Measuring Nutrition Literacy
Heather Gibbs, PhD, RD, LDN
Assistant Professor, Dietetics & Nutrition
Audience Participation!

Using 2-3 words, describe “health literacy”

To participate:
1. Text ‘heathergibbs494’ to ‘37607’ (to join)
2. Text your answer

https://www.polleverywhere.com/free_text_polls/7xFXYdTly7hknGs
Prevalence of Low Health Literacy

PERCENTAGE OF ADULTS IN EACH HEALTH LITERACY LEVEL: 2003

- Basic: 22%
- Below Basic: 14%
- Proficient: 12%
- Intermediate: 52%

US Department of Education, 2006
Associations of Low Health Literacy

- Decreased knowledge of illness and management
- Increased hospitalization rates
- Decreased use of preventive care services
- Increased cost of health care

Neilson-Bowman, Institute of Medicine, 2004
# Outcomes in Patients With Low Health Literacy

<table>
<thead>
<tr>
<th>Good Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher all-cause mortality rates of elderly persons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Moderate Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased use of emergency care and hospitalizations</td>
</tr>
<tr>
<td>Lower probability of mammogram screening and flu vaccinations</td>
</tr>
<tr>
<td>Poorer skills associated with taking medications</td>
</tr>
<tr>
<td><strong>Poorer interpretation of medication or nutrition labels</strong></td>
</tr>
<tr>
<td>Poorer health status among elderly persons</td>
</tr>
</tbody>
</table>

Note: Emerging evidence that health literacy may mediate racial disparities in health outcomes

Berkman et al. 2011
Health Literacy and Food Label Reading

Rothman, 2006
Health Literacy and Portion Sizing

Overestimation of a single food serving was more likely in those with low health literacy (p<0.001) or numeracy (p=0.008)

½ cup cranberry juice  1 cup cooked pasta  ½ cup pineapple  3 oz cooked ground beef

Huizinga, 2009; public domain photos
## Table 2: Healthy Eating Index (HEI) scores and sugar-sweetened beverage (SSB) intake in relation to health literacy categories (n=376)

<table>
<thead>
<tr>
<th>Score</th>
<th>Maximum Score</th>
<th>Overall (n=376)</th>
<th>Category 1*: High likelihood of limited health literacy (n=195)</th>
<th>Category 2*: Possibility of limited health literacy (n=83)</th>
<th>Category 3*: Adequate health literacy (n=98)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total HEI score</td>
<td>100</td>
<td>52.5±10.5</td>
<td>51.4±10.4</td>
<td>51.5±10.6</td>
<td>55.5±10.3</td>
<td>1&lt;3**; 2&lt;3*</td>
</tr>
<tr>
<td>Total fruit (includes 100% juice)</td>
<td>5</td>
<td>2.9±1.6</td>
<td>2.9±1.6</td>
<td>2.7±1.6</td>
<td>2.9±1.6</td>
<td>NS^b</td>
</tr>
<tr>
<td>Whole fruit (not juice)</td>
<td>5</td>
<td>2.3±1.7</td>
<td>2.2±1.6</td>
<td>2.0±1.5</td>
<td>2.6±1.8</td>
<td>2&lt;3*</td>
</tr>
<tr>
<td>Total vegetables</td>
<td>5</td>
<td>2.8±1.2</td>
<td>2.6±1.2</td>
<td>2.7±1.1</td>
<td>3.1±1.1</td>
<td>1&lt;3**</td>
</tr>
<tr>
<td>Dark-green and orange vegetables and legumes</td>
<td>5</td>
<td>1.4±1.2</td>
<td>1.4±1.2</td>
<td>1.4±1.2</td>
<td>1.6±1.1</td>
<td>NS</td>
</tr>
<tr>
<td>Total grains</td>
<td>5</td>
<td>4.1±1.0</td>
<td>4.1±1.0</td>
<td>4.0±1.0</td>
<td>4.2±0.9</td>
<td>NS</td>
</tr>
<tr>
<td>Whole grains</td>
<td>5</td>
<td>1.5±1.4</td>
<td>1.4±1.4</td>
<td>1.4±1.4</td>
<td>1.7±1.3</td>
<td>NS</td>
</tr>
<tr>
<td>Milk</td>
<td>10</td>
<td>4.7±2.8</td>
<td>4.5±2.8</td>
<td>4.6±2.7</td>
<td>5.3±2.8</td>
<td>NS</td>
</tr>
<tr>
<td>Meat and beans</td>
<td>10</td>
<td>9.3±1.5</td>
<td>9.3±1.5</td>
<td>8.9±1.8</td>
<td>9.5±1.2</td>
<td>2&lt;3*</td>
</tr>
<tr>
<td>Oils</td>
<td>10</td>
<td>5.9±2.5</td>
<td>5.4±2.4</td>
<td>6.3±2.8</td>
<td>6.5±2.3</td>
<td>1&lt;3**; 1&lt;2*</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>10</td>
<td>5.3±3.2</td>
<td>6.0±3.0</td>
<td>5.1±3.5</td>
<td>4.3±3.2</td>
<td>1&lt;3</td>
</tr>
<tr>
<td>Sodium</td>
<td>10</td>
<td>3.2±2.7</td>
<td>3.2±2.8</td>
<td>3.7±2.8</td>
<td>2.7±2.3</td>
<td>NS</td>
</tr>
<tr>
<td>Solid fat, alcohol, and added sugar</td>
<td>20</td>
<td>9.2±5.4</td>
<td>8.4±5.4</td>
<td>8.8±5.5</td>
<td>11.1±4.9</td>
<td>1&lt;3**</td>
</tr>
<tr>
<td>SSBs (kcal/d)</td>
<td>N/A</td>
<td>192±367</td>
<td>230±426</td>
<td>197±315</td>
<td>111±195</td>
<td>1&lt;3**</td>
</tr>
</tbody>
</table>

