Youth Risk Behavior Surveillance System
Measurement of Obesity

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Purposes of the YRBSS

• Focus the nation on behaviors among youth causing the most important health problems
• Assess how risk behaviors change over time
• Provide comparable data
Leading Causes of Death Among Persons Aged 10 – 24 Years in the United States, 2010

- Motor Vehicle Crashes: 23%
- Suicide: 15%
- Other Unintentional Injuries: 18%
- Homicide: 15%
- Other Causes: 29%
Leading Causes of Death Among Persons Aged 25 Years and Older in the United States, 2010

- Cardiovascular Disease: 33%
- Cancer: 24%
- Other Causes: 43%
Impact of Sexual Behaviors

In 2011,

- 329,772 births occurred among women aged 15 – 19 years
- 548,032 cases of chlamydia, gonorrhea, and syphilis reported among persons aged 15 – 19 years
- An estimated 2,240 cases of HIV diagnosed among persons aged 15 – 19 years
Priority Health-Risk Behaviors and Health Outcomes Monitored by YRBSS

• Behaviors that contribute to the leading causes of mortality and morbidity
  • Unintentional injuries and violence
  • Sexual behaviors
  • Alcohol and other drug use
  • Tobacco use
  • Unhealthy dietary behaviors
  • Inadequate physical activity
• Obesity and overweight
• Asthma
YRBSS Components

• Ongoing
  • National school-based YRBS
  • State, territorial, tribal, and local YRBS
• Previously
  • 2010 National Youth Physical Activity and Nutrition Study
  • Psychometric and methods studies
  • National alternative high school YRBS
  • National college YRBS
  • National household-based YRBS
Characteristics of the National, State, and Local School-Based YRBS’s

- 9th – 12th grade students
- Probability samples of schools and students
- Anonymous
- Self-administered, computer-scannable questionnaire or answer sheet
- Completed in one class period (45 minutes)
- Conducted biennially usually during the spring
- Height and weight questions must be included
National YRBS

- Conducted biennially since 1991
- National sample of public and private schools with any of grades 9-12
- Oversample African American and Hispanic students
- Average sample size - 14,517
- Self-administered questionnaire with ~99 multiple choice items
- Anonymous and voluntary participation
## Response Rates and Sample Sizes
### National YRBS, 1991 – 2013

<table>
<thead>
<tr>
<th>Year</th>
<th>School Response Rate</th>
<th>Student Response Rate</th>
<th>Overall Response Rate</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>75%</td>
<td>90%</td>
<td>68%</td>
<td>12,272</td>
</tr>
<tr>
<td>1993</td>
<td>78%</td>
<td>90%</td>
<td>70%</td>
<td>16,296</td>
</tr>
<tr>
<td>1995</td>
<td>70%</td>
<td>86%</td>
<td>60%</td>
<td>10,904</td>
</tr>
<tr>
<td>1997</td>
<td>79%</td>
<td>87%</td>
<td>69%</td>
<td>16,262</td>
</tr>
<tr>
<td>1999</td>
<td>77%</td>
<td>86%</td>
<td>66%</td>
<td>15,349</td>
</tr>
<tr>
<td>2001</td>
<td>75%</td>
<td>83%</td>
<td>63%</td>
<td>13,601</td>
</tr>
<tr>
<td>2003</td>
<td>81%</td>
<td>83%</td>
<td>67%</td>
<td>15,214</td>
</tr>
<tr>
<td>2005</td>
<td>78%</td>
<td>86%</td>
<td>67%</td>
<td>13,917</td>
</tr>
<tr>
<td>2007</td>
<td>81%</td>
<td>84%</td>
<td>68%</td>
<td>14,041</td>
</tr>
<tr>
<td>2009</td>
<td>81%</td>
<td>88%</td>
<td>71%</td>
<td>16,410</td>
</tr>
<tr>
<td>2011</td>
<td>81%</td>
<td>87%</td>
<td>71%</td>
<td>15,425</td>
</tr>
<tr>
<td>2013</td>
<td>77%</td>
<td>88%</td>
<td>68%</td>
<td>13,583</td>
</tr>
<tr>
<td></td>
<td>1991</td>
<td>1993</td>
<td>1995</td>
<td>1997</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td># of states</td>
<td>26</td>
<td>40</td>
<td>39</td>
<td>38</td>
</tr>
<tr>
<td># of cities</td>
<td>11</td>
<td>14</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td># of territories</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td># of tribal governments</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total # of sites</td>
<td>38</td>
<td>56</td>
<td>61</td>
<td>60</td>
</tr>
<tr>
<td>% of sites with weighted data</td>
<td>45%</td>
<td>59%</td>
<td>61%</td>
<td>72%</td>
</tr>
</tbody>
</table>

