated that modest decreases in salt intake reduced blood pressure and pulse pressure in children and adolescents. One randomized study showed

greater sodium retention in black adolescent females than white adolescent females. No studies in the recent literature examined potassium intake among children.

## **9. Tracking**

Of the 44 tracking studies, more than half (25) were related to weight status and dietary patterns. Numerous studies found tracking of BMI and other adiposity indices through childhood to adolescence and into adulthood. Studies found both high persistence of overweight through childhood and into adulthood as well as an increasing prevalence of overweight. In other words, overweight children are more likely to be overweight adults. However, non-overweight children may become overweight as they age as well. Certain studies assessed the impact of a childhood dietary pattern on adiposity measures within a few years. Increases in weight (BMI) were associated with an increase in soda consumption and high animal protein intake but not fruit or calcium intake. A review study as well as a cohort study found associations with sugar-sweetened beverages and overweight. However, another study that found that milk consumption predicted lower fat mass did not find an association with sugar-sweetened beverages. From adolescence to adulthood, consumption of fast-food increased and breakfast decreased. Breakfast and cereal consumption were associated with a lower BMI.

Twenty of the tracking studies focused on health outcomes other than weight. Many of the studies focused on the impact of a dietary pattern in childhood on a risk factor in childhood. Studies found that lower consumption of dairy products and fruits and vegetables was associated with larger increases in blood pressure per year in children. A diet that was low in saturated fat and cholesterol was associated with lower total and low density lipoprotein (LDL) cholesterol values. Drinking high amounts of fruit juice and drinking soda were associated with tooth erosion, although eating fruits other than apples and citrus lowered the risk. Sugar consumption and low dairy consumption were associated with dental caries as well. There were many positive associations with diet and bone health including energy; protein, calcium, magnesium, and zinc intake; and dairy product consumption. Some studies focused on the association between a diet in childhood and health issues in adulthood. A diet high in vegetable fat and vitamin E was negatively associated with breast cancer, but a higher consumption of dairy foods in childhood was associated with increased odds of colorectal cancer. A higher BMI in childhood was associated with an increased risk of a coronary heart disease event and was one of the risk factors associated with carotid intima-media thickness (IMT). High body weight in middle childhood was associated with asthma. Waist circumference predicted metabolic syndrome in adolescence. Adult metabolic syndrome was predicted by pediatric metabolic syndrome.

## **D. FOCUS OF THE RECENTLY PUBLISHED EVIDENCE**

For this analysis, the recent evidence was catalogued by topic area, following the approach used in the previous dietary guidelines. The articles could have been organized by the type of health outcome or dietary behavior evaluated as well. Table III.4 shows the distribution of primary research articles by outcome evaluated as well as topic area.

**Table III.4: Distribution of Articles Across Health Outcomes and Dietary Behaviors by Topic Area**

	Adequate Nutrients	Weight Manage- ment	Fat	Fruits and Vegetables	Whole Grains	Dairy and Calcium	Carbo- hydrates	Sodium and Potassium	Total*	Number of Tracking Studies
<b>Health Outcomes</b>										
Bone health	8	0	0	3	0	7	1	0	19	6
Cancer <sup>a</sup>	2	0	2	0	0	2	0	0	6	2
Cardiovascular health/risk factors <sup>b</sup>	2	6	6	1	0	1	2	3	21	6
Crohn's disease	0	0	1	1	0	0	0	0	2	0
Diabetes <sup>c</sup>	0	0	2	0	0	1	3	0	6	0
Growth/development <sup>d</sup>	0	0	1	0	0	0	0	0	1	0
Metabolic syndrome	0	2	0	0	0	0	0	0	2	2
Oral health	0	0	0	2	0	1	6	0	9	3
Respiratory health	1	1	2	3	1	0	0	0	8	1
Weight status	7	9	3	4	0	8	20	0	51	22
<b>Dietary Behaviors</b>										
Dietary patterns	0	5	0	0	0	0	1	0	6	3
Nutrient intake <sup>e</sup>	1	0	0	0	1	1	0	0	3	0
Energy intake/activity	0	3	0	0	0	0	0	0	3	0
Weight management interventions	0	3	0	0	0	0	0	0	3	0

\*Articles may be counted in more than one topic area.

<sup>a</sup> Includes measure of insulin-like growth factor.

<sup>b</sup> Includes measures of arterial stiffness, blood pressure, c-reactive protein, cholesterol, DHEA, fatty acids and lipids.

<sup>c</sup> Includes measures of insulin-resistance, insulin sensitivity and glucose metabolism.

<sup>d</sup> Measured exercise-induced growth hormone.

<sup>e</sup> Includes serum B vitamins, serum ferritin, serum homocysteine, and zinc.

The majority of research since 2004 has focused on different aspects of diet related to weight status. Weight status included measures of adiposity such as body mass index, body weight, being classified as overweight or obese, lean mass, and skinfolds. “Carbohydrates” was the topic area that contributed the largest number of articles to the weight management literature. Most of these articles focused on the association between sugar-sweetened beverages and items with added sugars and weight status. Articles examining the impact of sugar-sweetened beverages and items with added sugars comprised the majority of the research related to oral health outcomes as well.

Two other categories, bone health and cardiovascular health, had a large number of articles published since 2004. One reason for the larger number of articles related to bone health is that many of the articles that focused on associations with bone health evaluated multiple dietary aspects at the same time, resulting in articles that were included in both the “Adequate Nutrients” and the “Dairy and Calcium” categories. The large number of articles in the “Cardiovascular health/risk factors” category is due in part to the many factors that comprise cardiovascular health, such as blood pressure, cholesterol, and cardiovascular disease.

Weight status had substantially more tracking articles than any other health outcome, which may be due to the fact that obesity is a health outcome with high prevalence in childhood in the U.S. Therefore, in addition to evaluating dietary factors that are associated with weight status, there is also a focus on evaluating whether weight status persists into adulthood.

## CHAPTER IV

### SCIENCE BASE FOR DIETARY GUIDANCE FOR CHILDREN

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In reviewing the contemporary dietary guidance for children, and assessing whether there is sufficient new evidence to consider making changes to existing recommendations, it is important to consider the breadth and depth of the science base as well as significant changes in the population of interest. We had three primary analytical goals as we reviewed the science base for child-focused dietary guidance: (1) to quantify and describe the science base available to make contemporary dietary and nutrition recommendations for children, including emerging research topics, (2) to describe the extent to which contemporary recommendations are based on research on children or are based on research on adults and applied to children; and (3) to identify data gaps, as well as the *Dietary Guidelines* or focus areas most in need of additional research (this third goal is covered in Chapter V).

This chapter describes the science base underlying child-focused dietary guidance by synthesizing information in the historical review of the 2000 and 2005 *Dietary Guidelines* and other contemporary guidance statements (described in Chapter II), and the relevant research on children published between 2004 and 2008 (summarized in Chapter III). We first describe past approaches to analyzing the science base, and then summarize our review of the evolving science base by dietary guideline, followed by a review of the science base by health outcome.

#### A. PAST APPROACHES TO ANALYZING THE SCIENCE BASE

We reviewed the process and methods used by HHS and USDA and other organizations to establish dietary guidance (see Chapter II for details). In most cases, a committee or panel of nationally recognized experts had been charged with reviewing current scientific knowledge and recommending revisions, if warranted. For example, each DGAC has reviewed new and emerging research and has drawn on the seminal reports about diet and health available at the time. The guidance in the 1990-2000 period drew heavily on the 1988 Surgeon General's report (HHS 1988) and the National Research Council's (NRC) *Diet and Health* report (NRC 1989).

Since 2000, the work of the 2005 DGAC and other expert committees was greatly influenced by the Dietary Reference Intake (DRI) reports (Office of Disease Prevention and

Health Promotion 2007; DGAC 2004), in particular, the reports on macronutrients (IOM 2002/2005) and fluid and electrolytes (IOM 2004). Other important scientific resources cited in developing guidance statements include NIH consensus statements and clinical guidelines (McMurry 2003) and the 2005 IOM report *Preventing Childhood Obesity*. Scientific judgment was applied to the interpretation of findings from multiple sources.

In some cases, adult-based research was cited in support of recommendations for children. In many cases, lack of documentation limited our ability to determine the basis for applying research on adults to children. It is reasonable to deduce that, in the absence of relevant research on children, recommendations for children relied on research primarily conducted with adults if there also was lack of evidence that complying with the recommendation would cause harm. Future revisions to *Dietary Guidelines for Americans* will draw on the previous literature and consider new and emerging evidence -- both contribute to the evolving science base.

## **B. REVIEW AND SUMMARY OF THE SCIENCE BASE**

A review of the types and number of research studies cited in support of the federal government's and other authoritative organizations' contemporary guidance statements for children suggests that the research has evolved in a number of important ways related both to advancements in nutrition science (e.g., DRIs) and to emerging health issues in the population (e.g., increasing prevalence of childhood obesity). Clear messages from the 2005 DGAC were that (1) the *Dietary Guidelines for Americans* are primarily adult-based, and (2) there is an overarching need to investigate the impact on children's short- and long-term health of following the *Dietary Guidelines*.

Below, we briefly summarize our findings on topics addressed by one or more guidance statements and by the *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2005* (i.e., the historical evidence) and the 2004-2008 evidence published since the 2005 *Dietary Guidelines* (DGAC 2004; HHS and USDA 2005). The comparisons have limitations because the organizations that published guidance statements focused on health conditions, but the advisory committee focused on diet.

### **1. Review of the Science Base by Health Outcome**

**General Health of Children.** The 2005 DGAC provided more child-related references for the topic "relationships between milk product intake and health" than for any other dietary topic. Nonetheless, evidence that milk products support bone health was largely indirect (related to the nutrients provided by milk products) or observational, and evidence related to body weight was insufficient for drawing conclusions. Although the ADA (2004a, 2008) provided guidance for the general health of children, most of the cited evidence addressed obesity (ADA 2004a, 2008). Both the 2005 DGAC and the ADA relied heavily on prevalence data on nutrient intake and evidence of nutrient adequacy and satisfactory growth and development. Both called for more research.

In the 2004-2008 child-focused evidence, most primary research studies were on the “relationships between milk and dairy product intake and health” (bone health<sup>1</sup>, weight) and on “added sugars or sugar-sweetened beverages and health” (weight, dental caries). Research addressed dietary behaviors (food-based and/or nutrient-based) and a variety of health outcomes including respiratory health. The background citations include a number of studies with population-based prevalence data on nutrient intake and nutrient adequacy.

**Obesity Prevention.** The AAP and the IOM commented on the lack of research that addresses obesity prevention. The IOM in particular noted the need for sound research that addresses links between soft drink consumption and obesity, and between portion size and obesity. Similarly, despite reviewing a sizable number of studies relating the consumption of added sugars to the health (and weight) of children, the 2005 DGAC acknowledged that more data were needed to examine the effect of added sugars intake on weight gain. Both the IOM and the advisory committee noted the need for studies that link diet and obesity to health outcomes.

Recent scientific reviews by the American Dietetic Association (ADA 2004a) and the Centers for Disease Control and Prevention (2006) of the evidence relating consumption of sweetened beverages to risk of overweight in children and adolescents found that the larger and more rigorous (e.g., prospective design) studies tended to substantiate the connection between intake of sweetened beverages and overweight among children, whereas the evidence from cross-sectional studies was inconsistent and limited by differences in dietary intake methodology, sample size, and ages of children.

Under its Evidence Analysis Library, the ADA also conducted an analysis of the evidence on the relationship between consumption of fruits and vegetables and body weight and found a modest effect of intake on protecting against increased adiposity in children (ADA 2004b). Of the 18 studies that met ADA’s established criteria for evidence, the evidence was stronger for studies with larger sample sizes (thousands to tens of thousands) and for fruits alone or for fruits and vegetables combined than for vegetables alone. No association was found between consumption of 100% fruit juice and childhood overweight, although a few studies found a connection with very large amounts of total juice or apple juice.

The Evidence Analysis Library is also a resource for evidence on the relationship between children’s dietary practices and obesity. Summaries are available on eating frequency (meals and snacks) and eating breakfast in particular (ADA 2004c, 2004d). There is limited information on eating frequency and adiposity among children. Studies of breakfast and adiposity have found varying results across age and gender subgroups. Skipping breakfast may be a risk factor for increased adiposity among older children or adolescents and appears to be more important for girls than for boys. The 2004-2008 background citations include

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<sup>1</sup>An NIH-sponsored systematic review on vitamin D and bone health across the lifecycle found that there was fair evidence for an association of circulating vitamin D levels and changes in bone mineral density among adolescents and also noted the lack of data for children (University of Ottawa 2007).

prevalence data on dietary practices such as eating or skipping breakfast, portion sizes, and eating-away-from-home and trends in obesity (see Appendix C).

The American Institute for Cancer Research's (AICR's) report *Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective* reviews the scientific evidence regarding food, nutrition, physical activity and body composition and the risk of cancer throughout the life course, and makes specific dietary and lifestyle recommendations to prevent cancer. The review of scientific evidence and dietary and lifestyle recommendations include examination of food, nutrition and physical activity as factors that modify the risk of weight gain, overweight and obesity, which themselves influence cancer risk.<sup>2</sup> They conclude that there is probable evidence that energy-dense foods, sugary drinks, "fast foods", and TV watching increase the risk of weight gain and obesity (AICR 2007).

The 2004-2008 evidence review includes a considerable number of studies on children's diet and obesity - focusing primarily on beverage consumption (soft drinks, sugar-sweetened beverages, fruit juice, and milk), but also on fast foods, fruits and vegetables, breakfast cereals, and eating breakfast. A meta-analysis of 88 studies of the effects of soft drinks concluded that consumption was linked to increased calorie intake and weight in children. Eight studies examined dietary correlates of weight status. Higher current weight (BMI) or overweight was associated with greater fast food consumption, higher protein intake, and less vigorous physical activity.<sup>3</sup> Although two studies found a positive association between body fat or overweight and time watching TV or using the computer, one study found no association. A healthy weight (or less overweight) was associated with cereal consumption, consumption of fruits, vegetables, and milk, and eating breakfast. There were mixed results for associations between energy intake and BMI or overweight. One longitudinal study found that overweight adolescents' were more likely to reduce total energy intake and snack food intake (presumably to lose weight) and one study found that energy intake and meal patterns were positively associated with BMI. More than half of the tracking studies addressed the relationship between dietary patterns and overweight.

**Cancer Prevention.** Neither the ACS nor the DGAC provided solid child-based evidence for recommendations targeted toward cancer prevention. The advisory committee provided very few child-based references related to the consumption of fruits and/or vegetables or whole grains, and the fiber references all focused on constipation.

By and large the science base for dietary guidance for cancer prevention is not specific to cancer among children but rather general nutrition in support of meeting nutrient requirements. The 2004-2008 research included six studies on diet in childhood and the

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<sup>2</sup> The AICR guidance statement and report were not included as one of the contemporary guidance statements covered in this report because the AICR guidance statement was released in November, 2007, after the current project was underway.

<sup>3</sup> For additional information on the evidence on the association of children's physical activity to weight and obesity, readers are referred to the evidence review by the Physical Activity Guidelines Advisory Committee (2007) and IOM's report *Preventing Childhood Obesity* (2005).



occurrence of cancer later in life. Individual studies included: vitamin E and vegetable fat consumption and breast cancer, dietary fat and breast and testicular cancer, B vitamins and cancer, and two studies on milk consumption and cancer.

**Cardiovascular Health.** Many of the adult-based studies on cardiovascular disease conducted in the 1970s and 1980s (e.g., the Multiple Risk Factor Intervention Trial) focused on the relationship between diet (especially intake of fat, cholesterol, and sodium) and cardiovascular risk factors such as elevated levels of serum cholesterol and blood pressure. A strong adult-focused science base for cardiovascular health and studies on children at high-risk of cardiovascular disease (e.g., Bogalusa, Framingham), provided a foundation for child-focused dietary recommendations to promote cardiovascular health among children. For example, the Dietary Approaches to Stop Hypertension (DASH) study findings were pivotal to developing specific recommendations for the 2005 *Dietary Guidelines* (DGAC 2004).

Seven guidance statements (AAP 1998; AHA 2002, 2003, 2005, 2006; NCEP 1992; NHLBI 2004) addressed cardiovascular health and risk factor prevention, and the DGAC addressed these topics in its coverage of fats, healthy weight, and sodium. The AAP, AHA, NHLBI, and DGAC all pointed to the lack of research on children, especially studies that track childhood cardiovascular risk factors and adult cardiovascular risk. Because of a lack of evidence, the 2005 DGAC drew no conclusions specific to children regarding recommended intake of monounsaturated fat, saturated fat, trans-fat, cholesterol, n-6 polyunsaturated fatty acids, or n-3 polyunsaturated fatty acids (but this is not clearly stated in “Part E: Translating the Science into Dietary Guidance”).

The 2004-2008 evidence review found mixed results on the relationship between a) a low saturated fat/low cholesterol diet and lowered serum cholesterol, and b) dietary fat intake and BMI and percent body fat gain. A diet that was low in saturated fat and cholesterol was associated with lower total and LDL cholesterol values. One study showed partial tracking with age for serum DHA:alpha-linolenic acid but not for other fatty acids.

There were three studies in the recent literature that evaluated sodium intake and blood pressure among children. A meta-analysis demonstrated that modest decreases in salt intake reduced blood pressure and pulse pressure in children and adolescents, and one randomized study showed greater sodium retention in black adolescent females than white adolescent females. Tracking studies found that lower consumption of dairy products and fruits and vegetables was associated with larger increases in blood pressure per year in children.

**Other topics covered in the 2004-2008 evidence.** In addition to the health outcomes listed above (and oral health and bone health), single or multiple research studies addressed the relationship of diet and one or more of the following health outcomes: diabetes, asthma, metabolic syndrome, and Crohn’s disease.

**Research on high-risk children.** Many of the cardiovascular research studies conducted with high-risk children occurred prior to the 1992 NCEP report. Since this report was released, fewer than 15 research studies on high-risk children were cited in the contemporary guidance statements. In the 2004-2008 literature 13 studies included high-risk children or adolescents (i.e., 6 studies of overweight or obese children; 2 studies of children

with and without metabolic syndrome; 2 studies of children with type 1 diabetes; and individual studies of children with cancer, Crohn's disease, and hypercholesterolemia.

## **2. Review of the Science Base by Dietary Topic**

Table IV.1 shows the documented evidence available to support the dietary recommendations for children. Our analysis was based primarily on our review of the DGAC reports for the 2000 and 2005 *DGAs* and our review of the 2004-2008 research that met the study criteria. The strength of the evidence is based on the number and type of studies and their designs (experimental and non-experimental). Our intent was to document and synthesize the evidence in a systematic manner so that the 2010 DGAC could use it along with a rating or ranking system, if they decide to use such an approach.<sup>4,5</sup>

### **C. LIMITATIONS OF THE SYNTHESIS OF THE EVIDENCE**

Our review of the evidence is limited to the information contained in published articles and the quality and characteristics of the research itself. We recorded the data collection and statistical methods used in each research study, including the method(s) used to measure dietary intake, to provide information to be used by future *DGA* committees in their expert review and decision-making about specific recommendations for children. In general, the greatest limitation is the paucity of information across several of the dietary guidance topics of interest. In particular, even if a study addressed dietary intake, the measure tested was typically not the recommended *DGA* amount. Instead, the study authors usually reported the association between the highest and lowest quantile of intake of either a type of food or a nutrient and a health outcome.

For many dietary guideline topics or focus areas, only a few studies addressed the same dietary measure and the same health outcome, so the evidence depends on the relative merits and quality of those few studies. Individual studies with children, especially those with clinical measures, were often limited by small sample sizes (limiting the power to detect associations), or pertained only to a high-risk group (e.g., children with asthma or diabetes) whereby findings may not be relevant to the general child population. Further, longer-term follow-up data were not available for many topics. In some areas, a lack of a valid biomarker for nutrient intake makes it difficult to draw conclusions based on self-reported dietary data.

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<sup>4</sup> As an example, Woolf (2006) reviewed various systems of rating evidence, including the recommendations of the U.S. Preventive Services Task Force, and the approaches that can be used to rate evidence and translate or describe how the evidence was used in providing population-based guidelines.

<sup>5</sup> Australia and New Zealand have adopted evidence-based reviews in their periodic updates of national dietary guidelines; they developed and applied levels of evidence for assessing food-based nutrition trials, ranging from the highest level of systematic reviews of all RCTs to observational studies of implemented levels (Baghurst 2003).

**Table IV.1: Synthesis of the Evidence (or Science Base) Supporting Specific Recommendations for Children and Adolescents in the 2005 Dietary Guidelines for Americans (DGA) by Focus Area**

Focus Area	2005 DGA Recommendations for Children and Adolescents <sup>a</sup>	What is the level of child-focused evidence for recommending that children should follow the recommendation to.....? <sup>b</sup>	Comments
Adequate Nutrients Within Calorie Needs	Consume a variety of nutrient-dense foods and beverages within and among the basic food groups (while choosing foods that limit the intake of saturated fat and trans fats, cholesterol, added sugars, salt, and alcohol)	4 studies on nutrient status (none on health outcomes) and 10 studies on nutrient density (2005 DGA) Most recent evidence relates to the negative impact of consuming 'added sugars' or sugar-sweetened beverages. Some evidence (2 studies) showing a positive association between dietary fat intake and BMI/body fat. Little evidence on impact of low saturated fat/low cholesterol diet on health outcomes; two longer-term studies only showed effects for boys.	No studies focused on eating a variety of foods and its impact on health, although one study reported on dietary quality (assessed using the Healthy Eating Index and BMI). Most studies focused on certain food items or food groups, rather than variety or dietary patterns within calorie levels. Some studies may not have the sample size needed to detect gender differences.
	Meet recommended intakes within energy needs by adopting a balanced eating pattern	No studies on 'balanced eating pattern' although evidence that eating breakfast is negatively associated with BMI.	
Weight Management	To maintain body weight in a healthy range, balance calories from foods and beverages with calories expended.	6 studies cited in 2005 DGA and 8 recent studies on dietary correlates of weight status and 3 recent studies on weight management interventions. One review study and RCT show the importance of inclusion of a physical activity component to reduce adiposity.	Weight maintenance research studies may be undercounted from all weight articles published in 2004-2008 since the review did not include studies that looked at weight and physical activity <i>unless</i> they <i>also</i> included diet.
	<i>Overweight children:</i> Reduce the rate of body weight gain while allowing growth and development. Consult a healthcare provider before placing a child on a weight-reduction diet.	One review study and RCT show the importance of inclusion of a physical activity component to reduce adiposity. Few studies reported on the rate of weight gain. Most evidence reported is based on supervised weight intervention studies.	Strong evidence documenting the negative health outcomes of being overweight and tracking of weight status into later childhood and adulthood.

