

Youth Energy Expenditure Workshop: Executive Summary

April 19-20, 2012, Atlanta, GA

National Collaboration on Childhood Obesity Research (NCCOR)

Workshop Overview

Efforts to reduce childhood obesity must emphasize healthy eating and sufficient physical activity. In the physical activity arena, there is an ongoing need to convert self-reported or observed time spent in specific activities into a common measure of energy expenditure, such as Calories used per kilogram (kg) of body weight or metabolic equivalents (METs).

On April 19 and 20, 2012, the Centers for Disease Control and Prevention (CDC), the National Cancer Institute (NCI), and the National Collaborative on Childhood Obesity Research (NCCOR) convened a small group of experts on youth exercise physiology and energy expenditure, including the principal authors of the Adult Compendium of Physical Activities and the 2008 Youth Compendium of Physical Activities. These experts were charged with two goals:

1. Achieving consensus on methods and measurements to improve energy expenditure estimates for youth.
2. Developing a plan for updating, reformatting, and making the Youth Compendium publicly accessible.

Presentations and Discussions

Russell Pate opened the workshop by noting that an enhanced compendium of youth physical activities would contribute greatly to the development of standardized objective data, thereby improving efforts to conduct surveillance and research.

Barbara Ainsworth and **Steve Herrmann** described the development and impact of the Adult Compendium of Physical Activities. Compendium values have been used in thousands of research and evaluation activities and its web site currently has about 800 visitors per week.

Kate Ridley explained that the Youth Compendium—the first published collection of energy expenditure values for children and youth—contains 244 activities, only 56 of which are based on actual measurements in children. For activities with no child-specific data, the Compendium uses adult METs to assign energy expenditure values. Prediction equations based on age and speed are used to estimate the metabolic cost of walking and running.

Additional speakers (**Bob McMurray**, **Nancy Butte**, **Stewart Trost**, **Karin Pfeiffer**, **Don Morgan**, **David Bassett**, and **Bob Malina**) focused on the challenges of developing measures of energy expenditure in children and updating the Youth Compendium. These challenges fall into two groups. First, children and youth differ biologically and behaviorally from adults. Young children also differ from older children and adolescents. Key factors include the age-specific decline in basal metabolic rate (the foundation for calculating METs), improvements in coordination and efficiency of activities with age, and the energy consequences of puberty, which arise at different ages in boys and girls. These differences appear to preclude a compilation of METs as simple as that used in adults. Second, children present measurement challenges because they engage in considerable amounts of unstructured play and differ a great deal in the intensity and duration of activity during structured play. It also may be difficult to use children in studies that involve metabolic chambers or heavy measurement devices.

Areas of Agreement

The workshop's presentations and discussions led participants to consensus on a number of key issues. Most fundamentally, they agreed that the Youth Compendium is invaluable and efforts to enhance it are definitely warranted. Most of the data for the Compendium will come from the English-language literature, though some data may be found in literature of other languages. They also agreed that creating a repository of individual-level data concerning youth energy expenditure that could be used for research purposes is of great interest. In discussing the lack of consensus on the best energy expenditure metric to use in the Compendium, participants agreed that estimates from adults may be better than nothing, but they should not be included in the Youth Compendium. Rather, users should be directed to the Adult Compendium to retrieve estimates for activities not included in the Youth Compendium. They also felt that incorporating an allometric adjustment into the energy expenditure values to account for differences in size between children and adults is one possible approach, but that it requires careful consideration. They agreed that measured energy expenditure from monitoring devices, such as metabolic chambers or wearable respirometers, is superior to estimated energy expenditure. Participants also felt that accelerometers or other devices require additional development before they can be used to measure energy expenditure for a youth compendium. A final area of agreement was that the Youth Compendium must include unstructured play and team sports, account for age-specific changes in resting metabolic rate, and include overweight/obese and disabled children and youth, but that all of these issues pose significant challenges.

Planning the Next Steps

Workshop participants created seven teams, each of which was tasked with specific next steps. Notable progress already has been made by several of these teams. Team 1, the steering committee, is meeting regularly, has had an abstract for a tutorial session accepted for the 2013 meeting of the American College of Sports Medicine, and will be preparing a summary of the workshop for publication in a journal. Using data provided by workshop participants, Team 2 is evaluating different metrics for reporting youth energy expenditure to determine which is most accurate. Team 3 is working with Kate Ridley to prepare a plan for updating the Youth Compendium by reviewing relevant literature published since 2005. Team 4 has developed a proposed list of variables that should be included in data collection and reporting of youth energy expenditure values. The remaining teams will become active over time as the project matures.

Conclusion

In remarks that closed the workshop, **Thomas Rowland** stated that high-quality research tools, like an updated and expanded Youth Compendium, are critically important to promoting physical activity and exercise in children for health and to reduce future risk factors for adult diseases. The expanded Youth Compendium will be useful in identifying, designing, and evaluating interventions, especially in high-risk populations and communities. It also could be used to support national, state, and local surveillance activities and to facilitate research and program evaluation. In helping researchers achieve these aims, the Youth Compendium could play an important role in realizing NCCOR's overall mission, which is to improve the efficiency, effectiveness, and application of childhood obesity research and to halt the current childhood obesity epidemic through enhanced coordination and collaboration.