YRBSS 2013 Release – June 12, 2014

- Scientific products
  - *MMWR* Surveillance Summary
  - National, state, and local datasets
  - Youth Online
  - YRBS data widget
  - Fact sheets
  - Updated technical resources
- Social media
- Web site: [www.cdc.gov/yrbs](http://www.cdc.gov/yrbs)
Measurement of Height and Weight

• Added in 1999 to national and standard questionnaires
• Used to calculate BMI (kg/m²)
• Biologically implausible responses are edited out
• About 5% non-response
• BMI values compared with sex- and age-specific reference data from the 2000 CDC growth charts
• Obese = BMI of ≥95th percentile for age and sex
• Overweight = BMI of ≥85th percentile and <95th percentile for age and sex
• Note – not intended to diagnose obesity in individual students, but to provide population level estimates only

YRBSS
Youth Risk Behavior Surveillance System
6. 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.

Example

<table>
<thead>
<tr>
<th>Height</th>
<th>5</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

7. 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.

Example

<table>
<thead>
<tr>
<th>Weight</th>
<th>1</th>
<th>5</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pounds</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reliability and Validity of Self-reported Height and Weight Among High School Students

NANCY D. BRENER, Ph.D., TIM McMILLAN, M.S., DEBORAH A. GALUSKA, Ph.D., RICHARD LOWRY, M.D., M.S., AND HOWELL WECHSLER, Ed.D., M.P.H.

Purpose: To assess the reliability and validity of self-reported height and weight, and variables calculated from these values, in a diverse sample of adolescents.

Methods: A convenience sample of students (n = 4,410 in grades 9 through 12) reported their height and weight on two questionnaires administered approximately 2 weeks apart. Using a standard protocol, a subsample of these students (n = 2,802) also were weighed and had their height measured following completion of the first questionnaire.

Results: Self-reported heights at Time 1 and Time 2 were highly correlated, and the mean difference between height at Time 1 and Time 2 was small. Results were similar for self-reported weight at Time 1 and Time 2 and body mass index (BMI) calculated from these values. Although self-reported values of height, weight, and BMI were highly correlated with their measured values, on average, students overreported their height by 2.7 inches and underreported their weight by 3.5 pounds. Resulting BMI values were an average of 2.6 kg/m² lower when based on self-reported vs. measured values. The percentages of students classified as "overweight" or "at risk for overweight" were therefore lower when based on self-reported rather than on measured values. White students were more likely than those in other race/ethnic groups to overreport their height, and the tendency to overreport height increased by grade. Female students were more likely than male students to underreport their weight.

Conclusions: Self-reported height, weight, and BMI calculated from these values were highly reliable but were discrepant from measured height, weight, and BMIs calculated from measured values. BMIs based on self-reported height and weight values therefore underestimate the prevalence of overweight in adolescent populations.

KEY WORDS:
Adolescence
Body height
Body mass index
Body weight
Obesity
Reproducibility of results
Self-assessment
Sensitivity
Specificity

The prevalence of overweight among adolescents aged 12 to 19 years nearly tripled between the late 1970s and 1990, from 5% to 14% [1]. Not only is obesity an immediate health problem for adolescents, but it also is associated with obesity in adulthood as well as with diabetes and other chronic diseases [2].

To assess trends in overweight among nationally representative samples of adolescents, the Centers for Disease Control and Prevention (CDC) added questions on height and weight to the Youth Risk Behavior Surveillance System (YRBSS) in 1999. The YRBSS monitors priority health risk behaviors among young people and includes national, state, territorial, and local surveys of high school students. The CDC uses self-reported height and weight data from these surveys to calculate body mass index.
Reliability and Validity of Self-Reported Height and Weight Among High School Students

- Conducted in 2000
- Convenience sample of 61 schools from 20 states plus DC
  - 48% urban, 39% suburban, and 13% rural
- Anonymous and voluntary data collection following parental permission
- Reliability - Test/retest design about 2 weeks apart (n=4619)
- Validity – Subsample of 39 schools (n=2039)
  - Weighed and measured after Time 1 – standardized procedures

