Data-Gathering Workshop for the Committee on Evaluating Approaches to Assessing Prevalence and Trends in Obesity: Workshop in Brief

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PURPOSE OF THE WORKSHOP

The Robert Wood Johnson Foundation (RWJF) asked the Institute of Medicine of the National Academies of Sciences, Engineering, and Medicine to convene an ad hoc committee to examine the methodological approaches to collecting data, conducting analyses, and interpreting obesity prevalence and trends at the national, state, and local levels, with a particular focus on children and young adults. In a consensus report, due in 2016, the committee will address the items outlined in the statement of task (see Box 1).

The committee is undertaking several activities to inform its work. One such activity was convening a data-gathering workshop, held in Washington, DC, on July 28, 2015. The workshop was intended to provide the committee with information and perspectives to consider as it addresses the topic areas identified in the statement of task and progresses toward findings, conclusions, and recommendations. Box 2 enumerates the four workshop objectives the committee developed. This workshop in brief summarizes highlights from the presentations and discussions that took place during the data-gathering workshop. The information presented in this summary represents the positions, knowledge, and opinions of the individual workshop participants and are not necessarily those of the committee or the National Academies of Sciences, Engineering, and Medicine.

BOX 1
COMMITTEE'S STATEMENT OF TASK

An ad hoc committee under the auspices of the Institute of Medicine will examine methodological approaches to data collection, analytic procedures, and interpretation of data at the national, state, and local levels on issues related to obesity status in U.S. populations, principally children, up to 18 years of age, with consideration for inclusion of individuals up to 21 years of age and measures of trends in obesity. The committee will comment on data sources and limitations to data gathering among different population groups and advantages or disadvantages to approaches associated with recent reports on both prevalence and trend data collected at the national, state, and local levels. The committee will also consider the best approaches to evaluating differences in trends among diverse population groups, especially those at social and economic disadvantage. A brief workshop summary of the presentations and discussions at the data-gathering workshop will be prepared by a designated rapporteur in accordance with institutional guidelines. Based on the available evidence, the committee will develop a framework for assessing studies on trends in obesity, principally among children and young adults, for policy making and program planning purposes. The framework will guide assessment of the strengths and weaknesses of studies on prevalence and trends in obesity in the population groups of interest. The committee will recommend ways decision makers and others can move forward in assessing and interpreting reports on obesity trends. To guide future research, recommendations will be made on options for improving data collection and filling data gaps.

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OPENING REMARKS

The committee chair, Shari Barkin of the Vanderbilt University School of Medicine, opened the workshop by stating that the committee's work seeks to provide guidance on how best to extract meaning from obesity prevalence and trends data. In explaining the motivation for sponsoring this study, Tina Kauh of RWJF stated that one of RWJF's goals over the next decade is to ensure that all children can grow up at a healthy weight. Reports in the current literature suggest childhood obesity levels may be plateauing or even declining in some subpopulations, noted Kauh, but many methodological factors may affect the meaningfulness of these findings, such as the representativeness of those sampled, consistency of the population at each assessment, length of time between measurements, thresholds used for outliers, quality of data collected, and statistical approach taken. Given these issues, RWJF asked the committee to "develop a framework for how to assess trends and assess studies on trends and obesity." Such a framework will be of value not only to those interpreting reports, but also to those seeking to present findings in a transparent manner. RWJF also asked for recommendations on understanding trends in subpopulations and guidance on how reported declines should be practically assessed. Kauh concluded by stressing the importance of the committee weighing methodological rigor against what can be realistically implemented in a public health setting.

> **BOX 2**
> **DATA-GATHERING WORKSHOP OBJECTIVES**
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> The workshop will help the members of the committee:
> 1. Understand strengths, weaknesses, and opportunities of existing data at the federal, state, and local levels to assess childhood obesity prevalence and trends.
> 2. Review key analytic and interpretation principles to ensure appropriate conclusions are drawn from obesity data.
> 3. Understand the components of a framework for assessing obesity trend data and explore the needs of practitioners and policy makers in collecting, analyzing, and interpreting data so as to inform framework development.
> 4. Identify emerging approaches for assessing prevalence and trends in obesity.

