

New Data for an Updated Youth Compendium

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Overview

- Compendia History
- Compendium Challenges in Youth
- JPAH Special Issue
- Research Highlights
- Future Directions

NCCOR



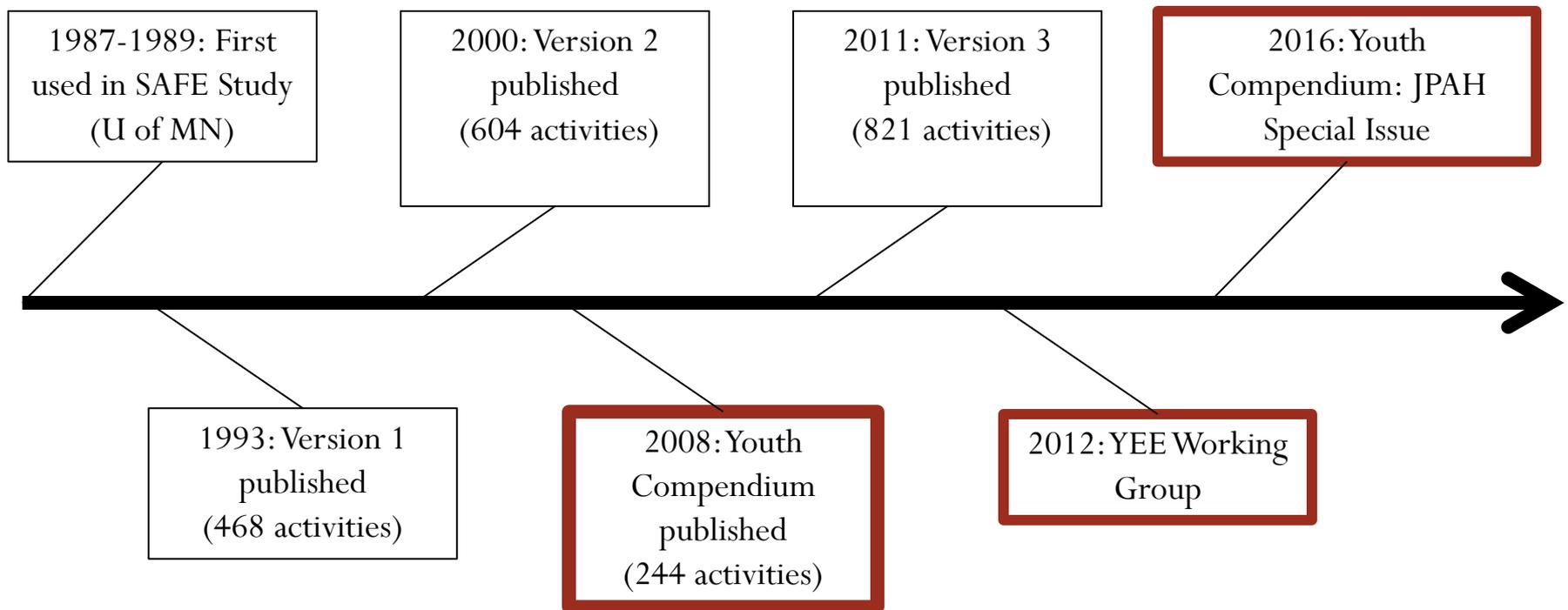
- The National Collaborative for Childhood Obesity Research

Mission: accelerate progress in reducing childhood obesity

- A partnership of 4 leading research funders to address the problem of childhood obesity in America.
 - Centers for Disease Control and Prevention (CDC)
 - National Institutes of Health (NIH)
 - Robert Wood Johnson Foundation (RWJF)
 - U.S. Department of Agriculture (USDA)
- www.nccor.org

