

Physical Activity in US Youth: Results from the NHANES National Youth Fitness Survey

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Division of the National Health and Nutrition Examination Surveys



Outline

- ❑ **Physical Activity in Children and Adolescents**
- ❑ **Overview of the NHANES National Youth Fitness Survey (NNYFS)**
- ❑ **Results from the NNYFS**
 - Measures of Muscular Strength
 - Physical Activity
 - TV and Computer Use
 - Cardiorespiratory Fitness Levels

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Background:

Physical Activity in Children and Adolescents

- ❑ **Along with diet, *regular* physical activity prevents overweight and obesity**
 - 1 in 3 children and adolescents either overweight or obese
- ❑ **Also increases lean body mass, muscle, and bone strength**
- ❑ **Fosters psychological well-being**

Background: Physical Activity Guidelines for Americans

- ❑ Physical Activity Guidelines for Americans published in 2008
- ❑ The guidelines: One hour or more a day, every day
- ❑ National data on the fitness levels of youth very limited



U.S. Department of
Health and Human Services



2008 Physical Activity Guidelines for Americans



Be Active, Healthy, and Happy!

www.health.gov/paguidelines

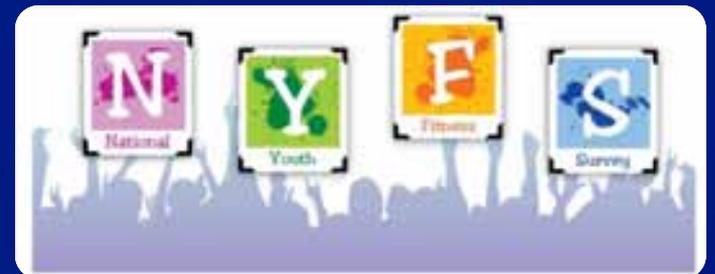


Outline

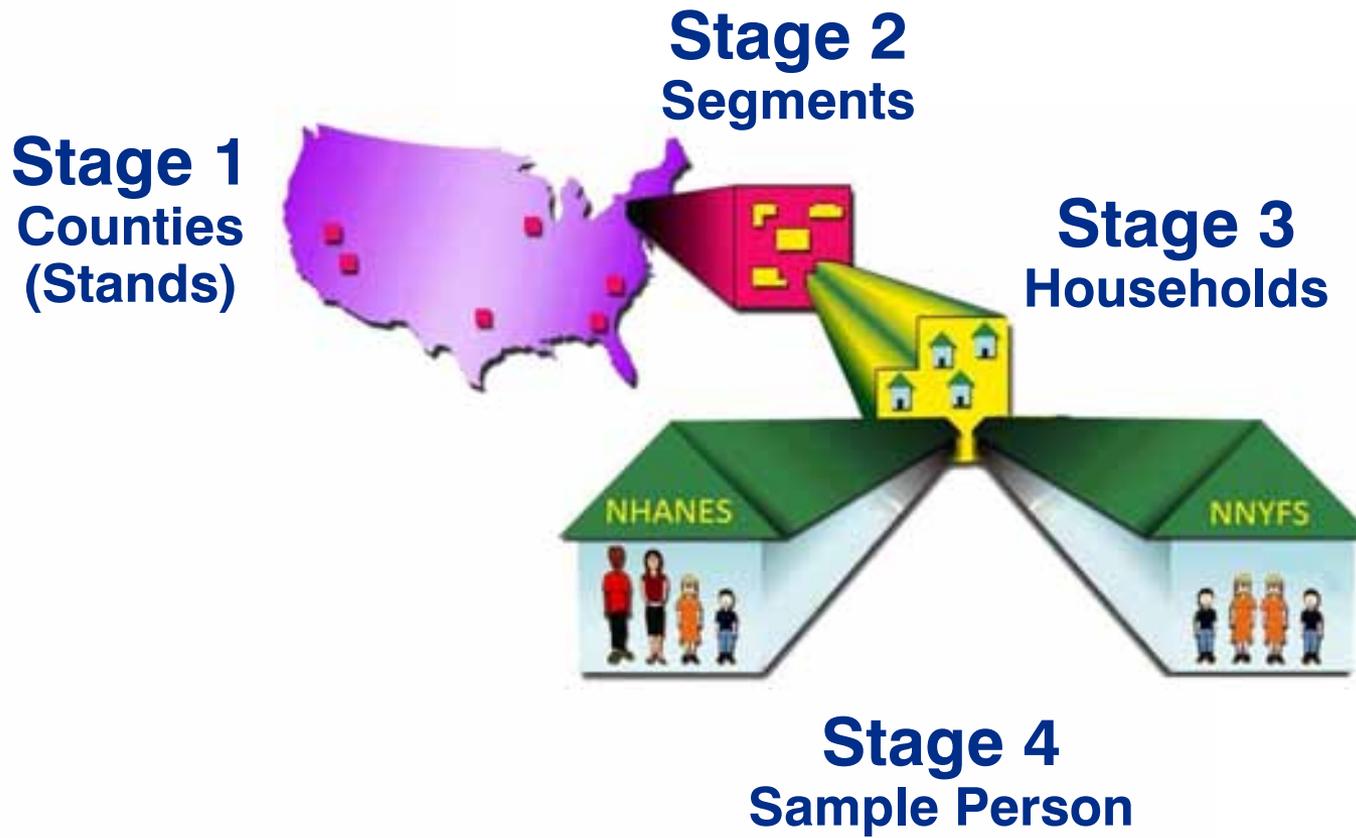
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Objective of the NHANES National Youth Fitness Survey (NNYFS)

- ❑ Provide national-level estimates of physical activity and fitness levels among 3-15 years of age
- ❑ Results are intended to:
 - Development of policies and programs
 - Development of national reference standards
 - Measure progress towards national objectives for youth fitness



Sampling Design of NNYFS



NNYFS: In-Home Interviews

- ❑ Demographic questions**
- ❑ Health history questions**
- ❑ Behavioral questions**

NNYFS: Mobile Examination Center (MEC)

- ❑ **Single trailer**
- ❑ **Designed to accommodate physical activity examinations and interviews**



NNYFS: Mobile Examination Center (MEC)

Components

Body measures

Core muscle strength (plank)

Gross motor skills

Lower body muscle strength (extension at the knee in sitting position)

Upper body muscle strength (grip strength)

Upper body muscle strength (modified pull-up)

Physical activity monitor (accelerometer)

Aerobic Fitness (maximal and submaximal exercise test)

Dietary recall interview



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Measures of Muscular Strength in U.S. Children and Adolescents, 2012

The first nationally representative data on core, upper body, and lower body measures of muscle strength

Measures of Muscular Strength in U.S. Children and Adolescents, 2012

R. Bethene Ervin, Ph.D.; Chia-Yih Wang, Ph.D.; Cheryl D. Fryar, M.S.P.H.; Ivey M. Miller, R.T.R.; and Cynthia L. Ogden, Ph.D., M.R.P.

