Connecting you with experts. Exploring the latest childhood obesity news and research.

We will begin at 3:05 to allow participants time to join the webinar.
1. Spotlight
   • Assessing Prevalence and Trends in Obesity: Navigating the Evidence
   • Using NHANES to Demonstrate
2. One on One
3. NCCOR Announcements
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Today’s Speakers

Elaine Arkin
National Collaborative on Childhood Obesity Research

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School of Public Health
Director, State Health Access Data Assistance Center (SHADAC)

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Chief/Epidemiologist
National Center for Health Statistics
Centers for Disease Control and Prevention
INTERACTIVE POLL
Assessing Prevalence and Trends in Obesity: Navigating the Evidence

Shari Barkin, M.D., M.S.H.S. (Chair)
William K. Warren Foundation Chair and Professor of Pediatrics
Director of Pediatric Obesity Research in the Diabetes Center
Chief of General Pediatrics
Vanderbilt University School of Medicine
This Committee’s Task

- **Examine** how obesity prevalence and trend data are collected, analyzed, and interpreted

- **Develop** a framework for assessing studies for policy making and program planning purposes

- **Offer** recommendations for moving the assessment and interpretation of reports forward, improving the collection of data, and filling data gaps
Acknowledgements

• Study Sponsor
  – Robert Wood Johnson Foundation

• Consensus Committee Convened by the National Academies of Sciences, Engineering, and Medicine
  – Shari Barkin, MD, MSHS. (Chair)
  – Cheryl A. M. Anderson, PhD, MPH
  – Lynn A. Blewett, PhD
  – Elizabeth Goodman, MD
  – Ross Hammond, PhD
  – Sandra Hassink, MD, MSc
  – Amy H. Herring, ScD
  – Giridhar Mallya, MD, MSHP (until September 2015)
  – Michael G. Perri, PhD
  – Eduardo Sanchez, MD, MPH, FAAFP
  – Jackson P. Sekhobó, PhD, MPA
  – Shumei S. Sun, PhD (from July 2015)
  – Donald Hedeker, PhD (consultant)
This Committee’s Task

Within the Task

• Assess different methodological and analytical approaches and how that shapes interpretation

Beyond the Task

• Determine current rates, trends, and their significance
• Prescribe how all future studies, assessments should be conducted
• Explore the etiologies of obesity or disparities in obesity
“End Users” of Obesity Reports

- State and local health departments
- Elected officials, state legislatures
- Community-based organizations
- Departments of education, school districts, and schools
- Public agencies (e.g., transportation, planning, parks and recreation)
- Nonprofit and philanthropic organizations
- Advocacy organizations
- Academic researchers and other data generators
- Health care providers
- Health care payers
- Private sector

NOTE: The list is not intended to be exhaustive, but rather illustrative of the range that exists.
Approaches to Data Collection

Key Considerations

Shari Barkin, M.D., M.S.H.S. (Chair)
Key Considerations

• Sampling
• Assessing weight and height status
• Demographic characteristics
Sampling

• The individuals who contribute data have implications for:
  – Representativeness of the data
  – Subgroup analyses
Sampling

• Obesity prevalence estimates can become compromised if the participants do not reflect the target population
Sampling

• One sampling challenge is capturing groups that comprise a small portion of the total population
Assessing Weight and Height Status

- **BMI reflects the measures of weight (kg) and height (m^2)**

- **Accuracy matters, especially for young children**

<table>
<thead>
<tr>
<th>Characteristics of the Individual</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>BMI (kg/m^2)</th>
<th>BMI Status Classification</th>
<th>Difference that Change BMI Status from Normal to Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female, age 2.0 years</td>
<td>86.3</td>
<td>13.4</td>
<td>18.0</td>
<td>Normal</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>86.3</td>
<td>14.3</td>
<td>19.2</td>
<td>Obese</td>
<td>+0.9 kilograms</td>
</tr>
<tr>
<td></td>
<td>83.7</td>
<td>13.4</td>
<td>19.1</td>
<td>Obese</td>
<td>−2.6 centimeters</td>
</tr>
<tr>
<td>Female, age 15.0 years</td>
<td>152.4</td>
<td>55.7</td>
<td>24.0</td>
<td>Normal</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>152.4</td>
<td>65.3</td>
<td>28.1</td>
<td>Obese</td>
<td>+9.6 kilograms</td>
</tr>
<tr>
<td></td>
<td>140.8</td>
<td>55.7</td>
<td>28.1</td>
<td>Obese</td>
<td>−11.6 centimeters</td>
</tr>
</tbody>
</table>
Direct Measurement