History

- Developed for epidemiologic studies



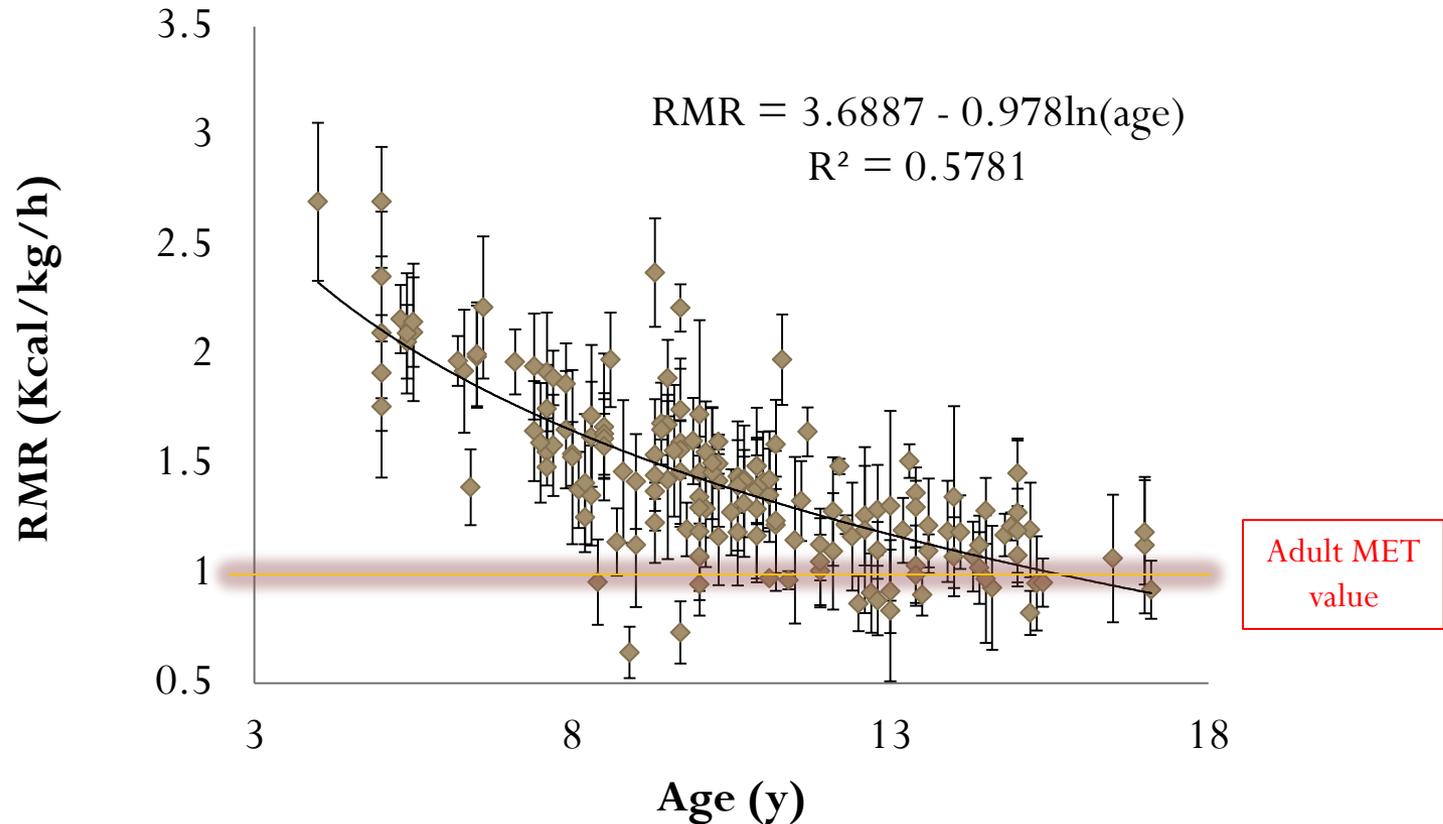
Youth Compendium (Ridley et al, 2008) <https://ijbnpa.biomedcentral.com/articles/10.1186/1479-5868-5-45>

Working Group: 3 Important Tasks

1. Determine unit of energy cost to be used in Youth Compendium and how to handle age-related changes in energy expenditure
2. Obtain new energy expenditure values from existing published literature
3. Obtain new energy expenditure values from new and unpublished data

Which energy expenditure metric
should be used?