Focus Area	2005 <i>DGA</i> Recommendations for Children and Adolescents <sup>a</sup>	What is the level of child-focused evidence for recommending that children should follow the recommendation to.....? <sup>b</sup>	Comments
Food Groups to Encourage: Fruits and Vegetables	<p>Consume a sufficient amount of fruits and vegetables (F/V) while staying within energy needs: Two cups of fruits and 2½ cups of vegetables per day are recommended per 2,000 calories.</p> <p>Choose a variety of fruits and vegetables each day. Select from all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.</p>	<p>15 studies overall (including one study on BMI in 2005 <i>DGA</i>) covering a range of dietary variables and outcomes with a favorable, but weak, association with health outcome or no effect on health outcome.</p> <p>1 case control study found that F/V reduced risk of Crohn's disease. F/V intake was either weakly associated with a moderately favorable effect or had no effect on health outcomes.</p> <p>1 study found an inverse relationship with vegetable consumption and BMI.</p> <p>No evidence of association of fruit intake and BMI, but two studies found a positive association with fruit juice intake and BMI.</p> <p>No study reported specifically on the health outcomes of complying with the recommendation for F/V consumption or consuming a variety of F/V.</p>	<p>Dietary methods included diet history, self-administered food frequency questionnaire (FFQs), 24-hr recall, 3-day food records.</p> <p>Most dietary studies used FFQs completed by children or their parents; some studies used more than one method to assess diet.</p> <p>Diet variables reported include: types of fruits and vegetables, fruit juice, and amounts as servings, frequency of intake, or quantile of intake.</p> <p>It is unclear whether many studies distinguished prepared vs. fresh F/V (e.g., fried potatoes).</p> <p>Studies did not address the impact of consuming specific amounts of fruits and vegetables (e.g., two cups of fruit vs. 1-1/2 cups). Instead, findings are reported for consuming more or less fruits and vegetables.</p>
Food Groups to Encourage: Whole grains	Consume 3 or more ounce-equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products.	<p>9 studies on fiber and constipation (2005 <i>DGA</i>)</p> <p>2 observational studies on beneficial effects of consumption of whole grains and a) serum homocysteine, folate, and B vitamins, and b) asthma.</p>	

Focus Area	2005 <i>DGA</i> Recommendations for Children and Adolescents <sup>a</sup>	What is the level of child-focused evidence for recommending that children should follow the recommendation to.....? <sup>b</sup>	Comments
Food Groups to Encourage: Dairy and Calcium	<i>Children 2 to 8 years:</i> Consume 2 cups per day of fat-free or low-fat milk or equivalent milk products. <i>Children 9 years and older:</i> Consume 3 cups per day of fat-free or low-fat milk or equivalent milk products.	48 studies overall, including one systematic review and most observational studies showing a positive relationship between calcium intake and bone health. 6 of 7 studies showed an inverse relationship between milk and dairy food consumption and BMI, but 1 large longitudinal study on consumption of 3 or more cups of milk daily showed a positive relationship with BMI (even for fat-free and low-fat milks).	Dietary methods included diet history, FFQs, 24-hr recall, and 3-day food records. Dietary variables reported include: types of milk by fat content, types of dairy products, and flavored milks. Some studies reported on dairy calcium (i.e., mg of calcium from dairy products) versus amounts of milk or other dairy products.
Fats	Consume less than 10 percent of calories from saturated fat and less than 300 mg/day of cholesterol, and keep trans fat consumption as low as possible.  Keep total fat intake between 30 to 35 percent of calories for children 2 to 3 years of age and between 25 to 35 percent of calories for children and adolescents 4 to 18 years of age.  When selecting and preparing meat, poultry, dry beans, and milk or milk products, make choices that are lean, low-fat, or fat-free.	2 studies on fats and growth and 3 RCTs on hypercholesterolemic children (2000 <i>DGA</i> ) 3 studies with no health outcomes ( <i>DGA</i> 2005) 22 studies with mixed results across health topics (asthma, cancer). 1 study found an inverse relationship between omega-3 fatty acid intake and risk of Crohn's disease. 1 study found that a low saturated fat diet reduced serum lipids. 1 observational study found that fat intakes above the Acceptable Macronutrient Distribution Ranges (AMDR) was associated with lower insulin sensitivity and higher insulin response to glucose among black children, but no relationship was found for white children.  1 RCT on low saturated fat diet (3-month intervention study) and lean beef or lean poultry and fish showed no effect on children's serum lipids.	Dietary methods included 24-hr recalls, weighed diet records, 7-day diaries, and FFQs. Fat intakes were reported as absolute amounts, as a percentage of total calories, and as fat or fatty acid ratios.

Focus Area	2005 <i>DGA</i> Recommendations for Children and Adolescents <sup>a</sup>	What is the level of child-focused evidence for recommending that children should follow the recommendation to.....? <sup>b</sup>	Comments
	Limit intake of fats and oils high in saturated fat or trans fat, and choose products low in such fats and oils. Most fats should come from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.	1 observational study found that children's fish consumption was associated with reduced asthma.	
Carbohydrates	Choose fiber-rich fruits, vegetables, and whole grains often.	1 case-control study found that F/V and fiber intake had a protective effect for Crohn's disease. <i>See also whole grains above.</i>	Some studies reported fresh F/V, but few reported on fiber from F/V.
	Choose and prepare foods and beverages with little added sugars or caloric sweeteners.	~50 studies (including 3 cited in the 2000 <i>DGA</i> and 22 in the 2005 <i>DGA</i> , and 2 reviews, 1 meta analysis, and 2 RCTs on the health effects of 'added sugars' on BMI, weight, and dental health.	
	Reduce the incidence of dental caries by practicing good oral hygiene and consuming sugar- and starch-containing foods and beverages less frequently.	Strong evidence from systematic review and RCT showing that consumption of 'added sugars' or sweetened beverages is associated with increased dental caries. 1 observational study found higher intake of fructose from sweetened beverages than from F/V among overweight children.	Studies reported on sugars or total carbohydrate, but not starch-containing foods.
Sodium and Potassium	Consume less than 2,300 mg of sodium per day.	1 meta analysis (including 12 RCTs) and 1 observational study found that modest decreases in salt intake reduced blood pressure.	Children's salt intake over the 40-year period of the meta analysis (1966-2006) may have changed.
	Choose and prepare foods with little salt. At the same time, consume potassium-rich foods, such as fruits and vegetables.	No studies specifically focused on potassium intake and health outcomes.	Unclear whether any studies tested health effects of 2,300 mg or higher daily sodium intake on blood pressure.

<sup>a</sup> See Appendix A for details about key recommendations that apply to the general population age 2 years and older and those specific to children and adolescents age 2-18 years.

<sup>b</sup> Includes research studies on children cited in the 2000 and 2005 *DGA* Committee reports and the 2004-2008 literature (Appendix E).

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## D. SUMMARY

Approximately 100 child-focused research studies on diet and health outcomes<sup>6</sup> were cited by the 2000 or 2005 DGACs in support of recommendations for children. Of these, most applied to the topic areas ‘dairy foods and calcium’ and ‘added sugars’. Since the 2005 *Dietary Guidelines* the science base has grown in the areas of ‘added sugars and weight’, ‘dairy foods and calcium and bone health and weight’, and to some extent for ‘diet and weight’ and ‘sodium and blood pressure’. However, evidence is lacking in several areas, especially the health effects of whole grains, potassium, and specific fats. Further, little research exists on how following the *Dietary Guidelines* affects the short- or long-term health of children.

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<sup>6</sup> This number was determined by counting research articles cited in the 2000 and 2005 *DGA* that focused on children’s dietary intake and health outcomes, excluding weight management studies that focused only on physical activity. This number provides a reasonable comparison to the 104 primary research articles in the 2004-2008 literature.

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## CHAPTER V

### KNOWLEDGE GAPS AND IMPLICATIONS FOR DEVELOPING DIETARY GUIDANCE FOR CHILDREN

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In developing dietary guidance for children, a key focus has been on meeting the unique energy and nutrient needs of children and on promoting their long-term health and development (DGAC 2004). The overarching recommendation by the advisory committee for the 2005 *Dietary Guidelines for Americans (DGA)* was to investigate how following adult-based dietary guidelines in childhood affects nutrient status and metabolic effects and health in children and later in life. This chapter covers knowledge gaps for the development of dietary guidance for children. It considers gaps previously identified by expert groups, our review of the documentation for the 2000 and 2005 *DGA*, and the 2004-2008 literature summarized in Chapter III. The chapter concludes with implications for developing dietary guidance for children.

#### A. KNOWLEDGE GAPS IN CHILD-FOCUSED DIETARY RECOMMENDATIONS

Research used to develop the *Dietary Guidelines* includes basic science such as that used to develop the Dietary Reference Intakes (DRIs), population-based research, and applied science on relationships between diet and other behaviors and health. This section summarizes the knowledge gaps for developing dietary guidance for children that have been identified by expert groups and that emerged from our review of documentation for the 2000 and 2005 *Dietary Guidelines for Americans* and the 2004-2008 research literature.

##### 1. Research Gaps Previously Identified by Expert Groups

Specific child-focused research gaps identified (or implied) by the 2000 and/or 2005 *DGA* committees include: the roles of added sugars and sugar-sweetened beverages, portion size, and energy density in determining weight status (along with physical activity behavior); the long-term health effects of sodium; implications of the consumption of bottled water on fluoride intake and on dental health; the effects of increased intake of potassium or potassium-containing foods on bone mineral density (BMD); and barriers to complying with the *DGA*.

Research gaps identified by other authoritative organizations include the lack of information on: effects of children's dietary patterns, parental behaviors, or the timing of snacks and portion sizes on energy balance and/or short- and long-term weight status (ADA 2004a; IOM 2005); the relationships of the intakes of dairy foods and calcium with bone density in children (ADA 2004a); and relationships of children's dietary intake with hypertension, specifically with regard to the intakes of fruits, vegetables, non-fat dairy, sodium, potassium, magnesium, calcium, folic acid, fiber, and fat (NHLBI 2004). Some organizations focused on gaps specific to their disease prevention goals, for example, the relationship of the distribution of body fat to the development of specific cancers (ACS 2006), or the relationship of triglyceride levels and insulin resistance syndrome in childhood to cardiovascular disease in adulthood (AHA/AHOY 2002).

Some dietary recommendations for children may have been based on the results of careful scientific review (e.g., the DRIs) but were hampered by the limited data on the nutrient requirements for growth and development and for health promotion and disease prevention (Devaney et al. 2007). In particular, a 2007 IOM-sponsored review of the DRIs identified 28 major knowledge gaps for infants, children and adolescents (Suitor and Meyers 2007). For children, the scientific evidence base that underlies dietary recommendations comes largely from studies done with adults.

## **2. Current Knowledge Gaps in the Science Base for Children**

To identify the current knowledge gaps in the science base for children, we considered the gaps identified above, documentation found in the 2000 and 2005 *Dietary Guidelines*, and findings from our 2004-2008 literature search. For most *Dietary Guidelines* focus areas, there were few research studies on any one topic. In some cases there were several studies on a topic or set of related topics. However, findings were inconsistent across health outcomes, or the results for the same outcome were inconsistent, however, suggesting that there was insufficient evidence to consider a gap filled.

A statement made by the 2005 *DGA* advisory committee is still true in 2008: research on the effectiveness of using adult-based dietary for children is limited. Highlighting the strengths of the data can illuminate the extent of knowledge gaps. Notably, of the 104 research articles that we examined since the advisory committee's statement was made, those that contributed most to the science base<sup>1</sup> are the following (*Dietary Guidelines* focus area(s) is shown in parenthesis):

- one systematic review including 13 randomized controlled trials (RCTs) (Lanou et al. 2005) and one other RCT on calcium, dairy food consumption, and bone health (Cheng et al. 2005) (adequate nutrients within calorie needs; dairy and calcium)

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<sup>1</sup> Studies that were systematic reviews, meta analysis, or RCTs were considered to have the strongest design.

- one systematic review of RCTs to prevent childhood obesity (Connelly et al. 2007) and one meta-analysis on weight and asthma among children (Flaherman and Rutherford 2006) (weight management)
- two systematic reviews of the consumption of sugar-sweetened beverages on weight (Malik et al. 2006; Vartanian et al. 2007); and one systematic review of their consumption on dental health including eight case control studies (Harris et al. 2004) (carbohydrates; weight management)
- one meta-analysis on salt intake and blood pressure (He and MacGregor 2006) (sodium)
- 45 studies that provided some type of tracking data; nearly half on dietary patterns and weight (weight management)

Below we summarize the current knowledge gaps by dietary guideline focus area.

#### **a. Adequate Nutrients within Calorie Needs**

Dietary guidance for this focus area relies on knowledge about key nutrients for children's health and the nutrition research used in establishing the DRIs. In many cases, gaps exist because the studies needed to set standards for children and adolescents did not exist (Suitor and Meyers 2007). The lack of appropriate source data for dietary recommendations for children and adolescents is an important problem.<sup>2</sup> In the case of the DRIs, if values for children are incorrect and are applied in various settings (e.g., school meals programs, nutrition counseling), they could result in nutrient intake problems (either too little or too much), incorrect dietary recommendations (such as in the *Dietary Guidelines*) and, potentially, adverse effects on health.

The single topic that received close attention was vitamin D and bone health, but many gaps were revealed. A 2007 report by the Agency for Healthcare Research and Quality University of Ottawa Evidence-based Practice Center reviewed the evidence for vitamin D and bone health across the lifecycle and noted the difficulty of separating the impact of vitamin D from that of calcium because many trials studied the effects of vitamin D plus calcium (University of Ottawa 2007). The report confirmed that vitamin D from ultraviolet-B (sunlight) exposure, fortified foods, or dietary supplements was effective in raising circulating levels of vitamin D, but noted that sparse data exist for dark-skinned individuals or high-risk subgroups such as pregnant and lactating women. This knowledge gap is applicable to dark-skinned children and pregnant or lactating adolescent females. The report also noted the need for high quality studies on children.

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<sup>2</sup> Nutrients that are most in need of additional research for children's DRIs are food energy, vitamins A and E, zinc, magnesium, potassium, and fiber (Devaney et al. 2007).

**b. Weight Management**

Although nearly half of the studies we reviewed from the 2004-2008 literature (48 of 104 primary research citations) addressed children's weight status, few studies focused on the long-term effects of dietary changes on weight, and most were tracking studies on weight (see 'tracking' below). In addition, the results of the few studies that investigated dietary patterns and/or energy intake and weight outcomes were inconsistent. Factors contributing to mixed results most likely include the methods used to collect dietary data, misreporting of intake by study respondents, and lack of adjustment for physical activity or other factors that may affect energy balance. Studies on the relationship of diet and obesity are hampered by a lack of dietary assessment tools at the individual level and by the misreporting of intake, especially among children or their caregivers. Therefore, considerable knowledge gaps persist in the area of childhood obesity.

**c. Fats**

Although evidence indicates that fat-controlled diets are compatible with normal growth and development of children, evidence is lacking on relationships of different types of fat with later health, especially cardiovascular health and cancer. None of the 2004-2008 research that we located provided specific information or research on trans fatty acids or omega-3-fatty acids consumption and the health of children, although one study looked at fish consumption and children's health. Initial research has been conducted on relationships of the proportions of fat and carbohydrate in the diet with health outcomes including weight, BMI, and insulin sensitivity.

**d. Food Groups to Encourage**

*Fruits and vegetables.* Knowledge gaps exist in the association between children's fruit and vegetable intake and general health, weight status, cancer risk, and blood pressure levels. The 2004-2008 studies varied greatly in methodologic approaches, outcomes, and findings, indicating a need for further research in this area.

*Whole grains.* Based on evidence from adults, the 2005 *DGA* recommended that children consume whole grains often and that half of daily grain servings (typically three daily servings) should be whole grains. Since whole grains are not required to be fortified with folate, and few are voluntarily fortified, there is concern that increases in whole grain consumption may compromise folate status (Jones and Coletta 2005). Folate status is especially important to females of child-bearing age, including adolescents. The 2004-2008 review included one observational study on grains and folate concentrations among adolescents, and one on grains and the respiratory health of children. A knowledge gap remains with regard to the effects of whole-grain product intake on folate status and health status among children and adolescents.

*Milk and dairy foods.* An NIH-sponsored systematic review on vitamin D and bone health across the lifecycle noted the lack of data on children and pregnant or lactating women (Davis et al. 2007; University of Ottawa 2007). Our 2004-2008 review found 21 studies on dairy food consumption or calcium intake, seven of which reported small benefits on the

bone health of children for higher intake of milk and dairy products. Three of six studies reported an inverse relationship between intake of milk and BMI or fat mass, two showed no effect, and one showed a positive relationship. Two studies reported the effects of higher intakes of milk products on cancer risk. One study was reported on dairy food intake and blood pressure levels in children. This active research area has produced inconsistent findings, calling for careful review of study quality and methods.

#### **e. Carbohydrates**

A 2001 symposium on carbohydrates and health assessed the state of the science and identified a number of research needs to address knowledge gaps across the lifespan (Schneeman 2001). These needs ranged from the accuracy and adequacy of nutrient composition data bases to physiological responses to carbohydrate-rich diets and to various forms of carbohydrate. Our 2004-2008 review found that the research for children focused primarily on ‘added sugars’ or particular types of food such as soft drinks and other sugar-sweetened beverages. There was little knowledge gained about the effects of high carbohydrate and low-fat diets on levels of serum lipids and triglycerides. With increases in the prevalence of type 2 diabetes among adolescents (Duncan 2006) an important knowledge gap is an understanding about the role of carbohydrate in insulin resistance and the long-term effects of high carbohydrate diets.

#### **f. Sodium and Potassium**

A meta-analysis covering 13 controlled trials of sodium intake contributed evidence relating sodium intake to the blood pressure of children, but nine of the studies occurred in the 1980s and may not reflect current intake levels. Also, there is a lack of information about how active adolescents can meet both energy needs and the recommended level of sodium intake.<sup>3</sup> No studies were found that reported potassium intake or emphasized the association of consumption of potassium-containing foods on health outcomes. There is a knowledge gap on the relationship of intakes of potassium and potassium-containing foods with children’s health.

#### **g. Tracking behaviors and/or health outcomes**

Other knowledge gaps include the behavioral determinants of eating patterns among children and the extent to which dietary behaviors track through childhood and into adulthood. Our 2004-2008 review found 45 tracking studies, half related to weight and dietary patterns, but also six each on bone health and cardiovascular health. The range of dietary factors studied included the consumption of fast food items, sugar-sweetened beverages, cereal, and breakfast. Only one study reported on children’s dietary quality and adherence to the *Dietary Guidelines* (assessed using the Healthy Eating Index) and BMI. No

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<sup>3</sup> The IOM is forming an expert committee in late 2008 to review and make recommendations in 2010 about various means that could be employed to reduce dietary sodium intake to levels recommended by the 2005 *Dietary Guidelines for Americans*.

studies looked at barriers to following dietary recommendations, an important research need stated by the 2004 DGAC. There were few studies that tracked dietary behaviors from early to later childhood, and only two studies tracked specific dietary behaviors from adolescence to adulthood.

#### **h. Other topics**

Looking at the evidence in more general terms, we found additional gaps:

- Very few studies tested or reported the dietary measure in a comparable way to the actual dietary recommendation (e.g., a study reported a higher or lower intake of a food or food group, not the consumption of eating ‘x’ amount of the recommended food group).
- Among studies that focused on a specific dietary area, there is little information on variety of intake within that food group (or on variety of intake, in general).
- Research is lacking on the long-term health outcomes of following the *Dietary Guidelines* from childhood to adulthood.

We also found little or no data on water consumption, fluoride intake, and children’s health.

### **B. IMPLICATIONS FOR DEVELOPING DIETARY GUIDANCE FOR CHILDREN**

Our use of a systematic literature search to identify evidence relevant to the development of dietary guidelines applicable to children reveals the paucity of relevant research studies conducted with children but also provides updated relevant data. For example, our review of the published literature for 2004-2008, coupled with the child-focused evidence put forth in the 2000 and 2005 *DGAs*, shows increased attention to dietary behaviors associated with weight management, obesity, bone health, and dental health. Considering the lack of child-focused studies, however, we see merit in building on an approach used by the 2005 Dietary Guidelines Advisory Committee, which carefully reviewed evidence on the safety of diets intended to reduce the development of cardiovascular risk factors in children. Such an approach would call for documentation of evidence that proposed dietary guidance is consistent with normal growth, development, and health. The simple application to children of guidance based on adult data has a major drawback in that children are not just adults in miniature (Life Sciences Research Office 1999). Children have unique energy and nutrient requirements associated with ongoing growth and development.

Because of concern about a high prevalence of childhood obesity (Ogden et al. 2008) and other risk factors for chronic disease, it has been widely accepted that dietary guidance for children needs to address the potential for overconsumption and promote the attainment of optimal health through diet and physical activity (IOM 2005; Sutor and Kraak 2006). There has been an increase in epidemiological evidence from longitudinal studies that

overweight, hypercholesterolemia, and hypertension track over time from childhood into adult life and that lifestyle choices, including dietary excess and physical inactivity can influence these risk factors (AHA 2005), but many of the reported relationships are weak. The 2005 *Dietary Guidelines*, as well as recommendations made by major professional associations, health promotion organizations, and government agencies include child-focused recommendations based on both population and clinical/high-risk approaches to disease prevention and health promotion. The clinical/high-risk approaches focus mainly on reducing the risk of cardiovascular disease. Such approaches aim to identify and treat the children and adolescents who are at greatest risk of developing disease. In addition to the question of the long-term safety of such approaches, the following question arises: to what extent are data from high-risk populations applicable in the development of *Dietary Guidelines* for American children?

In the review and assessment of the science base for children, it may be helpful to recognize that this process has led to recognition of nuanced differences in the recommendations of different organizations. For example, the 1992 NCEP and 1998 AAP recommendations for fat intake have not been changed in response to the DRIs for fats; and, in comparison with the DRIs, AHA guidance statements in some cases include more restrictive or specific recommendations for fat intake (specifically for the reduction of cardiovascular risk in children). Differences in dietary recommendations may be related to one or more of the following:

- the mission of the organization,
- different membership of expert committees and areas of expertise,
- different methods of assessment of the literature,
- different methods of examining and interpreting data or research studies,
- different measures of outcomes, and
- different ways to rank or rate the evidence.

This report, along with its companion report by Dodd et al. (2008) documents the process we used and the results of our systematic examination of the evidence. Our methods were designed to facilitate subsequent expert review of the evidence for children in concert with recent documents on research gaps for the DRIs (Devaney et al. 2007; Suitor and Meyers 2007), on childhood obesity (IOM 2005), and on physical activity (Suitor and Kraak 2006) and also in concert with the evidence for adults. Our findings will need to be supplemented by literature searches of data published after February 2008. The 2010 DGAC will provide the expert review and opinion required to make specific recommendations for children based on the science base and evidence to date and to set research priorities for longer-term public health goals.