• Protocols Differ
  – Equipment used
  – Training and oversight of data collectors
  – Number of repetitions
  – Precision of the recorded measurement
  – Data entry methods
## Proxy or Self-Reported Height & Weight Data

<table>
<thead>
<tr>
<th>Question for Reported Weight</th>
<th>Question for Reported Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>“How much does [sample child] weigh now?”</td>
<td>“How tall is [sample child] now?”</td>
</tr>
<tr>
<td>“How much do you weigh?”</td>
<td>“How tall are you?”</td>
</tr>
<tr>
<td>“How much do you weigh? ___ ___ ___ pounds”</td>
<td>“How tall are you? ___ feet ___ ___ inches”</td>
</tr>
<tr>
<td>“About how much do you weigh without shoes?”</td>
<td>“About how tall are you without shoes?”</td>
</tr>
<tr>
<td>“About how much do you (child) weigh without shoes? [IF NEEDED, SAY: ‘Your best guess is fine.’]”</td>
<td>“About how tall are you (child) without shoes? [IF NEEDED, SAY: ‘Your best guess is fine.’]”</td>
</tr>
<tr>
<td>“How much do you weigh without your shoes on? Directions: Write your weight in the shaded blank boxes. Fill in the matching oval below each number.”</td>
<td>“How tall are you without your shoes on? Directions: Write your height in the shaded blank boxes. Fill in the matching oval below each number.”</td>
</tr>
<tr>
<td>“How much do you weigh without your shoes on? Directions: Write your weight in the blank boxes and fill in the matching circle below each number on your answer sheet.”</td>
<td>“How tall are you without your shoes on? Directions: Write your height in the blank boxes and fill in the matching circle below each number on your answer sheet.”</td>
</tr>
</tbody>
</table>
Assessing Weight and Height Status

• Proxy-reported vs. Directly Measured
  – Generally do not lead to equivalent estimates of prevalence of obesity
  – In young children, error in reporting height largely driving the differences
  – Reporting error can vary by the child’s age, sex, and weight status
### Assessing Weight and Height Status

- **Self-reported vs. Directly Measured**
  - Generally do not lead to equivalent estimates of prevalence

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Height</th>
<th>Weight</th>
<th>Effect on obesity prevalence</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>~6-11</td>
<td>Underestimate</td>
<td>Underestimate</td>
<td>Overestimate</td>
<td>Beck et al., 2012</td>
</tr>
<tr>
<td>10-16</td>
<td>Not Significantly Different</td>
<td>Underestimate</td>
<td>Underestimate</td>
<td>Morrissey et al., 2006</td>
</tr>
<tr>
<td>12-18</td>
<td>Overestimate</td>
<td>Underestimate</td>
<td>Underestimate</td>
<td>Himes et al., 2005</td>
</tr>
<tr>
<td>~12-18</td>
<td>Not Reported</td>
<td>Underestimate</td>
<td>Underestimate</td>
<td>Goodman et al., 2000</td>
</tr>
<tr>
<td>~12-18</td>
<td>Overestimate</td>
<td>Underestimate</td>
<td>Underestimate</td>
<td>Pérez et al., 2015</td>
</tr>
<tr>
<td>~14-18</td>
<td>Overestimate</td>
<td>Underestimate</td>
<td>Underestimate</td>
<td>Brener et al., 2003; Jayawardene et al., 2014</td>
</tr>
</tbody>
</table>
Demographic Characteristics

• Importance of collecting demographic information
  – Determine representativeness of sample
  – Divide sample into subgroups
  – Assess disparities
  – Consider demographic shifts
Demographic Characteristics

- **Socioeconomic status**
  - Variation in measures across reports
    - Individual
      - Household income, highest education of one or both parent or caregiver, insurance type, participation in an income-based program (e.g., WIC, SNAP)
    - Community
      - Mean neighborhood income, percent of students eligible to receive free or reduced price school meals, neighborhood education level
- **Race and ethnicity**
  - OMB classification
    - American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White
    - Hispanic or Latino, not Hispanic or Latino
  - Some data source provide a long list of ethnic or origin groups for which participants choose
Demographic Characteristics

• Geography
  – Can be the basis for how sampling is designed
  – Not all samples represent a geographic region

• Rurality
  – Typically defined by population density
Demographic Shift

• The U.S. is becoming increasingly more diverse
  – Within group heterogeneity
    • Implications for the collection of demographic data

• Stability of the population provides context for interpretation
Key Messages

• Sampling approaches affect what the data reflect for the target population of interest.