DATA ANALYSIS AND INTERPRETATION

The first session of the workshop explored methodological considerations for studies of obesity prevalence and trends, using two federal data sources as examples: the National Health and Nutrition Examination Survey (NHANES) and the Youth Risk Behavior Surveillance System (YRBSS).

"Obesity refers to excess body fat," said Cynthia Ogden of the Centers for Disease Control and Prevention (CDC). She explained that body mass index ([BMI]; weight in kilograms divided by height in meters squared [kg/m^2]) is used as a proxy for adiposity, noting that BMI does not distinguish between fat and muscle or provide insight into fat distribution, but is highly correlated with fat, especially at higher BMIs. Ogden explained that BMI varies with age and sex during childhood, so classification of obesity in children differs from the BMI cut-point approach used to classify obesity in adults (i.e., BMI ≥ 30 kg/m^2). For children, BMI-for-age is compared to a reference population. Ogden emphasized that the definition of obesity in children is a statistical one (as opposed to health risk-based) and is a function of the reference population selected and associated cut-points to which the BMI is being compared. She presented three examples of common growth references and standards. Ogden first discussed the CDC growth charts, which are used in the United States. The growth charts were developed using national survey data from the 1960s through part of the 1980s. A child who has a BMI at or above the 95th percentile on the CDC BMI-for-age growth charts is classified as obese. Ogden explained that, by definition, 5 percent of children in each age- and sex-group whose data were used to generate the growth charts (i.e., children from the 1960s through part of the 1980s) would have fallen above this cut-point. The second example Ogden presented was the International Obesity Task Force (IOTF) reference population, which was developed by compiling data from Brazil, Hong Kong, The Netherlands, Singapore, the United Kingdom, and the United States.[1] The IOTF linked cut-points in children to the BMI cut-points used in adults. To do this, the centiles corresponding to BMIs of 25 and 30 kg/m^2 (adult cut-points for overweight and obesity, respectively) at age 18 years were determined and used throughout the age distribution. Ogden showed that the IOTF cut-points for obesity are generally higher than CDC's 95th percentile (see Figure). Finally, she presented the World Health Organization

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[1] For more information about the IOTF reference population, see Cole, T. J., M. C. Bellizzi, K. M. Flegal, and W. H. Dietz. 2000. Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal* 320(7244):1240–1243.
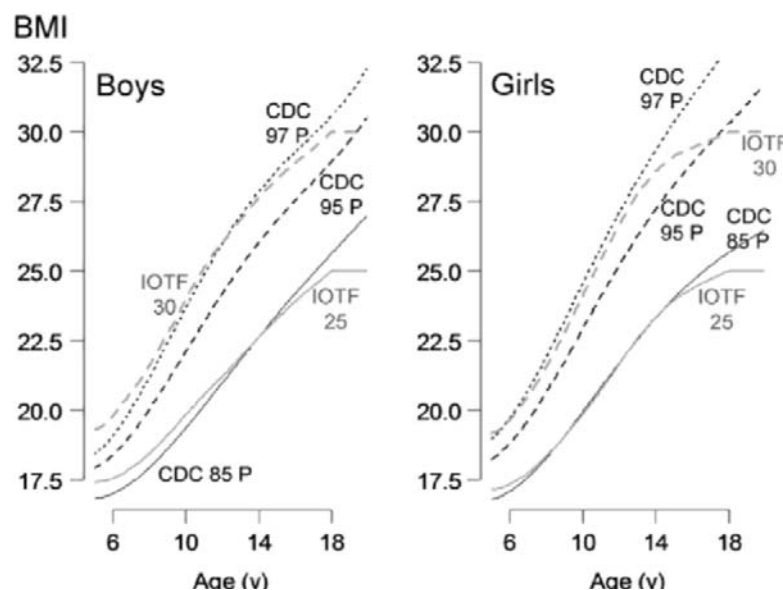
FIGURE Comparison of the Centers for Disease Control and Prevention (CDC) and International Obesity Task Force (IOTF) body mass index cut-points for overweight and obesity among 5- to 19-year-olds.