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## REFERENCES

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- American Academy of Pediatrics. Committee on Nutrition. "Prevention of Pediatric Overweight and Obesity." Policy Statement. *Pediatrics*, vol. 112, no. 2, Aug 2003, pp. 424-430. Last accessed on March 14, 2008. <http://aappolicy.aappublications.org/cgi/content/full/pediatrics;112/2/424>
- American Academy of Pediatrics. "The Use and Misuse of Fruit Juice in Pediatrics." *Pediatrics*, vol. 107, no. 5, 2001, pp. 1210-1213.
- American Academy of Pediatrics. Committee on Nutrition. "Cholesterol in Childhood." Policy Statement. *Pediatrics*, vol. 101, no. 1, Jan 1998, pp. 141-147. Last accessed on March 14, 2008. <http://aappolicy.aappublications.org/cgi/content/full/pediatrics;101/1/141>
- American Cancer Society. "Guidelines on Nutrition and Physical Activity for Cancer Prevention: Reducing the Risk of Cancer with Healthy Food Choices and Physical Activity." *CA Cancer J Clin.*, vol. 56, 2006, pp. 254-281. Last accessed on August 20, 2008. <http://caonline.amcancersoc.org/cgi/content/full/56/5/254>
- American Dental Association. "Interim Guidance on Fluoride Intake for Infants and Young Children." ADA, November 2006. Available at [[www.ada.org/prof/resources/positions/statements/fluoride\\_infants.asp](http://www.ada.org/prof/resources/positions/statements/fluoride_infants.asp)]. Accessed August 20, 2008.
- American Dental Association. "ADA Statement on Early Childhood Caries." Report No. 454. ADA, 2000. Available at [[www.ada.org/prof/resources/positions/statements/caries.asp](http://www.ada.org/prof/resources/positions/statements/caries.asp)]. Accessed August 20, 2008.
- American Diabetes Association. "Evidence-Based Nutrition Principles and Recommendations for the Treatment and Prevention of Diabetes and Related Complications." Position Statement. *Diabetes Care*, vol. 25, 2002, pp. S50-S60. Available at [[http://care.diabetesjournals.org/cgi/content/full/25/suppl\\_1/s50](http://care.diabetesjournals.org/cgi/content/full/25/suppl_1/s50)]. Accessed August 20, 2008.
- American Dietetic Association. "Dietary Guidance for Healthy Children Aged 2 to 11 Years." *Journal of the American Dietetic Association*, vol. 108, no. 6, June 2008, pp. 1038-

1047. Available at [www.eatright.org/ada/files/Guidancenp.pdf]. Accessed August 26, 2008.

American Dietetic Association. "Dietary Guidance for Healthy Children Aged 2 to 11 Years" *Journal of the American Dietetic Association*. vol. 104, 2004a, pp. 660-677. Last accessed on March 14, 2008. <http://www.eatright.org/ada/files/dietarynp.pdf>

American Dietetic Association. Evidence Analysis Library. Fruit and vegetable intake and childhood overweight. <http://www.adaevidencelibrary.com/topic.cfm?cat=1054>. Published September 2004b. Accessed May 14, 2008.

American Dietetic Association. Evidence Analysis Library. Meal or Eating Frequency and Overweight in Children. Published September 2004c. [http://www.adaevidencelibrary.com/evidence.cfm?evidence\\_summary\\_id=21](http://www.adaevidencelibrary.com/evidence.cfm?evidence_summary_id=21) Accessed June 13, 2008.

American Dietetic Association. Evidence Analysis Library. Breakfast Skipping and Childhood Overweight. Published September 2004d. <http://www.adaevidencelibrary.com/topic.cfm?cat=1047> Accessed June 13, 2008.

American Heart Association, Nutrition Committee. "Diet and Lifestyle Recommendations Revision 2006." A Scientific Statement. *Circulation*, vol. 114, 2006, pp. 82-96. Last accessed on March 14, 2008. <http://circ.ahajournals.org/cgi/content/full/114/1/82>

American Heart Association. "Dietary Recommendations for Children and Adolescents. A Guide for Practitioners: Consensus Statement From the American Heart Association." Scientific statement endorsed by AAP. *Circulation*, vol. 112, 2005, pp. 2061-2075. Last accessed on March 14, 2008. <http://circ.ahajournals.org/cgi/content/full/112/13/2061>

American Heart Association. "Guidelines for Primary Prevention of Atherosclerotic Cardiovascular Disease Beginning in Childhood." Scientific Statement. *Circulation*, vol. 107, 2003, pp. 1562-1566. Last accessed on March 14, 2008. <http://circ.ahajournals.org/cgi/content/full/107/11/1562>

American Heart Association/Committee on Atherosclerosis, Hypertension, and Obesity in the Young. "Cardiovascular Health in Childhood." Scientific Statement. *Circulation*, vol. 106, 2002, pp. 143-160. Last accessed on March 14, 2008. <http://circ.ahajournals.org/cgi/content/full/106/1/143>

Baghurst, K.I. "Dietary Guidelines: The Development Process in Australia and New Zealand." *Journal of the American Dietetic Association*, vol. 103, 2003, pp. S17-S21.

Brittten P., K. Marcoe, S. Yamini, and C. Davis. "Development of Food Intake Patterns for the MyPyramid Food Guidance System." *Journal of Nutrition Education and Behavior*, vol. 38, 2006, pp. S78-S92.

- 
- Centers for Disease Control and Prevention. "Does Drinking Beverages with Added Sugars Increase Risk of Overweight?" Research to Practice Series, no. 3, 2006. [http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/r2p\\_sweetend\\_beverages.pdf](http://www.cdc.gov/nccdphp/dnpa/nutrition/pdf/r2p_sweetend_beverages.pdf). Accessed May 27, 2008.
- Davis, C.D., V. Hartmuller, M. Freedman, P. Hartge, M.F. Picciano, C.A. Swanson, and J.A. Milner. "Vitamin D and Cancer: Current Dilemmas and Future Needs." *Nutrition Reviews*, vol. 65, suppl. no. 1, 2007, pp. 71-74.
- Devaney, B., M.K. Crepinsek, L. Quay, and K. Forston. *Review of Dietary Reference Intakes for Selected Nutrients: Challenges and Implications for Federal Food and Nutrition Policy*. Washington, DC: U.S. Department of Agriculture, Economic Research Service, 2007.
- Dietary Guidelines Advisory Committee. "Report of the Dietary Guidelines Advisory Committee, 2005." Washington, DC: US Department of Agriculture, Agricultural Research Service, 2004. Available at [\[www.health.gov/dietaryguidelines/dga2005/report/\]](http://www.health.gov/dietaryguidelines/dga2005/report/). Accessed August 26, 2008.
- Dietary Guidelines Advisory Committee. "Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2000." Washington, DC: US Department of Agriculture, Agricultural Research Service, 2000. Available at [\[www.health.gov/dietaryguidelines/dgac/pdf/dgac\\_ful.pdf\]](http://www.health.gov/dietaryguidelines/dgac/pdf/dgac_ful.pdf). Accessed August 26, 2008.
- Dodd, A.H., C. Cabili, R. Briefel, N. Williams, and C. Suitor. "Summary of Published Evidence Related to the Dietary Guidelines for Children, 2004-2008." Washington DC: Mathematica Policy Research, Inc., September 2008.
- Duncan, G.E. "National Survey Estimates Prevalence of Type 2 Diabetes Among Adolescents." *Archives of Pediatrics and Adolescent Medicine*, vol. 160, 2006, pp. 523-528.
- Institute of Medicine, Committee on Prevention of Obesity in Children and Youth. Jeffrey Koplan, Catharyn T. Liverman and Vivica I. Kraak. *Preventing Childhood Obesity: Health in the Balance*. Washington, DC: National Academies Press, 2005.
- Institute of Medicine. *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate*. Washington, DC: National Academy Press, 2005.
- Institute of Medicine. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academy Press, 2002/2005.
- Institute of Medicine. *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc*. Washington, DC: National Academy Press, 2001.
- Institute of Medicine. *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids*. Washington, DC: National Academy Press, 2000.

Institute of Medicine. *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline*. Washington, DC: National Academy Press, 1998.

Institute of Medicine. *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride*. Washington, DC: National Academy Press, 1997.

Jones, J.M. and F.A. Coletta. "The 2005 Dietary Guidelines: Avoiding a Fortification "Misstep" as we "Step up" to Whole Grains." *Nutrition Today*, vol. 40, no. 5, 2005, pp. 216-223.

Krauss, R.M., R.H. Eckel, B. Howard, et al. "AHA dietary guidelines: revision 2000: A statement for healthcare professionals from the Nutrition Committee of the American Heart Association." *Circulation*, vol. 102, no. 18, October 2000, pp. 2284-2299.

Life Sciences Research Office. *Review and Assessment of the Scientific Basis for Dietary Guidelines for Children, Including Those Less Than Two Years of Age*. Bethesda, MD: American Society for Nutritional Sciences, 1999.

Marantz, P.R., E.D. Bird, and M.H. Alderman. "A Call for Higher Standards of Evidence for Dietary Guidelines." *American Journal of Preventive Medicine*, vol. 34, no. 3, 2008, pp. 234-240.

McMurry, K.Y. "Setting Dietary Guidelines: The US Process." *Journal of the American Dietetic Association*, vol. 103, 2003, pp. S10-S16.

National Cholesterol Education Program. *Report of the Expert Panel on Blood Cholesterol in Children and Adolescents*. Bethesda, MD: National Cholesterol Education Program, 1991.

National Cholesterol Education Program. "Highlights of the Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents." *Pediatrics*, vol. 89, 1992, pp. 495-501. Last accessed on March 14, 2008. <http://pediatrics.aappublications.org/cgi/content/abstract/89/3/495>

National Heart, Lung, and Blood Institute, National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. "The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents." *Pediatrics*, vol. 114, no. 2, Aug 2004, pp. 555-576. Last accessed on March 14, 2008. <http://pediatrics.aappublications.org/cgi/content/full/114/2/S2/555>

National Research Council. *Diet and Health: Implications for Reducing Chronic Disease Risk*. Washington, DC: National Academy Press, 1989.

Office of Disease Prevention and Health Promotion. "Backgrounder: 2005 Dietary Guidelines Advisory Committee Report." 2007. Available at

---

[web.health.gov/dietaryguidelines/dga2005/Backgrounder.htm]. Accessed September 2, 2008.

Ogden, C.L., M.D. Carroll, and K.M. Flegal. "High body mass index for age among US children and adolescents, 2003-2006." *JAMA*, vol. 299, no. 20, 2008, pp. 2401-2405.

Physical Activity Guidelines Advisory Committee. "Physical Activity Guidelines Advisory Committee Report, 2008." Washington, DC: U.S. Department of Health and Human Services, 2008.

Rockhill, B., I. Kawachi, and G.A. Colditz. "Individual Risk Prediction and Population-wide Disease Prevention." *Epidemiologic Reviews*, vol. 22(1), 2000, pp. 176-180.

Schneeman, B.O. "Carbohydrate: Friend or Foe? Summary of Research Needs." *Journal of Nutrition*, vol. 131, 2001, pp. 2764S-2765S.

Suitor, C.W. and V.I. Kraak. *Adequacy of Evidence for Physical Activity Guidelines Development: Workshop Summary*. Washington, DC: National Academies Press, 2007.

Suitor, C. and L. Meyers, Eds. *Dietary Reference Intakes Research Synthesis: Workshop Summary*. Washington, DC: The National Academies Press, 2007.

University of Ottawa Evidence-based Practice Center. "Effectiveness and Safety of Vitamin D in Relation to Bone Health." Evidence Report/Technology Assessment Number 158. AHRQ Publication No. 07-E013. August 2007. Agency for Healthcare Research and Quality.

U.S. Department of Agriculture. Center for Nutrition Policy and Promotion. MyPyramid Food Intake Patterns. April 2005.

U.S. Department of Health and Human Services. Healthy People 2010 (Conference Edition in 2 Volumes). Washington, DC: U.S. Department of Health and Human Services, 2000.

U.S. Department of Health and Human Services. *The Surgeon General's Report on Nutrition and Health*. Washington, DC: DHHS (PHS) Publication No. 88-50210, 1988.

U.S. Department of Agriculture and U.S. Department of Health and Human Services. "Nutrition and Your Health: Dietary Guidelines for Americans." 5th ed. Washington, DC: U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2000.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. "Dietary Guidelines for Americans, 2005." 6th ed. Washington, DC: U.S. Government Printing Office, 2005.

- U.S. Department of Health and Human Services and U.S. Department of Agriculture. "MyPyramid: Steps to a Healthier You." Available at [www.mypyramid.gov/]. Accessed August 27, 2008.
- U.S. Department of Health and Human Services and U.S. Department of Agriculture. "Dietary Guidelines for Americans, 1995." 4th ed. Washington, DC: U.S. Government Printing Office, 1995.
- U.S. Preventive Services Task Force. *Guide to Clinical Preventive Services: Second Edition*. Washington, DC: U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality, 1996.
- Woolf, S.H. "Weighing the Evidence to Formulate Dietary Guidelines." *Journal of the American College of Nutrition*, vol. 25, no. 6. 2006, pp. 277S-284S.
- World Cancer Research Fund/American Institute for Cancer Research. "Food, Nutrition, and the Prevention of Cancer: A Global Perspective." Washington, DC: World Cancer Research Fund and American Institute for Cancer Research, 2007.
- World Health Organization. World Health Report 2002: Reducing Risks, Promoting Healthy Life. Geneva, Switzerland: World Health Organization, 2002. Available at [www.who.int/whr/2002/en/whr02\_en.pdf]. Accessed August 26, 2008.

## APPENDIX A

# THE 2005 DIETARY GUIDELINES FOR AMERICANS: FOCUS AREAS, KEY RECOMMENDATIONS, AND SPECIFIC RECOMMENDATIONS FOR CHILDREN AND ADOLESCENTS

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**Table A.1: The 2005 Dietary Guidelines for Americans: Focus Areas, Key Recommendations, and Specific Recommendations for Children and Adolescents**

Focus Area	Key Recommendations <sup>a</sup>	Specific Recommendations for Children and Adolescents <sup>b</sup>
Adequate Nutrients Within Calorie Needs	<p>Consume a variety of nutrient-dense foods and beverages within and among the basic food groups while choosing foods that limit the intake of saturated fat and trans fats, cholesterol, added sugars, salt, and alcohol.</p> <p>Meet recommended intakes within energy needs by adopting a balanced eating pattern.</p>	
Weight Management	<p>To maintain body weight in a healthy range, balance calories from foods and beverages with calories expended.</p> <p>To prevent gradual weight gain over time, make small decreases in food and beverage calories and increase physical activity.<sup>c</sup></p>	<i>Overweight children:</i> Reduce the rate of body weight gain while allowing growth and development. Consult a healthcare provider before placing a child on a weight-reduction diet.
Physical Activity	Engage in regular physical activity and reduce sedentary activities to promote health, psychological well-being, and a healthy body weight.	Engage in at least 60 minutes of physical activity on most, preferably all, days of the week.
Food Groups to Encourage	<p>Consume a sufficient amount of fruits and vegetables while staying within energy needs: Two cups of fruits and 2½ cups of vegetables per day are recommended per 2,000 calories.</p> <p>Choose a variety of fruits and vegetables each day. Select from all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.</p> <p>Consume 3 or more ounce-equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products.</p>	Consume whole-grain products often; at least half the grains should be whole grains.



Focus Area	Key Recommendations <sup>a</sup>	Specific Recommendations for Children and Adolescents <sup>b</sup>
	Consume 3 cups per day of fat-free or low-fat milk or equivalent milk products.	<p><i>Children 2 to 8 years:</i> Consume 2 cups per day of fat-free or low-fat milk or equivalent milk products.</p> <p><i>Children 9 years and older:</i> Consume 3 cups per day of fat-free or low-fat milk or equivalent milk products.</p>
Fats	<p>Consume less than 10 percent of calories from saturated fat and less than 300 mg/day of cholesterol, and keep trans fat consumption as low as possible.</p> <p>Keep total fat intake between 20 and 35 percent of calories, with most fats coming from sources of polyunsaturated and monounsaturated fats, such as fish, nuts, and vegetable oils.</p> <p>When selecting and preparing meat, poultry, dry beans, and milk or milk products, make choices that are lean, low-fat, or fat-free.</p> <p>Limit intake of fats and oils high in saturated fat or trans fat, and choose products low in such fats and oils.</p>	<p>Keep total fat intake between 30 to 35 percent of calories for children 2 to 3 years of age and between 25 to 35 percent of calories for children and adolescents 4 to 18 years of age.</p>
Carbohydrates	<p>Choose fiber-rich fruits, vegetables, and whole grains often.</p> <p>Choose and prepare foods and beverages with little added sugars or caloric sweeteners.</p> <p>Reduce the incidence of dental caries by practicing good oral hygiene and consuming sugar- and starch-containing foods and beverages less frequently.</p>	
Sodium and Potassium	<p>Consume less than 2,300 mg of sodium per day.</p> <p>Choose and prepare foods with little salt, and at the same time, consume potassium-rich foods, such as fruits and vegetables.</p>	

Focus Area	Key Recommendations <sup>a</sup>	Specific Recommendations for Children and Adolescents <sup>b</sup>
Alcoholic Beverages	<p>Those who choose to drink alcoholic beverages should do so sensibly and in moderation—defined as the consumption of up to one drink per day for women and up to two drinks per day for men.</p> <p>Alcoholic beverages should not be consumed those who cannot restrict their alcohol intake, women of child-bearing age who may become pregnant, pregnant and lactating women, individuals taking medications that can interact with alcohol, and those with specific medical conditions.</p> <p>Alcoholic beverages should be avoided by individuals engaging in activities that require attention, skill or coordination.</p>	<p>Alcoholic beverages should not be consumed.</p>
Food Safety	<p>To avoid microbial foodborne illness: Clean hands, food contact surfaces, and fruits and vegetables; separate raw, cooked, and ready-to-eat foods while shopping, preparing, or storing foods; cook foods to a safe temperature to kill microorganisms; chill perishable foods promptly and defrost foods properly; avoid raw (unpasteurized) milk or any products made from unpasteurized milk; raw or partially cooked eggs or foods containing raw eggs; raw or undercooked meat, poultry, fish or shellfish; unpasteurized juices; and raw sprouts.</p>	<p><i>Infants and young children:</i> Do not eat or drink raw (unpasteurized) milk or any products made from unpasteurized milk; raw or partially cooked eggs or foods containing raw eggs; raw or undercooked meat, poultry, fish or shellfish; unpasteurized juices; and raw sprouts.</p>

<sup>a</sup>Key recommendations are applicable to the general population ages 2 years and older (HHS and USDA 2005).

<sup>b</sup>Additional recommendations may apply to pregnant and lactating adolescents or female adolescents of childbearing age.

<sup>c</sup>Applicable to adults (DGAC 2004).

## APPENDIX B

### REFERENCES FOR GUIDANCE STATEMENTS

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American Academy of Pediatrics. Committee on Nutrition. "Prevention of Pediatric Overweight and Obesity." Policy Statement. In *Pediatrics*, vol. 112, no. 2, Aug 2003, pp. 424-430. Last accessed on March 14, 2008. <http://aappolicy.aappublications.org/cgi/content/full/pediatrics;112/2/424>

American Academy of Pediatrics. Committee on Nutrition. "Cholesterol in Childhood." Policy Statement. In *Pediatrics*, vol. 101, no. 1, Jan 1998, pp. 141-147. Last accessed on March 14, 2008. <http://aappolicy.aappublications.org/cgi/content/full/pediatrics;101/1/141>

American Cancer Society. "Guidelines on Nutrition and Physical Activity for Cancer Prevention: Reducing the Risk of Cancer with Healthy Food Choices and Physical Activity." In *CA Cancer J Clin.*, vol. 56, 2006, pp 254-281. Last accessed on August 20, 2008. <http://caonline.amcancersoc.org/cgi/content/full/56/5/254>

American Dietetic Association. "Dietary Guidance for Healthy Children Aged 2 to 11 Years" In *J Am Diet Assoc.*, vol. 104, 2004, pp 660-677. Last accessed on March 14, 2008. <http://www.eatright.org/ada/files/dietarynp.pdf>

American Heart Association, Nutrition Committee. "Diet and Lifestyle Recommendations Revision 2006." A Scientific Statement. In *Circulation*, vol. 114, 2006, pp. 82-96. Last accessed on August 25, 2008. <http://circ.ahajournals.org/cgi/content/full/114/1/82>

American Heart Association. "Dietary Recommendations for Children and Adolescents. A Guide for Practitioners: Consensus Statement From the American Heart Association." Scientific statement endorsed by AAP. In *Circulation*, vol. 112, 2005, pp 2061-2075. Last accessed on March 14, 2008. <http://circ.ahajournals.org/cgi/content/full/112/13/2061>

American Heart Association. "Guidelines for Primary Prevention of Atherosclerotic Cardiovascular Disease Beginning in Childhood." Scientific Statement. In *Circulation*,

vol. 107, 2003, pp. 1562-1566. Last accessed on March 14, 2008.  
<http://circ.ahajournals.org/cgi/content/full/107/11/1562>

American Heart Association Committee on Atherosclerosis, Hypertension, and Obesity in the Young. "Cardiovascular Health in Childhood." Scientific Statement. In *Circulation*, vol. 106, 2002, pp. 143-160. Last accessed on March 14, 2008.  
<http://circ.ahajournals.org/cgi/content/full/106/1/143>

Institute of Medicine, Committee on Prevention of Obesity in Children and Youth. Jeffrey Koplan, Catharyn T. Liverman and Vivica I. Kraak. *Preventing Childhood Obesity: Health in the Balance*. Washington, DC: National Academies Press. 2005.

National Cholesterol Education Program. "Report of the Expert Panel on Blood Cholesterol in Children and Adolescents." In *Pediatrics*, vol. 89, no. 3, March 1992, pp. 525-584.

National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. "The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents." In *Pediatrics*, vol. 114, no. 2, Aug 2004, pp. 555-576. Last accessed on March 14, 2008.  
<http://pediatrics.aappublications.org/cgi/content/full/114/2/S2/555>

U.S. Department of Health and Human Services and U.S. Department of Agriculture. *Dietary Guidelines for Americans: 2005*. Washington, DC: U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2005.

## APPENDIX C

### BACKGROUND CITATIONS

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"Mercury and Seafood Advice Still Current." *FDA Consumer*, vol. 40, no. 5, 2006, pp. 2-3.

"The Effects of Alcohol on Physiological Processes and Biological Development." *Alcohol Research & Health*, vol. 28, no. 3, 2005, pp. 125-131.

"The Scope of the Problem." *Alcohol Research & Health*, vol. 28, no. 3, 2005, pp. 111-120.

Affenito, S. G., D. R. Thompson, B. A. Barton, D. L. Franko, S. R. Daniels, E. Obarzanek, G. B. Schreiber, and R. H. Striegel-Moore. "Breakfast Consumption by African-American and White Adolescent Girls Correlates Positively with Calcium and Fiber Intake and Negatively with Body Mass Index." *Journal of the American Dietetic Association*, vol. 105, no. 6, 2005, pp. 938-945.

Affenito, S. G., D. R. Thompson, D. L. Franko, R. H. Striegel-Moore, S. R. Daniels, B. A. Barton, G. B. Schreiber, M. Schmidt, and P. B. Crawford. "Longitudinal Assessment of Micronutrient Intake among African-American and White Girls: The National Heart, Lung, and Blood Institute Growth and Health Study." *Journal of the American Dietetic Association*, vol. 107, no. 7, 2007, pp. 1113-1123.

Albertson, A. M., D. L. Franko, D. Thompson, A. L. Eldridge, N. Holschuh, S. G. Affenito, R. Bauserman, and R. H. Striegel-Moore. "Longitudinal Patterns of Breakfast Eating in Black and White Adolescent Girls." *Obesity*, vol. 15, no. 9, September 2007, pp. 2282-2292.

Alexy, U., M. Kersting, and W. Sichert-Hellert. "Evaluation of Dietary Fibre Intake from Infancy to Adolescence Against various References--Results of the DONALD Study." *European Journal of Clinical Nutrition*, vol. 60, no. 7, 2006, pp. 909-914.

Ambroszkiewicz, J., T. Laskowska-Klita, and W. Klemarczyk. "Low Serum Leptin Concentration in Vegetarian Prepubertal Children." *Roczniki Akademii Medycznej W Białymstoku*, vol. 49, 2004, pp. 103-105.