Key findings

Data from the National Health and Nutrition Examination Survey, National Youth Fitness Survey

- There were no significant differences by sex in core, lower, or upper body measures of strength for younger boys and girls. In contrast, adolescent boys had higher values than adolescent girls on all measures of strength.
- Adolescent boys and girls had higher scores than younger boys and girls on the core and lower body strength measures and upper body strength as measured by the grip strength test.
- Adolescent boys completed more modified pull-ups, a measure of upper body strength, than younger boys. There was no significant difference in the number of modified pull-ups completed between adolescent and younger girls.

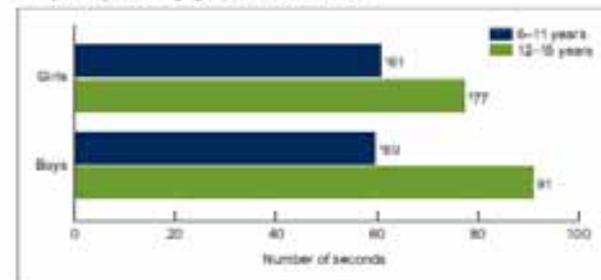
In 2008, the federal government released the Physical Activity Guidelines for Americans, which provide guidance on the types and amounts of physical activities that provide substantial health benefits for Americans of all ages. Regular physical activity reduces the risk of many adverse health outcomes and helps control the percentage of body fat in children and adolescents (1). This report provides the first nationally representative data on core, upper body, and lower body measures of muscle strength among U.S. children and adolescents aged 6–15 years by sex and age group.

Keywords: muscle force • strength measurements • weight status • National Health and Nutrition Examination Survey

Were there differences in core muscle strength by sex and age group among children and adolescents?

- There were no significant differences between younger girls and boys aged 6–11 years on the plank test, which is a measure of core body strength. Girls held the plank for 61 seconds and boys held it for 60 seconds (Figure 1).

Figure 1. Number of seconds plank position held among children and adolescents aged 6–15 years, by sex and age group—United States, 2012



*Significantly different from those aged 12–15 years in the same sex group, $p < 0.05$.
†Significantly different from males in the same age group, $p < 0.05$.
NOTE: To view this table for Figure 1 at <http://www.cdc.gov/nchs/data/series/a117101.pdf>.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, National Youth Fitness Survey.



Core or Abdominal Strength

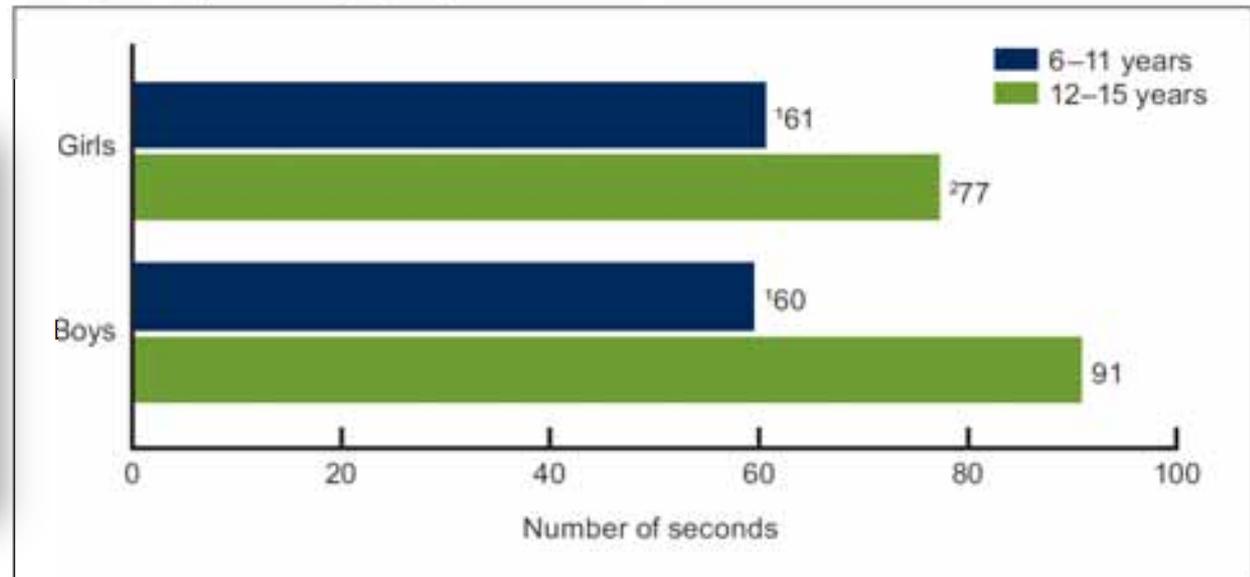


NNYFS



Core or Abdominal Strength – Plank: Differences by age and sex

Figure 1. Number of seconds plank position held among children and adolescents aged 6–15 years, by sex and age group: United States, 2012



¹Significantly different from those aged 12–15 years in the same sex group, $p < 0.05$.

²Significantly different from males in the same age group, $p < 0.05$.

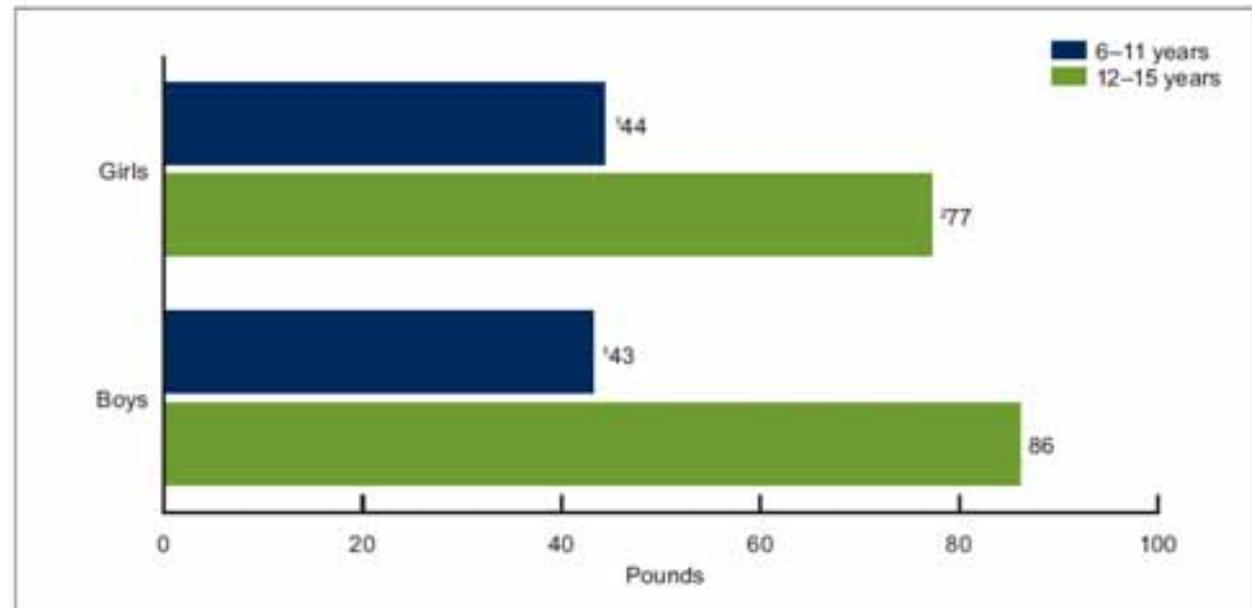
NOTE: Access data table for Figure 1 at: http://www.cdc.gov/nchs/data/databriefs/db139_table.pdf#1.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, National Youth Fitness Survey.

