The Road to the 2010 Dietary Guidelines –
Looking Ahead to 2015

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Disclaimer

• The opinions and comments presented do not reflect those of the 2010 Dietary Guidelines Advisory Committee, the USDA and CNPP, or HHS.

• The opinions and comments expressed reflect evidence and perspectives as a member of the 2010 Dietary Guidelines Advisory Committee and as the sole food scientist on that committee.
Appreciation

• The exceptional and professional staff associated with USDA, CNPP and HHS are gratefully acknowledged for the extensive expertise and guidance in the development and execution of the Dietary Guidelines Advisory Committee, and the final publication of the 2010 Dietary Guidelines.
Learning Objectives

At the end of the presentation, the audience should be able to:

• Explain the development and application of the Nutrition Evidence Library
• Examine evidence that support or refute conclusions relative to dietary policy
• Explore future of food, nutrition and health research applied to public policy and personal practices
• Employ new communications tools directed to the Dietary Guidelines
The Development Process

Phase 1: Dietary Guidelines Advisory Committee
Phase 2: Review of and comment on DGAC Report
Phase 3: Drafting and review of DGA

• 445-page advisory report provided scientific basis (see Orange report available at www.dietaryguidelines.gov) of policy document
• 95-page policy document
Phase 2: Review of and comment on DGAC Report

- Public comments
  - 1159 written comments posted to public comments database between June 15 through July 15, 2010
  - 50 organizations and individuals provided oral testimony on July 8, 2010
  - Staff reviewed and considered all public comments in development of policy document
  - All comments available at www.dietaryguidelines.gov for public view

- USDA and HHS agency review for program-specific policy implications
Formulate Systematic Review Questions
- Exploratory searches
- Public comment
- Dialogue with experts
- Analytical framework
- PICO*

Literature Search and Sort
- Identify study eligibility criteria
- Determine search strategy
- Search for relevant studies
- List included studies
- List excluded studies and rationale

Extract Evidence from Studies
- Create evidence worksheets

Summarize and Synthesize the Evidence
- Assess quality of individual studies
- Assess applicability
- Summarize and synthesize evidence

Develop and Grade Conclusion Statements

Define Research Recommendations

* PICO: patient problem or population (P), intervention (I), comparison (C), and outcome(s) (O); see Sackett DL et al, Clin Orthop Relat Res. 2007;455:3-5, for background on evidence-based medicine
Hierarchy of Evidence

Stronger Evidence

- RCT
- Dbl Blinded

Weaker Evidence

- Cohort Study
- Case Control
- Case Series
- Case Report
- Expert Opinion
Executive Summary

• Policy Document Contents
  – Includes 23 key recommendations for the general population and 6 for subpopulation groups
  – Organized to present information in an integrated way

• Two overarching concepts
  – *Maintain calorie balance over time to achieve and sustain a healthy weight*
    - Calories in versus calories expended (physical activity)
  – *Focus on consuming nutrient-dense foods and beverages*
    - Foods and food components to reduce
    - Foods and nutrients to increase
Candid Discussions
Balancing Calories

- Epidemic of overweight and obesity in all segments of our society
  - Environmental factors contribute to weight gain
- Evidence exists - no optimal proportion of macronutrients for weight loss
- Calorie balance over time is key
- Important modifiable factors
  - Calories consumed in foods and beverages
  - Calories expended in physical activity
Knowledge of Calories Per Day

63% responded, but estimated incorrectly

63% responded, but estimated incorrectly

As far as you know, how many calories should a person of your age, weight, height, and physical activity consume per day? [Open end](n=1024)

2010 Food & Health Survey
http://www.foodinsight.org
To what extent, if at all, do you make a conscious effort to monitor the balance between how many calories you consume and how many calories you “burn”/use per day? [Select one](n=1024)