- Balas, M., O. Perichart, A. Villanueva, A. Rodriguez, M. Serrano, A. Suverza, and F. Vadillo-Ortega. "Impact of Obesity on Cardiovascular Risk Factors and Resting Metabolic Rate in Mexican School Age Children." *Journal of the American Dietetic Association*, vol. 107, no. 8, August 2007, pp. A22.
- Bates, C. J., G. D. Mishra, and A. Prentice. "Gamma-Tocopherol as a Possible Marker for Nutrition-Related Risk: Results from Four National Diet and Nutrition Surveys in Britain." *British Journal of Nutrition*, vol. 92, no. 1, 2004, pp. 137-150.
- Bibbins-Domingo, K., P. Coxson, M. J. Pletcher, J. Lightwood, and L. Goldman. "Adolescent Overweight and Future Adult Coronary Heart Disease." *New England Journal of Medicine*, vol. 357, no. 23, 2007, pp. 2371-2379.
- Blozis, S. A., B. Feldman, and R. D. Conger. "Adolescent Alcohol use and Adult Alcohol Disorders: A Two-Part Random-Effects Model with Diagnostic Outcomes." *Drug and Alcohol Dependence*, vol. 88, no. Suppl 1, 2007, pp. S85-96.
- Bowden, R. G., B. A. Lanning, E. I. Doyle, B. Slonaker, H. M. Johnston, and G. Scanes. "Systemic Glucose Level Changes with a Carbohydrate-Restricted and Higher Protein Diet Combined with Exercise." *Journal of American College Health*, vol. 56, no. 2, 2007, pp. 147-152.
- Bowman, S. A., S. L. Gortmaker, C. B. Ebbeling, M. A. Pereira, and D. S. Ludwig. "Effects of Fast-Food Consumption on Energy Intake and Diet Quality among Children in a National Household Survey." *Pediatrics*, vol. 113, no. 1 Pt 1, 2004, pp. 112-118.
- Britten, P., K. Marcoe, S. Yamini, and C. Davis. "Development of Food Intake Patterns for the MyPyramid Food Guidance System." *Journal of Nutrition Education and Behavior*, vol. 38, no. 6S: Supplement, 2006, pp. S78-92.
- Budek, A. Z., C. Hoppe, K. F. Michaelsen, S. Bugel, and C. Molgaard. "Associations of Total, Dairy, and Meat Protein with Markers for Bone Turnover in Healthy, Prepubertal Boys." *Journal of Nutrition*, vol. 137, no. 4, 2007, pp. 930-934.
- Budek, A. Z., C. Hoppe, K. F. Michaelsen, and C. Molgaard. "High Intake of Milk, but Not Meat, Decreases Bone Turnover in Prepubertal Boys After 7 Days." *European Journal of Clinical Nutrition*, vol. 61, no. 8, 2007, pp. 957-962.
- Burke, V., L. J. Beilin, D. Dunbar, and M. Kevan. "Associations between Blood Pressure and Overweight Defined by New Standards for Body Mass Index in Childhood." *Preventive Medicine*, vol. 38, no. 5, 2004, pp. 558-564.
- Burke, V., L. J. Beilin, K. Simmer, W. H. Oddy, K. V. Blake, D. Doherty, G. E. Kendall, J. P. Newnham, L. I. Landau, and F. J. Stanley. "Predictors of Body Mass Index and Associations with Cardiovascular Risk Factors in Australian Children: A Prospective Cohort Study." *International Journal of Obesity*, vol. 29, no. 1, 2005, pp. 15-23.

- 
- Butte, N. F. "Energy Requirements of Infants and Children." *Nestle Nutrition Workshop Series. Paediatric Programme*, vol. 58, 2006, pp. 19-32.
- Butte, N. F., E. Christiansen, and T. I. A. Sørensen. "Energy Imbalance Underlying the Development of Childhood Obesity." *Obesity*, vol. 15, no. 12, December 2007, pp. 3056-3066.
- Chen, A. K., C. K. Roberts, and R. J. Barnard. "Effect of a Short-Term Diet and Exercise Intervention on Metabolic Syndrome in Overweight Children." *Metabolism: Clinical & Experimental*, vol. 55, no. 7, 2006, pp. 871-878.
- Christensen, B. B., H. Rosenquist, H. M. Sommer, N. L. Nielsen, S. Fagt, N. L. Andersen, and B. Norrung. "A Model of Hygiene Practices and Consumption Patterns in the Consumer Phase." *Risk Analysis*, vol. 25, no. 1, 2005, pp. 49-60.
- Daniels, S. R., D. K. Arnett, R. H. Eckel, S. S. Gidding, L. L. Hayman, S. Kumanyika, T. N. Robinson, B. J. Scott, S. St Jeor, and C. L. Williams. "Overweight in Children and Adolescents: Pathophysiology, Consequences, Prevention, and Treatment." *Circulation*, vol. 111, no. 15, April 2005, pp. 1999-2012.
- Delva, J., L. D. Johnston, and P. M. O'Malley. "The Epidemiology of Overweight and Related Lifestyle Behaviors: Racial/ethnic and Socioeconomic Status Differences among American Youth." *American Journal of Preventive Medicine*, vol. 33, no. 4 Suppl, 2007, pp. S178-86.
- Dietrich, M., C. J. P. Brown, S. Cho, and G. Block. "What is the Average Effect on Energy, Macronutrient, and Micronutrient Intake Whenever Americans Substitute Plant Protein for Beef Or Pork?" *Nutrition Today*, vol. 40, no. 4, 2005, pp. 156-164.
- Dietz, W. H. "Sugar Sweetened Beverages, Milk Intake, and Obesity in Children and Adolescents." *The Journal of Pediatrics*, vol. 148, no. 2, February 2006, pp. 152-154.
- Din-Dzietham, R., Y. Liu, M. V. Bielo, and F. Shamsa. "Hight Blood Pressure Trends in Children and Adolescents in National Surveys, 1963 to 2002." *Circulation*, vol. 116, no. 13, September 2007, pp. 1488-1496.
- Donovan, J. E. "Really Underage Drinkers: The Epidemiology of Children's Alcohol use in the United States." *Prevention Science*, vol. 8, no. 3, 2007, pp. 192-205.
- Drewel, B. T., D. W. Giraud, S. R. Davy, and J. A. Driskell. "Less than Adequate Vitamin E Status Observed in a Group of Preschool Boys and Girls Living in the United States." *Journal of Nutritional Biochemistry*, vol. 17, no. 2, 2006, pp. 132-138.
- Dubois, L., A. P. Farmer, M. Girard, and K. Peterson. "Preschool Children's Eating Behaviours are Related to Dietary Adequacy and Body Weight." *European Journal of Clinical Nutrition*, vol. 61, no. 7, 2007, pp. 846-855.

- Duffey, K. D. and B. M. Popkin. "Shifts in Patterns and Consumption of Beverages between 1965 and 2002." *Obesity*, vol. 15, no. 11, November 2007, pp. 2739-2747.
- Dunnigan, M. G., J. B. Henderson, D. J. Hole, E. Barbara Mawer, and J. L. Berry. "Meat Consumption Reduces the Risk of Nutritional Rickets and Osteomalacia." *British Journal of Nutrition*, vol. 94, no. 6, 2005, pp. 983-991.
- Ebbeling, C. B., E. Garcia-Lago, M. M. Leidig, L. G. Seger-Shippe, H. A. Feldman, and D. S. Ludwig. "Altering Portion Sizes and Eating Rate to Attenuate Gorging during a Fast Food Meal: Effects on Energy Intake." *Pediatrics*, vol. 119, no. 5, 2007, pp. 869-875.
- Epstein, L. H., J. N. Roemmich, R. A. Paluch, and H. A. Raynor. "Influence of Changes in Sedentary Behavior on Energy and Macronutrient Intake in Youth." *American Journal of Clinical Nutrition*, vol. 81, no. 2, 2005, pp. 361-366.
- Ervin, R. B., C. Y. Wang, J. D. Wright, and J. Kennedy-Stephenson. "Dietary Intake of Selected Minerals for the United States Population: 1999-2000." *Advance Data*, no. 341, 2004, pp. 1-5.
- Ervin, R. B., J. D. Wright, C. Y. Wang, and J. Kennedy-Stephenson. "Dietary Intake of Fats and Fatty Acids for the United States Population: 1999-2000." *Advance Data*, no. 348, 2004, pp. 1-6.
- Etcheverry, P., K. M. Hawthorne, L. K. Liang, S. A. Abrams, and I. J. Griffin. "Effect of Beef and Soy Proteins on the Absorption of Non-Heme Iron and Inorganic Zinc in Children." *Journal of the American College of Nutrition*, vol. 25, no. 1, 2006, pp. 34-40.
- Fiorito, L. M., A. K. Ventura, D. C. Mitchell, H. Smiciklas-Wright, and L. L. Birch. "Girls' Dairy Intake, Energy Intake, and Weight Status." *Journal of the American Dietetic Association*, vol. 106, no. 11, 2006, pp. 1851-1855.
- Fisher, J. O. "Effects of Age on Children's Intake of Large and Self-Selected Food Portions." *Obesity*, vol. 15, no. 2, 2007, pp. 403-412.
- Fisher, J. O., A. Arreola, L. L. Birch, and B. J. Rolls. "Portion Size Effects on Daily Energy Intake in Low-Income Hispanic and African American Children and their Mothers." *American Journal of Clinical Nutrition*, vol. 86, no. 6, December 2007, pp. 1709-1716.
- Fisher, J. O., Y. Liu, L. L. Birch, and B. J. Rolls. "Effects of Portion Size and Energy Density on Young Children's Intake at a Meal." *American Journal of Clinical Nutrition*, vol. 86, no. 1, 2007, pp. 174-179.
- Ford, E. S., A. H. Mokdad, and U. A. Ajani. "Trends in Risk Factors for Cardiovascular Disease among Children and Adolescents in the United States." *Pediatrics*, vol. 114, no. 6, 2004, pp. 1534-1544.



- Forrest, K. Y. and M. J. Leeds. "Prevalence and Associated Factors of Overweight among Mexican-American Adolescents." *Journal of the American Dietetic Association*, vol. 107, no. 10, 2007, pp. 1797-1800.
- Forshee, R. A., P. A. Anderson, and M. L. Storey. "Changes in Calcium Intake and Association with Beverage Consumption and Demographics: Comparing Data from CSFII 1994-1996, 1998 and NHANES 1999-2002." *Journal of the American College of Nutrition*, vol. 25, no. 2, 2006, pp. 108-116.
- Forshee, R. A. and M. L. Storey. "Controversy and Statistical Issues in the use of Nutrient Densities in Assessing Diet Quality." *Journal of Nutrition*, vol. 134, no. 10, 2004, pp. 2733-2737.
- Franco, D. L., R. H. Striegel-Moore, D. Thompson, S. G. Affenito, G. B. Schreiber, S. R. Daniels, and P. B. Crawford. "The Relationship between Meal Frequency and Body Mass Index in Black and White Adolescent Girls: More is Less." *International Journal of Obesity*, vol. 32, no. 1, January 2008, pp. 23-29.
- Fulgoni, V., 3rd, J. Nicholls, A. Reed, R. Buckley, K. Kafer, P. Huth, D. DiRienzo, and G. D. Miller. "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." *Journal of the American Dietetic Association*, vol. 107, no. 2, 2007, pp. 256-264.
- Fulgoni, V. L., 3rd, P. J. Huth, D. B. DiRienzo, and G. D. Miller. "Determination of the Optimal Number of Dairy Servings to Ensure a Low Prevalence of Inadequate Calcium Intake in Americans." *Journal of the American College of Nutrition*, vol. 23, no. 6, 2004, pp. 651-659.
- Ganji, V. and M. R. Kafai. "Frequent Consumption of Milk, Yogurt, Cold Breakfast Cereals, Peppers, and Cruciferous Vegetables and Intakes of Dietary Folate and Riboflavin but Not Vitamins B-12 and B-6 are Inversely Associated with Serum Total Homocysteine Concentrations in the US Population." *American Journal of Clinical Nutrition*, vol. 80, no. 6, 2004, pp. 1500-1507.
- Gao, X., P. E. Wilde, A. H. Lichtenstein, and K. L. Tucker. "Meeting Adequate Intake for Dietary Calcium without Dairy Foods in Adolescents Aged 9 to 18 Years (National Health and Nutrition Examination Survey 2001-2002)." *Journal of the American Dietetic Association*, vol. 106, no. 11, 2006, pp. 1759-1765.
- Garemo, M., V. Palsdottir, and B. Strandvik. "Metabolic Markers in Relation to Nutrition and Growth in Healthy 4-y-Old Children in Sweden." *American Journal of Clinical Nutrition*, vol. 84, no. 5, 2006, pp. 1021-1026.
- Garlick, P. J. "Protein Requirements of Infants and Children." *Nestle Nutrition Workshop Series. Paediatric Programme*, vol. 58, 2006, pp. 39-47.

- Gehling, R. K., A. M. Magarey, and L. A. Daniels. "Food-Based Recommendations to Reduce Fat Intake: An Evidence-Based Approach to the Development of a Family-Focused Child Weight Management Programme." *Journal of Paediatrics & Child Health*, vol. 41, no. 3, 2005, pp. 112-118.
- Gibbons, M. J., N. L. Gilchrist, C. Frampton, P. Maguire, P. H. Reilly, R. L. March, and C. R. Wall. "The Effects of a High Calcium Dairy Food on Bone Health in Pre-Pubertal Children in New Zealand." *Asia Pacific Journal of Clinical Nutrition*, vol. 13, no. 4, 2004, pp. 341-347.
- Gillis, L. and A. Gillis. "Nutrient Inadequacy in Obese and Non-Obese Youth." *Canadian Journal of Dietetic Practice and Research*, vol. 66, no. 4, 2005, pp. 237-242.
- Givens, M. L., C. Lu, S. M. Bartell, and M. A. Pearson. "Estimating Dietary Consumption Patterns among Children: A Comparison between Cross-Sectional and Longitudinal Study Designs." *Environmental Research*, vol. 103, no. 3, 2007, pp. 325-330.
- Goolsby, S. L., P. H. Casey, J. E. Stuff, S. Zaghoul, J. Weber, J. Gossett, P. Simpson, and M. L. Bogle. "Consumption of Calcium among African American Adolescent Girls." *Ethnicity & Disease*, vol. 16, no. 2, 2006, pp. 476-482.
- Griel, A. E., B. Eissenstat, V. Juturu, G. Hsieh, and P. M. Kris-Etherton. "Improved Diet Quality with Peanut Consumption." *Journal of the American College of Nutrition*, vol. 23, no. 6, 2004, pp. 660-668.
- Gunnarsson, B. S., I. Thorsdottir, and G. Palsson. "Associations of Iron Status with Dietary and Other Factors in 6-Year-Old Children." *European Journal of Clinical Nutrition*, vol. 61, no. 3, 2007, pp. 398-403.
- Haidong, Z., W. Yan, G. Dongliang, F. A. Treiber, G. A. Harshfield, G. Kapuku, H. Snieder, and Y. Dong. "Relationships of Cardiovascular Phenotypes with Healthy Weight, at Risk of Overweight, and Overweight in US Youths." *Pediatrics*, vol. 121, no. 1, January 2008, pp. 115-122.
- He, F. J., N. M. Marrero, and G. A. MacGregor. "Salt Intake is Related to Soft Drink Consumption in Children and Adolescents: A Link to Obesity?" *Hypertension*, vol. 51, no. 3, 2008, pp. 629-634.
- Heffernan, T. M. and J. Bartholomew. "Does Excessive Alcohol use in Teenagers Affect their Everyday Prospective Memory?" *Journal of Adolescent Health*, vol. 39, no. 1, 2006, pp. 138-140.
- Holick, M. F. "High Prevalence of Vitamin D Inadequacy and Implications for Health.[See Comment]." *Mayo Clinic Proceedings*, vol. 81, no. 3, 2006, pp. 353-373.

- Hoppe, C., C. Molgaard, A. Vaag, V. Barkholt, and K. F. Michaelsen. "High Intakes of Milk, but Not Meat, Increase s-Insulin and Insulin Resistance in 8-Year-Old Boys." *European Journal of Clinical Nutrition*, vol. 59, no. 3, 2005, pp. 393-398.
- Horton, E. G. "Racial Differences in the Effects of Age of Onset on Alcohol Consumption and Development of Alcohol-Related Problems among Males from Mid-Adolescence to Young Adulthood." *Journal of Ethnicity in Substance Abuse*, vol. 6, no. 1, 2007, pp. 1-13.
- Jeffery, A., B. Metcalf, J. Hosking, L. D. Voss, and T. Wilkin. "Obesity-Linked Insulin Resistance in Children -- an Emerging Problem: The Early Bird Study (31)." *European Diabetes Nursing*, vol. 3, no. 1, 2006, pp. 41-45.
- Jobli, E. C., H. S. Dore, C. E. Werch, and M. J. Moore. "High Potency and Other Alcoholic Beverage Consumption among Adolescents." *Journal of Alcohol and Drug Education*, vol. 49, no. 4, 2005, pp. 45-67.
- Johnson, S. B., L. L. Pilkington, L. C. Deeb, S. Jeffers, J. He, and C. Lamp. "Prevalence of Overweight in North Florida Elementary and Middle School Children: Effects of Age, Sex, Ethnicity, and Socioeconomic Status." *Journal of School Health*, vol. 77, no. 9, 2007, pp. 630-636.
- Kersting, M., U. Alexy, and K. Clausen. "Using the Concept of Food Based Dietary Guidelines to Develop an Optimized Mixed Diet (OMD) for German Children and Adolescents." *Journal of Pediatric Gastroenterology & Nutrition*, vol. 40, no. 3, 2005, pp. 301-308.
- Kirk, S., M. Zeller, R. Claytor, M. Santangelo, P. R. Khoury, and S. R. Daniels. "The Relationship of Health Outcomes to Improvement in BMI in Children and Adolescents." *Obesity Research*, vol. 13, no. 5, 2005, pp. 876-882.
- Knol, L. L., B. Haughton, and E. C. Fitzhugh. "Dietary Patterns of Young, Low-Income US Children." *Journal of the American Dietetic Association*, vol. 105, no. 11, 2005, pp. 1765-1773.
- Kostyak, J. C., P. Kris-Etherton, D. Bagshaw, J. P. DeLany, and P. A. Farrell. "Relative Fat Oxidation is Higher in Children than Adults." *Nutrition Journal*, vol. 6, 2007, pp. 19.
- Kral, T. V., A. J. Stunkard, R. I. Berkowitz, V. A. Stallings, D. D. Brown, and M. S. Faith. "Daily Food Intake in Relation to Dietary Energy Density in the Free-Living Environment: A Prospective Analysis of Children Born at Different Risk of Obesity." *American Journal of Clinical Nutrition*, vol. 86, no. 1, 2007, pp. 41-47.
- Kranz, S. "Meeting the Dietary Reference Intakes for Fiber: Sociodemographic Characteristics of Preschoolers with High Fiber Intakes." *American Journal of Public Health*, vol. 96, no. 9, 2006, pp. 1538-1541.

- Kranz, S., T. Hartman, A. M. Siega-Riz, and A. H. Herring. "A Diet Quality Index for American Preschoolers Based on Current Dietary Intake Recommendations and an Indicator of Energy Balance." *Journal of the American Dietetic Association*, vol. 106, no. 10, 2006, pp. 1594-1604.
- Kranz, S., P. J. Lin, and D. A. Wagstaff. "Children's Dairy Intake in the United States: Too Little, Too Fat?" *Journal of Pediatrics*, vol. 151, no. 6, 2007, pp. 642; e-646.
- Kranz, S., L. J. Mahood, and D. A. Wagstaff. "Diagnostic Criteria Patterns of U.S. Children with Metabolic Syndrome: NHANES 1999-2002." *Nutrition Journal*, vol. 6, 2007, pp. 38.
- Kranz, S., D. C. Mitchell, A. M. Siega-Riz, and H. Smiciklas-Wright. "Dietary Fiber Intake by American Preschoolers is Associated with More Nutrient-Dense Diets." *Journal of the American Dietetic Association*, vol. 105, no. 2, 2005, pp. 221-225.
- Kranz, S., A. M. Siega-Riz, and A. H. Herring. "Changes in Diet Quality of American Preschoolers between 1977 and 1998." *American Journal of Public Health*, vol. 94, no. 9, 2004, pp. 1525-1530.
- Kranz, S., H. Smiciklas-Wright, and L. A. Francis. "Diet Quality, Added Sugar, and Dietary Fiber Intakes in American Preschoolers." *Pediatric Dentistry*, vol. 28, no. 2, 2006, pp. 164-171.
- Kranz, S., H. Smiciklas-Wright, A. M. Siega-Riz, and D. Mitchell. "Adverse Effect of High Added Sugar Consumption on Dietary Intake in American Preschoolers." *Journal of Pediatrics*, vol. 146, no. 1, 2005, pp. 105-111.
- Kwon, H. L., B. Ortiz, R. Swaner, K. Shoemaker, B. Jean-Louis, M. E. Northridge, R. D. Vaughan, T. Marx, A. Goodman, L. N. Borrell, S. W. Nicholas, and Harlem Children's Zone Asthma Initiative. "Childhood Asthma and Extreme Values of Body Mass Index: The Harlem Children's Zone Asthma Initiative." *Journal of Urban Health*, vol. 83, no. 3, 2006, pp. 421-433.
- Larson, N. I., D. Neumark-Sztainer, P. J. Hannan, and M. Story. "Trends in Adolescent Fruit and Vegetable Consumption, 1999-2004: Project EAT." *American Journal of Preventive Medicine*, vol. 32, no. 2, 2007, pp. 147-150.
- Lee, S. K., R. Novotny, Y. G. Daida, V. Vijayadeva, and J. Gittelsohn. "Dietary Patterns of Adolescent Girls in Hawaii Over a 2-Year Period." *Journal of the American Dietetic Association*, vol. 107, no. 6, 2007, pp. 956-961.
- Leonard, M. B., J. Shults, Wilson, A. M. Tershakovec, and Zemel. "Obesity during Childhood and Adolescence Augments Bone Mass and Bone Dimensions." *American Journal of Clinical Nutrition*, vol. 80, no. 2, 2004, pp. 514-523.

- 
- Lobstein, T. and R. Jackson-Leach. "Child Overweight and Obesity in the USA: Prevalence Rates According to IOTF Definitions." *International Journal of Pediatric Obesity*, vol. 2, no. 1, 2007, pp. 62-64.
- Lorch, S. M. and A. Sharkey. "Myocardial Velocity, Strain, and Strain Rate Abnormalities in Healthy Obese Children." *Journal of the CardioMetabolic Syndrome*, vol. 2, no. 1, Winter 2007, pp. 30-34.
- Marshall, T. A., J. M. Eichenberger Gilmore, B. Broffitt, P. J. Stumbo, and S. M. Levy. "Diet Quality in Young Children is Influenced by Beverage Consumption." *Journal of the American College of Nutrition*, vol. 24, no. 1, 2005, pp. 65-75.
- Mattila, M. L., P. Rautava, M. Aromaa, A. Ojanlatva, P. Paunio, L. Hyssala, H. Helenius, and M. Sillanpaa. "Behavioural and Demographic Factors during Early Childhood and Poor Dental Health at 10 Years of Age." *Caries Research*, vol. 39, no. 2, 2005, pp. 85-91.
- Mazurek, J., E. Salehi, D. Propes, J. Holt, T. Bannerman, L. M. Nicholson, M. Bundesen, R. Duffy, and R. L. Moolenaar. "A Multistate Outbreak of Salmonella Enterica Serotype Typhimurium Infection Linked to Raw Milk Consumption--Ohio, 2003." *Journal of Food Protection*, vol. 67, no. 10, 2004, pp. 2165-2170.
- McConahy, K., H. Smiciklas-Wright, D. C. Mitchell, and M. Picciano. "Portion Size of Common Foods Predicts Energy Intake among Preschool-Aged Children." *Journal of the American Dietetic Association*, vol. 104, no. 6, June 2004, pp. 975-979.
- McNaughton, S. A., K. Ball, G. D. Mishra, and D. A. Crawford. "Dietary Patterns of Adolescents and Risk of Obesity and Hypertension." *Journal of Nutrition*, vol. 138, no. 2, 2008, pp. 364-370.
- Miller<sup>1</sup>, J. W., T. S. Naimi, R. D. Brewer, and S. E. Jones. "Binge Drinking and Associated Health Risk Behaviors among High School Students." *Pediatrics*, vol. 119, no. 1, 2007, pp. 76-85.
- Moore, C. E., M. M. Murphy, and M. F. Holick. "Vitamin D Intakes by Children and Adults in the United States Differ among Ethnic Groups." *Journal of Nutrition*, vol. 135, no. 10, 2005, pp. 2478-2485.
- Mrdjenovic, G. and D. A. Levitsky. "Children Eat What They are Served: The Imprecise Regulation of Energy Intake." *Appetite*, vol. 44, no. 3, June 2005, pp. 273-282.
- Nead, K. G., J. S. Halterman, J. M. Kaczorowski, P. Auinger, and M. Weitzman. "Overweight Children and Adolescents: A Risk Group for Iron Deficiency." *Pediatrics*, vol. 114, no. 1, 2004, pp. 104-108.