Lower Body Strength – Knee Extension Differences by age and sex



Figure 2. Maximum right knee extension force among children and adolescents aged 6–15 years, by sex and age group: United States, 2012



*Significantly different from those aged 12–15 years in the same sex group, $p < 0.05$.

†Significantly different from males in the same age group, $p < 0.05$.

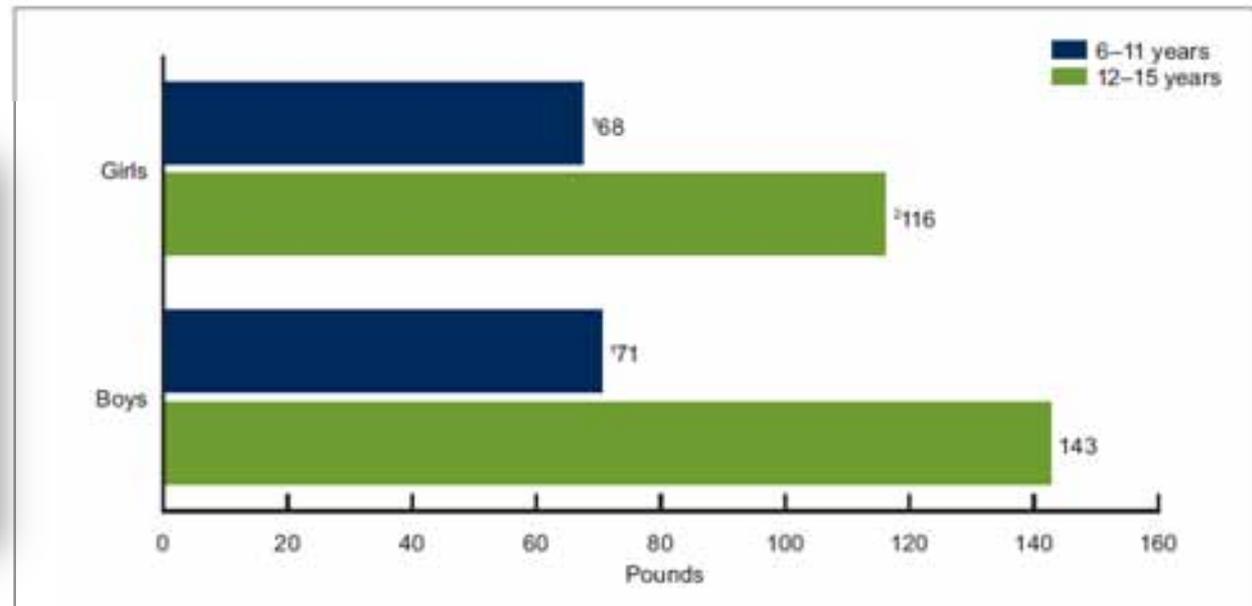
NOTES: The knee extension score used was the maximum force exerted by the right knee. Access data table for Figure 2 at: http://www.cdc.gov/nchs/data/databriefs/db139_table.pdf#2.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, National Youth Fitness Survey.

Upper Body Strength – Hand Grip: Differences by age and sex



Figure 4. Combined grip strength force among children and adolescents aged 6–15 years, by sex and age group: United States, 2012



¹Significantly different from those aged 12–15 years in the same sex group, $p < 0.05$.

²Significantly different from males in the same age group, $p < 0.05$.

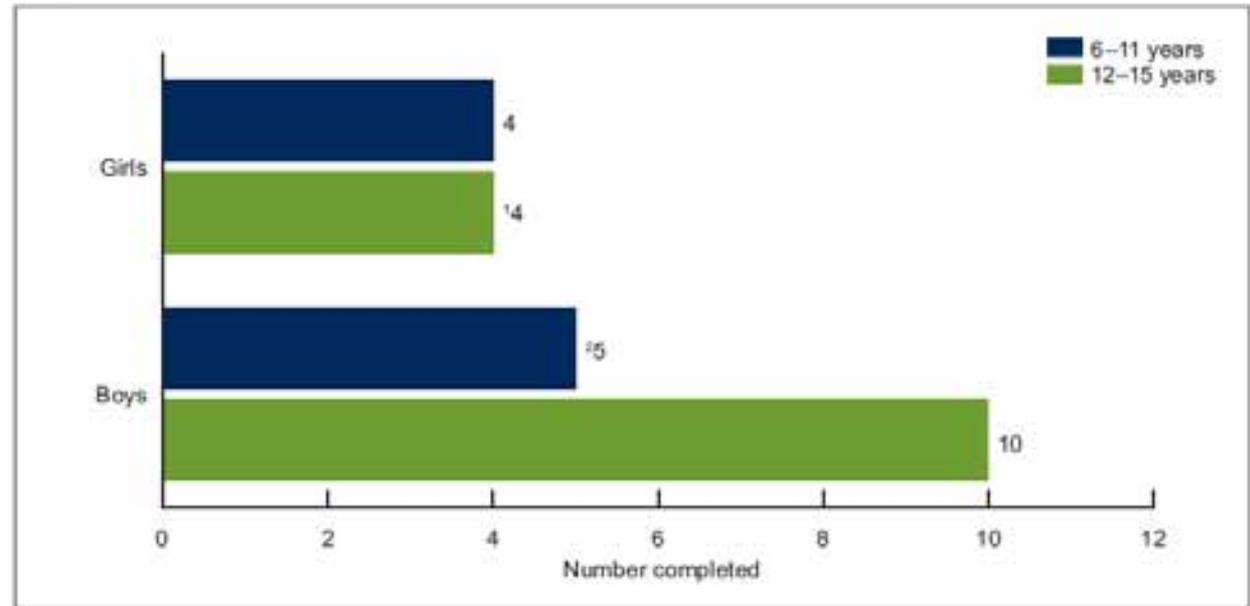
NOTES: The combined grip strength score was the sum of the largest readings from each hand. Access data table for Figure 4 at: http://www.cdc.gov/nchs/data/databriefs/db139_table.pdf.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, National Youth Fitness Survey.

