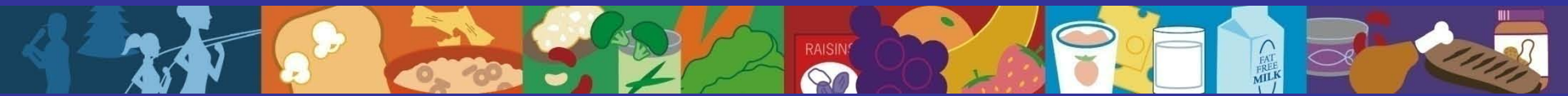




The Development and Evaluation of the Healthy Eating Index-2005

Patricia M. Guenther, PhD, RD
Center for Nutrition Policy and Promotion
US Department of Agriculture

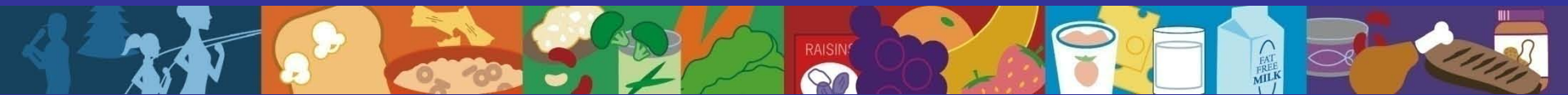




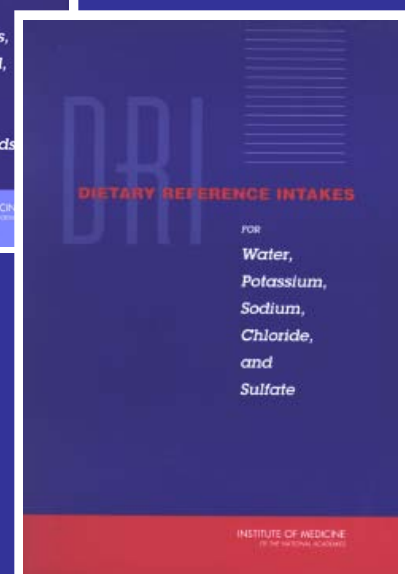
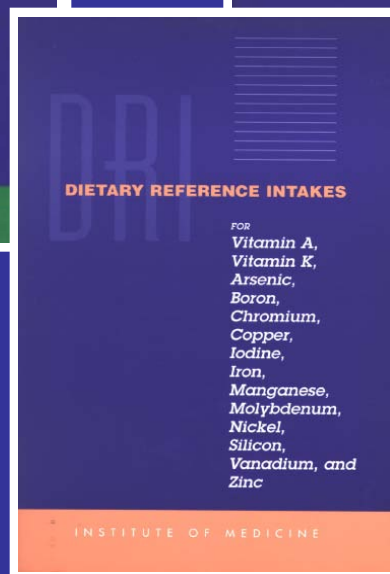
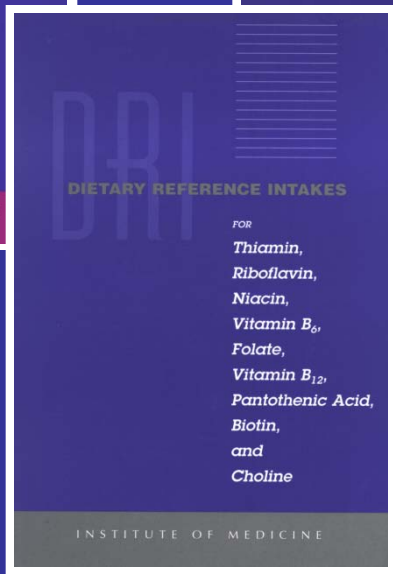
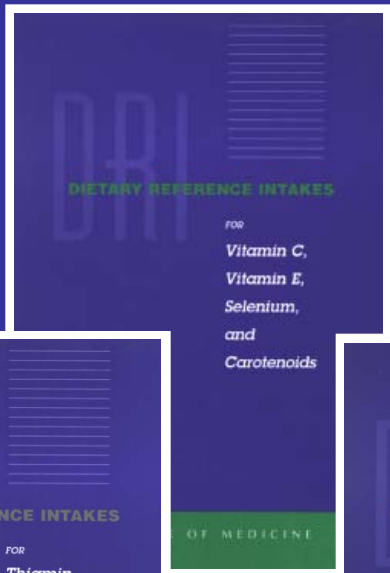
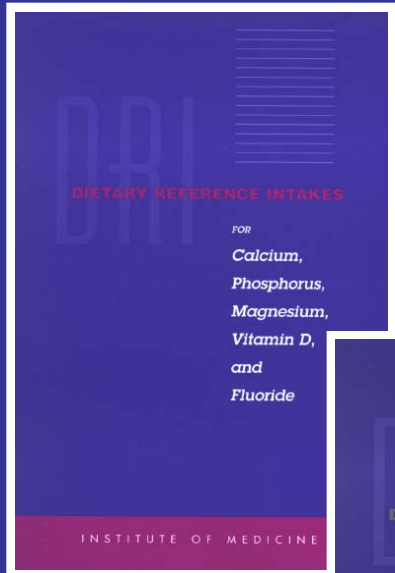
Overview