---

<sup>1</sup> Met the criteria for a primary research article on alcoholic beverages.

- Newby, P. K. "Are Dietary Intakes and Eating Behaviors Related to Childhood Obesity? A Comprehensive Review of the Evidence." *Journal of Law, Medicine & Ethics*, vol. 35, no. 1, 2007, pp. 35-60.
- Nguyen, S., C. McCulloch, P. Brakeman, A. Portale, and C. Y. Hsu. "Being Overweight Modifies the Association between Cardiovascular Risk Factors and Microalbuminuria in Adolescents." *Pediatrics*, vol. 121, no. 1, 2008, pp. 37-45.
- Nicklas, T. A., D. Demory-Luce, S. J. Yang, T. Baranowski, I. Zakeri, and G. Berenson. "Children's Food Consumption Patterns have Changed Over Two Decades (1973-1994): The Bogalusa Heart Study." *Journal of the American Dietetic Association*, vol. 104, no. 7, 2004, pp. 1127-1140.
- Nicklas, T. A., J. S. Hampl, C. A. Taylor, V. J. Thompson, and W. C. Heird. "Monounsaturated Fatty Acid Intake by Children and Adults: Temporal Trends and Demographic Differences." *Nutrition Reviews*, vol. 62, no. 4, 2004, pp. 132-141.
- Nicklas, T. A., M. Morales, A. Linares, S. Yang, T. Baranowski, C. De Moor, and G. Berenson. "Children's Meal Patterns have Changed Over a 21-Year Period: The Bogalusa Heart Study." *Journal of the American Dietetic Association*, vol. 104, no. 5, May 2004, pp. 753-761.
- Ogden, C. L., M. D. Carroll, L. R. Curtin, M. A. McDowell, C. J. Tabak, and K. M. Flegal. "Prevalence of Overweight and Obesity in the United States, 1999-2004." *JAMA*, vol. 295, no. 13, 2006, pp. 1549-1555.
- Palmer, C. A. "Dental Caries and Obesity in Children: Different Problems, Related Causes." *Quintessence International*, vol. 36, no. 6, 2005, pp. 457-461.
- Patil<sup>2</sup>, S. R., S. Cates, and R. Morales. "Consumer Food Safety Knowledge, Practices, and Demographic Differences: Findings from a Meta-Analysis." *Journal of Food Protection*, vol. 68, no. 9, 2005, pp. 1884-1894.
- Piirainen, T., K. Laitinen, and E. Isolauri. "Impact of National Fortification of Fluid Milks and Margarines with Vitamin D on Dietary Intake and Serum 25-Hydroxyvitamin D Concentration in 4-Year-Old Children." *European Journal of Clinical Nutrition*, vol. 61, no. 1, 2007, pp. 123-128.
- Pinhas-Hamiel, O., L. Lerner-Geve, N. M. Copperman, and M. S. Jacobson. "Lipid and Insulin Levels in Obese Children: Changes with Age and Puberty." *Obesity*, vol. 15, no. 11, November 2007, pp. 2825-2831.

---

<sup>2</sup> Met the criteria for a primary research review article on food safety.

- Pitkanen<sup>3</sup>, T., A. Lyyra, and L. Pulkkinen. "Age of Onset of Drinking and the Use of Alcohol in Adulthood: A Follow-Up Study from Age 8-42 for Females and Males." *Addiction*, vol. 100, no. 5, 2005, pp. 652-661.
- Rajeshwari, R., T. A. Nicklas, S. J. Yang, and G. S. Berenson. "Longitudinal Changes in Intake and Food Sources of Calcium from Childhood to Young Adulthood: The Bogalusa Heart Study." *Journal of the American College of Nutrition*, vol. 23, no. 4, 2004, pp. 341-350.
- Rajeshwari, R., S. J. Yang, T. A. Nicklas, and G. S. Berenson. "Secular Trends in Children's Sweetened-Beverage Consumption (1973 to 1994): The Bogalusa Heart Study." *Journal of the American Dietetic Association*, vol. 105, no. 2, 2005, pp. 208-214.
- Roberts, C. K., A. K. Chen, and R. J. Barnard. "Effect of a Short-Term Diet and Exercise Intervention in Youth on Atherosclerotic Risk Factors." *Atherosclerosis*, vol. 191, no. 1, 2007, pp. 98-106.
- Rockell, J. E., S. M. Williams, R. W. Taylor, A. M. Grant, I. E. Jones, and A. Goulding. "Two-Year Changes in Bone and Body Composition in Young Children with a History of Prolonged Milk Avoidance." *Osteoporosis International*, vol. 16, no. 9, 2005, pp. 1016-1023.
- Rodriguez, S., C. Hotz, and J. A. Rivera. "Bioavailable Dietary Iron is Associated with Hemoglobin Concentration in Mexican Preschool Children." *The Journal of Nutrition*, vol. 137, no. 10, October 2007, pp. 2304-2310.
- Rogers, I. S., D. Gunnell, P. M. Emmett, L. R. Glynn, D. B. Dunger, and J. M. Holly. "Cross-Sectional Associations of Diet and Insulin-Like Growth Factor Levels in 7- to 8-Year-Old Children." *Cancer Epidemiology, Biomarkers & Prevention*, vol. 14, no. 1, 2005, pp. 204-212.
- Roth, D. E. "Bones and Beyond: An Update on the Role of Vitamin D in Child and Adolescent Health in Canada." *Applied Physiology, Nutrition, & Metabolism = Physiologie Appliquee, Nutrition Et Metabolisme*, vol. 32, no. 4, 2007, pp. 770-777.
- Savoye, M., M. Shaw, J. Dziura, W. V. Tamborlane, P. Rose, C. Guandalini, R. Goldberg-Gell, T. S. Burgert, A. M. Cali, R. Weiss, and S. Caprio. "Effects of a Weight Management Program on Body Composition and Metabolic Parameters in Overweight Children: A Randomized Controlled Trial." *JAMA*, vol. 297, no. 24, 2007, pp. 2697-2704.

---

<sup>3</sup> Met the criteria for a primary research article on alcoholic beverages.

- Schiel, R., W. Beltschikow, G. Kramer, and G. Stein. "Overweight, Obesity and Elevated Blood Pressure in Children and Adolescents." *European Journal of Medical Research*, vol. 11, no. 3, 2006, pp. 97-101.
- Schiel, R., W. Beltschikow, S. Radon, G. Kramer, T. Perenthaler, and G. Stein. "Increased Carotid Intima-Media Thickness and Associations with Cardiovascular Risk Factors in Obese and Overweight Children and Adolescents." *European Journal of Medical Research*, vol. 12, no. 10, 2007, pp. 503-508.
- Schmidt, M., S. G. Affenito, R. Striegel-Moore, P. R. Khoury, B. Barton, P. Crawford, S. Kronsberg, G. Schreiber, E. Obarzanek, and S. Daniels. "Fast-Food Intake and Diet Quality in Black and White Girls: The National Heart, Lung, and Blood Institute Growth and Health Study." *Archives of Pediatrics & Adolescent Medicine*, vol. 159, no. 7, 2005, pp. 626-631.
- Seiquer, I., J. DiazAlguacil, C. DelgadoAndrade, M. LopezFrias, A. Munoz Hoyos, G. Galdo, and M. P. Navarro. "Diets Rich in Maillard Reaction Products Affect Protein Digestibility in Adolescent Males Aged 11-14 y." *American Journal of Clinical Nutrition*, vol. 83, no. 5, 2006, pp. 1082-1088.
- Storey, M. L., R. A. Forshee, and P. A. Anderson. "Beverage Consumption in the US Population." *Journal of the American Dietetic Association*, vol. 106, no. 12, December 2006, pp. 1992-2000.
- Striegel-Moore, R. H., D. R. Thompson, S. G. Affenito, D. L. Franko, B. A. Barton, G. B. Schreiber, S. R. Daniels, M. Schmidt, and P. B. Crawford. "Fruit and Vegetable Intake: Few Adolescent Girls Meet National Guidelines." *Preventive Medicine*, vol. 42, no. 3, 2006, pp. 223-228.
- Sugiyama, T., D. Xie, R. C. Graham-Maar, K. Inoue, Y. Kobayashi, and N. Stettler. "Dietary and Lifestyle Factors Associated with Blood Pressure among U.S. Adolescents." *Journal of Adolescent Health*, vol. 40, no. 2, 2007, pp. 166-172.
- Taveras, E. M., C. S. Berkey, S. L. Rifas-Shiman, D. S. Ludwig, H. R. Rockett, A. E. Field, G. A. Colditz, and M. W. Gillman. "Association of Consumption of Fried Food Away from Home with Body Mass Index and Diet Quality in Older Children and Adolescents." *Pediatrics*, vol. 116, no. 4, 2005, pp. e518-24.
- Taylor, E. D., K. R. Theim, M. C. Mirch, S. Ghorbani, M. Tanofsky-Kraff, D. C. Adler-Wailes, S. Brady, J. C. Reynolds, K. A. Calis, and J. A. Yanovski. "Orthopedic Complications of Overweight in Children and Adolescents." *Pediatrics*, vol. 117, no. 6, 2006, pp. 2167-2174.
- Thorsdottir, I. and B. S. Gunnarsson. "Dietary Quality and Adequacy of Micronutrient Intakes in Children." *Proceedings of the Nutrition Society*, vol. 65, no. 4, 2006, pp. 366-375.



- Timlin, M. T., M. A. Pereira, M. Story, and D. Neumark-Sztainer. "Breakfast Eating and Weight Change in a 5-Year Prospective Analysis of Adolescents: Project EAT (Eating among Teens)." *Pediatrics*, vol. 121, no. 3, March 2008, pp. 638-645.
- Tompson, O. M., C. Ballew, K. Resnicow, A. Must, L. G. Bandini, H. Cyr, and W. H. Dietz. "Food Purchased Away from Home as a Predictor of Change in BMI z-Score among Girls." *International Journal of Obesity*, vol. 28, no. 2, February 2004, pp. 282-289.
- Tsai, H. J. and A. C. Tsai. "The Association of Diet with Respiratory Symptoms and Asthma in Schoolchildren in Taipei, Taiwan." *Journal of Asthma*, vol. 44, no. 8, 2007, pp. 599-603.
- Tudor-Locke, C., J. J. Kronenfeld, S. S. Kim, M. Benin, and M. Kuby. "A Geographical Comparison of Prevalence of Overweight School-Aged Children: The National Survey of Children's Health 2003." *Pediatrics*, vol. 120, no. 4, 2007, pp. e1043-50.
- US Preventive Services Task,Force. "Screening and Interventions for Overweight in Children and Adolescents: Recommendation Statement." *Pediatrics*, vol. 116, no. 1, 2005, pp. 205-209.
- Wang, Y. and Q. Zhang. "Are American Children and Adolescents of Low Socioeconomic Status at Increased Risk of Obesity? Changes in the Association between Overweight and Family Income between 1971 and 2002." *American Journal of Clinical Nutrition*, vol. 84, no. 4, 2006, pp. 707-716.
- Wang, Y. C., S. L. Gortmaker, A. M. Sobol, and K. M. Kuntz. "Estimating the Energy Gap among US Children: A Counterfactual Approach." *Pediatrics*, vol. 118, no. 6, 2006, pp. e1721-33.
- Wang, Z., S. Heshka, A. Pietrobelli, Z. Chen, A. M. Silva, L. B. Sardinha, J. Wang, D. Gallagher, and S. B. Heymsfield. "A New Total Body Potassium Method to Estimate Total Body Skeletal Muscle Mass in Children." *Journal of Nutrition*, vol. 137, no. 8, 2007, pp. 1988-1991.
- Wang, Z., S. Heshka, J. Wang, and S. B. Heymsfield. "Total Body Protein Mass: Validation of Total Body Potassium Prediction Model in Children and Adolescents." *Journal of Nutrition*, vol. 136, no. 4, 2006, pp. 1032-1036.
- Wansink, B. and J. Kim. "Bad Popcorn in Big Buckets: Portion Size can Influence Intake as Much as Taste." *Journal of Nutrition Education & Behavior*, vol. 37, no. 5, 2005, pp. 242-245.
- Wells, J. C., M. S. Fewtrell, J. E. Williams, D. Haroun, M. S. Lawson, and T. J. Cole. "Body Composition in Normal Weight, Overweight and Obese Children: Matched Case-Control Analyses of Total and Regional Tissue Masses, and Body Composition Trends in Relation to Relative Weight." *International Journal of Obesity*, vol. 30, no. 10, 2006, pp. 1506-1513.

- Wells, J. E., L. J. Horwood, and D. M. Fergusson. "Drinking Patterns in Mid-Adolescence and Psychosocial Outcomes in Late Adolescence and Early Adulthood." *Addiction*, vol. 99, no. 12, 2004, pp. 1529-1541.
- Wiley, A. S. "Does Milk make Children Grow? Relationships between Milk Consumption and Height in NHANES 1999-2002." *American Journal of Human Biology*, vol. 17, no. 4, 2005, pp. 425-441.
- Younus, M., M. J. Wilkins, M. M. Arshad, M. H. Rahbar, and A. M. Saeed. "Demographic Risk Factors and Incidence of Salmonella Enteritidis Infection in Michigan." *Foodborne Pathogens & Disease*, vol. 3, no. 3, 2006, pp. 266-273.
- Zhu, H., W. Yan, D. Ge, F. A. Treiber, G. A. Harshfield, G. Kapuku, H. Snieder, and Y. Dong. "Relationships of Cardiovascular Phenotypes with Healthy Weight, at Risk of Overweight, and Overweight in US Youths." *Pediatrics*, vol. 121, no. 1, 2008, pp. 115-122.
- Zhu, K., X. Du, C. T. Cowell, H. Greenfield, B. Blades, T. A. Dobbins, Q. Zhang, and D. R. Fraser. "Effects of School Milk Intervention on Cortical Bone Accretion and Indicators Relevant to Bone Metabolism in Chinese Girls Aged 10-12 y in Beijing." *American Journal of Clinical Nutrition*, vol. 81, no. 5, 2005, pp. 1168-1175.

## APPENDIX D

### PRIMARY CITATIONS

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1. Aeberli, I., M. B. Zimmermann, L. Molinari, R. Lehmann, D. l'Allemand, G. A. Spinas, and K. Berneis. "Fructose Intake is a Predictor of LDL Particle Size in Overweight Schoolchildren." *American Journal of Clinical Nutrition*, vol. 86, no. 4, 2007, pp. 1174-1178.
2. Alexy, U., T. Remer, F. Manz, C. M. Neu, and E. Schoenau. "Long-Term Protein Intake and Dietary Potential Renal Acid Load are Associated with Bone Modeling and Remodeling at the Proximal Radius in Healthy Children." *American Journal of Clinical Nutrition*, vol. 82, no. 5, 2005, pp. 1107-1114.
3. Alexy, U., W. Sichert-Hellert, M. Kersting, and V. Schultze-Pawlitschko. "Pattern of Long-Term Fat Intake and BMI during Childhood and Adolescence--Results of the DONALD Study." *International Journal of Obesity & Related Metabolic Disorders: Journal of the International Association for the Study of Obesity*, vol. 28, no. 10, 2004, pp. 1203-1209.
4. Amre, D. K., S. D'Souza, K. Morgan, G. Seidman, P. Lambrette, G. Grimard, D. Israel, D. Mack, P. Ghadirian, C. Deslandres, V. Chotard, B. Budai, L. Law, E. Levy, and E. G. Seidman. "Imbalances in Dietary Consumption of Fatty Acids, Vegetables, and Fruits are Associated with Risk for Crohn's Disease in Children." *American Journal of Gastroenterology*, vol. 102, no. 9, 2007, pp. 2016-2025.
5. Andersen L.F., I.T. Lillegaard, N. Overby, L. Lytle, K.I. Klepp, and L. Johansson. "Overweight and Obesity Among Norwegian Schoolchildren: Changes from 1993 to 2000." *Scandinavian Journal of Public Health*, vol. 33, no. 2, 2005, pp. 99-106.
6. Ariza, A. J., E. H. Chen, H. J. Binns, and K. K. Christoffel. "Risk Factors for Overweight in Five- to Six-Year-Old Hispanic-American Children: A Pilot Study." *Journal of Urban Health*, vol. 81, no. 1, March 2004, pp. 150-161.

7. Baker, J. L., L. W. Olsen, and T. I. Sorensen. "Childhood Body-Mass Index and the Risk of Coronary Heart Disease in Adulthood." *New England Journal of Medicine*, vol. 357, no. 23, 2007, pp. 2329-2337.
8. Barba, G., E. Troiano, P. Russo, A. Venezia, and A. Siani. "Inverse Association between Body Mass and Frequency of Milk Consumption in Children." *British Journal of Nutrition*, vol. 93, no. 1, 2005, pp. 15-19.
9. Barton, B. A., A. L. Eldridge, D. Thompson, S. G. Affenito, R. H. Striegel-Moore, D. L. Franko, A. M. Albertson, and S. J. Crockett. "The Relationship of Breakfast and Cereal Consumption to Nutrient Intake and Body Mass Index: The National Heart, Lung, and Blood Institute Growth and Health Study." *Journal of the American Dietetic Association*, vol. 105, no. 9, 2005, pp. 1383-1389.
10. Berkey, C. S., H. R. Rockett, W. C. Willett, and G. A. Colditz. "Milk, Dairy Fat, Dietary Calcium, and Weight Gain: A Longitudinal Study of Adolescents." *Archives of Pediatrics & Adolescent Medicine*, vol. 159, no. 6, 2005, pp. 543-550.
11. Blum, J., D. Jacobsen, and J. Donnelly. "Beverage Consumption Patterns in Elementary School Aged Children across a Two-Year Period." *Journal of the American College of Nutrition*, vol. 24, no. 2, 2005, pp. 93-98.
12. Bolte, G., I. Kompauer, M. Fobker, P. Cullen, U. Keil, E. Mutius, and S. K. Weiland. "Fatty Acids in Serum Cholesteryl Esters in Relation to Asthma and Lung Function in Children." *Clinical & Experimental Allergy*, vol. 36, no. 3, 2006, pp. 293-302.
13. Bounds, W., J. Skinner, B. R. Carruth, and P. Ziegler. "The Relationship of Dietary and Lifestyle Factors to Bone Mineral Indexes in Children." *Journal of the American Dietetic Association*, vol. 105, no. 5, 2005, pp. 735-741.
14. Braun, M., B. R. Martin, M. Kern, G. McCabe, M. Peacock, Z. Jiang, and C. Weaver. "Calcium Retention in Adolescent Boys on a Range of Controlled Calcium Intakes." *American Journal of Clinical Nutrition*, vol. 84, no. 2, 2006, pp. 414-418.
15. Burns, J. S., D. W. Dockery, L. M. Neas, J. Schwartz, B. A. Coull, M. Raizenne, and F. E. Speizer. "Low Dietary Nutrient Intakes and Respiratory Health in Adolescents." *Chest*, vol. 132, no. 1, 2007, pp. 238-245.
16. Cheng, S., A. Lyytikainen, H. Kroger, C. Lamberg-Allardt, M. Alen, A. Koistinen, Q. J. Wang, M. Suuriniemi, H. Suominen, A. Mahonen, P. H. Nicholson, K. K. Ivaska, R. Korpela, C. Ohlsson, K. H. Vaananen, and F. Tylavsky. "Effects of Calcium, Dairy Product, and Vitamin D Supplementation on Bone Mass Accrual and Body Composition in 10-12-y-Old Girls: A 2-y Randomized Trial." *American Journal of Clinical Nutrition*, vol. 82, no. 5, 2005, pp. 1115-1126.

17. Connelly, J. B., M. J. Duaso, and G. Butler. "A Systematic Review of Controlled Trials of Interventions to Prevent Childhood Obesity and Overweight: A Realistic Synthesis of the Evidence." *Public Health*, vol. 121, no. 7, 2007, pp. 510-517.
18. Crimmins, N. A., L. M. Dolan, L. J. Martin, J. A. Bean, S. R. Daniels, M. L. Lawson, E. Goodman, and J. G. Woo. "Stability of Adolescent Body Mass Index during Three Years of Follow-Up." *Journal of Pediatrics*, vol. 151, no. 4, 2007, pp. 383-387.
19. Crowe, F. L., C. M. Skeaff, T. J. Green, and A. R. Gray. "Serum Fatty Acids as Biomarkers of Fat Intake Predict Serum Cholesterol Concentrations in a Population-Based Survey of New Zealand Adolescents and Adults." *American Journal of Clinical Nutrition*, vol. 83, no. 4, 2006, pp. 887-894.
20. Cullen, K., T. Baranowski, L. Klesges, K. Watson, N. Sherwood, M. Story, I. Zakeri, D. Leachman-Slawson, and C. Pratt. "Anthropometric, Parental, and Psychosocial Correlates of Dietary Intake of African-American Girls." *Obesity Research*, vol. 12, Supplement September 2004, pp. 20S-31S.
21. Davis, J. N., K. E. Alexander, E. E. Ventura, L. A. Kelly, C. J. Lane, C. E. Byrd-Williams, C. M. Toledo-Corral, C. K. Roberts, D. Spruijt-Metz, M. J. Weigensberg, and M. I. Goran. "Associations of Dietary Sugar and Glycemic Index with Adiposity and Insulin Dynamics in Overweight Latino Youth." *American Journal of Clinical Nutrition*, vol. 86, no. 5, 2007, pp. 1331-1338.
22. Davis, J. N., E. E. Ventura, M. J. Weigensberg, G. D. Ball, M. L. Cruz, G. Q. Shaibi, and M. I. Goran. "The Relation of Sugar Intake to Beta Cell Function in Overweight Latino Children." *American Journal of Clinical Nutrition*, vol. 82, no. 5, 2005, pp. 1004-1010.
23. Deshmukh-Taskar, P., T. A. Nicklas, M. Morales, S. J. Yang, I. Zakeri, and G. S. Berenson. "Tracking of Overweight Status from Childhood to Young Adulthood: The Bogalusa Heart Study." *European Journal of Clinical Nutrition*, vol. 60, no. 1, 2006, pp. 48-57.
24. Dixon, L. B., M. A. Pellizzon, A. F. Jawad, and A. M. Tershakovec. "Calcium and Dairy Intake and Measures of Obesity in Hyper- and Normocholesterolemic Children." *Obesity Research*, vol. 13, no. 10, 2005, pp. 1727-1738.
25. Dubois, L., A. Farmer, M. Girard, and K. Peterson. "Regular Sugar-Sweetened Beverage Consumption between Meals Increases Risk of Overweight among Preschool-Aged Children." *Journal of the American Dietetic Association*, vol. 107, no. 6, 2007, pp. 924-934.
26. Dugmore, C. R. and W. P. Rock. "A Multifactorial Analysis of Factors Associated with Dental Erosion." *British Dental Journal*, vol. 196, no. 5, 2004, pp. 283-286.