Upper Body Strength – Modified Pull Ups



Figure 3. Number of modified pull-ups completed among children and adolescents aged 6–15 years, by sex and age group: United States, 2012



¹Significantly different from males in the same age group, $p < 0.05$.

²Significantly different from those aged 12–15 years in the same sex group, $p < 0.05$.

NOTE: Access data table for Figure 3 at: http://www.cdc.gov/nchs/data/databriefs/db139_table.pdf.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, National Youth Fitness Survey.

55% of female Marine recruits could not pass a minimum 3-pullup requirement



Marines Delay Strength Requirement for Women
More than half of female Marines in boot camp cannot do three pull-ups, the minimum standard that was supposed to take effect with the new year.
www.nytimes.com

The CHRISTIAN SCIENCE
MONITOR

Just three pull-ups: Too many for women in the Marine Corps?

The Marine Corps reports that most women in recruit training are pull-ups. As the US military moves toward allowing more women questions about physical standards.

By Brad Knickerbocker, Staff writer / January 4, 2014



The Washington Post

The Marines' pull-up controversy: An unexpected battle in the gender wars



Conclusions

- ❑ The first nationally representative estimates of strength for U.S. children and adolescents
- ❑ No significant differences between the sexes for younger children
- ❑ Adolescent boys had more strength than adolescent girls
- ❑ Adolescent boys and girls had more strength than younger aged boys and girls

Physical Activity in U.S. Youth Aged 12–15 Years, 2012

Tala H.I. Fakhour, Ph.D., M.P.H.; Jeffery P. Hughes, M.P.H.; Vicki L. Burt, Sc.M., R.N.; MinKyoung Song, Ph.D., R.N.; Janet E. Fulton, Ph.D.; and Cynthia L. Ogden Ph.D., M.P.R.

Key findings

Data from the combined National Health and Nutrition Examination Survey (NHANES) and the NHANES National Youth Fitness Survey, 2012

- In 2012, about one-quarter of U.S. youth aged 12–15 years engaged in moderate-to-vigorous physical activity for at least 60 minutes daily.
- Basketball was the most common activity reported among active boys, followed by running, football, bike riding, and walking.
- Running was the most common activity among active girls, followed by walking, basketball, dancing, and bike riding.
- The percentage of male youth who were physically active for at least 60 minutes daily decreased as weight status increased.

Physical Activity in U.S. Youth Aged 12–15 Years, 2012

The most recent national data from 2012 on physical activity among youth, by sex and weight status

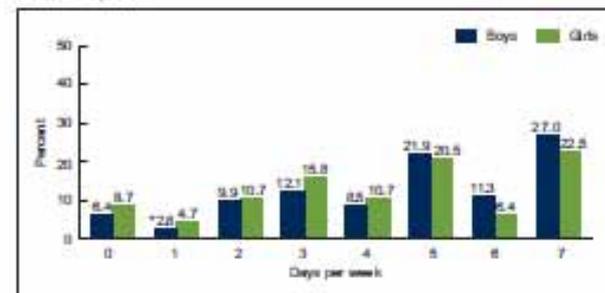
The 2008 Physical Activity Guidelines for Americans, which have been adopted by the First Lady's Let's Move! initiative and the American Academy of Pediatrics, recommend that youth participate in *daily* moderate-to-vigorous physical activity for at least 60 minutes (1–5). This report presents the most recent national data from 2012 on self-reported physical activity among youth aged 12–15 years, by sex and weight status. This report also describes the most common types of physical activities—outside of school-based physical education (PE) or gym classes—in which youth engage.

Keywords: National Health and Nutrition Examination Survey • NHANES National Youth Fitness Survey

What percentage of youth engaged in moderate-to-vigorous physical activity for at least 60 minutes each day?

About one-quarter (24.8%) of youth engaged in moderate-to-vigorous physical activity, including activities both in school and outside of school, for at least 60 minutes daily (data not shown in figure). Only 7.6% did not

Figure 1. Percentage of youth who were physically active, by number of days per week and sex: United States, 2012



* These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. † These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. ‡ These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. § These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. ¶ These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. †† These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. ††† These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. †††† These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling. ††††† These activities include all activities that increase heart rate and breathing, such as walking, jogging, swimming, and bicycling.