- Background
- Purpose
- HEI-2005
 - Components and standards
 - Empty calories
 - Evaluations
- Recommendations
- Questions





From science to assessment



From science to assessment



From science to assessment



www.DietaryGuidelines.gov

From science to assessment

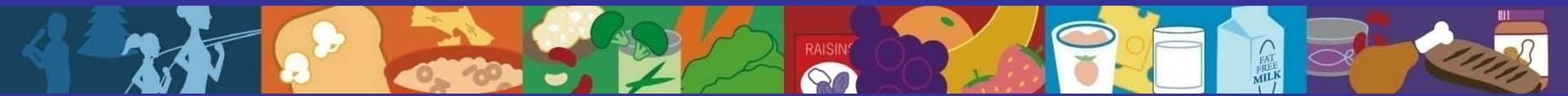


From science to assessment



From science to assessment





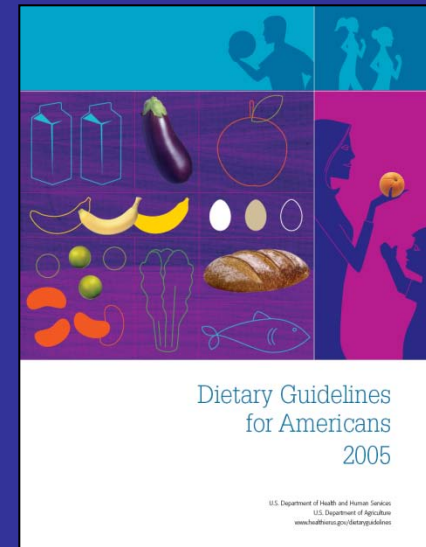
Applications

- Assess diet quality of populations
- Research on dietary patterns and health
- Nutrition interventions

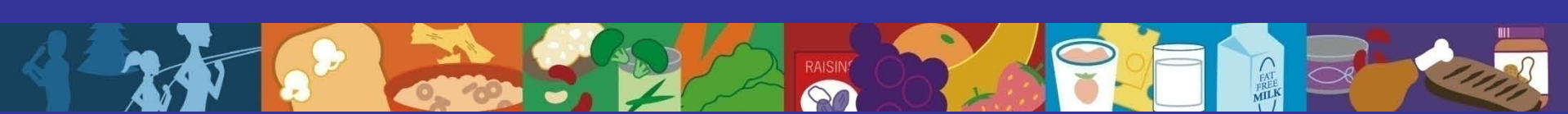


Purposes of this project

- Revise HEI to conform to 2005 Dietary Guidelines
- Evaluate psychometric properties
 - Validity
 - Reliability



Guenther et al, *J Am Dietet Assc*, Nov, 2008



Original Healthy Eating Index

Adequacy:

- Total Fruit
- Total Vegetables
- Total Grains
- Milk
- Meat & Beans

Moderation:

- **Total Fat**
- Saturated Fat
- **Cholesterol**
- Sodium

Variety





Healthy Eating Index-2005

Adequacy:

- Total Fruit
- **Whole Fruit**
- Total Vegetables
- **Dark Green/Orange/
Legumes**
- Total Grains
- **Whole Grains**

- Milk
- Meat & Beans
- **Oils**

Moderation:

- Saturated Fat
- Sodium
- **Calories from Solid Fats,
Alcohol, Added Sugars**



Healthy Eating Index-2005

Adequacy:

- Total Fruit
- Whole Fruit
- Total Vegetables
- Dark Green/Orange/
Legumes
- Total Grains
- Whole Grains

- Milk
- Meat & Beans
- Oils

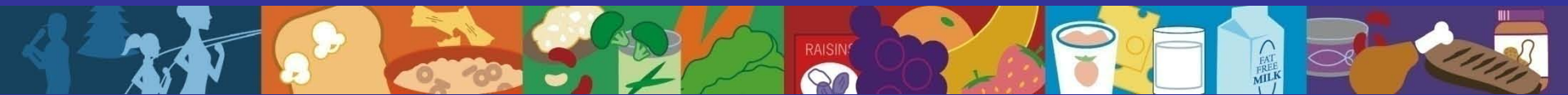
Moderation:

- Saturated Fat
- Sodium
- Calories from Solid Fats,
Alcohol, Added Sugars
("empty calories")