YRBSS
Youth Risk Behavior Surveillance System
### Reliability Results*

<table>
<thead>
<tr>
<th>Metric</th>
<th>Pearson r</th>
<th>Mean Time 1</th>
<th>Mean Time 2</th>
<th>Mean Time 1-Time 2 Difference</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (m)</td>
<td>0.93</td>
<td>1.69</td>
<td>1.70</td>
<td>-0.03</td>
<td>-0.11, 0.05</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>0.93</td>
<td>67.0</td>
<td>67.2</td>
<td>-0.08</td>
<td>-0.13, 0.04</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>0.87</td>
<td>23.3</td>
<td>23.3</td>
<td>-0.49</td>
<td>-0.91, 0.06</td>
</tr>
</tbody>
</table>

*No significant subgroup differences by sex, grade, or race/ethnicity.

- **Overweight prevalence**
  - Time 1 – 14.5%
  - Time 2 – 14.8%

- **Obese prevalence**
  - Time 1 – 13.2%
  - Time 2 – 13.0%
### Demographic Characteristics of Validity Sample

<table>
<thead>
<tr>
<th></th>
<th>Sample Distribution</th>
<th>National Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>47.1</td>
<td>51.0</td>
</tr>
<tr>
<td>Female</td>
<td>52.9</td>
<td>49.9</td>
</tr>
<tr>
<td>Grade 9</td>
<td>37.8</td>
<td>25.7</td>
</tr>
<tr>
<td>Grade 10</td>
<td>26.4</td>
<td>25.7</td>
</tr>
<tr>
<td>Grade 11</td>
<td>20.8</td>
<td>24.5</td>
</tr>
<tr>
<td>Grade 12</td>
<td>15.0</td>
<td>24.1</td>
</tr>
<tr>
<td>White</td>
<td>43.2</td>
<td>64.8</td>
</tr>
<tr>
<td>Black</td>
<td>40.7</td>
<td>12.1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>7.4</td>
<td>13.3</td>
</tr>
</tbody>
</table>

- 9th grade students overrepresented and 12th grade students underrepresented
- Black students overrepresented and white and Hispanic students underrepresented
### Validity Results

<table>
<thead>
<tr>
<th></th>
<th>Height (inches)</th>
<th>Weight (pounds)</th>
<th>BMI (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Difference</td>
<td>Pearson r</td>
<td>Mean Difference</td>
</tr>
<tr>
<td>Total</td>
<td>2.7</td>
<td>0.90</td>
<td>-3.5</td>
</tr>
<tr>
<td>Female</td>
<td>2.7</td>
<td>0.82</td>
<td>-4.5</td>
</tr>
<tr>
<td>Male</td>
<td>2.6</td>
<td>0.87</td>
<td>-2.4</td>
</tr>
<tr>
<td>Black</td>
<td>2.5</td>
<td>0.88</td>
<td>-3.9</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.6</td>
<td>0.77</td>
<td>-3.0</td>
</tr>
<tr>
<td>White</td>
<td>2.9</td>
<td>0.93</td>
<td>-3.5</td>
</tr>
</tbody>
</table>

- Female students more likely to underreport weight
- White students more likely to overreport height
- Grade was positively associated with height difference
- Biggest problem is with height
## Validity Results

<table>
<thead>
<tr>
<th></th>
<th>Height</th>
<th>Weight</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean self-reported</td>
<td>Mean measured</td>
<td>Correlation</td>
<td>Mean self-reported</td>
</tr>
<tr>
<td>66.4</td>
<td>63.7</td>
<td>0.90</td>
<td>147.8</td>
</tr>
</tbody>
</table>

- **Overweight prevalence**
  - Self-reported – 14.8%
  - Measured – 21.4%

- **Obese prevalence**
  - Self-reported – 14.9%
  - Measured – 26.0%
Percentage of High School Students Who Were Overweight,* by Sex, Grade,† and Race/Ethnicity,† 2013

* ≥ 85th percentile but < 95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.
†9 > 11; B > W, H > W (Based on t-test analysis, p < 0.05.)
Black and White races are non-Hispanic.

National Youth Risk Behavior Survey, 2013
Percentage of High School Students Who Were Overweight,* 1999-2013†

* ≥ 85th percentile but < 95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.

† Increased 1999-2013 [Based on linear and quadratic trend analyses using logistic regression models controlling for sex, race/ethnicity, and grade (p < 0.05)].