2010 Food & Health Survey
http://www.foodinsight.org
Top Sources of Calories
Among Americans 2 Years and Older

1. Grain-based desserts
   – Cake, cookies, pie, cobbler, sweet rolls, pastries, and donuts

2. Yeast breads
   – White bread and rolls, mixed-grain bread, flavored bread, whole-wheat bread, and bagels

3. Chicken and chicken mixed dishes
   – Fried and baked chicken parts, chicken strips/patties, stir-fries, casseroles, sandwiches, salads, and other chicken mixed dishes

4. Soda/energy/sports drinks
   – Sodas, energy drinks, sports drinks, and sweetened bottled water including vitamin water

5. Pizza

From Table 2. Top 25 sources of calories among Americans ages 2 years and older, NHANES 2005–2006.
Case Study
Sodium in US Food Supply

FIGURE 3-2. Sources of Sodium in the Diets of the U.S. Population Ages 2 Years and Older, NHANES 2005-2006

- Yeast breads 7.3%
- Chicken and chicken mixed dishes 6.8%
- Pizza 6.3%
- Pasta and pasta dishes 5.1%
- Cold cuts 4.5%
- Condiments 4.4%
- Tortillas, burritos, tacos 4.1%
- Sausage, franks, bacon, ribs 4.1%
- Soup 3.3%
- Grain-based desserts 3.4%
- Regular cheese 3.5%
- All other food categories 31.9%
- Ready-to-eat cereals 2.0%
- Salad dressing 2.4%
- Burgers 2.4%
- Eggs and egg mixed dishes 2.6%
- Rice and rice mixed dishes 2.6%

Dietary Guidelines for Americans 2010
Sodium in US Food Supply

Data are for 197 USDA food subgroups in FNDDS1.0

Courtesy of Adam Drewnowski, March 2011
Should Sodium be Calculated Per 100g or Per Serving Size (RACC)?

![Graph showing median mg sodium per serving vs median mg sodium per 100g for various food categories.](image)

Courtesy of Adam Drewnowski, March 2011
Sodium in the Food Supply

Salt (NaCl) has multiple unique functions

- Taste
- Enhances other flavors
- Reduces bitterness
- Microbial safety
- Promotes development of color in cooked meat products, cereals, and bread
- Controls fermentation in cheese and related products
- Minimizes ice-crystal formation in frozen products
- Promotes firm texture in processed meats
- Provides binding strength in meats
- Improves tenderness
- Reduces cooking loss in meats
- Strengthens gluten in bread dough for uniform texture, grain and dough strength

Other sodium salts

- Bicarbonate – leavening in baking
- Ascorbate – vitamin C source
- Lactate and sorbate – preservation
- MSG – umami taste
- Citrate – pH regulation
Potassium Intakes Plotted Against Sodium Intakes

Data from 2010 DGAC (NHANES 2005-6 cycle)

Courtesy of Adam Drewnowski, March 2011
Nutrient Dense and Non-Nutrient Dense Forms of Sample Foods

FIGURE 5-2. Examples of the Calories in Food Choices That Are Not in Nutrient Dense Forms and the Calories in Nutrient Dense Forms of These Foods

- Regular ground beef patty (75% lean) cooked 3 ounces: 184 calories in nutrient-dense form, 52 additional calories, total 236 calories.
- Baked chicken breast: 138 calories in nutrient-dense form, 108 additional calories, total 246 calories.
- Breading and frying fat: 108 additional calories.
- Frosted corn flakes cereal 1 cup: 90 calories in nutrient-dense form, 57 additional calories, total 147 calories.
- Baked potato: 117 calories in nutrient-dense form, 141 additional calories, total 258 calories.
- Frying fat: 141 additional calories.
- Unsweetened applesauce 1 cup: 105 calories in nutrient-dense form, 68 additional calories, total 173 calories.
- Fat-free milk: 83 calories in nutrient-dense form, 66 additional calories, total 149 calories.
- Whole milk 1 cup: 83 calories in nutrient-dense form, 66 additional calories, total 149 calories.