• Directly measured compared to reported height and weight data generally do not lead to equivalent estimates of obesity prevalence, but can result in similar trends reported.

• Demographic variables need to be considered to provide context for population estimates.
Contact Information

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Data Sources

Key Considerations

Lynn Blewett, Ph.D.
Types of Common Data Sources

- Population surveillance surveys
- School-based assessments
- Clinical, public health administrative data
- Cohort studies
Objectives

- For many data sources, information on height and weight is just one component of a larger surveys whose goals and objectives may or may not be related to your information needs.

Methods

- Different combinations of target population, survey design, data collection methodologies
  - Not always feasible to directly measure heights and weights
Geographic Area of Interest

- **National**
  - NHANES has measured weight and height
  - NHIS self-report but conditions/health behaviors, do not collect height and weight data for children <12 years

- **State**
  - BRFSS, YRBSS, other state-based household surveys

- **County**
  - Model-based estimates

- **School District**

- **Clinic/Health System EHR**
## Key National & State Data Sources

<table>
<thead>
<tr>
<th>Survey</th>
<th>Approximate Sample Size</th>
<th>Representativeness</th>
<th>Height &amp; Weight Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHANES</td>
<td>5,000 per year</td>
<td>U.S. population</td>
<td>Directly measured</td>
</tr>
<tr>
<td>NHIS</td>
<td>35,000 households</td>
<td>U.S. population</td>
<td>Interview (proxy-, self-reported)</td>
</tr>
<tr>
<td>MEPS-HC</td>
<td>13,000 households</td>
<td>U.S. population</td>
<td>Interview (proxy-, self-reported)</td>
</tr>
<tr>
<td>YRBS, national</td>
<td>14,500 per survey year</td>
<td>U.S. high school students</td>
<td>Paper-based survey (self-reported)</td>
</tr>
<tr>
<td>YRBS, state and local</td>
<td>Varies by location</td>
<td>U.S. high school students; locations vary by year</td>
<td>Paper-based survey (self-reported)</td>
</tr>
<tr>
<td>WIC PC data</td>
<td>9.3 nationally; varies by location</td>
<td>WIC participants as of April of the assessment year</td>
<td>Directly measured</td>
</tr>
<tr>
<td>NSCH (2003, 2007, 2011-2012)</td>
<td>96,000 per cycle (1,800 per state)</td>
<td>U.S. children, 0-17 years All 50 states, Washington DC, U.S., Virgin Islands</td>
<td>Telephone survey (proxy-reported)</td>
</tr>
<tr>
<td>Redesigned NSCH/NS-CSHCN</td>
<td><em>To be released in 2017</em></td>
<td>U.S. children, 0-17 years All 50 states, Washington DC, U.S.</td>
<td>Web- and mail-base (proxy-reported)</td>
</tr>
</tbody>
</table>
The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

PedNSS

- Discontinued surveillance system
- Included data from low-income children participating in federally funded program
- Data from the entire year
- Not all agencies participated

WIC Participant and Program Characteristics (PC)

- Conducted biennially
- Collects near-census level data on participants enrolled in April
School-Based Assessments

- Variation in grades assessed, data collector, frequency
- Family Educational Rights and Privacy Act (FERPA)
  - Data access consideration

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Students Assessed</th>
<th>Sample Size</th>
<th>Who Performs Measurement</th>
<th>Collaborators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas BMI Assessment</td>
<td>All public school students, Pre-K/K, and grades 2, 4, 6, 8, 10</td>
<td>181,000 per year</td>
<td>School staff member</td>
<td>Arkansas Dept. of Education Arkansas Dept. of Health ACHI Schools, Districts</td>
</tr>
<tr>
<td>California Annual FitnessGram®</td>
<td>All public school students, grades 5, 7, 9</td>
<td>1.3 million per year</td>
<td>Local education agency or county education office employee</td>
<td>California Dept. of Education</td>
</tr>
<tr>
<td>Texas SPAN</td>
<td>Public school students, grades 4, 8, 11 in sampled schools</td>
<td>17,000 per cycle</td>
<td>Project staff and Dept. of State Health and Services employees</td>
<td>University researchers Texas Dept. of State Health and Services Selected schools, districts</td>
</tr>
</tbody>
</table>
Other Data Sources