Resting Metabolic Rates of Children 4-17 y of age



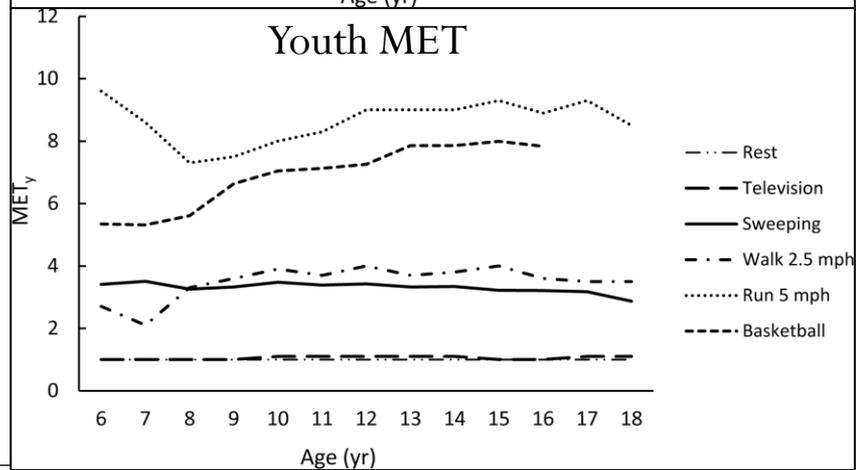
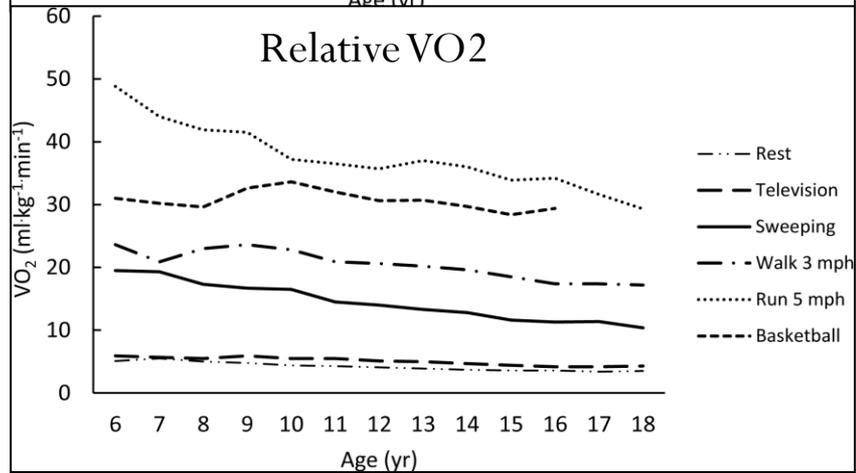
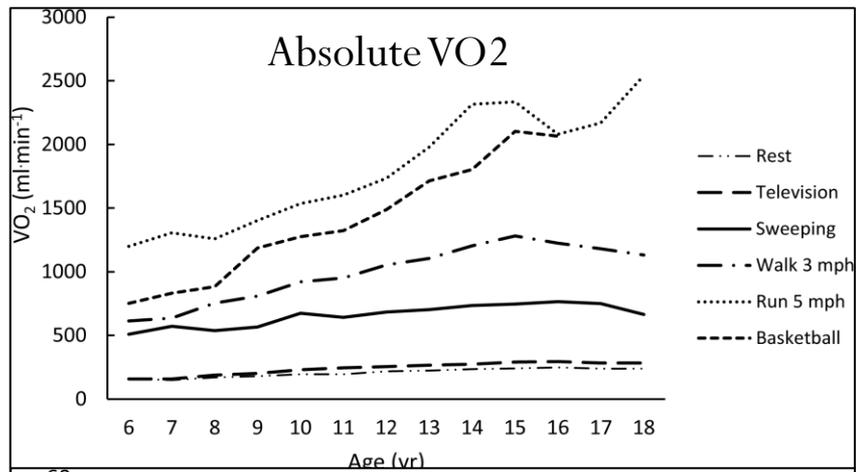
- Each data point represents a mean & SD for one of 79 studies of children.
 - Data from Robert McMurray

Challenges in the Youth Compendium

- 65% of youth compendium values were based on adult data.
- Adult MET vs. Youth MET
 - **Adult MET:**
 - $\text{RMR} = 3.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ($1.0 \text{ kcal} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$)
 - **Youth MET:**
 - $\text{RMR} = \text{Activity energy expenditure} / \text{measured resting energy expenditure}$
 - $\text{RMR} = \text{Activity energy expenditure} / \text{Schofield equation estimate}$

Exploring Metrics for Express Energy Expenditure of Physical Activity in Youth (McMurray et al, 2015)

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130869>



What new data are available from published studies?