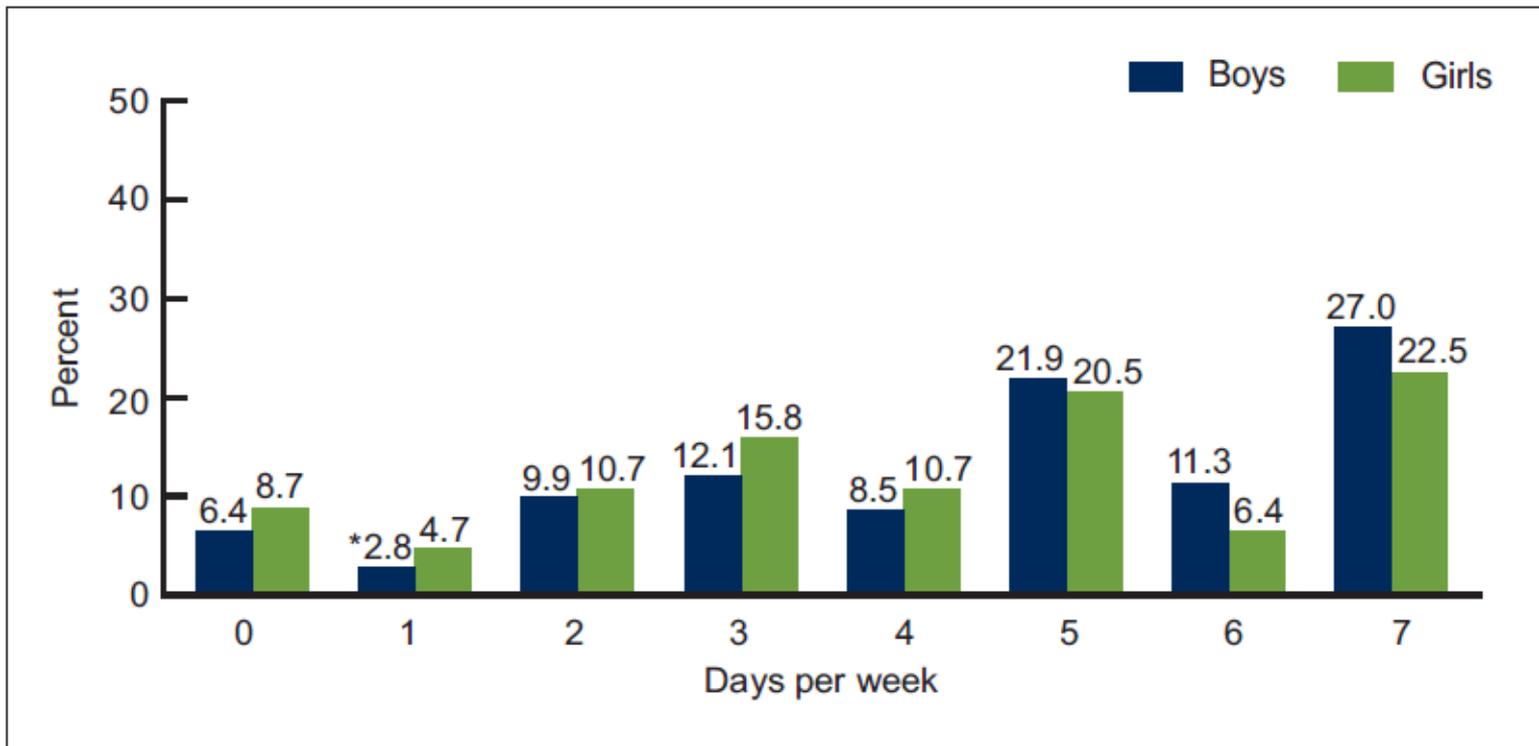


U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics



Only 27% of Boys and 23% of Girls Physically Active for 1 Hour or More Daily

Figure 1. Percentage of youth who were physically active, by number of days per week and sex: United States, 2012



* Does not meet standard of statistical reliability and precision (relative standard error of $\geq 30\%$ but $< 40\%$).

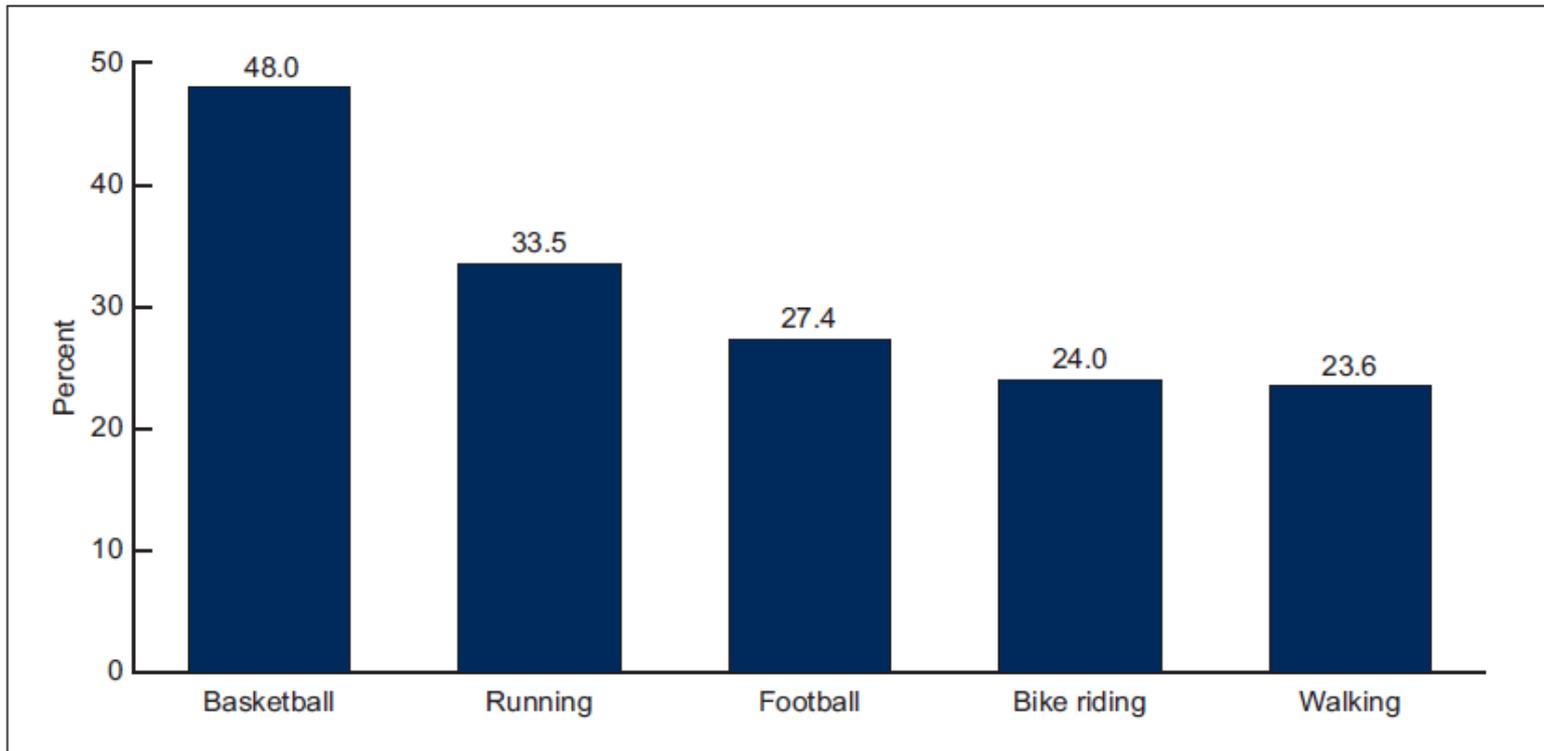
NOTES: Physically active is defined as engaging in any kind of moderate-to-vigorous physical activity, including activities both in school and outside of school, that increased heart rate and made breathing harder some of the time for at least 60 minutes.

Weighted percentages are shown. Access data table for Figure 1 at: http://www.cdc.gov/nchs/data/databriefs/db141_table.pdf#1.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey and National Youth Fitness Survey, 2012.