27. Ebbeling, C. B., H. A. Feldman, S. K. Osganian, V. R. Chomitz, S. J. Ellenbogen, and D. S. Ludwig. "Effects of Decreasing Sugar-Sweetened Beverage Consumption on Body Weight in Adolescents: A Randomized, Controlled Pilot Study." *Pediatrics*, vol. 117, no. 3, 2006, pp. 673-680.
28. Evers, S., R. Arnold, T. Hamilton, and C. Midgett. "Persistence of Overweight among Young Children Living in Low Income Communities in Ontario." *Journal of the American College of Nutrition*, vol. 26, no. 3, 2007, pp. 219-224.
29. Fiorito, L. M., D. C. Mitchell, H. Smiciklas-Wright, and L. L. Birch. "Girls' Calcium Intake is Associated with Bone Mineral Content during Middle Childhood." *Journal of Nutrition*, vol. 136, no. 5, 2006, pp. 1281-1286.
30. Fisher, J. O., D. C. Mitchell, H. Smiciklas-Wright, M. L. Mannino, and L. L. Birch. "Meeting Calcium Recommendations during Middle Childhood Reflects Mother-Daughter Beverage Choices and Predicts Bone Mineral Status." *American Journal of Clinical Nutrition*, vol. 79, no. 4, April 2004, pp. 698-706.
31. Flaherman, V. and G. W. Rutherford. "A Meta-Analysis of the Effect of High Weight on Asthma." *Archives of Disease in Childhood*, vol. 91, no. 4, 2006, pp. 334-339.
32. Forshee R.A., P.A. Anderson, and M.L. Story. "The Role of Beverage Consumption, Physical Activity, Sedentary Behavior, and Demographics on Body Mass Index of Adolescents." *International Journal of Food Sciences and Nutrition*, vol. 55, no. 6, 2004, pp. 463-478.
33. Frazier, A. L., L. Li, E. Cho, W. C. Willett, and G. A. Colditz. "Adolescent Diet and Risk of Breast Cancer." *Cancer Causes & Control*, vol. 15, no. 1, 2004, pp. 73-82.
34. Freedman, D. S., L. K. Khan, M. K. Serdula, W. H. Dietz, S. R. Srinivasan, and G. S. Berenson. "The Relation of Childhood BMI to Adult Adiposity: The Bogalusa Heart Study." *Pediatrics*, vol. 115, no. 1, 2005, pp. 22-27.
35. Galassetti, P., J. Larson, K. Iwanaga, S. L. Salsberg, A. Eliakim, and A. Pontello. "Effect of a High-Fat Meal on the Growth Hormone Response to Exercise in Children." *Journal of Pediatric Endocrinology*, vol. 19, no. 6, 2006, pp. 777-786.
36. Garces, C., B. Cano, M. A. Lasuncion, A. Mangas, M. Benavente, I. de Oya, A. Studer, and M. de Oya. "Dehydroepiandrosterone Sulfate and High-Density Lipoprotein-Cholesterol Levels in Overweight Children." *Obesity*, vol. 15, no. 5, 2007, pp. 1147-1154.
37. Garnett, S. P., L. A. Baur, S. Srinivasan, J. W. Lee, and C. T. Cowell. "Body Mass Index and Waist Circumference in Midchildhood and Adverse Cardiovascular Disease Risk Clustering in Adolescence." *The American Journal of Clinical Nutrition*, vol. 86, no. 3, September 2007, pp. 549-555.

- 
38. Goulding, A., J. E. P. Rockell, R. E. Black, A. M. Grant, I. E. Jones, and S. M. Williams. "Children Who Avoid Drinking Cow's Milk Are at Increased Risk for Prepubertal Bone Fractures." *Journal of the American Dietetic Association*, vol. 104, no. 2, 2004, pp. 250-253.
  39. Guerra, A., H. Demmelmair, A. M. Toschke, and B. Koletzko. "Three-Year Tracking of Fatty Acid Composition of Plasma Phospholipids in Healthy Children." *Annals of Nutrition & Metabolism*, vol. 51, no. 5, 2007, pp. 433-438.
  40. Gunther, A. L. B., T. Remer, A. Kroke, and A. E. Buyken. "Early Protein Intake and Later Obesity Risk: Which Protein Sources at which Time Points Throughout Infancy and Childhood are Important for Body Mass Index and Body Fat Percentage at 7 Years of Age?" *American Journal of Clinical Nutrition*, vol. 86, no. 6, December 2007, pp. 1765-1772.
  41. Harris, R., A. D. Nicoll, P. M. Adair, and C. M. Pine. "Risk Factors for Dental Caries in Young Children: A Systematic Review of the Literature." *Community Dental Health*, vol. 21, no. 1 Suppl., 2004, pp. 71-85.
  42. He, F. J., N. M. Marrero, and G. A. Macgregor. "Salt and Blood Pressure in Children and Adolescents." *Journal of Human Hypertension*, vol. 22, no. 1, 2008, pp. 4-11.
  43. He, F. J. and G. A. MacGregor. "Importance of Salt in Determining Blood Pressure in Children: Meta-Analysis of Controlled Trials.[See Comment]." *Hypertension*, vol. 48, no. 5, 2006, pp. 861-869.
  44. Huang, T. T., N. C. Howarth, B. H. Lin, S. B. Roberts, and M. A. McCrory. "Energy Intake and Meal Portions: Associations with BMI Percentile in U.S. Children." *Obesity Research*, vol. 12, no. 11, 2004, pp. 1875-1885.
  45. Johnson, L., A. P. Mander, L. R. Jones, P. M. Emmett, and S. A. Jebb. "Is Sugar-Sweetened Beverage Consumption Associated with Increased Fatness in Children?." *Nutrition*, vol. 23, no. 7-8, 2007, pp. 557-563.
  46. King, D. E., A. G. Mainous 3rd, M. E. Geesey, and T. Ellis. "Magnesium Intake and Serum C-Reactive Protein Levels in Children." *Magnesium Research*, vol. 20, no. 1, 2007, pp. 32-36.
  47. Koenigsberg, J., G. S. Boyd, S. S. Gidding, S. G. Hassink, and B. Falkner. "Association of Age and Sex with Cardiovascular Risk Factors and Insulin Sensitivity in Overweight Children and Adolescents." *Journal of the CardioMetabolic Syndrome*, vol. 1, no. 4, 2006, pp. 253-258.
  48. Kvaavik E., L.F. Andersen, and K.I. Klepp. "The Stability of Soft Drinks Intake from Adolescence to Adult Age and the Association Between Long-Term Consumption of Soft Drinks and Lifestyle Factors and Body Weight." *Public Health Nutrition*, vol. 8, no. 2, 2005, pp. 149-157.

49. Lanou, A. J., S. E. Berkow, and N. D. Barnard. "Calcium, Dairy Products, and Bone Health in Children and Young Adults: A Reevaluation of the Evidence.[See Comment]." *Pediatrics*, vol. 115, no. 3, 2005, pp. 736-743.
50. Lappe, J. M., K. A. Rafferty, K. M. Davies, and G. Lypaczewski. "Girls on a High-Calcium Diet Gain Weight at the Same Rate as Girls on a Normal Diet: A Pilot Study." *Journal of the American Dietetic Association*, vol. 104, no. 9, 2004, pp. 1361-1367.
51. LaRowe, T. L., S. M. Moeller, and A. K. Adams. "Beverage Patterns, Diet Quality, and Body Mass Index of US Preschool and School-Aged Children." *Journal of the American Dietetic Association*, vol. 107, no. 7, 2007, pp. 1124-1133.
52. Levine, R. S., Z. J. Nugent, M. C. Rudolf, and P. Sahota. "Dietary Patterns, Toothbrushing Habits and Caries Experience of Schoolchildren in West Yorkshire, England." *Community Dental Health*, vol. 24, no. 2, 2007, pp. 82-87.
53. Li, J. and Y. Wang. "Tracking of Dietary Intake Patterns is Associated with Baseline Characteristics of Urban Low-Income African-American Adolescents." *Journal of Nutrition*, vol. 138, no. 1, 2008, pp. 94-100.
54. Lutsey, P. L., L. M. Steffen, H. A. Feldman, D. H. Hoelscher, L. S. Webber, R. V. Luepker, L. A. Lytle, M. Zive, and S. K. Osganian. "Serum Homocysteine is Related to Food Intake in Adolescents: The Child and Adolescent Trial for Cardiovascular Health." *American Journal of Clinical Nutrition*, vol. 83, no. 6, 2006, pp. 1380-1386.
55. Ma D. and G. Jones. "Soft Drink and Milk Consumption, Physical Activity, Bone Mass, and Upper Limb Fractures in Children: a Population-Based Case-Control Study." *Calcified Tissue International*, vol. 75, no. 4, 2004, pp. 286-291.
56. Malik, V. S., M. B. Schulze, and F. B. Hu. "Intake of Sugar-Sweetened Beverages and Weight Gain: A Systematic Review." *American Journal of Clinical Nutrition*, vol. 84, no. 2, 2006, pp. 274-288.
57. Marshall, T. A., J. M. Eichenberger-Gilmore, B. A. Broffitt, J. J. Warren, and S. M. Levy. "Dental Caries and Childhood Obesity: Roles of Diet and Socioeconomic Status." *Community Dentistry & Oral Epidemiology*, vol. 35, no. 6, 2007, pp. 449-458.
58. Marshall, T. A., B. Broffitt, J. Eichenberger-Gilmore, J. J. Warren, M. A. Cunningham, and S. M. Levy. "The Roles of Meal, Snack, and Daily Total Food and Beverage Exposures on Caries Experience in Young Children." *Journal of Public Health Dentistry*, vol. 65, no. 3, 2005, pp. 166-173.
59. Martin, R. M., J. M. Holly, N. Middleton, G. Davey Smith, and D. Gunnell. "Childhood Diet and Insulin-Like Growth Factors in Adulthood: 65-Year Follow-Up of the Boyd Orr Cohort." *European Journal of Clinical Nutrition*, vol. 61, no. 11, 2007, pp. 1281-1292.



- 
60. Melgar-Quinonez, H. and L. L. Kaiser. "Relationship of Child Feeding Practices to Overweight in Low-Income Mexican- American Preschool-Aged Children." *Journal of the American Dietetic Association*, vol. 104, no. 7, July 2004, pp. 1110-1119.
  61. Moore, L. L., M. L. Bradlee, D. Gao, and M. R. Singer. "Low Dairy Intake in Early Childhood Predicts Excess Body Fat Gain." *Obesity*, vol. 14, no. 6, 2006, pp. 1010-1018.
  62. Moore, L. L., M. R. Singer, M. L. Bradlee, L. Djousse, M. H. Proctor, L. A. Cupples, and R. C. Ellison. "Intake of Fruits, Vegetables, and Dairy Products in Early Childhood and Subsequent Blood Pressure Change." *Epidemiology*, vol. 16, no. 1, 2005, pp. 4-11.
  63. Morrison, J. A., L. A. Friedman, P. Wang, and C. J. Glueck. "Metabolic Syndrome in Childhood Predicts Adult Metabolic Syndrome and Type 2 Diabetes Mellitus 25 to 30 Years Later." *The Journal of Pediatrics*, vol. 152, no. 2, February 2008, pp. 201-206.
  64. Morrison, J. A., L. A. Friedman, W. R. Harlan, L. C. Harlan, B. A. Barton, G. B. Schreiber, and D. J. Klein. "Development of the Metabolic Syndrome in Black and White Adolescent Girls: A Longitudinal Assessment." *Pediatrics*, vol. 116, no. 5, November 2005, pp. 1178-1182.
  65. Must, A., E. N. Naumova, S. M. Phillips, M. Blum, B. Dawson-Hughes, and W. M. Rand. "Childhood Overweight and Maturation Timing in the Development of Adult Overweight and Fatness: The Newton Girls Study and its Follow-Up." *Pediatrics*, vol. 116, no. 3, 2005, pp. 620-627.
  66. Nader, P. R., M. O'Brien, R. Houts, R. Bradley, J. Belsky, R. Crosnoe, S. Friedman, Z. Mei, E. J. Susman, and National Institute of Child Health and Human Development Early Child Care Research Network. "Identifying Risk for Obesity in Early Childhood." *Pediatrics*, vol. 118, no. 3, 2006, pp. e594-601. [Erratum in *Pediatrics* 2006 Nov;118(5):2270]
  67. Niemeier, H. M., H. A. Raynor, E. E. Lloyd-Richardson, M. L. Rogers, and R. R. Wing. "Fast Food Consumption and Breakfast Skipping: Predictors of Weight Gain from Adolescence to Adulthood in a Nationally Representative Sample." *Journal of Adolescent Health*, vol. 39, no. 6, December 2006, pp. 842-849.
  68. Niinikoski, H., H. Lagstrom, E. Jokinen, M. Siltala, T. Ronnema, J. Viikari, O. T. Raitakari, A. Jula, J. Marniemi, K. Nanto-Salonen, and O. Simell. "Impact of Repeated Dietary Counseling between Infancy and 14 Years of Age on Dietary Intakes and Serum Lipids and Lipoproteins: The STRIP Study." *Circulation*, vol. 116, no. 9, 2007, pp. 1032-1040.
  69. Nja, F., W. Nystad, K. C. Lodrup Carlsen, O. Hetlevik, and K. H. Carlsen. "Effects of Early Intake of Fruit Or Vegetables in Relation to Later Asthma and Allergic

- Sensitization in School-Age Children." *Acta Paediatrica*, vol. 94, no. 2, 2005, pp. 147-154.
70. Novotny R., Y.G. Daida, S. Acharya, J.S. Grove, and T.M. Vogt. "Dairy Intake is Associated with Lower Body Fat and Soda Intake with Greater Weight in Adolescent Girls." *Journal of Nutrition*, vol. 134, no. 8, 2004a, pp. 1905-1909.
  71. Novotny, R., Y. G. Daida, J. S. Grove, S. Acharya, T. M. Vogt, and D. Paperny. "Adolescent Dairy Consumption and Physical Activity Associated with Bone Mass." *Preventive Medicine*, vol. 39, no. 2, 2004b, pp. 355-360.
  72. O'Connor, T. M., S. J. Yang, and T. A. Nicklas. "Beverage Intake among Preschool Children and its Effect on Weight Status." *Pediatrics*, vol. 118, no. 4, 2006, pp. e1010-8.
  73. Oddy, W. H., N. H. de Klerk, G. E. Kendall, S. Mhrshahi, and J. K. Peat. "Ratio of Omega-6 to Omega-3 Fatty Acids and Childhood Asthma." *Journal of Asthma*, vol. 41, no. 3, 2004, pp. 319-326.
  74. Okoko, B. J., P. G. Burney, R. B. Newson, J. F. Potts, and S. O. Shaheen. "Childhood Asthma and Fruit Consumption." *European Respiratory Journal*, vol. 29, no. 6, 2007, pp. 1161-1168.
  75. Palacios C., K. Wigertz, B.R. Martin, L. Jackman, J.H. Pratt, M. Peacock, G. McCabe, and C.M. Weaver. "Sodium Retention in Black and White Female Adolescents in Response to Salt Intake." *Journal of Clinical Endocrinology and Metabolism*, vol. 89, no. 4, 2004, pp. 1858-1863.
  76. Prynne, C. J., G. D. Mishra, M. A. O'Connell, G. Muniz, M. A. Laskey, L. Yan, A. Prentice, and F. Ginty. "Fruit and Vegetable Intakes and Bone Mineral Status: A Cross Sectional Study in 5 Age and Sex Cohorts." *American Journal of Clinical Nutrition*, vol. 83, no. 6, 2006, pp. 1420-1428.
  77. Rodearmel, S. J., H. R. Wyatt, N. Stroebele, S. M. Smith, L. G. Ogden, and J. O. Hill. "Small Changes in Dietary Sugar and Physical Activity as an Approach to Preventing Excessive Weight Gain: The America on the Move Family Study." *Pediatrics*, vol. 120, no. 4, 2007, pp. e869-79.
  78. Roseman, M. G., W. K. Yeung, and J. Nickelsen. "Examination of Weight Status and Dietary Behaviors of Middle School Students in Kentucky." *Journal of the American Dietetic Association*, vol. 107, no. 7, July 2007, pp. 1139-1145.
  79. Rosenbauer, J., P. Herzig, P. Kaiser, and G. Giani. "Early Nutrition and Risk of Type 1 Diabetes Mellitus--a Nationwide Case-Control Study in Preschool Children." *Experimental & Clinical Endocrinology & Diabetes*, vol. 115, no. 8, 2007, pp. 502-508.
  80. Rzehak, P. and J. Heinrich. "Development of Relative Weight, Overweight and Obesity from Childhood to Young Adulthood. A Longitudinal Analysis of Individual

- 
- Change of Height and Weight." *European Journal of Epidemiology*, vol. 21, no. 9, 2006, pp. 661-672.
81. Sanigorski, A. M., A. C. Bell, and B. A. Swinburn. "Association of Key Foods and Beverages with Obesity in Australian Schoolchildren." *Public Health Nutrition*, vol. 10, no. 2, February 2007, pp. 152-157.
  82. Sarnblad, S., U. Ekelund, and J. Aman. "Dietary Fat Intake Predicts 1-Year Change in Body Fat in Adolescent Girls with Type 1 Diabetes." *Diabetes Care*, vol. 29, no. 6, 2006, pp. 1227-1230.
  83. Schack-Nielsen, L., C. Molgaard, D. Larsen, C. Martyn, and K. F. Michaelsen. "Arterial Stiffness in 10-Year-Old Children: Current and Early Determinants." *British Journal of Nutrition*, vol. 94, no. 6, 2005, pp. 1004-1011.
  84. Skinner, J. D., W. Bounds, B. R. Carruth, M. Morris, and P. Ziegler. "Predictors of Children's Body Mass Index: A Longitudinal Study of Diet and Growth in Children Aged 2-8 y." *International Journal of Obesity*, vol. 28, no. 4, 2004, pp. 476-482.
  85. Slyper, A., J. Jurva, J. Pleuss, R. Hoffmann, and D. Guttermann. "Influence of Glycemic Load on HDL Cholesterol in Youth." *American Journal of Clinical Nutrition*, vol. 81, no. 2, 2005, pp. 376-379.
  86. Snetselaar, L., P. Stumbo, C. Chenard, L. Ahrens, K. Smith, and B. Zimmerman. "Adolescents Eating Diets Rich in Either Lean Beef Or Lean Poultry and Fish Reduced Fat and Saturated Fat Intake and Those Eating Beef Maintained Serum Ferritin Status." *Journal of the American Dietetic Association*, vol. 104, no. 3, 2004, pp. 424-428.
  87. Sohn, W., B. A. Burt, and M. R. Sowers. "Carbonated Soft Drinks and Dental Caries in the Primary Dentition." *Journal of Dental Research*, vol. 85, no. 3, 2006, pp. 262-266.
  88. Stallmann-Jorgensen, I. S., B. Gutin, J. L. Hatfield-Laube, M. C. Humphries, M. H. Johnson, and P. Barbeau. "General and Visceral Adiposity in Black and White Adolescents and their Relation with Reported Physical Activity and Diet." *International Journal of Obesity*, vol. 31, no. 4, 2007, pp. 622-629.
  89. Stang, A., W. Ahrens, C. Baumgardt-Elms, C. Stegmaier, H. Merzenich, M. de Vrese, J. Schrezenmeier, and K. H. Jockel. "Adolescent Milk Fat and Galactose Consumption and Testicular Germ Cell Cancer." *Cancer Epidemiology, Biomarkers & Prevention*, vol. 15, no. 11, 2006, pp. 2189-2195.
  90. Striegel-Moore, R. H., D. Thompson, S. G. Affenito, D. L. Franko, E. Obarzanek, B. A. Barton, G. B. Schreiber, S. R. Daniels, M. Schmidt, and P. B. Crawford. "Correlates of Beverage Intake in Adolescent Girls: The National Heart, Lung, and Blood Institute Growth and Health Study." *The Journal of Pediatrics*, vol. 148, no. 2, 2006, pp. 183-187.

91. Sunehag, A. L., G. Toffolo, M. Campioni, D. M. Bier, and M. W. Haymond. "Effects of Dietary Macronutrient Intake on Insulin Sensitivity and Secretion and Glucose and Lipid Metabolism in Healthy, Obese Adolescents." *Journal of Clinical Endocrinology & Metabolism*, vol. 90, no. 8, 2005, pp. 4496-4502.
92. Tabak, C., A. H. Wijga, G. de Meer, N. A. Janssen, B. Brunekreef, and H. A. Smit. "Diet and Asthma in Dutch School Children (ISAAC-2)." *Thorax*, vol. 61, no. 12, 2006, pp. 1048-1053.
93. Tam, C. S., S. P. Garnett, C. T. Cowell, K. Campbell, G. Cabrera, and L. A. Baur. "Soft Drink Consumption and Excess Weight Gain in Australian School Students: Results from the Nepean Study." *International Journal of Obesity*, vol. 30, no. 7, 2006, pp. 1091-1093.
94. te Velde, S. J., J. W. Twisk, and J. Brug. "Tracking of Fruit and Vegetable Consumption from Adolescence into Adulthood and its Longitudinal Association with Overweight." *British Journal of Nutrition*, vol. 98, no. 2, 2007, pp. 431-438.
95. Thompson, D. R., E. Obarzanek, D. L. Franko, B. A. Barton, J. Morrison, F. M. Biro, S. R. Daniels, and R. H. Striegel-Moore. "Childhood Overweight and Cardiovascular Disease Risk Factors: The National Heart, Lung, and Blood Institute Growth and Health Study." *Journal of Pediatrics*, vol. 150, no. 1, 2007, pp. 18-25.
96. Tylavsky, F. A., K. Holliday, R. Danish, C. Womack, J. Norwood, and L. Carbone. "Fruit and Vegetable Intakes are an Independent Predictor of Bone Size in Early Pubertal Children." *American Journal of Clinical Nutrition*, vol. 79, no. 2, 2004, pp. 311-317.
97. van der Pols, J. C., C. Bain, D. Gunnell, G. D. Smith, C. Frobisher, and R. M. Martin. "Childhood Dairy Intake and Adult Cancer Risk: 65-y Follow-Up of the Boyd Orr Cohort." *American Journal of Clinical Nutrition*, vol. 86, no. 6, December 2007, pp. 1722-1729.
98. Vartanian, L. R., M. B. Schwartz, and K. D. Brownell. "Effects of Soft Drink Consumption on Nutrition and Health: A Systematic Review and Meta-Analysis." *American Journal of Public Health*, vol. 97, no. 4, 2007, pp. 667-675.
99. Vatanparast, H., A. Baxter-Jones, R. A. Faulkner, D. A. Bailey, and S. J. Whiting. "Positive Effects of Vegetable and Fruit Consumption and Calcium Intake on Bone Mineral Accrual in Boys during Growth from Childhood to Adolescence: The University of Saskatchewan Pediatric Bone Mineral Accrual Study." *American Journal of Clinical Nutrition*, vol. 82, no. 3, 2005, pp. 700-706.
100. Viikari, J. S., H. Niinikoski, M. Juonala, O. T. Raitakari, H. Lagstrom, T. Kaitosaari, T. Ronnema, and O. Simell. "Risk Factors for Coronary Heart Disease in Children and Young Adults." vol. 93, no. 446, December 2004, pp. 34-42.