NOTE: 85 P = 85th percentile on the CDC growth charts, corresponding to a classification of overweight; 95 P = 95th percentile on the CDC growth charts, corresponding to a classification of obese; 97 P = 97th percentile on the CDC growth charts; IOTF 25 = IOTF cut-point for overweight; IOTF 30 = IOTF cut-point for obesity.

SOURCE: Reprinted from *Global Perspectives on Childhood Obesity: Current Status, Consequences, and Prevention,* edited by D. Bagchi, "The Measurement and Epidemiology of Child Obesity," Freedman DS, CL Ogden, and SE Cusick, p. 36, Copyright 2011, with permission from Elsevier (www.elsevier.com). The version shown at the workshop was an adaptation of the figure presented here.

(WHO) reference populations. For children birth to age 4 years, growth standards were developed using data from the Multicentre Growth Reference Study, which had data collection sites in Brazil, Ghana, India, Norway, Oman, and the United States. Rather than being nationally representative, data were collected from children with optimal nutrition, environment, and care. Ogden described the growth standards as prescriptive, representing how children should grow if given optimal care and feeding. For children ages 5 years and older, a reference was developed by modifying the 1978 WHO growth chart data. Where CDC uses the 95th percentile for classifying a child as obese, the WHO uses +2 standard deviations, which corresponds to the 97.7th percentile. In addition to considering the reference population, Ogden underscored the importance of accuracy by presenting examples of how even small errors in measured or self-/proxy-reported weight and height can affect BMI classification, especially in young children.

NHANES is currently a continuous, nationally representative cross-sectional survey of the civilian, non-institutionalized U.S. population and is regarded as the gold standard for national estimates of obesity. Approximately 5,000 people are surveyed each year, with each person's height and weight objectively assessed using a stadiometer (a device for measuring height) and scale that sends measurements directly to the NHANES database. The survey's sample parameters have evolved over time (see Table), which, Ogden commented, has implications for the ability to perform trends analyses on certain age groups. With respect to trends, she showed how changing the selected time period for the trends analysis can lead to different results and interpretation. For example, the past several cycles of NHANES obesity estimates do not significantly differ from each other, but extending the analysis to include data from more than 10 years ago (1999–2000 survey through 2009–2010 survey) produces results indicating a significant increase in obesity for both men and boys. Ogden also discussed how combining survey years may improve estimates, especially when the sample size is small. She stated that NHANES can provide a baseline for what is happening in the overall population, to which local data could be compared.

3

TABLE Survey Periods Before Establishing the Continuous NHANES in 1999

Survey	Dates	Ages
NHES I	1960–62	18–79 years
NHES II	1963–65	6–11 years
NHES III	1966–70	12–17 years
NHANES I	1971–75	1–74 years
NHANES II	1976–80	6 mo.–74 years
HHANES	1982–84	6 mo.–74 years
NHANES III	1988–94	2 mo.+

NOTES: NHES, National Health Examination Survey; HHANES, Hispanic Health and Nutrition Examination Survey. The NHES collected height and weight data. In 1971, NHANES replaced NHES when nutrition was added to the survey.
SOURCE: Cynthia Ogden presentation, July 28, 2015.

Next, Laura Kann of CDC discussed the YRBSS, which is a predominantly high school-based, cross-sectional survey with three primary purposes: (1) focus the nation on behaviors among children that cause the most health problems; (2) be a system that allows the assessment of change over time; and (3) provide comparable data among different subgroups and at the national, state, and local level. YRBSS biennially collects anonymous, self-reported data directly from students in the school setting. Kann noted that unlike the Behavioral Risk Factor Surveillance System (BRFSS), which aggregates state-level data to generate national estimates, YRBSS conducts a separate national survey of approximately 14,500 students, in addition to surveying most states and select cities. All data collected through the YRBSS receive the same cleaning, editing, and weighting.