National Youth Risk Behavior Surveys, 1999-2013
Range and Median Percentage of High School Students Who Were Overweight,* Across 42 States and 21 Cities, 2013

* ≥ 85th percentile but < 95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.
Percentage of High School Students Who Were Overweight*

*85th percentile but < 95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.

State Youth Risk Behavior Surveys, 2013
Percentage of High School Students Who Were Obese,* by Sex,† Grade, and Race/Ethnicity, 2013

* ≥ 95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.
†M > F (Based on t-test analysis, p < 0.05.)
Black and White races are non-Hispanic.
Percentage of High School Students Who Were Obese, * 1999-2013†

* ≥ 95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.
†Increased 1999-2013 [Based on linear and quadratic trend analyses using logistic regression models controlling for sex, race/ethnicity, and grade (p < 0.05)].
Range and Median Percentage of High School Students Who Were Obese,* Across 42 States and 21 Cities, 2013

* ≥ 95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.
Percentage of High School Students Who Were Obese*

*95th percentile for body mass index, based on sex- and age-specific reference data from the 2000 CDC growth charts.
Uses of YRBS Obesity Data

• Alaska
  • Assess impact of Sugary Drinks Public Education media campaign
  • Monitor school-level impact of School Obesity Prevention Grants from the Alaska Obesity Program
  • Assess impact of district wellness policies and programs

• Connecticut
  • Develop indicators for the state’s 5-year Chronic Disease and Health Promotion Plan and Healthy Connecticut 2020
  • Track obesity levels among high school students to influence policies and programs across the state
Uses of YRBS Obesity Data

- **Hawaii**
  - Track the effects of school wellness policies which restrict access to sugar-sweetened beverages on campus
  - Monitor impact of Eat Your Veggies campaign
  - Provide their Childhood Obesity Taskforce with data to help support new legislation to increase participation in physical activity and physical education class

- **Ohio**
  - Provide Ohio Adolescent Health Partnership with data to support selection of goals, objectives, and strategies for increasing breakfast consumption, water intake, fruit and vegetable consumption, and physical activity and decreasing SSB consumption
Uses of YRBS Obesity Data

- Chicago
  - Support an updated, district-wide policy requiring daily physical education for all students
- San Diego
  - Help school nurses understand the purpose of and need for the district’s new Wellness Policy
YRBSS Scientific Publications

Centers for Disease Control and Prevention

YRBSS

Youth Risk Behavior Surveillance — United States, 2011

American Journal of Public Health

ARCHIVES OF PEDIATRICS & ADOLESCENT MEDICINE

Public Opinion Quarterly

JAMA

The Journal of the American Medical Association

MMWR

Morbidity and Mortality Weekly Report

American Journal of Preventive Medicine

PEDIATRICS

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

YRBSS
Youth Risk Behavior Surveillance System
Journal Articles Using YRBS Obesity Data

• Trends in Weight Management Goals and Behaviors Among High School Students—United States, 1999–2009
• Associations of Body Mass Index With Sexual Risk-Taking and Injection Drug Use Among US High School Students
• Regular-Soda Intake Independent of Weight Status Is Associated With Asthma Among US High School Students
• Association of Sleep Duration With Obesity Among US High School Students
• Trends in Perceived Overweight Status Among Overweight and Non-Overweight Adolescents
• Associations of Trying To Lose Weight, Weight Control Behaviors, and Current Cigarette Use Among US High School Students
Journal Articles Using YRBS Obesity Data

- Weight Management and Fruit and Vegetable Intake Among US High School Students
- Physical Activity-Related Injury and Body Mass Index Among US High School Students
- Relationship Between Asthma, Overweight, and Physical Activity Among US High School Students
- Associations of Body Mass Index and Perceived Weight With Suicide Ideation and Suicide Attempts Among High School Students
- Obesity and Other Correlates of Physical Activity and Sedentary Behaviors Among U.S. High School Students
Journal Articles Using YRBS Obesity Data

- The Association Between Weight Perception and BMI Among High School Students
- Physical Activity and Body Mass Index Among US Adolescents: Youth Risk Behavior Survey, 1999
- Television Viewing and Its Associations With Overweight, Sedentary Lifestyle, and Insufficient Consumption of Fruits and Vegetables Among US High School Students
- Weight Management Goals and Practices Among US High School Students: Associations With Physical Activity, Diet, and Smoking
- Physical Activity, Food Choice, and Weight Management Goals and Practices Among US College Students