- 
101. Warner, M. L., K. Harley, A. Bradman, G. Vargas, and B. Eskenazi. "Soda Consumption and Overweight Status of 2-Year-Old Mexican-American Children in California." *Obesity*, vol. 14, no. 11, 2006, pp. 1966-1974.
  102. Weigensberg, M. J., G. D. Ball, G. Q. Shaibi, M. L. Cruz, B. A. Gower, and M. I. Goran. "Dietary Fat Intake and Insulin Resistance in Black and White Children." *Obesity Research*, vol. 13, no. 9, 2005, pp. 1630-1637.
  103. Welsh, J. A., M. E. Cogswell, S. Rogers, H. Rockett, Z. Mei, and L. M. Grummer-Strawn. "Overweight among Low-Income Preschool Children Associated with the Consumption of Sweet Drinks." *Pediatrics*, vol. 115, no. 2, February 2005, pp. e223-e229.
  104. Woo, K. S., P. Chook, C. W. Yu, R. Y. T. Sung, M. Qiao, S. S. F. Leung, C. W. K. Lam, C. Metreweli, and D. S. Celermajer. "Effects of Diet and Exercise on Obesity-Related Vascular Dysfunction in Children." *Circulation*, vol. 109, no. 16, April 2004, pp. 1981-1986.

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**APPENDIX E**  
**SUMMARY TABLES FOR 2004-2008**  
**PUBLISHED EVIDENCE**

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### ADEQUATE NUTRIENTS WITHIN CALORIE NEEDS

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	Alexy et al. 2005	Long-term protein intake and dietary potential renal acid load are associated with bone modeling and remodeling at the proximal radius in healthy children	2	229 children & adolescents 6-18 y/o			cohort (longitudinal)	X			X	
2	Barba et al. 2005	Inverse association between body mass and frequency of milk consumption in children	8	884 7 y/o not on dietary regimen selected out of 1,087 (M:F 451:433)			cross sectional					
3	Barton et al. 2005	The relationship of breakfast and cereal consumption to nutrient intake and body mass index: the National Heart, Lung, and Blood Institute Growth and Health Study	9	At baseline, 2,379 9-10 y/o girls (1,166 white, 1,213 AA) from Berkeley, CA; Cincinnati, OH; and Washington, DC. Participants from NHLBI Growth and Health Study. F/up at 19 y/o			cohort (longitudinal)			X	X	
4	Berkey et al. 2005	Milk, dairy fat, dietary calcium, and weight gain: a longitudinal study of adolescents	10	12,829 9-14 y/o US children			cohort (longitudinal)					
5	Bounds et al. 2005	The relationship of dietary and lifestyle factors to bone mineral indexes in children	13	52 healthy white children studied from 2 mo to 8 y/o (25 M, 27 F) and their mothers			cohort (longitudinal)	X			X	
6	Braun et al. 2006	Calcium retention in adolescent boys on a range of controlled calcium intakes	14	31 adolescent boys aged 12-15 yrs. Comparison group was 35 adolescent girls previously studied.		metabolic crossover						
7	Burns et al. 2007	Low dietary nutrient intakes and respiratory health in adolescents	15	2,112 12th-graders from 13 US and Canadian communities in 1998-99 school yr			cross sectional					
8	Cheng et al. 2005	Effects of calcium, dairy product, and vitamin D supplementation on bone mass accrual and body composition in 10-12-y-old girls: a 2-y randomized trial	16	195 10-12 y/o, Tanner stage I-II girls w/Ca intakes 50%		RCT						



#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
9	Fiorito et al. 2006	Girls' Calcium Intake Is Associated with Bone Mineral Content During Middle Childhood	29	151 non-Hispanic white girls			cohort (longitudinal)	X			X	
10	Fisher et al. 2004	Meeting calcium recommendations during middle childhood reflects mother-daughter beverage choices and predicts bone mineral status	30	192 5, 7, 9 y/o non-Hispanic white girls and mothers			cohort (longitudinal)	X			X	
11	Frazier et al. 2004	Adolescent diet and risk of breast cancer	33	47,355 participants in the Nurses Health Study II			cohort (retrospective)	X				X
12	Goulding et al. 2004	Children who avoid drinking cow's milk are at increased risk for prepubertal bone fractures	38	50 3-13 y/o (30 girls, 20 boys) who had avoided drinking cow's milk for prolonged periods, and 22/50 overweight; these 50 compared w/ a birth cohort of >1,000 children in same city.			cross sectional					
13	Gunther et al. 2007	Early protein intake and later obesity risk: Which protein sources at which time points throughout infancy and childhood are important for body mass index and body fat percentage at 7 years of age?	40	203 6 mo-7 y/o in the Dortmund Nutritional and Longitudinally Designed Study who had diet information			cohort (longitudinal)	X			X	
14	King et al. 2007	Magnesium intake and serum C-reactive protein levels in children	46	6-17 y/o in NHANES			cross sectional					
15	Lanou et al. 2005	Calcium, dairy products, and bone health in children and young adults: a reevaluation of the evidence	49	1-25 y/o	X	RCT (13)	cross-sectional (22); retrospective (13), and longitudinal prospective studies (10)	X			X	X

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
16	Lappe et al. 2004	Girls on a high-calcium diet gain weight at the same rate as girls on a normal diet: a pilot study	50	59 9 y/o girls in metropolitan Omaha, NE communities		RCT		X			X	
17	LaRowe et al. 2007	Beverage patterns, diet quality, and body mass index of US preschool and school-aged children	51	541 Two-5 y/o and 793 six-11 y/o children from 2001-2002 NHANES			cross sectional					
18	Martin et al. 2007	Childhood diet and insulin-like growth factors in adulthood: 65-year follow-up of the Boyd Orr Cohort	59	Baseline: 679 2.9-9.6 y/o (median 5.8 y/o) in the Carnegie (Boyd Orr) Survey of Diet and Health 1937-1939 in England and Scotland; f/up 65 for yrs			cohort (retrospective)					
19	Skinner et al. 2004	Predictors of children's body mass index: a longitudinal study of diet and growth in children aged 2-8 y	84	70 white, middle/upper SES children (37 M, 33 F) participating in longitudinal study from 2-9 y/o			cohort (longitudinal)	X		X	X	
20	Snetselaar et al. 2004	Adolescents eating diets rich in either lean beef or lean poultry and fish reduced fat and saturated fat intake and those eating beef maintained serum ferritin status	86	86 7th and 8th graders		RCT						

## WEIGHT MANAGEMENT

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	Andersen et al. 2005	Overweight and obesity among Norwegian schoolchildren: Changes from 1993 to 2000	5	Nationally representative sample of 1,489 Norwegian 4th and 8th graders			cross sectional					
2	Baker et al. 2007	Childhood body-mass index and the risk of coronary heart disease in adulthood	7	276,835 Danish schoolchildren w/height and wt measurements			cohort (longitudinal)			X		X
3	Barton et al. 2005	The relationship of breakfast and cereal consumption to nutrient intake and body mass index: the National Heart, Lung, and Blood Institute Growth and Health Study	9	At baseline, 2,379 9-10 y/o girls (1,166 white, 1,213 AA) from Berkeley, CA; Cincinnati, OH; and Washington, DC. Participants from NHLBI Growth and Health Study. F/up at 19 y/o			cohort (longitudinal)			X	X	
4	Connelly et al. 2007	A systematic review of controlled trials of interventions to prevent childhood obesity and overweight: a realistic synthesis of the evidence	17	At least 30 children per trial from non clinical population	X	28 RCTs and controlled trials						
5	Crimmins et al. 2007	Stability of adolescent body mass index during three years of follow-up	18	1,746 adolescents in school-based study			cohort (longitudinal)			X	X	
6	Deshmukh-Taskar et al. 2006	Tracking of overweight status from childhood to young adulthood: the Bogalusa Heart Study	23	841 19-35 y/o (68% Euro-Americans, 32% African-Americans) who also did a survey at 9-11 y/o			cohort (longitudinal) created from cross sectional surveys			X		X
7	Evers et al. 2007	Persistence of overweight among young children living in low income communities in Ontario	28	760 jr kindergarteners-3rd graders; from economically disadvantaged communities in Ontario, Canada in the Better Beginnings, Better Futures project.			cohort (longitudinal)			X	X	
8	Flaherman & Rutherford 2006	A meta-analysis of the effect of high weight on asthma	31	Children	X		cohort studies (12)	X			X	

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
9	Forshee et al. 2004	The role of beverage consumption, physical activity, sedentary behavior, and demographics on body mass index of adolescents	32	2,216 12-16 y/o sampled in the 1988-1994 NHANES			cross sectional					
10	Freedman et al. 2005	The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study	34	2,610 2-17 y/o (baseline); f/up age 18-37 y/o from Bogalusa Heart Study (1973-1996)			cohort (longitudinal)			X		X
11	Garces et al. 2007	Dehydroepiandrosterone sulfate and high-density lipoprotein-cholesterol levels in overweight children.	36	684 6-8 y/o (350 M, 334 F) categorized by overwt			cross sectional					
12	Garnett et al. 2007	Body mass index and waist circumference in midchildhood and adverse cardiovascular disease risk clustering in adolescence	37	342 8 y/o at baseline. 290 15 y/o at f/up.			cohort (longitudinal)	X			X	
13	Huang et al. 2004	Energy intake and meal portions: associations with BMI percentile in U.S. children	44	Overall sample: 1,077 3-5 y/o, 537 6-11 y/o, 381 12-19 y/o (1,005 M, 990 F) from USDA CSFII 1994-96 and 1998; Sample w/plausible reported energy intake =45.3%			cross sectional					
14	Koenigsberg et al. 2006	Association of age and sex with cardiovascular risk factors and insulin sensitivity in overweight children and adolescents	47	497 overwt 2-18 y/o (268 were 11 y/o and older)			cross sectional					
15	Li & Wang 2008	Tracking of dietary intake patterns is associated with baseline characteristics of urban low-income African-American adolescents	53	181 low-income African-American adolescents			cohort (longitudinal)	X	X		X	

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
16	Morrison et al. 2008	Metabolic syndrome in childhood predicts adult metabolic syndrome and type 2 diabetes mellitus 25 to 30 years later	63	5-19 y/o NHLBI Lipid Research Clinics and 30-48 y/o in Princeton Prevalence Study (1973-1976) and the Princeton Follow-up Study (2000-2004)			cohort (prospective)			X		X
17	Morrison et al. 2005	Development of the Metabolic Syndrome in Black and White Adolescent Girls: A Longitudinal Assessment	64	Black and white girls 9-10 y/o and 18-19 y/o from 2 centers in NHLBI Growth and Health Study			cohort (longitudinal)			X	X	
18	Must et al. 2005	Childhood overweight and maturational timing in the development of adult overweight and fatness: the Newton Girls Study and its follow-up	65	307 women w/ child wt data out of 448 in the 30 yr f/up to the Newton Girls Study (mean age 42.1 y/o, SD 0.76)			cohort (prospective)			X		X
19	Nader et al. 2006	Identifying risk for obesity in early childhood [erratum in Pediatrics 2006 Nov;118(5):2270]	66	1,042 healthy US children from 10 locations born in 1991 from NICHD Study of Early Child Care and Youth Development			cohort (longitudinal)			X	X	
20	Niemeier et al. 2006	Fast Food Consumption and Breakfast Skipping: Predictors of Weight Gain from Adolescence to Adulthood in a Nationally Representative Sample	67	9,919 adolescents in waves II (11–21 y/o) and III (18–27 y/o) of the National Longitudinal Study of Adolescent Health			cohort (prospective)	X				X
21	Rodearmel et al. 2007	Small changes in dietary sugar and physical activity as an approach to preventing excessive weight gain: the America on the Move family study	77	192 families w/at least one 7-14 y/o overwt or at risk for overwt child		RCT						

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
22	Roseman et al. 2007	Examination of Weight Status and Dietary Behaviors of Middle School Students in Kentucky	78	4,049 middle school students in central Kentucky			cross sectional					
23	Rzehak & Heinrich 2006	Development of relative weight, overweight and obesity from childhood to young adulthood. A longitudinal analysis of individual change of height and weight	80	2,183 5-25 y/o (5-13 y/o at baseline); 12 yrs of f/up using surveys in 1992-93, 1995-96, 1998-99 and 2004-05 in 3 areas of Germany			cohort (longitudinal)			X	X	X
24	Stallmann-Jorgensen et al. 2007	General and visceral adiposity in black and white adolescents and their relation with reported physical activity and diet	88	661 healthy black and white 14-18 y/o			cross sectional					
25	Thompson et al. 2007	Childhood overweight and cardiovascular disease risk factors: the National Heart, Lung, and Blood Institute Growth and Health Study	95	1,166 Caucasian and 1,213 African-American girls ages 9-23 y/o in NHLBI Growth and Health Study.			cohort (longitudinal)			X	X	X
26	Viikari et al. 2004	Risk factors for coronary heart disease in children and young adults	100	2 ongoing studies in Finland: 1) 3,596 3-18 y/o and f/up in 2,264 24-39 y/o in Cardiovascular Risk in Young Finns study, 2) 1,062 7 mo old - 7 y/o in Special Turku Coronary Risk Factor Intervention Project for Children (STRIP)		RCT (STRIP)	cohort (longitudinal)	X		X		X
27	Woo et al. 2004	Effects of Diet and Exercise on Obesity-Related Vascular Dysfunction in Children	104	82 overwt 9-12 y/o (BMI = 25±3)		Controlled Trials (2 intervention groups)						

## FATS

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	Alexy et al. 2004	Pattern of long-term fat intake and BMI during childhood and adolescence--results of the DONALD Study	3	228 2-18 y/o in the Dortmund Nutritional Anthropometric Longitudinally Designed Study			cohort (longitudinal)	X			X	
2	Amre et al. 2007	Imbalances in dietary consumption of fatty acids, vegetables, and fruits are associated with risk for Crohn's disease in children	4	130 children <=20 y/o (mean age 14 y/o; 59% male) newly diagnosed w/ Crohn's disease recruited from 3 pediatric gastroenterology clinics in Canada; 202 control cases in population or hospital matched for time of diagnosis (+/-6 months) and area of residence			case control					
3	Bolte et al. 2006	Fatty acids in serum cholesteryl esters in relation to asthma and lung function in children	12	8-11 y/o (242 girls and 284 boys) in Munich, Germany.			nested case control					
4	Crowe et al. 2006	Serum fatty acids as biomarkers of fat intake predict serum cholesterol concentrations in a population-based survey of New Zealand adolescents and adults	19	2,793 teens >=15 y/o in the 1997 National Nutrition Survey, New Zealand			cross sectional					
5	Frazier et al. 2004	Adolescent diet and risk of breast cancer	33	47,355 participants in the Nurses Health Study II			cohort (retrospective)	X				X
6	Galassetti et al. 2006	Effect of a high-fat meal on the growth hormone response to exercise in children	35	Twelve 11-15 y/o (6 M, 6 F)		controlled trial						

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
7	Guerra et al. 2007	Three-year tracking of fatty acid composition of plasma phospholipids in healthy children	39	26 children; enrolled at birth, tracked to 5 y/o			cohort (prospective)			X	X	
8	Niirikoski et al. 2007	Impact of repeated dietary counseling between infancy and 14 years of age on dietary intakes and serum lipids and lipoproteins: the STRIP study	68	Intervention group 7 mo old infants (n=540) and control children (n=522) from Special Turku Coronary Risk Factor Intervention Project (STRIP); 7 mo olds followed for 14 yrs		random-ized inter-vention		X			X	
9	Oddy et al. 2004	Ratio of omega-6 to omega-3 fatty acids and childhood asthma	73	335 6 and 8 y/o in the Western Australian Pregnancy Cohort Study (166 w/current asthma, 169 controls)			case-control in prospective cohort					
10	Sarnblad et al. 2006	Dietary fat intake predicts 1-year change in body fat in adolescent girls with type 1 diabetes	82	23 12-19 y/o girls w/ type 1 diabetes and 19 age-matched healthy control girls			case control					
11	Schack-Nielsen et al. 2005	Arterial stiffness in 10-year-old children: current and early determinants	83	93 infants w/ f/up at 10 y/o			cross sectional					
12	Skinner et al. 2004	Predictors of children's body mass index: a longitudinal study of diet and growth in children aged 2-8 y	84	70 white, middle/upper SES children (37 M, 33 F) participating in longitudinal study from 2-9 y/o			cohort (longitudinal)	X		X	X	
13	Snetselaar et al. 2004	Adolescents eating diets rich in either lean beef or lean poultry and fish reduced fat and saturated fat intake and those eating beef maintained serum ferritin status	86	86 7th and 8th graders		RCT						



#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
14	Stang et al. 2006	Adolescent milk fat and galactose consumption and testicular germ cell cancer	89	Population based study of 269 cases and 797 controls (response rates 76% and 46%, respectively)			case control					
15	Sunehag et al. 2005	Effects of dietary macronutrient intake on insulin sensitivity and secretion and glucose and lipid metabolism in healthy, obese adolescents	91	13 healthy obese volunteers (6M, 7F, mean age 14.7 y/o; mean BMI of 34, mean body fat 42%) [results were compared w/ those of previously studied lean adolescents]		Random crossover study						
16	Viikari et al. 2004	Risk factors for coronary heart disease in children and young adults	100	2 ongoing studies in Finland: 1) 3,596 3-18 y/o and f/up in 2,264 24-39 y/o in Cardiovascular Risk in Young Finns study, 2) 1,062 7 mo old - 7 y/o in Special Turku Coronary Risk Factor Intervention Project for Children (STRIP)		RCT (STRIP)	cohort (longitudinal)	X		X		X
17	Weigensberg et al. 2005	Dietary fat intake and insulin resistance in black and white children	102	142 healthy children 6.5-14 y/o (81 whites, 61 blacks)			cross sectional					

## FRUITS AND VEGETABLES

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	Amre et al. 2007	Imbalances in dietary consumption of fatty acids, vegetables, and fruits are associated with risk for Crohn's disease in children	4	130 children $\leq 20$ y/o (mean age 14 y/o; 59% male) newly diagnosed w/ Crohn's disease recruited from 3 pediatric gastroenterology clinics in Canada; 202 control cases in population or hospital matched for time of diagnosis ( $\pm 6$ months) and area of residence			case control					
2	Burns et al. 2007	Low dietary nutrient intakes and respiratory health in adolescents	15	2,112 12th-graders from 13 US and Canadian communities in 1998-99 school yr			cross sectional					
3	Cullen et al. 2004	Anthropometric, parental, and psychosocial correlates of dietary intake of African-American girls	20	114 8-10 y/o African-American girls			cross sectional					
4	Dugmore & Rock 2004	A multifactorial analysis of factors associated with dental erosion	26	1,149 12 y/o (out of 1,753 randomly sampled at baseline) w/usable data; f/up at 14 y/o			cohort (longitudinal)	X			X	
5	Melgar-Quinonez & Kaiser 2004	Relationship of child feeding practices to overweight in low-income Mexican- American preschool-aged children	60	204 low-income Mexican-American families from California w/at least 1 child 3-5 y/o			cross sectional					
6	Moore et al. 2005	Intake of fruits, vegetables, and dairy products in early childhood and subsequent blood pressure change	62	95 children in Framingham study enrolled when 3-6 y/o			cohort (prospective)	X			X	

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
7	Nja et al. 2005	Effects of early intake of fruit or vegetables in relation to later asthma and allergic sensitization in school-age children	69	502 Swedish primary school children selected from survey of 4,585 school children (6-16 y/o) reporting diagnosed asthma (n=166), wheeze in the last 12 mo (n=155) and no asthma/no wheeze (n=181). Children from urban Oslo (37%), the mountainous area of Hallingdal (42%), and the industrial, coastal area of Odda (21%)			cross sectional					
8	Okoko et al. 2007	Childhood asthma and fruit consumption	74	2,640 school children 5-10 y/o in UK			cross sectional					
9	Prynne et al. 2006	Fruit and vegetable intakes and bone mineral status: a cross sectional study in 5 age and sex cohorts	76	Adolescents 16-18 y/o; young women 23-37 y/o; older men and women 60-83 y/o			cross sectional					
10	Sanigorski et al. 2007	Association of key foods and beverages with obesity in Australian schoolchildren	81	Representative sample of 2,184 school children from Victoria, Australia			cross sectional					
11	Sohn et al. 2006	Carbonated soft drinks and dental caries in the primary dentition	87	2-10 y/o in NHANES III 1988-94			cross sectional					
12	te Velde et al. 2007	Tracking of fruit and vegetable consumption from adolescence into adulthood and its longitudinal association with overweight	94	168 12 y/o boys and girls tracked over 24 yrs			cohort (longitudinal)	X				X
13	Tylavsky et al. 2004	Fruit and vegetable intakes are an independent predictor of bone size in early pubertal children	96	56 prepubertal Tanner Stage 2 white females			cross sectional					

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/health outcome	Behavior effect on behavior	Biologic/health status on biologic/health outcome	Early to later childhood	Childhood to adulthood
14	Vatanparast et al. 2005	Positive effects of vegetable and fruit consumption and calcium intake on bone mineral accrual in boys during growth from childhood to adolescence: the University of Saskatchewan Pediatric Bone Mineral Accrual Study	99	85 boys & 67 girls 8-20 y/o, Canadian			cohort (longitudinal)	X				X

## WHOLE GRAINS

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	Lutsey et al. 2006	Serum homocysteine is related to food intake in adolescents: the Child and Adolescent Trial for Cardiovascular Health	54	2,695 adolescents 15-20 y/o (mean = 18 y/o) in the Child and Adolescent Trial for Cardiovascular Health study			cross sectional					
2	Tabak et al. 2006	Diet and asthma in Dutch school children (ISAAC-2)	92	598 Dutch children 8-13 y/o			cross sectional					

## DAIRY AND CALCIUM

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	Barba et al. 2005	Inverse association between body mass and frequency of milk consumption in children	8	884 7 y/o not on dietary regimen selected out of 1,087 (M:F 451:433)			cross sectional					
2	Berkey et al. 2005	Milk, dairy fat, dietary calcium, and weight gain: a longitudinal study of adolescents	10	12,829 9-14 y/o US children			cohort (longitudinal)					
3	Cheng et al. 2005	Effects of calcium, dairy product, and vitamin D supplementation on bone mass accrual and body composition in 10-12-y-old girls: a 2-y randomized trial	16	195 10-12 y/o, Tanner stage I-II girls w/Ca intakes 50%		RCT						
4	Dixon et al. 2005	Calcium and dairy intake and measures of obesity in hyper- and normocholesterolemic children	24	342 non-obese hypercholesterolemic (HC) and non-hypercholesterolemic (non-HC) 4-10 y/o in NHLBI Children's Health project study			cohort (longitudinal)					
5	Fiorito et al. 2006	Girls' Calcium Intake Is Associated with Bone Mineral Content During Middle Childhood	29	151 non-Hispanic white girls			cohort (longitudinal)	X			X	
6	Fisher et al. 2004	Meeting calcium recommendations during middle childhood reflects mother-daughter beverage choices and predicts bone mineral status	30	192 5, 7, 9 y/o non-Hispanic white girls and mothers			cohort (longitudinal)	X			X	