*Assessed using the Newest Vital Sign: 0-1 correct answers—high likelihood of limited literacy, 2-3 correct answers—possibility of limited literacy, and 4-6 correct answers—adequate literacy skills.

^NS—not significant.

^P<0.05.

^*P<0.01.
What is “nutrition literacy”?  

“the degree to which individuals have the capacity to obtain, process, and understand nutrition information and skills needed in order to make appropriate nutrition decisions”

◦ Conceptual nutrition knowledge
◦ Functional capabilities (skill)
DIETARY GUIDELINES FOR AMERICANS
2015-2020
EIGHTH EDITION

Welch's Fruit Snacks
MIXED FRUIT

Nutrition Facts
Serving Size 8 g
Serving Per Container 1

Amount Per Serving
Calories 0

Total Fat 0g
Saturated Fat 0g
Trans Fat 0g

Cholesterol 0mg
Potassium 34mg
Sodium 1mg

Total Carbohydrate 6g
Dietary Fiber 4g
Sugars 0g

Protein 0g

Vitamin A 0%  •  Vitamin C 1%
Calcium 8%  •  Iron 4%
Vitamin E 1%  •  Vitamin K 3%
Niacin 1%  •  Phosphorus 1%
Magnesium 1%  •  Zinc 1%
Manganese 70%

THE TO BURN FAT FAST

NO LARD • NO CHOL

LEAVENING (CORNStl, SUGAR, BAKING SODA, SODIUM ALUMINUM ACID PHOSPHATE, SODIUM SACCHARIN, ELECTROLYTE) AND OR: POTASSIUM SORBATE (PRESERVATIVE), DUGH CONDITIONERS (FUMARIC ACID, SODIUM ACETATE, CITRATE, AND SORBIC ACID)
Assessment Tools

GENERAL HEALTH LITERACY

Rapid Estimate of Adult Literacy in Medicine\(^1\) (REALM)

Test of Functional Health Literacy in Adults\(^2\) (TOFHLA)

Shortened-TOFHLA\(^3\)

NUTRITION RELATED

Newest Vital Sign\(^4\) (NVS)

Diabetes Numeracy Test\(^5\) (DNT)

Nutrition Literacy Scale\(^6\) (NLS)

Critical Nutrition Literacy\(^7\)

\(^1\)Davis, 1993; \(^2\)Parker, 1995; \(^3\)Baker, 1999; \(^4\)Weiss, 2005; \(^5\)Huizinga, 2008; \(^6\)Diamond, 2007; \(^7\)Guttersrud, 2014
Development of a Measure of Nutrition Literacy (NLit)