Scoring

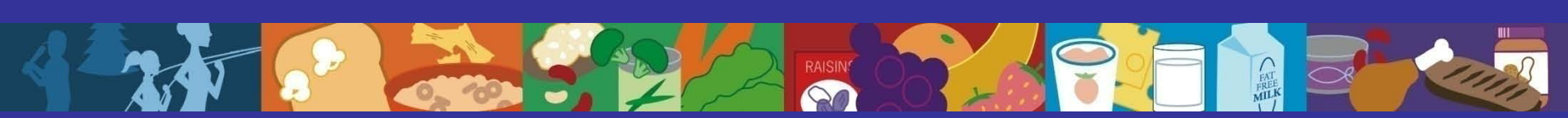
- Fruit
 - Total (5)
 - Whole (5)
- Vegetables
 - Total (5)
 - Dark Green/Orange/
Legumes (5)
- Grains
 - Total (5)
 - Whole (5)
- Milk (10)
- Meat & Beans (10)
- Oils (10)
- Saturated Fat (10)
- Sodium (10)
- Calories from Solid Fats, Alcohol, Added Sugars (20)



Density standards

- Density approach
 - Express recommended amounts per 1000 calories
- True to pattern intentions
 - Over time intake should have these proportions of food groups
- Assesses the mix of foods
- No need to determine an individual's appropriate calorie level

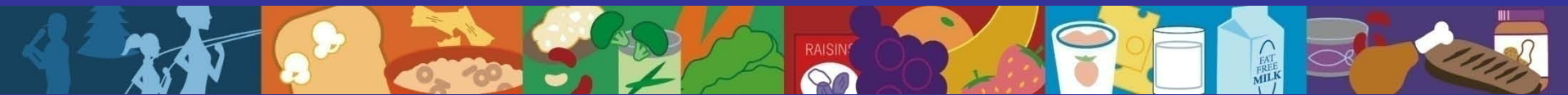




Complementary measures

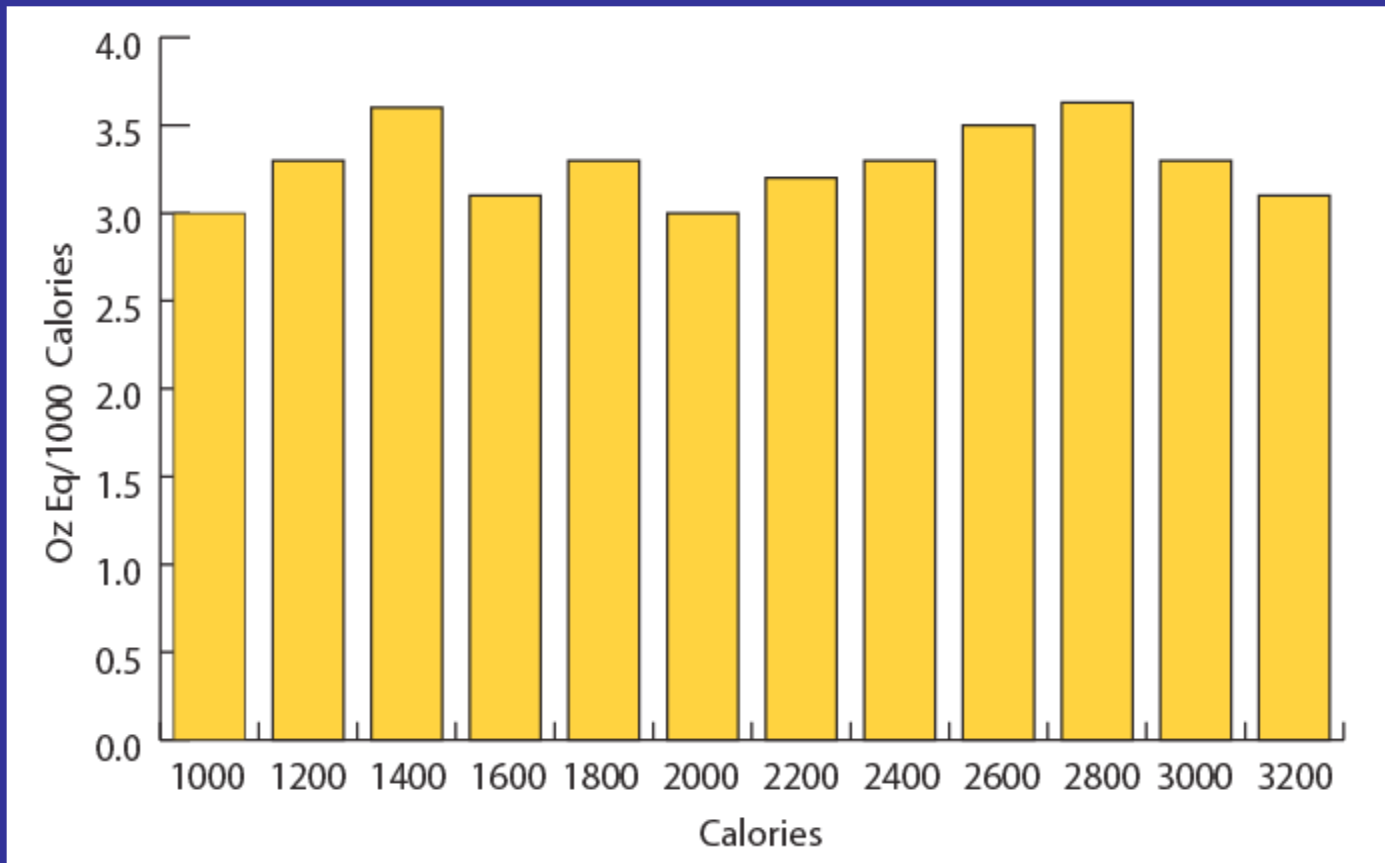
- Anthropometrics
 - Body Mass Index
 - Waist circumference
- Physical activity