The Most Common Activities among Active Boys

Figure 2. The top five activities outside of school-based physical education and gym classes reported among boys aged 12–15 years: United States, 2012

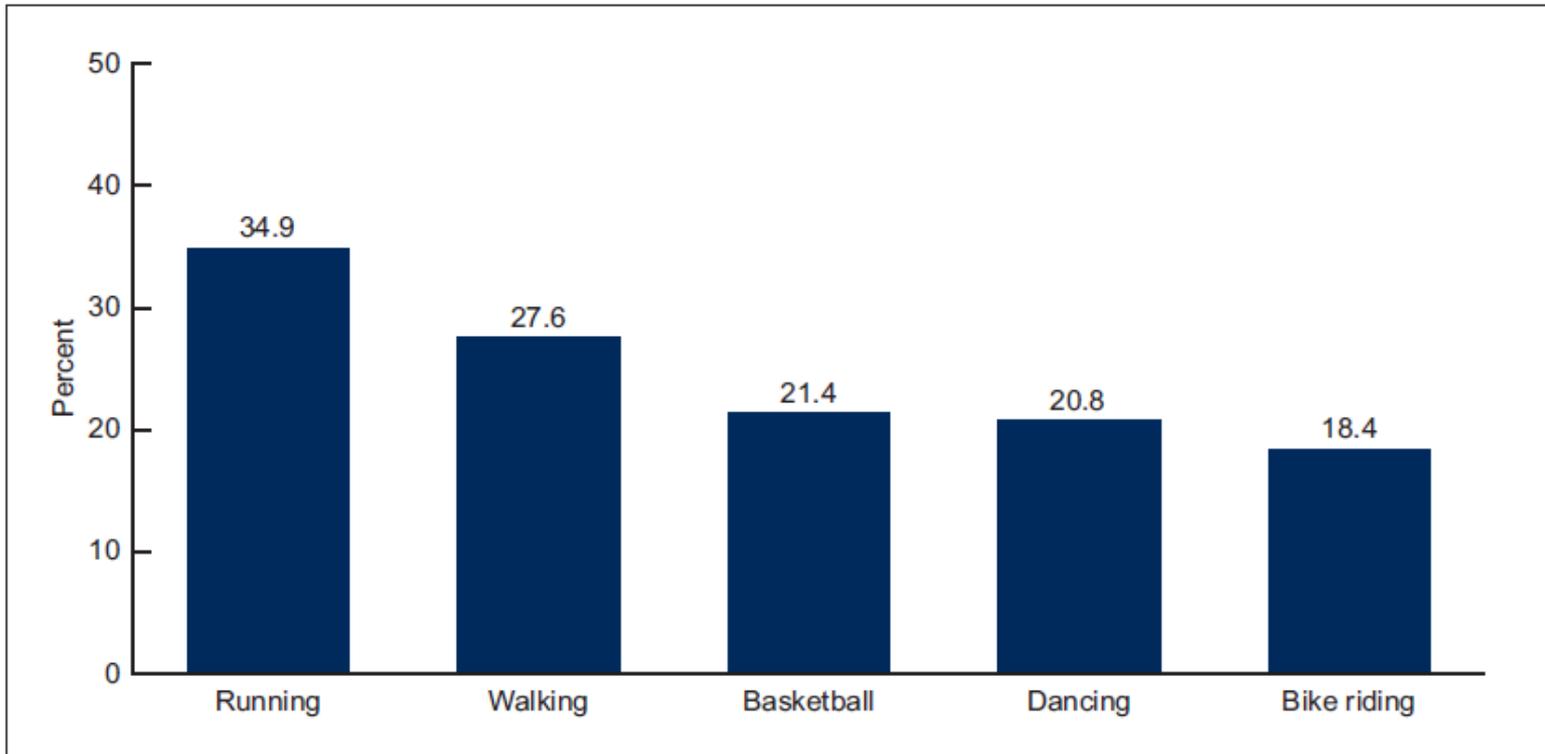


NOTES: Based on any physical activity, regardless of intensity, reported in the past week. More than one activity could be reported. Access data table for Figure 2 at: http://www.cdc.gov/nchs/data/databriefs/db141_table.pdf#2.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey and National Youth Fitness Survey, 2012.

The Most Common Activities among Active Girls

Figure 3. The top five activities outside of school-based physical education and gym classes reported among girls aged 12–15 years: United States, 2012