Interviews
- Interviewed 8 nutrition education experts to determine instrument domains

RD Critique
- Registered dietitians critiqued the instrument via online survey (n=134-178)

Health, 2012

Prev Chronic Disease, 2013

2 Pilots
- Breast Cancer Patients: Content experts & patient interviews; Instrument testing with 71 patients
  - J Canc Educ, 2015
- Parents of 4-6 yr olds: Instrument testing with 101 dyads
  - J Nutr Educ Behav, 2016

Validation
- Nutrition related chronic disease
- Data collection completed May 2016

KU Medical Center
The University of Kansas
Domains of Nutrition Literacy

NUTRITION KNOWLEDGE

Nutrition and Health
Energy Sources in Food
Food Groups

NUTRITION SKILL

Household Food Measurement
Food Label and Numeracy
Consumer Skills

Goal Length: 6 items per domain (36 items total)
Administered online or in print
2. Using the photos above, choose the right portion for chicken:
   A. thigh (3 ounces)
   B. quarter (5 ounces)
   C. half (10 ounces)
Example: Food Label & Numeracy Domain

This Nutrition Facts Panel at right is taken from the back of a container of macaroni and cheese.

1. How many calories will you eat if you eat the whole container?
   A. 250 calories  
   B. 500 calories  
   C. 700 calories  
   D. 750 calories

2. If you are trying to eat fewer than 500 mg of sodium per meal, how many cups of this food can you eat if you eat nothing else at the meal?
   A. 1 cup  
   B. 2 cups  
   C. 3 cups  
   D. 4 cups
1. If calories are equal for one serving of each food, which provides the most healthful nutrients overall?

A. Applesauce with no sugar added
B. Apple
C. Applesauce with no sugar added is equal to an apple in nutrition.
NLit Validation Study Aims

1. Revise the NLit based upon feedback from nutrition experts and members of the target audience (patients).

2. Evaluate the validity and reliability of the revised NLit.
Revision Process

- **Item Development**
  - Breast Ca Pilot Content Validity Index = 0.93
  - Chronic Disease Content Validity Index = 0.90

- **Expert Content Review**
  - ‘Energy density’ and ‘nutrient density’ are difficult terms
  - Actual portions consumed may be a reference if people do not know recommended portions
  - Calculating % (food label application) was not attempted by some

- **Cognitive Interviews with Target Audience**
Strength of relationships between instrument domains and diet quality

<table>
<thead>
<tr>
<th>NLit-BCa Domain</th>
<th>General linear model</th>
<th>Education and race controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>P value</td>
</tr>
<tr>
<td>Nutrition &amp; Health</td>
<td>3.289</td>
<td>0.124</td>
</tr>
<tr>
<td>Macronutrients</td>
<td>2.481</td>
<td>0.040*</td>
</tr>
<tr>
<td>Household Food Measurements</td>
<td>2.724</td>
<td>0.025*</td>
</tr>
<tr>
<td>Food Label &amp; Numeracy</td>
<td>2.795</td>
<td>0.003*</td>
</tr>
<tr>
<td>Food Groups</td>
<td>1.607</td>
<td>0.018*</td>
</tr>
<tr>
<td>Consumer Skills</td>
<td>2.870</td>
<td>0.007*</td>
</tr>
</tbody>
</table>

*P<0.05

Data for 71 breast cancer patients (17 primary prevention, 54 survivors)
Nutrition Literacy is Related to Diet Quality

101 parent-child dyads

Parent nutrition literacy assessed by NLit-P
- 42 items
- 5 domains

Child (4.9 ± .7 yrs) diet quality assessed by Healthy Eating Index-2010 score from 2, 24-hour recalls

Every 1% increase in parental nutrition literacy = 0.51 increase in child Healthy Eating Index ($R^2=0.174$, $p<0.001$)

NLit Validation Initial Findings
Closing Thoughts

Uses for nutrition literacy assessment:

- Research: tool for nutrition literacy identification
- Practice: identify deficits and determine educational messages
- Outcome measure for targeting improved nutrition literacy

Efforts to improve diet quality may include improving nutrition literacy
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