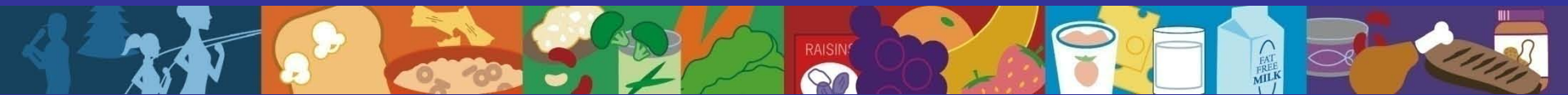




Total Grains

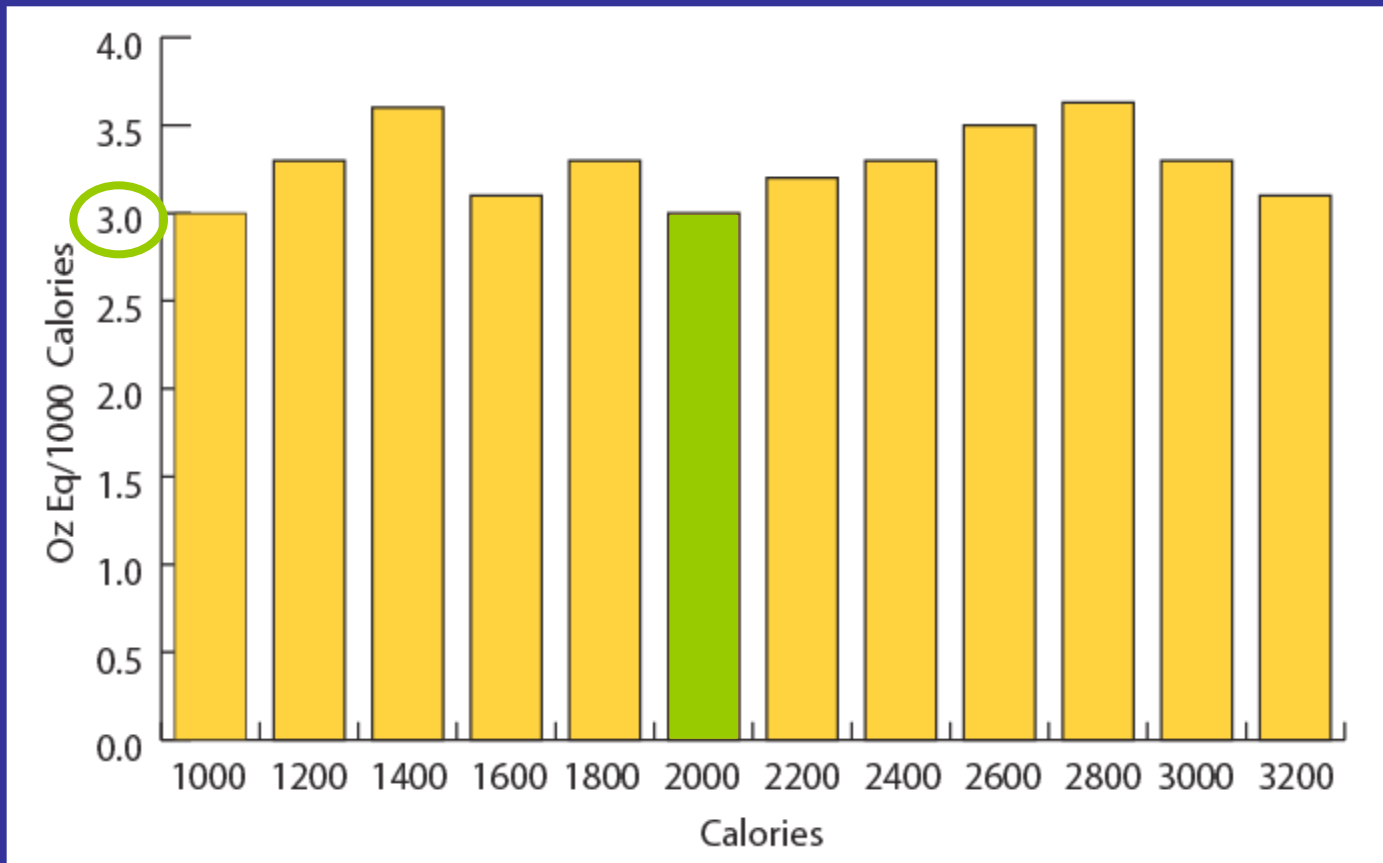
Recommended amounts per 1000 calories

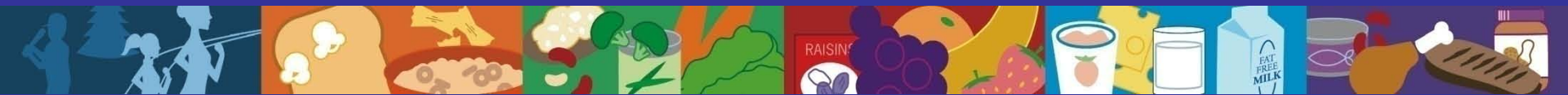




Total Grains

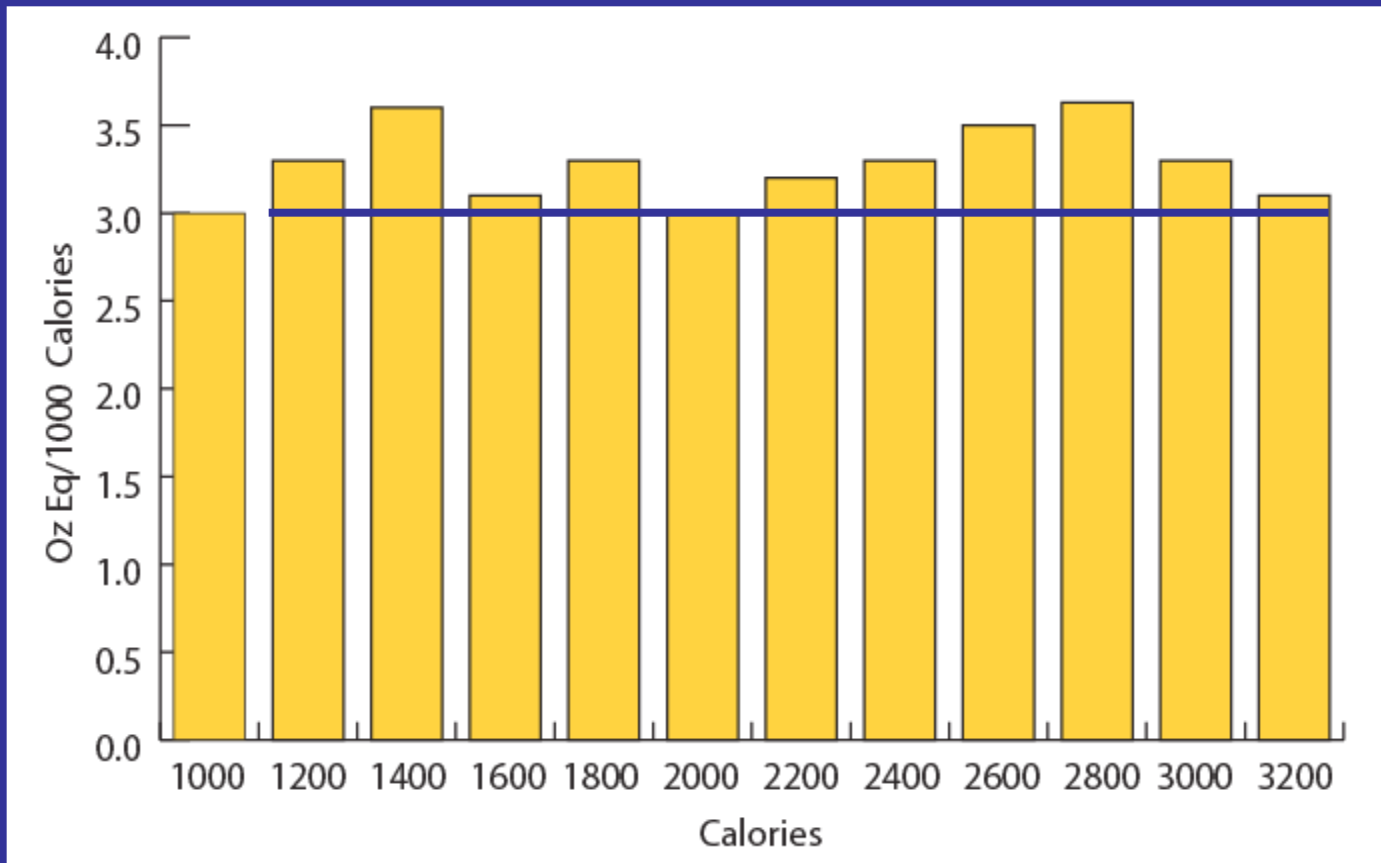
Recommended amounts per 1000 calories





Total Grains

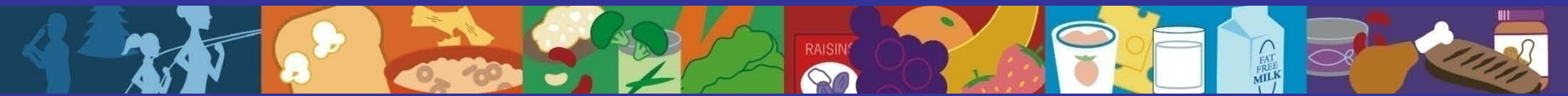
Recommended amounts per 1000 calories





Scoring

- Adequacy components
 - Maximum points for meeting the standard
 - 0 points for none
- Moderation components
 - Scientific standards for maximum score
 - Population distributions examined to set minimum scores



Discretionary calories

- Introduced 2005 Dietary Guidelines Advisory Committee
 - “Difference between total energy requirements and energy consumed to meet recommended nutrient intakes”
 - Includes solid fats, alcohol and added sugars