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
7	Goulding et al. 2004	Children who avoid drinking cow's milk are at increased risk for prepubertal bone fractures	38	50 3-13 y/o (30 girls, 20 boys) who had avoided drinking cow's milk for prolonged periods, and 22/50 overweight; these 50 compared w/ a birth cohort of >1,000 children in same city.			cross sectional					
8	Johnson et al. 2007	Is sugar-sweetened bvg consumption associated with increased fatness in children?	45	subsample of British children from the Avon Longitudinal Study of Parents and Children; enrolled at 5 y/o (n = 521) and 7 y/o (n = 682) ; assessed at 9 y/o			cohort (longitudinal)	X			X	
9	Lanou et al. 2005	Calcium, dairy products, and bone health in children and young adults: a reevaluation of the evidence	49	1-25 y/o	X	RCT (13)	cross-sectional (22); retrospective (13), and longitudinal prospective studies (10)	X			X	X
10	Lappe et al. 2004	Girls on a high-calcium diet gain weight at the same rate as girls on a normal diet: a pilot study	50	59 9 y/o girls in metropolitan Omaha, NE communities		RCT		X			X	
11	LaRowe et al. 2007	Beverage patterns, diet quality, and body mass index of US preschool and school-aged children	51	541 Two-5 y/o and 793 six-11 y/o children from 2001-2002 NHANES			cross sectional					
12	Lutsey et al. 2006	Serum homocysteine is related to food intake in adolescents: the Child and Adolescent Trial for Cardiovascular Health	54	2,695 adolescents 15-20 y/o (mean = 18 y/o) in the Child and Adolescent Trial for Cardiovascular Health study			cross sectional					

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
13	Ma & Jones 2004	Soft drink and milk consumption, physical activity, bone mass, and upper limb fractures in children: a population-based case-control study	55	9-16 y/o from Tasmania, 206 case-control pairs			case control					
14	Moore et al. 2006	Low dairy intake in early childhood predicts excess body fat gain	61	99 of 106 families in Framingham Children's Study w/a 6 y/o at baseline, followed to 13 y/o			cohort (longitudinal)	X			X	
15	Novotny et al. 2004a	Dairy intake is associated with lower body fat and soda intake with greater weight in adolescent girls	70	323 9-14 year old Hawaiian girls with Asian or Caucasian ancestry			cross sectional					
16	Novotny et al. 2004b	Adolescent dairy consumption and physical activity associated with bone mass	71	323 girls examined at Kaiser Permanente, Oahu, Hawaii (Mean age =11.6 y/o; mean Asian=48%; White =43%; other=10%)			cross sectional					
17	O'Connor et al. 2006	Beverage intake among preschool children and its effect on weight status	72	1,160 2-5 y/o boys and girls from 1999-2002 NHANES; 24% were overweight or at risk of overweight			cross sectional					
18	Rosenbauer et al. 2007	Early nutrition and risk of Type 1 diabetes mellitus--a nationwide case-control study in preschool children	79	Newly diagnosed type 1 diabetes <5 y/o (760 cases); 630 age matched controls selected by case families' acquaintance; studied in 1992-1995			case control					
19	Sohn et al. 2006	Carbonated soft drinks and dental caries in the primary dentition	87	2-10 y/o in NHANES III 1988-94			cross sectional					
20	Stang et al. 2006	Adolescent milk fat and galactose consumption and testicular germ cell cancer	89	Population based study of 269 cases and 797 controls (response rates 76% and 46%, respectively)			case control					
21	van der Pols et al. 2007	Childhood dairy intake and adult cancer risk: 65-y follow-up of the Boyd Orr cohort	97	4,383 out of 4,999 children in England and Scotland in study of family food consumption btw 1937-1939 (770 registered w/ cancer btw 1948-2005)			cohort (retrospective)	X				X



## CARBOHYDRATES

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	Aeberli et al. 2007	Fructose intake is a predictor of LDL particle size in overweight schoolchildren	1	74 normal-wt and overwt 6-14 y/o Swiss children			cross sectional					
2	Andersen et al. 2005	Overweight and obesity among Norwegian schoolchildren: Changes from 1993 to 2000	5	Nationally representative sample of 1,489 Norwegian 4th and 8th graders			cross sectional					
3	Ariza et al. 2004	Risk factors for overweight in five- to six-year-old Hispanic-American children: A pilot study	6	250 5-6 y/o Hispanic (mostly Mexican-American) kindergarteners from Chicago, IL.			cross sectional					
4	Blum et al. 2005	Beverage consumption patterns in elementary school aged children across a two-year period.	11	164 children			cohort (longitudinal)	X			X	
5	Davis et al. 2007	Associations of dietary sugar and glycemic index with adiposity and insulin dynamics in overweight Latino youth.	21	120 10-17 y/o overwt Latinos w/family history of type 2 diabetes			cross sectional					
6	Davis et al. 2005	The relation of sugar intake to beta cell function in overweight Latino children.	22	63 overwt Latino children 9-13 y/o			cross sectional					
7	Dubois et al. 2007	Regular sugar-sweetened bvg consumption between meals increases risk of overweight among preschool-aged children.	25	Representative sample of infants from Quebec, Canada born in 1998 (n= 2,103) and a subsample of 1,944 4-5 y/o children			cohort (longitudinal)	X			X	
8	Dugmore & Rock 2004	A multifactorial analysis of factors associated with dental erosion	26	1,149 12 y/o (out of 1,753 randomly sampled at baseline) w/usable data; f/up at 14 y/o			cohort (longitudinal)	X			X	

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
9	Ebbeling et al. 2006	Effects of decreasing sugar-sweetened bvg consumption on body weight in adolescents: a randomized, controlled pilot study.	27	103 adolescents 13-18 y/o who regularly consumed sugar-swtnd bvg		RCT						
10	Forshee et al. 2004	The role of beverage consumption, physical activity, sedentary behavior, and demographics on body mass index of adolescents	32	2,216 12 -16 y/o sampled in the 1988-1994 NHANES			cross sectional					
11	Harris et al. 2004	Risk factors for dental caries in young children: a systematic review of the literature	41	6 y/o and younger	X	interventional studies (7)	cross sectional (43), cohort (19) case control (8)	X			X	
12	Johnson et al. 2007	Is sugar-sweetened bvg consumption associated with increased fatness in children?.	45	subsample of British children from the Avon Longitudinal Study of Parents and Children; enrolled at 5 y/o (n = 521) and 7 y/o (n = 682) ; assessed at 9 y/o			cohort (longitudinal)	X			X	
13	Kvaavik et al. 2005	The stability of soft drinks intake from adolescence to adult age and the association between long-term consumption of soft drinks and lifestyle factors and body weight	48	15 y/o in Oslo Norway Youth study, with follow-up at 25 and 33 y/o			cohort (longitudinal)		X			X
14	LaRowe et al. 2007	Beverage patterns, diet quality, and body mass index of US preschool and school-aged children.	51	541 2-5 y/o and 793 6-11 y/o children from 2001-2002 NHANES			cross sectional					

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
15	Levine et al. 2007	Dietary patterns, toothbrushing habits and caries experience of schoolchildren in West Yorkshire, England	52	437 7-11 y/o selected from 6 (or 18?) schools over a wide geographic area who had consent and all dietary data. F/up 4 yrs later.			cohort (longitudinal)	X			X	
16	Ma & Jones 2004	Soft drink and milk consumption, physical activity, bone mass, and upper limb fractures in children: a population-based case-control study	55	9-16 y/o from Tasmania, 206 case-control pairs			case control					
17	Malik et al. 2006	Intake of sugar-sweetened beverages and weight gain: a systematic review	56	Children and adults	X	5 experimental studies	15 cross-sectional, 10 prospective	X			X	X
18	Marshall et al. 2005	The roles of meal, snack, and daily total food and bvg exposures on caries experience in young children.	58	634 1-6 y/o in the Iowa Fluoride Study.			cohort (longitudinal)					
19	Marshall et al. 2007	Dental caries and childhood obesity: roles of diet and socioeconomic status.	59	1-10 y/o in the Iowa Fluoride Study			cohort (longitudinal)					
20	Novotny et al. 2004	Dairy intake is associated with lower body fat and soda intake with greater weight in adolescent girls	70	323 9-14 year old Hawaiian girls with Asian or Caucasian ancestry			cross sectional					
21	O'Connor et al. 2006	Beverage intake among preschool children and its effect on weight status.	72	1,160 2-5 y/o boys and girls from 1999-2002 NHANES; 24% were overweight or at risk of overweight			cross sectional					

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
22	Rodearmel et al. 2007	Small changes in dietary sugar and physical activity as an approach to preventing excessive weight gain: the America on the Move family study.	77	192 families w/at least one 7-14 y/o overwt or at risk for overwt child		RCT						
23	Sanigorski et al. 2007	Association of key foods and beverages with obesity in Australian schoolchildren	81	Representative sample of 2,184 school children from Victoria, Australia			cross sectional					
24	Skinner et al. 2004	Predictors of children's body mass index: a longitudinal study of diet and growth in children aged 2-8 y.	84	70 white, middle/upper SES children (37 M, 33 F) participating in longitudinal study from 2-9 y/o			cohort (longitudinal)	X		X	X	
25	Slyper et al. 2005	Influence of glycemic load on HDL cholesterol in youth.	85	32 11-25 y/o healthy M and F w/range of LDL-cholesterol values (1.71-6.67 mmol/L) and BMI z scores (-1.18 to 2.64)			cross sectional					
26	Sohn et al. 2006	Carbonated soft drinks and dental caries in the primary dentition	87	2-10 y/o in NHANES III 1988-94			cross sectional					
27	Striegel-Moore et al. 2006	Correlates of beverage intake in adolescent girls: the National Heart, Lung, and Blood Institute Growth and Health Study	90	9-19 y/o black (n=1,210) & white (n=1,161) girls in the National Heart, Lung, and Blood Institute Growth and Health Study			cohort (longitudinal)	X			X	
28	Sunehag et al. 2005	Effects of dietary macronutrient intake on insulin sensitivity and secretion and glucose and lipid metabolism in healthy, obese adolescents	91	13 healthy obese volunteers (6M, 7F, mean age 14.7 y/o; mean BMI of 34, mean body fat 42%) [results were compared w/ those of previously studied lean adolescents]		Random crossover study						

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
29	Tam et al. 2006	Soft drink consumption and excess weight gain in Australian school students: results from the Nepean study	93	268 children (136 males) from Sydney, Australia. Mean/SD age = 7.7+/-0.6 y/o			cohort (longitudinal)	X			X	
30	Vartanian et al. 2007	Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis	98	Children and adults	X							
31	Warner et al. 2006	Soda consumption and overweight status of 2-year-old Mexican-American children in California	101	354 2 y/o Mexican-American children from Salinas Valley, CA			cross sectional					
32	Welsh et al. 2005	Overweight among low-income preschool children associated with the consumption of sweet drinks	103	10,904 children 2-3 y/o			cohort (longitudinal)	X			X	

## SODIUM AND POTASSIUM

#	Citation		Article ID	Population Studied	Study Design			Tracking				
	Author	Title			Systematic Review or Meta-Analysis	Controlled Trials	Observational (cohort, case control, cross sectional)	Behavior effect on biologic/ health outcome	Behavior effect on behavior	Biologic/ health status on biologic/ health outcome	Early to later childhood	Childhood to adulthood
1	He et al. 2008	Salt and blood pressure in children and adolescents	42	1,658 4-18 y/o w/salt and blood pressure recorded in Great Britain's 1997 National Diet and Nutrition Survey for young people			cross sectional					
2	He & MacGregor 2006	Importance of salt in determining blood pressure in children: meta-analysis of controlled trials [see comment]	43	966 8-16 y/o (median age: 13 y/o); 551 infants	X	10 controlled trials for 8-16 y/o, 3 controlled trials for infants						
3	Palacios 2004	Sodium retention in black and white female adolescents in response to salt intake	75	22 black and 14 white girls ages 11-15 years old		Randomized crossover design						

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1	Alexy et al. 2005	Long-term protein intake and dietary potential renal acid load are associated with bone modeling and remodeling at the proximal radius in healthy children	2	229 children & adolescents 6-18 y/o			cohort (longitudinal)	X			X	
2	Alexy et al. 2004	Pattern of long-term fat intake and BMI during childhood and adolescence--results of the DONALD Study	3	228 2-18 y/o in the Dortmund Nutritional Anthropometric Longitudinally Designed Study			cohort (longitudinal)	X			X	
3	Baker et al. 2007	Childhood body-mass index and the risk of coronary heart disease in adulthood	7	276,835 Danish schoolchildren w/height and wt measurements			cohort (longitudinal)			X		X
4	Barton et al. 2005	The relationship of breakfast and cereal consumption to nutrient intake and body mass index: the National Heart, Lung, and Blood Institute Growth and Health Study	9	At baseline, 2,379 9-10 y/o girls (1,166 white, 1,213 AA) from Berkeley, CA; Cincinnati, OH; and Washington, DC. Participants from NHLBI Growth and Health Study. F/up at 19 y/o			cohort (longitudinal)			X	X	
5	Blum et al. 2005	Beverage consumption patterns in elementary school aged children across a two-year period	11	164 children			cohort (longitudinal)	X			X	
6	Bounds et al. 2005	The relationship of dietary and lifestyle factors to bone mineral indexes in children	13	52 healthy white children studied from 2 mo to 8 y/o (25 M, 27 F) and their mothers			cohort (longitudinal)	X			X	
7	Crimmins et al. 2007	Stability of adolescent body mass index during three years of follow-up	18	1,746 adolescents in school-based study			cohort (longitudinal)			X	X	

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8	Deshmukh-Taskar et al. 2006	Tracking of overweight status from childhood to young adulthood: the Bogalusa Heart Study	23	841 19-35 y/o (68% Euro-Americans, 32% African-Americans) who also did a survey at 9-11 y/o			cohort (longitudinal) created from cross sectional surveys			X		X
9	Dubois et al. 2007	Regular sugar-sweetened bvg consumption between meals increases risk of overweight among preschool-aged children	25	Representative sample of infants from Quebec, Canada born in 1998 (n= 2,103) and a subsample of 1,944 4-5 y/o children			cohort (longitudinal)	X			X	
10	Dugmore & Rock 2004	A multifactorial analysis of factors associated with dental erosion	26	1,149 12 y/o (out of 1,753 randomly sampled at baseline) w/usable data; f/up at 14 y/o			cohort (longitudinal)	X			X	
11	Evers et al. 2007	Persistence of overweight among young children living in low income communities in Ontario	28	760 jr kindergarteners-3rd graders; from economically disadvantaged communities in Ontario, Canada in the Better Beginnings, Better Futures project.			cohort (longitudinal)			X	X	
12	Fiorito et al. 2006	Girls' Calcium Intake Is Associated with Bone Mineral Content During Middle Childhood	29	151 non-Hispanic white girls			cohort (longitudinal)	X			X	
13	Fisher et al. 2004	Meeting calcium recommendations during middle childhood reflects mother-daughter beverage choices and predicts bone mineral status	30	192 5, 7, 9 y/o non-Hispanic white girls and mothers			cohort (longitudinal)	X			X	
14	Flaherman & Rutherford 2006	A meta-analysis of the effect of high weight on asthma	31	Children	X		cohort studies (12)	X			X	
15	Frazier et al. 2004	Adolescent diet and risk of breast cancer	33	47,355 participants in the Nurses Health Study II			cohort (retrospective)	X				X



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16	Freedman et al. 2005	The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study	34	2,610 2-17 y/o (baseline); f/up age 18-37 y/o from Bogalusa Heart Study (1973-1996)			cohort (longitudinal)			X		X
17	Garnett et al. 2007	Body mass index and waist circumference in midchildhood and adverse cardiovascular disease risk clustering in adolescence	37	342 8 y/o at baseline. 290 15 y/o at f/up.			cohort (longitudinal)	X			X	
18	Guerra et al. 2007	Three-year tracking of fatty acid composition of plasma phospholipids in healthy children	39	26 children; enrolled at birth, tracked to 5 y/o			cohort (prospective)			X	X	
19	Gunther et al. 2007	Early protein intake and later obesity risk: Which protein sources at which time points throughout infancy and childhood are important for body mass index and body fat percentage at 7 years of age?	40	203 6 mo-7 y/o in the Dortmund Nutritional and Longitudinally Designed Study who had diet information			cohort (longitudinal)	X			X	
20	Harris et al. 2004	Risk factors for dental caries in young children: a systematic review of the literature	41	6 y/o and younger	X	inter-ventional studies (7)	cross sectional (43), cohort (19) case control (8)	X			X	
21	Johnson et al. 2007	Is sugar-sweetened bvg consumption associated with increased fatness in children?	45	subsample of British children from the Avon Longitudinal Study of Parents and Children; enrolled at 5 y/o (n = 521) and 7 y/o (n = 682) ; assessed at 9 y/o			cohort (longitudinal)	X			X	

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22	Kvaavik et al. 2005	The stability of soft drinks intake from adolescence to adult age and the association between long-term consumption of soft drinks and lifestyle factors and body weight	48	15 year olds in Oslo Norway Youth study, with follow-up at 25 and 33 years old			cohort (longitudinal)		X			X
23	Lanou et al. 2005	Calcium, dairy products, and bone health in children and young adults: a reevaluation of the evidence	49	1-25 y/o	X	RCT (13)	cross-sectional (22); retrospective (13), and longitudinal prospective studies (10)	X			X	X
24	Lappe et al. 2004	Girls on a high-calcium diet gain weight at the same rate as girls on a normal diet: a pilot study	50	59 9 y/o girls in metropolitan Omaha, NE communities		RCT		X			X	
25	Levine et al. 2007	Dietary patterns, toothbrushing habits and caries experience of schoolchildren in West Yorkshire, England	52	437 7-11 y/o selected from 6 (or 18?) schools over a wide geographic area who had consent and all dietary data. F/up 4 yrs later.			cohort (longitudinal)	X			X	
26	Li & Wang 2008	Tracking of dietary intake patterns is associated with baseline characteristics of urban low-income African-American adolescents	53	181 low-income African-American adolescents			cohort (longitudinal)	X	X		X	
27	Malik et al. 2006	Intake of sugar-sweetened beverages and weight gain: a systematic review	56	Children and adults	X	5 experimental studies	15 cross-sectional, 10 prospective	X			X	X
28	Moore et al. 2006	Low dairy intake in early childhood predicts excess body fat gain	61	99 of 106 families in Framingham Children's Study w/a 6 y/o at baseline, followed to 13 y/o			cohort (longitudinal)	X			X	

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29	Moore et al. 2005	Intake of fruits, vegetables, and dairy products in early childhood and subsequent blood pressure change	62	95 children in Framingham study enrolled when 3-6 y/o			cohort (prospective)	X			X	
30	Morrison et al. 2008	Metabolic syndrome in childhood predicts adult metabolic syndrome and type 2 diabetes mellitus 25 to 30 years later	63	5-19 y/o NHLBI Lipid Research Clinics and 30-48 y/o in Princeton Prevalence Study (1973-1976) and the Princeton Follow-up Study (2000-2004)			cohort (prospective)			X		X
31	Morrison et al. 2005	Development of the Metabolic Syndrome in Black and White Adolescent Girls: A Longitudinal Assessment	64	Black and white girls 9-10 y/o and 18-19 y/o from 2 centers in NHLBI Growth and Health Study			cohort (longitudinal)			X	X	
32	Must et al. 2005	Childhood overweight and maturational timing in the development of adult overweight and fatness: the Newton Girls Study and its follow-up	65	307 women w/ child wt data out of 448 in the 30 yr f/up to the Newton Girls Study (mean age 42.1 y/o, SD 0.76)			cohort (prospective)			X		X
33	Nader et al. 2006	Identifying risk for obesity in early childhood [erratum in Pediatrics 2006 Nov;118(5):2270]	66	1,042 healthy US children from 10 locations born in 1991 from NICHD Study of Early Child Care and Youth Development			cohort (longitudinal)			X	X	
34	Niemeier et al. 2006	Fast Food Consumption and Breakfast Skipping: Predictors of Weight Gain from Adolescence to Adulthood in a Nationally Representative Sample	67	9,919 adolescents in waves II (11–21 y/o) and III (18–27 y/o) of the National Longitudinal Study of Adolescent Health			cohort (prospective)	X				X

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35	Niinikoski et al. 2007	Impact of repeated dietary counseling between infancy and 14 years of age on dietary intakes and serum lipids and lipoproteins: the STRIP study	68	intervention group 7 mo old infants (n=540) and control children (n=522) from Special Turku Coronary Risk Factor Intervention Project (STRIP); 7 mo olds followed for 14 yrs		randomized intervention		X			X	
36	Rzehak & Heinrich 2006	Development of relative weight, overweight and obesity from childhood to young adulthood. A longitudinal analysis of individual change of height and weight	80	2,183 5-25 y/o (5-13 y/o at baseline); 12 yrs of f/up using surveys in 1992-93, 1995-96, 1998-99 and 2004-05 in 3 areas of Germany			cohort (longitudinal)			X	X	X
37	Skinner et al. 2004	Predictors of children's body mass index: a longitudinal study of diet and growth in children aged 2-8 y	84	70 white, middle/upper SES children (37 M, 33 F) participating in longitudinal study from 2-9 y/o			cohort (longitudinal)	X		X	X	
38	Striegel-Moore et al. 2006	Correlates of beverage intake in adolescent girls: the National Heart, Lung, and Blood Institute Growth and Health Study	90	9-19 y/o black (n=1,210) & white (n=1,161) girls in the National Heart, Lung, and Blood Institute Growth and Health Study			cohort (longitudinal)	X			X	
39	Tam et al. 2006	Soft drink consumption and excess weight gain in Australian school students: results from the Nepean study	93	268 children (136 males) from Sydney, Australia. Mean/SD age = 7.7+/-0.6 y/o			cohort (longitudinal)	X			X	
40	te Velde et al. 2007	Tracking of fruit and vegetable consumption from adolescence into adulthood and its longitudinal association with overweight	94	168 12 y/o boys and girls tracked over 24 yrs			cohort (longitudinal)	X				X

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41	Thompson et al. 2007	Childhood overweight and cardiovascular disease risk factors: the National Heart, Lung, and Blood Institute Growth and Health Study	95	1,166 Caucasian and 1,213 African-American girls ages 9-23 y/o in NHLBI Growth and Health Study.			cohort (longitudinal)			X	X	X
42	van der Pols et al. 2007	Childhood dairy intake and adult cancer risk: 65-y follow-up of the Boyd Orr cohort	97	4,383 out of 4,999 children in England and Scotland in study of family fd consumption btw 1937-1939 (770 registered w/ cancer btw 1948-2005)			cohort (retrospective)	X				X
43	Vatanparast et al. 2005	Positive effects of vegetable and fruit consumption and calcium intake on bone mineral accrual in boys during growth from childhood to adolescence: the University of Saskatchewan Pediatric Bone Mineral Accrual Study	99	85 boys & 67 girls 8-20 y/o, Canadian			cohort (longitudinal)	X				X
44	Viikari et al. 2004	Risk factors for coronary heart disease in children and young adults	100	2 ongoing studies in Finland: 1) 3,596 3-18 y/o and f/up in 2,264 24-39 y/o in Cardiovascular Risk in Young Finns study, 2) 1,062 7 mo old - 7 y/o in Special Turku Coronary Risk Factor Intervention Project for Children (STRIP)		RCT (STRIP)	cohort (longitudinal)	X		X		X
45	Welsh et al. 2005	Overweight among low-income preschool children associated with the consumption of sweet drinks	103	10,904 children 2-3 y/o			cohort (retrospective)	X			X	