Dietary Guidelines for Americans 2010
Other Recommendations: Foods & Food Components to Reduce

• Sodium

• Fats
  – Saturated fatty acids
  – *Trans* fatty acids
  – Cholesterol

• Calories from solid fats and added sugars

• Refined grains

• Alcohol
Foods & Food Components to Reduce Sodium

• Reduce intake to less than 2300 mg per day
  – Further reduce intake to 1500 mg per day for
    – Adults ages 51+
    – African Americans ages 2+
    – People ages 2+ with high blood pressure, diabetes, or chronic kidney disease

• The 1500 mg recommendation applies to half the total population (ages 2+) and to the majority of adults

• Immediate, deliberate reduction in sodium content of foods is needed
Foods & Food Components to Reduce

Fats
• Saturated fatty acids—less than 10% of calories
  – Less than 7% reduces risk of CVD further
  – Replace with poly- and monounsaturated fatty acids (not with sugar or refined grain)
• Trans fats—as low as possible
• Cholesterol—less than 300 mg per day
  – Effect small compared to saturated and trans fats new
  – Eggs—up to 1 per day new
Saturated Fatty Acids

• **Summary**
  - Limit SFA intake to < 7%en, replacing these calories with MUFA or PUFA rather than CHO to reduce risk of CVD and T2D (adults and children)
  - Goal: Take steps to < 7%en by consuming < 10%en

> Decrease major sources of SFA

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* Sources of dietary SFA in U.S. population > 2 yo, NHANES 2005-06
Saturated Fatty Acids

Hu FB et al., J Am Coll Nutr 2001;20:5-19
Stearic Acid

- **Question**
  - What are the effects of dietary stearic acid on LDL cholesterol?

- **Evidence:** Since 2000, review of 20 RCTs + IOM report (2002)

- **Conclusion**
  - Committee: Moderate evidence from a systematic review indicates that
    - when stearic acid is substituted for other SFA or *trans* fatty acids, plasma LDL cholesterol levels are decreased;
    - when substitute for CHO, LDL cholesterol levels are unchanged;
    - when substituted for MUFA or PUFA, LDL cholesterol levels are increased;
    - → the impact of stearic acid replacement of other energy sources is variable regarding LDL cholesterol, and the potential impact of changes in stearic acid intake on CVD risk remains unclear.

- Policy: No comment
Top Dietary Sources of Stearic Acid among U.S. Population (2005-06 NHANES)

These 18 food sources of stearic acid represent 76.7% of the total intake.
Stearic Acid

• Functional Alternatives – Stearic Acid (18:0)
  – Health Impact
    ➢ Clinical study: Stearic acid reduced LDL-C, did not affect the ratio of LDL to HDL cholesterol (Aro A et al., Am J Clin Nutr 1997;65:1419-26)
    ➢ Institute of Medicine: Stearic acid considered neutral effect on LDL cholesterol (IOM, 2002; not part of 2010 NEL review)
    ➢ Metabolic review: Based on the available evidence about the biological effects of stearic acid, we propose that it is a viable candidate as a replacement for tFA. (Kris-Etherton PM et al., Lipids 2005;40:1193-200)
    ➢ Meta-analysis: Four studies that assessed substitution of stearic acid (7-9%en) for tFA (7-8%en) showed not adverse effects on CVD risk. (Hunter JE et al., Am J Clin Nutr doi:10.3945/ajcn.2009.27661)
  – Regulatory Implications – Unknown
    ➢ What if SFA omitted stearic acid (18:0) from the nutrition facts panel?
Ruminant trans-Fatty Acids

• Question
  – What effect does consuming natural (ruminant) versus synthetic (industrially hydrogenated) trans fatty acids have on LDL-, HDL- and non HDL cholesterol levels?

• Evidence: Two strong randomized controlled cross-over trials and one methodologically neutral review since 2000.