 - Additional amounts of nutrient-rich foods

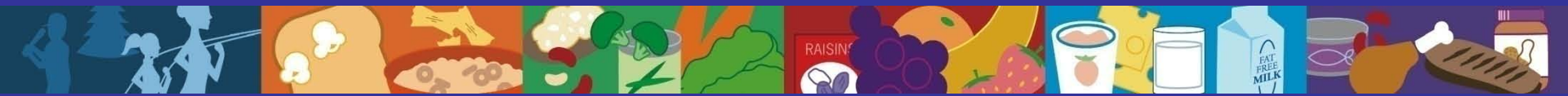




Discretionary calories

- Discretionary calories difficult to measure
- Desire a component to address over-consumption

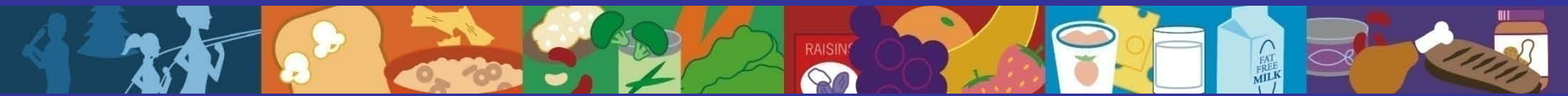




Operational definition

- Calories from Solid Fats, Alcohol and Added Sugars
 - Represents a subset of all discretionary calories
 - Does not cover intake above recommended amounts of MyPyramid food groups
 - Total grains and meat





Evaluation

- Content validity
 - Check against Dietary Guidelines
- Construct validity
 - Exemplary menus
 - Smokers vs nonsmokers
- Reliability
 - Internal consistency





Content validity

- Extent to which the measure captures the variety of attributes that make up the construct
- Includes face validity
- Test
 - Check against Dietary Guidelines





Evaluation

- Content validity
 - Check against Dietary Guidelines
- **Construct validity**
 - Exemplary menus
 - Smokers vs nonsmokers
- Reliability
 - Internal consistency





Construct validity

- Indicates theoretical construct and is consistent with theoretical hypotheses
- Tests
 - Scored exemplary menus
 - Smokers vs nonsmokers





Menu data

- MyPyramid.gov
- [Your Guide to Lowering Your Blood Pressure With DASH](#)
- [Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating](#)
- AmericanHeart.org



Exemplary Menu

	MyPyramid	DASH	Harvard	AHA
Total Grains	5	4.8	5	5
Whole Grains	5	5	5	5
Total Vegetables	5	5	5	5
Dark Green, etc.	5	5	5	4.9
Fruit	5	5	5	5
Whole Fruit	5	5	5	5
Milk	10	10	0.9	8.7
Meat & Beans	10	10	10	10
Oils	10	10	10	10
Sodium	10	10	10	10
Saturated Fat	10	10	10	10
Empty Calories	20	20	20	20
Total	100	99.8	90.9	98.6