• **Innovations in Health Systems and Big Data**
  – Electronic health records
  – Data sharing
  – State-based registries
  – HEDIS, quality measurement strategies

• **Cohort Studies**
  – Provide longitudinal perspective on weight status
  – Used to identify risk factors for obesity
  – Can target populations of interest
Key Messages

• A variety of data sources are being used to assess obesity at the national, state, and local levels.

• Directly measured weight and height data is preferable, but is not always feasible to collect. Knowing the pros and cons of proxy- and self-reported data is critical to effective use of these data.

• Innovations are occurring in the clinical setting both in the collection and use of data through information technology, big data, and electronic health records.
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School of Public Health, University of Minnesota
Director, State Health Access Data Assistance Center (SHADAC)
Email: blewe001@umn.edu
Analytic Approaches

Key Considerations

Jackson P. Sekhobo, Ph.D., M.P.A.
Key Considerations

• **Data Preparation**
  – Reference populations
  – Biologically implausible values (BIV)
  – Weighting for complex sampling designs

• **Statistical Analysis**
  – Role of sample size
  – Assessing prevalence & trends over time
Obesity Classification

• **Adults**
  - BMI $\geq 30$ kg/m$^2$

• **Children**
  - BMI changes throughout childhood due to growth
# Reference Populations

<table>
<thead>
<tr>
<th>Growth Reference</th>
<th>Source Population</th>
<th>Cut Point to Classify Obesity</th>
<th>Age aligned with adult cut point</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 CDC BMI-for-age</td>
<td>Nationally representative cross-sectional samples of the U.S. children, adolescents, and young adults</td>
<td>≥95th percentile</td>
<td>Males: 19.3 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Females: 17.5 years</td>
</tr>
<tr>
<td>International Obesity Task Force</td>
<td>Representative samples from six international locations</td>
<td>Centile corresponding to a BMI of 30 kg/m² at age 18 years applied throughout the distribution</td>
<td>18 years</td>
</tr>
<tr>
<td>WHO, growth standard</td>
<td>MGRS</td>
<td>+2 standard deviations</td>
<td>N/A – For children 0 to 5 years</td>
</tr>
<tr>
<td>WHO, growth reference</td>
<td>1977 National Center for Health Statistics/WHO data, merged with the MGRS data</td>
<td>+2 standard deviations</td>
<td>19 years (approximately)</td>
</tr>
</tbody>
</table>
Biologically Implausible Values (BIV)

- Extreme values in height, weight, BMI data
- Different approaches to identification
- How they are handled also varies
- Not all values flagged as a BIV are errors
Weighting

• Weighting is an approach used to correct imbalances in sampling and better represent the target population in complex sampling designs

• Not every study will have or need to have sample weights
The Role of Sample Size

• The reliability of an estimate is dependent on sample size

• Sample size also has implications for:
  – Subgroup analyses and the assessment of disparities
  – Small area estimates
Change in Prevalence

Absolute Change
2 percentage points
Relative Change
4%

Absolute Change
2 percentage points
Relative Change
67%

Percent of Population that has Obesity

Scenario 1

Scenario 2
Trend Analyses

• **Analytic Approach**
  – Start and end dates
  – Time points

• **Comparing Trends**
  – Person
  – Place
  – Time
  – Analytic Approaches
Key Messages

• Obesity prevalence in children can differ depending on the reference population used.

• Biologically implausible values can affect the prevalence estimates.

• Interpretation of trend estimates includes consideration of the person, place, time, and analytic approach.
Jackson P. Sekhobo, Ph.D., M.P.A.
Director of Evaluation, Research, and Surveillance
Division of Nutrition
New York State Department of Health
Email: jackson.sekhobo@health.ny.gov
Additional Resources

Shari Barkin, M.D., M.S.H.S. (Chair)
Consensus Report

Interactive Framework & Booklet

Also available at:
Using NHANES to Demonstrate
Applied Examples

Cynthia L. Ogden, Ph.D., M.R.P.
NHANES – The Gold Standard

• Approximately 5,000 people surveyed each year
Measured Versus Reported
• Prevalence lower based on self report

Prevalence of obesity, US adolescents

- YRBS (grades 9-12, self report)
- NHANES (12-19 years, measured)

• Higher estimates with parental report

Prevalence of obesity, US, 1999-2004

Measured data: NHANES
Proxy-report data: NHIS

Different Reference Populations

• Which one is used?