• Conclusion
  – Committee: Limited evidence is available to support a substantial biological difference in the detrimental effects of industrial trans fatty acids (iTFA) and ruminant trans fatty acids (rTFA) on health when rTFA is consumed at 7-10 times the normal level of consumption.
  – Policy: There is limited evidence to conclude whether synthetic and natural trans fatty acids differ in their metabolic effects and health outcomes. Because natural trans fatty acids are present in meat, milk, and milk products, their elimination is not recommended because this could have potential implications for nutrient adequacy.
Dietary Cholesterol

• Modeling
  – < 200 mg/d → < 2 eggs/wk and 20% ↓ of meat, chicken + substitution with nuts and soy + limit solid fats at 10 g/d + isocaloric substitution with oils
  – Potential unintended consequences

• Conclusion
  – Committee:
    - Moderate evidence from epidemiological studies relates dietary cholesterol to clinical CVD endpoints
    - RCTs suggest 1 egg/d is not associated with risk of CHD
    - Among those with T2D, increased dietary cholesterol associated with CVD risk
  – Policy
    - One egg/d does not increase risk of CVD in healthy people
    - Consuming < 300 mg/d can help maintain normal blood cholesterol levels
    - Consuming < 200 mg/d can help individuals at high risk of CVD
Dietary Sources of Solid Fats

![Pie chart showing sources of solid fats in the diets of the U.S. population ages 2 years and older, NHANES 2003-2004.](image)

- All other food categories: 23.1%
- Grain-based desserts: 10.8%
- Pizza: 9.1%
- Regular cheese: 7.6%
- Sausage, franks, bacon, ribs: 7.1%
- Fried white potatoes: 4.8%
- Dairy desserts: 4.7%
- Tortillas, burritos, tacos: 4.6%
- Chicken and chicken mixed dishes: 4.1%
- Pasta and pasta dishes: 3.9%
- Whole milk: 3.9%
- Burgers: 3.8%
- Eggs and egg mixed dishes: 3.7%
- Reduced-fat milk: 3.4%
- Beef and beef mixed dishes: 2.9%
- Butter: 2.4%

Dietary Guidelines for Americans 2010
Food Sources of Added Sugars

FIGURE 3-6. Sources of Added Sugars in the Diets of the U.S. Population Ages 2 Years and Older, NHANES 2005–2006a

- Soda, energy drinks, sports drinks: 35.7%
- Grain-based desserts: 12.9%
- Fruit drinks: 10.5%
- Dairy desserts: 6.5%
- Candy: 6.1%
- Ready-to-eat cereals: 3.8%
- Sugars and honey: 3.5%
- Tea: 3.5%
- Yeast breads: 2.1%
- All other food categories: 15.4%
Added Sugars and Body Weight

- There is insufficient evidence that an exchange of sugar for non-sugar carbohydrates results in lower body weights (a calorie = a calorie)
- Observational (cross-sectional) studies suggest a possible relationship between consumption of sugar-sweetened beverages (SSB) and body weight; no supporting RCTs
- Insufficient evidence to support a difference between liquid and solid sugar intake and body weight control

Sugar-Sweetened Beverages

• There is limited evidence that intake of SSB is linked to higher energy intake in adults.

• There is moderate epidemiologic evidence that suggests greater consumption of SSB is associated with increased body weight. In isocaloric conditions, added sugars, including SSB, are no more likely to cause weight gain than any other source of energy.
Sugar-Sweetened Beverages and Childhood Obesity

Conclusion

• Strong evidence

• Limited evidence
  – Greater intake of fruits and vegetables may protect against adiposity (NEL 2004-2009 + ADA 1982-2004)
  – 100% fruit juice associated only in children who are overweight (NEL 2004-2009 + ADA 1982-2004)
Challenges in Reducing Sugars

- Consumer distraction and confusion with “HFCS”, “natural”
- Sports/energy drinks
- No added sugar/sugar-free claims not possible with current peptide sweeteners
- Tolerance of sugar alternatives can limit applicability
  - e.g., polyols (excess consumption → GI distress)
Sources of Refined Grains