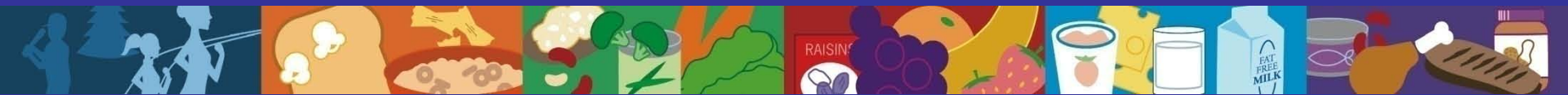




Food intake data

- NHANES 2001-2002
- N = 8650
- One 24-hour recall per respondent

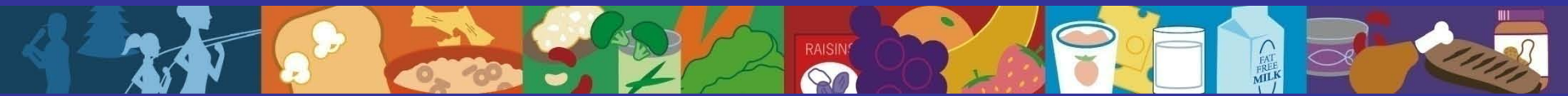




Evaluation

- Content validity
 - Check against Dietary Guidelines
- Construct validity
 - Exemplary menus
 - **Smokers vs nonsmokers**
- Reliability
 - Internal consistency





Concurrent criterion validity

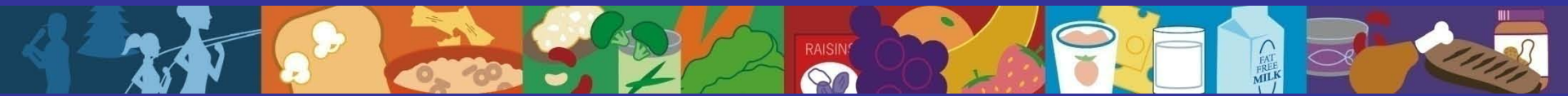
- Distinguishes between groups in the present time
- Test
 - Smokers vs nonsmokers





Smokers vs nonsmokers

- Different component scores
 - Original HEI 5 of 10
 - HEI-2005 9 of 12
- Different total score
 - Original HEI 5.5 points
 - HEI-2005 8.6 points



Evaluation

- Content validity
 - Check against Dietary Guidelines
- Construct validity
 - Exemplary menus
 - Smokers vs nonsmokers
- Reliability
 - Internal consistency





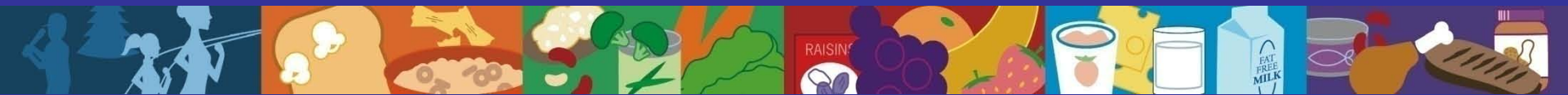
Types of reliability

- Test-retest
 - Respondent recall
 - Data collection and coding
- Inter-rater
 - No judgment required
- Internal consistency



Internal consistency

- Cronbach's alpha = 0.43
- Anticipated to be low
- Components
 - Not measuring same thing
 - Relationships vary
- HEI as a set of profile scores



HEI-2005

- Reflects the 2005 Dietary Guidelines
- Uncouples diet quality and diet quantity
 - Density approach
- Provides a valid set of profile scores
 - Monitoring diet quality
 - Research on dietary patterns and health
 - Nutrition interventions





Assessing usual intake

- Institute of Medicine (IOM) dietary assessment report
- IOM and Dietary Guidelines
 - Recommendations to be met over time
 - Assess usual intake
- 1-day means estimate group usual intake

IOM, *DRIs: Applications in Dietary Assessment*, 2002



Population HEI-2005 score

$$\frac{\sum (\text{Food Group})_{\text{individual}}}{\sum (\text{Energy})_{\text{individual}}}$$

Freedman et al, *J Nutr*, Sept, 2008



Population HEI-2005 score

$$\frac{\sum (\text{Food Group})_{\text{individual}}}{\sum (\text{Energy})_{\text{individual}}}$$