The WHO Child Growth Standards
This website presents the WHO Child Growth Standards. These standards were developed using data collected in the WHO Multicentre Growth Reference Study. The site presents documentation on how the physical growth curves and milestone windows of achievement were developed as well as application support implementation of the standards.

2 to 20 years: Boys
Body mass index-for-age percentiles

World Obesity / IOTF
Knowledge Solutions Action
Different Reference Populations

• Give different estimates


Different Reference Populations

- Not different trends if age distribution same

Prevalence of high weight-for-length, US children birth-<24 months

BIVs

- How to define BIV?
- NHANES is relatively clean
BIVs

- Sometimes BIV exclusions are valid

Prevalence of obesity, US youth

BIVs

• Comparison to maximum NHANES values may provide guidance
Small Sample Sizes

• NHANES subgroups small sample sizes

<table>
<thead>
<tr>
<th>2011-2012</th>
<th>Total</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth-&lt;24 months</td>
<td>584</td>
<td>53</td>
</tr>
<tr>
<td>2-5 years</td>
<td>871</td>
<td>91</td>
</tr>
<tr>
<td>6-11 years</td>
<td>1268</td>
<td>258</td>
</tr>
<tr>
<td>12-19 years</td>
<td>1216</td>
<td>244</td>
</tr>
</tbody>
</table>

Small Sample Sizes

• See less stability, bouncing


NOTES: Obesity is defined as body mass index (BMI) greater than or equal to the 95th percentile from the sex-specific BMI-for-age 2000 CDC Growth Charts.

Small Sample Sizes

- Bigger sample (combining years), more stable

Prevalence of obesity, US youth

CDC/NCHS: NHANES data
Start and End Points

• Over what time period?
1999-00 to 2009-10: up men, no change women

Prevalence of obesity, US adults

Start and End Points

- 2003-04 to 2011-12: No change

Prevalence of obesity, US adults

Percent

Women
Men

2005-06 to 2013-14: no change men, up women

Prevalence of obesity, US, adults
Start and End Points

- All the data


NOTES: Age-adjusted by the direct method to the year 2000 U.S. Census Bureau estimates using age groups 20–39, 40–59, and 60–74. Overweight is body mass index (BMI) of 25 kg/m² or greater but less than 30 kg/m²; obesity is BMI greater than or equal to 30; and extreme obesity is BMI greater than or equal to 40. Pregnant females were excluded from the analysis.

SOURCES: NCHS, National Health Examination Survey and National Health and Nutrition Examination Surveys.

Cynthia L. Ogden, Ph.D., M.R.P.
NHANES Analysis Branch Chief/Epidemiologist
National Center for Health Statistics
Centers for Disease Control and Prevention
Email: Cogden@cdc.gov
QUESTIONS?

Please type your question(s) in the chat box located on the right.
ONE ON ONE
FURTHER QUESTIONS?

Other questions about NCCOR or upcoming activities?

Email the NCCOR Coordinating Center

nccor@fhi360.org
WHAT'S HAPPENING IN
NCCOR NEWS

NCCOR at APHA
Connect & Explore SNAP-Ed Evaluation Framework Q&A
Connect & Explore: Evaluating Health Care-Community Collaborations: Hospital-Based Programs
Three ways NCCOR is accelerating progress to reduce Childhood Obesity
NCCOR Childhood Obesity Declines - New RWUF Signs of Progress Data

Connect & Explore

Upcoming Webinars
Mark your calendar for these upcoming Connect & Explore webinars!

GREEN

2016
NOV 10
Evaluating Health Care-Community Collaborations: Implications and Recommendations for the Field

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2018
2015
2014
2011
2010
2009

2016
OCT 27
Looking Back and Looking Forward: Nine Years of School District Wellness Policy Implementation

2016
SEP 14
Evaluating Health Care-Community Collaborations - A Three-Part Series
THANK YOU!