FIGURE 3-7. Sources of Refined Grains in the Diets of the U.S. Population Ages 2 Years and Older, NHANES 2003–2004*
Foods and Food Components to Reduce

Refined Grains

• Limit consumption of refined grains, especially those that contain solid fats, added sugars, and sodium new

• Enriched refined grain products provide some vitamins and minerals, but not the fiber provided by whole grains

• Replace refined grains with whole grains
# Variable Composition

## Percent

<table>
<thead>
<tr>
<th>Grain/Component</th>
<th>Germ *</th>
<th>Endosperm (flour)</th>
<th>Bran *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>3 ± 0.5</td>
<td>83 ± 1.0</td>
<td>14 ± 0.5</td>
</tr>
<tr>
<td>Corn</td>
<td>11 ± 1.5</td>
<td>82 ± 1.5 (e.g., grits, meal, flour)</td>
<td>7 ± 0.5</td>
</tr>
<tr>
<td>Oats</td>
<td></td>
<td>67 ± 0.5</td>
<td>33 ± 0.5</td>
</tr>
<tr>
<td>Rice</td>
<td>2.5 ± 0.5</td>
<td>90 ± 1.0</td>
<td>7.5 ± 0.5</td>
</tr>
</tbody>
</table>

* Germ and Bran provide > 80% of phenolics, even though these components represents a small percentage of the total grain. Endosperm represents the large majority of whole grains, this is the main source of digestible carbohydrates (energy) and the main source of white flours.

Calculations from published data (peer reviewed and textbook) by Deirdre Ortiz Ph.D., 2010
Challenges in Reducing Refined Grains

• Inconsistent nomenclature
  – Enriched flour/refined flour (see regulations)
• Enriched flour not quantified on product label
• Ability to communicate health benefits of whole grains in products with < 51% whole grains
• Unintended consequences
  – Increased sugars for taste
  – Decreased folic acid from enriched grains
Foods and Nutrients to Increase

While staying within calorie needs, increase intake of

• Vegetables
• Fruits
• Whole grains
• Milk
• Seafood, in place of some meat/poultry new
• Oils

Nutrients of public health concern

• Potassium
• Fiber
• Calcium
• Vitamin D
US Trends on Plant-based Diets

• 23% US adult population followed diet void of meat, fish, poultry
  – Includes vegans and lacto-ovo vegetarians*
  – ~1.4% of adults are vegans
  – 6.7% of adults said they never eat meat*

• 3% US children and adolescents follow vegetarian diets**
  – ~1% are vegans

• Certain religious groups strictly consume only plant-based foods
  – Hindus, Buddhists

• Other religious group are predominately vegetarian or restrict intake of animal-based components
  – Seventh Day Adventists
  – Kosher Jewish

• Many reasons: personal (ethical), health (perceived and real), food safety, religious

* 2006 Data; ** 2005 Data
Health Benefits of Plant-based Diets

• No randomized, controlled trials of these diet patterns
• DASH diet
  – $\downarrow$ plasma lipids and blood pressure; $\downarrow$ CVD risk
• Mediterranean diet
  – $\downarrow$ CVD risk
• Lacto-ovo diet
  – $\downarrow$ BMI
• USDA DG diet
  – Testing recommended by DGAC

Courtesy of NL Keim and LH Allen, USDA ARS, UC Davis, October 2010
Agricultural Challenges
(to meet 2010 DG within next 5 years)

• 8.9 million more acres of cropland would be needed to support vegetable production (2002 statistic) → 10.3 million more acres (2015 projection)
• 4.1 million more acres of cropland would be needed to support fruit production (2002 statistic) → 4.7 million more acres (2015 projection)
• In general, need nearly 2% increase in total US cropland (2002 statistic) → more than 2.3% increase in total US cropland (2015 projection) or about 3% increase in harvested cropland (about 320 million acres; 1997 acreage)
• 107.7 billion additional pounds of fluid milk and milk products are needed (an increase of 66% - impact on number of dairy cows, feed grains, and “grazing” acreage) → 124.6 billion additional pounds (2015 projection) → nearly 80% increase (cows, feed grains, grazing acreage)