YRBSS first collected height and weight data in 1999 and uses the CDC growth charts and cut-points to classify obesity. Kann presented findings from a study of 4,600 students, which indicated students reliably self-reported their heights and weights over two administrations of the questionnaire separated by 2 weeks. An evaluation of accuracy in a convenience sample of 2,000 students, however, revealed that weights were underreported by a mean of 3.5 pounds and heights were overestimated by a mean of 2.7 inches. For this sample, the overestimation of heights significantly skewed the BMIs, resulting in lower estimates of obesity prevalence compared to estimates from measured heights and weights. In discussing analytical considerations, Kann emphasized that data are used to produce population estimates, not individual diagnoses, and indicated that data can be used to look at subgroup differences and trends despite underestimating the prevalence estimate. She described that states and cities use the data for a variety of purposes, including assessing the impact of wellness policies and supporting the goals, objectives, and strategies of initiatives. Similar to Ogden, Kann demonstrated that changing the starting point for assessing trends can lead to different results and interpretations, with an increase in obesity prevalence emerging between 1999 and 2013, but estimates remaining fairly consistent over the past four to five cycles of data collection. When asked to describe the biggest challenge facing the YRBSS, Kann stated, "school-based surveys are unique in the sense that there are a whole lot of gatekeepers ... we are so far away from our actual respondent."

FRAMEWORK DEVELOPMENT AND IMPLEMENTATION

The second session explored the development and implementation of effective frameworks from two different perspectives—education and public health.

Jill Constantine of Mathematica Policy Research used the What Works Clearinghouse as an example to describe how standards (or, in this case, a framework) can be developed. Such standards help use existing evidence more effectively to make decisions. The first step she outlined was assembling a group to develop an approach, noting an expert panel is not always necessary, but can bring credibility to a field where methodologies are rapidly developing. Next, the group decides whether the standard will be absolute or relative, with an absolute standard setting the benchmark based on best practices and a relative standard rating the existing field against the best available study. It is up to the group to decide which type of standard will facilitate the best decision making. When preparing the standard to be

disseminated to various stakeholders, Constantine suggested striking a balance between being accessible to non-research audiences, yet providing sufficient documentation and evidence for researchers. The final step Constantine discussed was facilitating adoption of the standard. She presented an example from What Works in which acceptance from both investigators and funders created buy-in that enhanced uptake of the standard.

Complementing the concepts presented in Constantine's talk, Nicolaas Pronk of HealthPartners presented three framework examples. Pronk first showed a feedforward/feedback framework, in which the various components inform each other. He then presented a practice- and research-connected model. In this framework, findings from efficacy studies, effectiveness research, and systematic reviews lead to an observation, which progresses toward practical applications, develops into a prototype of a solution that is piloted, and eventually matures into a standard. As that solution is implemented, it is evaluated, which generates new hypotheses and research. Pronk's third example, which is embedded in the practice- and research-connected model, addresses plausibility. This framework connects the 4-S of program design (effect size, scope of services, scalability, and sustainability) to the PIPE Impact Metric (penetration, implementation, participation, and effectiveness), which evaluates an intervention's dose and response. Specifically addressing the committee's task, Pronk suggested adding the assessment of obesity incidence to increase the confidence of findings and to help identify groups at greatest risk. Speaking broadly about frameworks, he suggested building in sustainability, which allows the solutions that are developed to be tied to the data that flows through the model. He also stressed that the approaches that typically work are multidisciplinary in nature and integrate the reality of practice, address the needs of various stakeholders, and function on multiple levels. When asked what elements make for an actionable, useful, and practical framework, Pronk emphasized that it has to be low resource, simple, and understandable for the user.

PANEL DISCUSSION

The third session of the workshop provided insight into the approaches to and challenges of assessing obesity prevalence and trends at the local and state levels. The four panelists were Lisa Pivec of the Cherokee Nation Health Services, Thomas Ricketts of the University of North Carolina at Chapel Hill, Paul Simon of the Los Angeles County Department of Public Health, and Joseph Thompson of the Arkansas Center for Health Improvement.