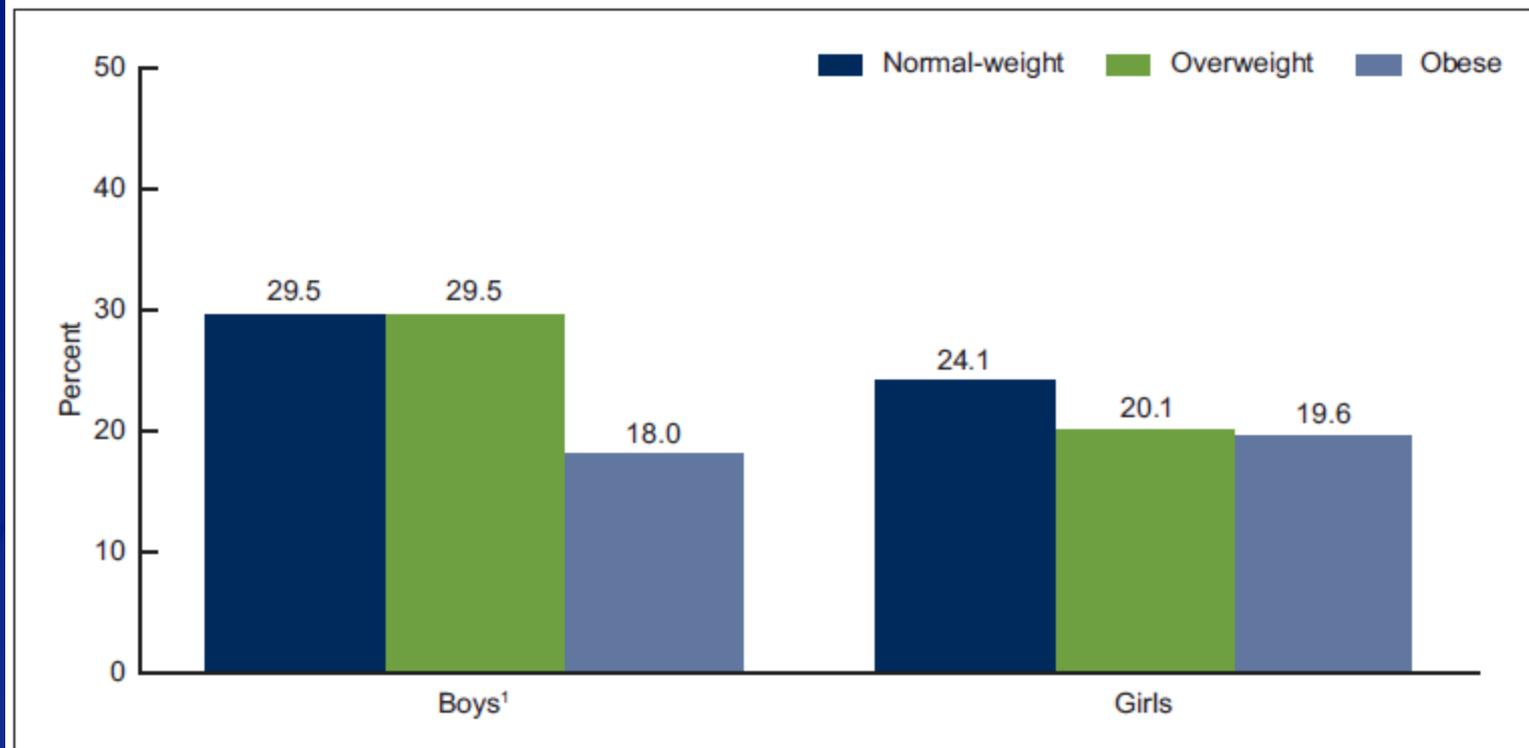


NOTES: Based on any physical activity, regardless of intensity, reported in the past week. More than one activity could be reported. Access data table for Figure 3 at: http://www.cdc.gov/nchs/data/databriefs/db141_table.pdf#3.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey and National Youth Fitness Survey, 2012.

Physical Activity and Weight Status

Figure 4. The percentage of youth who were physically active daily, by weight status and sex: United States, 2012



¹Significant linear trend.

NOTES: Physically active is defined as engaging in any kind of moderate-to-vigorous physical activity, including activities both in school and outside of school, that increased heart rate and made breathing harder some of the time for at least 60 minutes. Access data table for Figure 4 at:

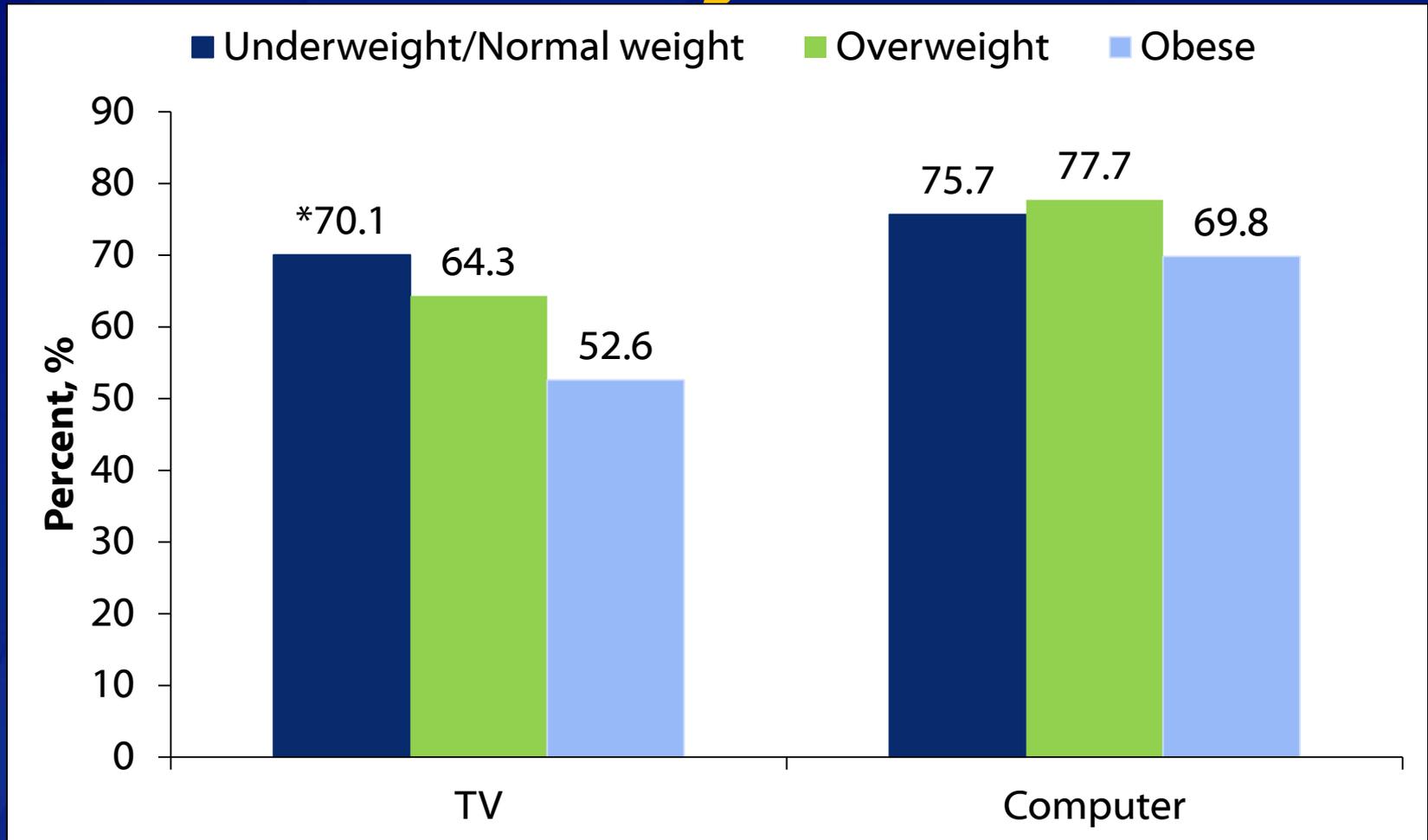
http://www.cdc.gov/nchs/data/databriefs/db141_table.pdf#4.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey and National Youth Fitness Survey, 2012.