Recommendations

Intake as percent of goal or limit

Eat more of these:
- Whole Grains: 15%
- Vegetables: 59%
- Fruits: 42%
- Milk: 52%
- Oils: 61%
- Fiber: 40%
- Potassium: 56%
- Vitamin D: 42%
- Calcium: 75%

Eat less of these:
- Calories from SoFAS: 280%
- Added sugars: 242%
- Solid fats: 281%
- Refined grains: 200%
- Sodium: 229%
- Saturated fat: 158%
Principles of Communications

• Simple, direct, actionable messages
• Behavior-change focused
• Motivational
• Reach where consumers need to make food decisions
• Collaborative process
Communications Processes

Multi-modal Approach

- Formative Research
- Improving USDA’s Online Interactive Educational Tools
- Dietary Guidelines Communications Rollout
- Plan for Sustained Momentum
Interactive Tool
Interactive Tool
Coordinated Approach to Messaging Campaign Calendar

• Develop seasonal calendar for phased-in release of Dietary Guidelines messages

• Share calendar broadly for ultimate coordination
  – Message intervals will allow stakeholders time to build into communication plans and sufficient public “shelf life” for each theme

• The vision: A public that receives specific messages simultaneously, repeatedly, through various channels = maximum reinforcement!
Sustained Tools
**Bok Choy Cole Slaw**

**Measure**
- 2 tablespoons mayonnaise
- 2 tablespoons apple cider vinegar
- 2 tablespoons olive oil
- 1 teaspoon salt
- 1 teaspoon cumin
- 1 teaspoon hot pepper sauce
- 1 pound Chinese cabbage – shredded
- 3 medium carrots – shredded
- 1 large red bell pepper – shredded

**DID YOU KNOW?**
Compare sodium in foods like soup, bread, and frozen meals—and choose the foods with lower numbers.

**INSTRUCTIONS**
Whisk the mayonnaise, vinegar, olive oil, salt, cumin and hot pepper sauce together in a large serving bowl until smooth. Add the cabbage, carrots and bell pepper and toss to coat with the dressing. Refrigerate until ready to serve. Reserve 2 cups for Soft Veggie Tacos.
Research for 2015 and Beyond Examples

- Conduct well-controlled and powered prospective studies to characterize the association between specific dietary factors and childhood obesity.
- Conduct clinical trials among children and adults to critically examine the impact of adherence to the 2010 *Dietary Guidelines for Americans* as a total dietary approach to a healthy lifestyle on body weight change, CVD, T2D, cancer, and osteoporosis and related clinical endpoints.
Research for 2015 and Beyond
Examples

• Conduct randomized controlled trials comparing different types of nuts on intermediate markers, such as serum lipids, and classify each specific type of nut as more or less associated with CVD risk reduction.

• Elucidate further the role of polyphenolic compounds as major active ingredients in the health benefits of chocolate and other foods commonly consumed by the general public.

• Conduct studies of potential limitations of plant-based diet for key nutrients, including calcium, iron, vitamin $B_{12}$ and protein quality, especially in children and the elderly.
Helping Americans Make Healthy Choices

• Current food and physical activity environment is influential—for better and for worse
• All elements of society, have a role
  – Individuals and families
  – Communities
  – Business and industry
  – All levels of government
• Work together to improve the Nation’s nutrition and physical activity
Call to Action

Public Health Imperative Poses Challenges and Opportunities

• Create a Roadmap for Innovation - Prioritize and Focus on Dedicated Changes:
  – Reduce calories
  – Less calories overall, sodium, saturated fat, added sugars

• More fruits, vegetables, whole grains, low fat dairy

How will your foods and programs help consumers follow the Dietary Guidelines for Americans?