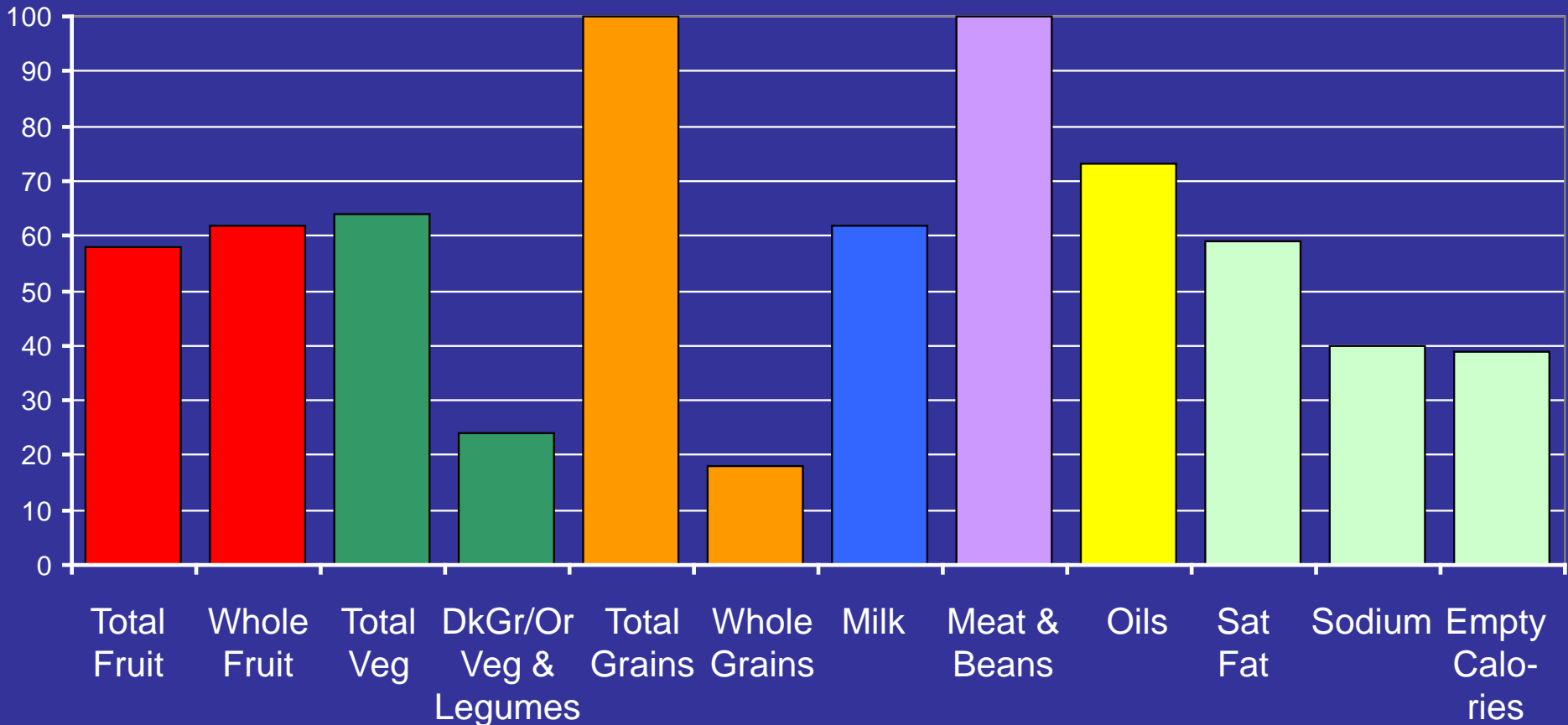
→ Assign score

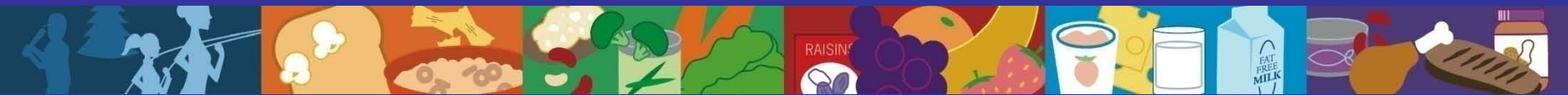
Freedman et al, *J Nutr*, Sept, 2008

HEI-2005 population scores

as a percent of the standard

Total score = 57.5%





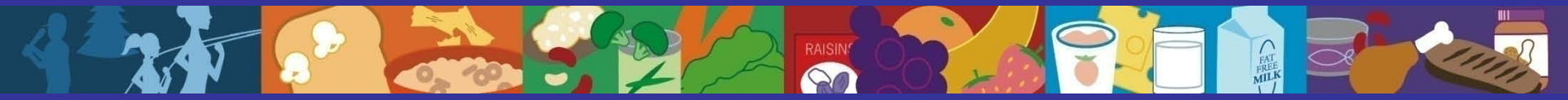
Application to EFNEP

- Evaluate the effectiveness of the program
 - Collect one 24-hour recall from a sample
 - Before the intervention
 - Collect one 24-hour recall from the sample
 - After the intervention
 - Calculate and compare pre- and post-HEI scores at the group (state) level



From science to assessment





Resources

www.cnpp.usda.gov/HealthyEatingIndex

www.DietaryGuidelines.gov

Patricia.Guenther@cnpp.usda.gov