Panelists described the various approaches to assessing obesity prevalence and trends that have been used in their respective regions. In the Cherokee Nation, for example, trends have been assessed using health care data. Los Angeles County makes use of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) database, which encompasses approximately 60 percent of county children younger than age 5 years. School-based assessments of children's weight status were common among panelists, although their approaches varied. Simon explained that California's fitness test of all public school fifth, seventh, and ninth graders contains a body composition component that is typically fulfilled through measuring students' heights and weights. Thompson described Arkansas' approach as a BMI census of children in even-based grades, kindergarten through 10th grade, which is now in its 12th year of collection. Pivec noted that for the past several years, the Cherokee Nation has conducted its own Youth Risk Behavior Survey, mostly with their own resources, and has also collected BMI data in a sample of schools. Each of the panelists noted that gathering school-based data is becoming increasingly more difficult, citing strict interpretation of the Family Educational Rights and Privacy Act and declining cooperation of schools as barriers to collecting and accessing student data.

The panelists described the impact of national-level survey results at the local and state levels. Ricketts remarked that as national estimates are refined, the variability and the reality of what is happening at the local level can get lost. Both Pivec and Simon noted that diverse populations are often grouped together in national surveys due to small sample sizes—such as categorizing members of all tribes as American Indian and combining Pacific Islanders with Asians. In discussing how national data could be more beneficial to local and state efforts, Thompson suggested data could be presented by regions or quadrants of the United States. Ricketts echoed the sentiment, proposing sampling from communities stratified by size, complexity, and location. Simon thought oversampling of special populations would be beneficial, but would necessitate additional resources to execute.

Panelists discussed existing obesity surveillance infrastructure and shared ideas for improvements. Pivec explained that the Cherokee Nation has no public health infrastructure for surveillance and monitoring, and its development is highly dependent on cooperative agreements with CDC and funding from the tribal government. Ricketts felt that state epidemiologists were an underused resource and indicated that academic institutions and health depart-

ments could better collaborate. Thompson noted, however, that joint efforts may be impeded, as public health officials and policy makers often need and use data faster than researchers can release it in peer-reviewed publications.

The role of decision makers also was a topic of discussion. Pivec described the importance of conveying to policy makers the long-term nature of changes in obesity rates. She described an instance where her group lost tribal-level funding for school-based BMI assessments because they could not demonstrate a rapid-enough reduction in childhood obesity over a 3-year period. Similarly, Simon described the two childhood obesity surveillance systems used in Los Angeles County as "immensely valuable" but "very precarious." Thompson thought that full commitment to surveillance efforts does not exist because obesity is not prioritized as an issue, and Ricketts suggested that an opportunity exists to create a sense of urgency as findings are disseminated.

Panelists also explored elements of study and surveillance design. Pivec and Thompson both noted that when they are determining the relevance of recent obesity data, they seek out studies conducted in populations with similar demographic characteristics to their own. Thompson noted that a need exists to provide guidance on when, why, and how different study designs might be employed. Given that obesity can be assessed various ways, Simon said he sought an objective measure that can be used to compare populations. Thompson stressed that BMI is a screening tool, and it is susceptible to measurement and conversion errors that can result in misclassification. In discussing the collection of data, Pivec and Simon stated that collaboration with local organizations and foundations may be important, both to gain insights into their perspectives and to obtain technical support.

Simon noted that no single method can be applied to all situations when analyzing, presenting, and interpreting obesity data. He also stated that distinguishing between relative and absolute percent change is important, as a relative percent change is highly subject to the baseline value. Thompson proposed that a direct or indirect adjustment be made when comparing populations so as to make the effect comparable across standardized populations. On the topic of subgroups, Simon suggested that a sample be broken into groups to the extent that specific subgroups are of interest to the target audience or distinct differences between groups exist. Ricketts added that variability, as opposed to central tendency, is important because it highlights where the outliers exist and provides insight into where intervention is needed.