Conclusions

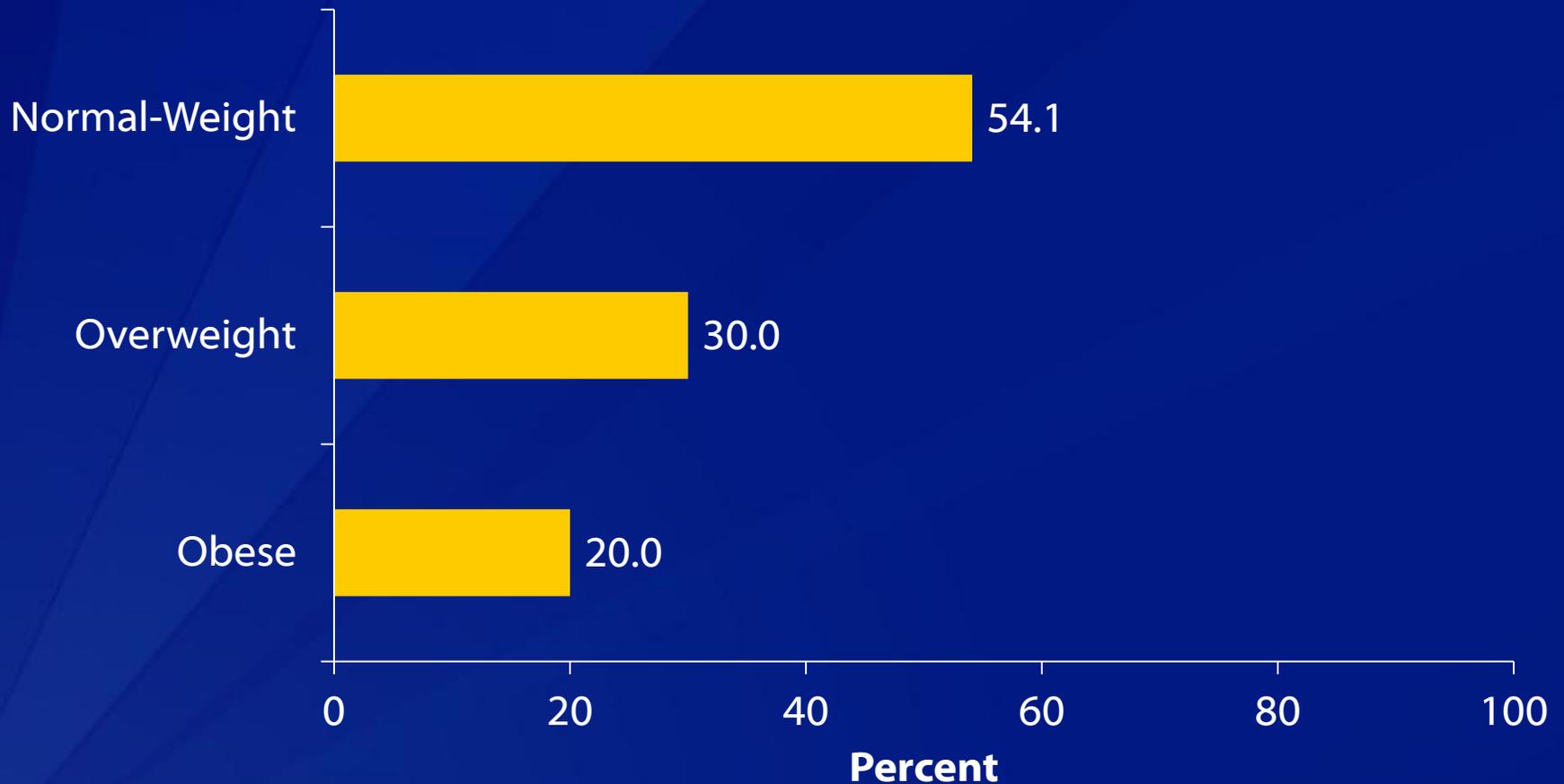
- ❑ **About 1 out of 4 U.S. youth met national physical activity guidelines.**
- ❑ **Basketball was the most popular activity among active boys**
- ❑ **Running was the most popular activity among active girls**
- ❑ **Among boys, increased weight status was associated with decreased physical activity**

A Lower Percentage of Obese Youth Viewed TV for 2 Hours or Less Compared to Normal and Overweight Youth



Unpublished, in progress, Herrick et al

Cardiorespiratory Fitness Decreased as Weight Status Increased



Unpublished, in progress, Gahche et al

Conclusions

- ❑ **NNYFS was conducted in 2012**
- ❑ **First nationally representative data on physical activity, fitness, and strength among youth**
- ❑ **NNYFS included Interviews and examinations**
- ❑ **Results are intended for the development of programs and policies, and for the developments of national reference standards**

Acknowledgments

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- Ana Terry
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- George Zipf

Jaime Gahche and Kirsten Herrick



Body Measurements

- *Target:* Ages 3-15 years
- *Protocol:*
 - Height and weight
 - Lengths of the entire arm and upper arm
 - Mid-arm, mid-calf, and waist circumferences
 - Subscapular, triceps, and calf skinfold thicknesses



Test of Gross Motor Development (TGMD-2)

- *Objective:* Assess coordination and balance
 - First nationally representative data on locomotion and object control skills for young children.
- *Target:* Ages 3-5 years
- *Protocol:* The TGMD-2 consists of two subtests:
 - Locomotor: Run, gallop, hop, leap, horizontal jump, slide
 - Object Control: striking a stationary ball, stationary dribble, kick, catch, overhand throw, and underhand roll



Abdominal or Core Muscle Strength



- *Objective:* Assess muscular endurance and core strength
 - First nationally representative data on core strength for children and adolescents.
- *Target:* Ages 3-15 years
- *Protocol:* Front plank position; maintain position for as long as possible



Dietary Recall Interview

- *Objective:* Obtain detailed dietary intake information on the types and amounts of foods and beverages consumed
 - First nationally representative data on both fitness and nutrition measures.
- *Target:* Ages 3 to 15
- *Protocol:* 24-hour dietary recall (only 1 day of recall)
 - Detailed information about food and beverages reported using measurement and visual aids recorded
 - Usage of dietary supplement use and non-prescription antacids

Physical Activity Monitor or Accelerometer



- *Objective:* Measure the physical activity levels of participants by recording body movement during everyday activities.
 - First nationally representative data on measured physical activity levels for children ages 3–5 years.
- *Target:* Ages 3-15 years
- *Protocol:* monitor is worn on the wrist, non-dominant arm, continuously for 7 days
- Water resistant – swimming, showering, bathing

Upper Body Muscle Strength



- *Objective:* Measure upper body muscle (back, shoulder, forearm, and arm) strength.
 - First nationally representative data in which schools can compare results from their districts.
- *Target:* Ages 5 to 15
- *Protocol:* Modified pull up
 - Participant raises his/her body by flexing the arm, keeping body straight with only the heels touching the ground
 - Repeated as many times as possible
- Results are compared to Fitnessgram[®] criterion-referenced standards.

Lower Body Muscle Strength



- *Objective:* Collect nationally representative data on lower body muscle strength
 - first nationally representative lower body muscle strength data for children and adolescents.
- *Target:* Ages 6-15 years
- *Protocol:* Measure knee extension force using a hand-held dynamometer
- Repeated 3 times on each leg



Grip Strength

- *Objective:* to provide nationally representative data on muscle strength
- *Target:* Ages 6 to 15
- *Protocol:* handgrip dynamometer was used to measure isometric grip strength
 - Participant squeezes the dynamometer three times in each hand
- NNYFS used the same protocol for the grip strength test used in NHANES.



Aerobic Fitness

- *Objective:* to estimate aerobic fitness levels
- *Target:* Ages 6-15 years
- *Protocol:*
 - Maximal treadmill test measuring endurance (ages 6-11y)
 - Sub-maximal treadmill test measuring cardiorespiratory fitness (12-15y)
 - NHANES 1999-2006 for ages 12-49 years