FORWARD THINKING AND TECHNOLOGICAL ADVANCEMENTS

The final session of the workshop focused on considerations for data collection and analysis in years ahead. Topics included changes in the demographic landscape and uses of technology.

Today's children are on the leading edge of a demographic transition in the United States and will be part of the first generation in which no single group comprises the majority, said Don Hernandez of The City University of New York. Hernandez stated that approximately 25 percent of children in the United States have at least one immigrant parent—most having Latin American, Asian, Caribbean, or African origins—but are themselves U.S. citizens. He presented data demonstrating that tremendous diversity exists across immigrant groups in terms of language spoken in the home, low-income status, and level of maternal education. Given this, Hernandez indicated that obesity rates also may vary across immigrant origin groups. He suggested the ten data elements developed by the National Research Center on Hispanic Children and Families could be used to help "unpack the diversity of children with immigrant parents." Hernandez stated that NHANES, which currently collects 5 of these 10 data elements, could be enhanced by adding others, such as questions about parental English speaking proficiency and legal residency status (child and parents). He noted that the Youth Risk Behavior Survey does not currently capture any of these data elements and suggested prioritizing the questions as country of birth (self and parental), followed by language spoken at home, and perhaps parental education. Looking ahead, Hernandez indicated that the general demographic trends among U.S. children were likely to continue, with the Census Bureau projecting continued growth of the Hispanic population and immigration of Asian populations. He suggested population trends can be monitored through the American Community Survey.

Next, Charles Bailey of Children's Healthcare of Philadelphia described ways electronic health records (EHRs) are being used to assess pediatric obesity within PEDSnet, which is "a collaboration of eight large pediatric health systems in the United States, built around learning health system principles." He explained that the number of height and weight measurements recorded in children's EHRs is often bolstered because pediatricians monitor growth, medications are typically dosed on weight, and schools often require a well-child check. Bailey explained that the analysis of EHR data faces a range of challenges, though, because: (1) data are collected with differing protocols and scales depending on site of data collection; (2) intervals between measurements can be irregular and are driven by differing patient needs (both well and sick visits); (3) data reflect only populations who access medical care; (4) EHR interoper-

ability is currently limited; (5) technical and regulatory standards for data collection and exchange are still emerging; and (6) patient privacy is a concern. Bailey reported on a pilot study that used outpatient data on anthropometric measures and obesity diagnoses that were collected during a 2-year window on slightly more than 800,000 children at six of the eight PEDSnet sites. Summarizing the findings, Bailey noted that these data were very reliable and consistent and yielded relatively similar results to resource-intensive national survey data. He also presented findings using longitudinal EHR data to examine associations between select exposures and subsequent obesity. Bailey indicated that these assessments are limited by information not captured by the EHR, such as environmental exposures and socioeconomic factors, but opportunities exist to link this information. When asked whether the EHR is an avenue for surveillance, Bailey responded that he does not foresee it replacing careful surveys, but instead views it as a complementary technique.

In the final presentation of the workshop, Stephen Intille of Northeastern University explained how emerging technologies could be leveraged to capture obesity-related data. He described a range of ideas that could be developed, acknowledging that most would involve significant changes to policy, substantial resources, innovative technology buy-in, and/or intensive coordination among researchers. For example, he said, crowdsourcing, if adequately incentivized, could be implemented among community health workers, pediatricians, or schools to increase the number of data points collected. Self-report through smartphones or fitness apps could be another source of large quantities of information, he added. Technology could be developed not only to collect data, but also to improve the quality of information collected. Intille noted that in addition to quantifying the issue of obesity, it is critical to collect data that inform solutions. Large-scale surveys, he argued, often provide limited insight into the context or the decision-making process. Recognizing that factors and decisions affecting weight status are occurring constantly and quickly, Intille suggested collecting intensive longitudinal data on relatively few individuals—so-called small big data. In this approach, information is continually being gathered and can be used to generate individual-level models. These models could help decipher not only what people do, but also how technology can strategically and meaningfully interact with them.◆◆◆

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