Systematic Literature Review

- Dr. Kate Ridley (first author of 2008 Youth Compendium) led this project.
- Goals
 - locate published studies
 - Before & after 2008 Compendium
 - widen the age range to all children and adolescents aged < 18 y
 - expand the databases used to search for relevant studies.

Systematic Literature Review

- 2 searches
 - (CINAHL; Cochrane library; EMBASE; Medline; Proquest; PsychINFO; SCOPUS; SportDiscus; and Web of Science)
- Searches returned 18,513 and 3,408 hits
 - 11,606 after duplicates removed
 - All abstracts were reviewed for inclusion/exclusion
 - Authors were contacted for clarification and missing data as needed.
 - $n = 91$ studies included for data synthesis
- Descriptive and quantitative data were extracted from full text
- Quality Assurance
 - ~40% of studies were double coded

Systematic Literature Review

- 71 studies not included in 2008 Youth Compendium
- 347 new unique mean energy costs values

Number of unique mean energy cost values in review categorized by activity type that were NOT included in 2008 Youth EE compendium.

Activity Category	Number of mean energy cost values	% of total new data points
Active video games	79	22.8%
Sedentary screen time	61	17.6%
Lying/sitting/standing quietly	44	12.7%
Simulated sports/games	39	11.2%
Dance/aerobics/calisthenics/gymnastics	27	7.8%
Active outdoor play	18	5.2%
Chores	15	4.3%
Reading/writing/academic pursuits	15	4.3%
Sedentary play	15	4.3%

Note: remaining ~ 10% of activities spread across remaining activity categories.

How can we solicit new data?

Call for Papers

Purpose: To gather unpublished data to inform the updated compendium

- Call in Fall 2015
 - *Required:* Assess EE with indirect or whole-room calorimetry
- Submission deadline December 31, 2015
- Accepted: 17 manuscripts
 - From 4 countries

Highlights in the Special Issue

- ~250 activities reported
- Ages range from 3-18 y
- Sample sizes vary from 11-209 participants

Study	Sample Size	Age Group
1	40	5-12
2	28	3-6
3	37	5-15
4	11	3-6
5	30	12
6	27	9-11
7	24	10-17
8	105	7-13
9	28	10-11
10	36	9-18
11	119	3-5
12	53	9-15.5
13	178	8-18
14	106	6-18
15	32	4th-5th grade
16	209	6-18
17	57	5-12

Summary: Special Issue

- 3 studies included preschool-age youth (3-6 years)

(Byun et al.; Groβeck et al.; Puyau et al.)

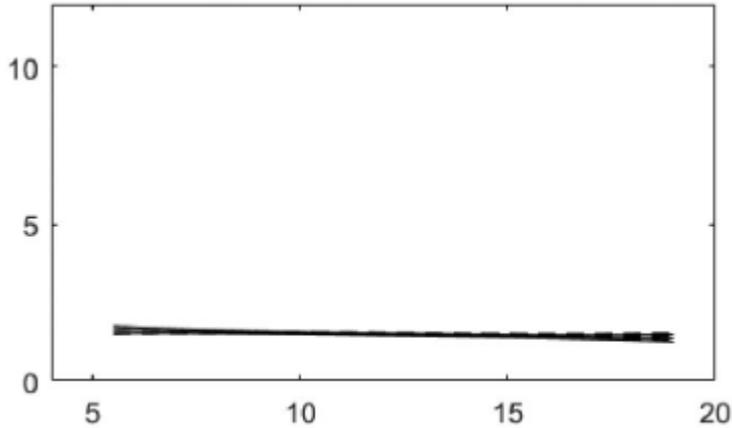
- Active video games
- ball toss
- standing art
- tablet activity
- cleaning up
- treasure hunt
- bicycle riding
- obstacle course
- soccer
- shooting baskets
- puzzles
- dance

- Some studies included a wide age range

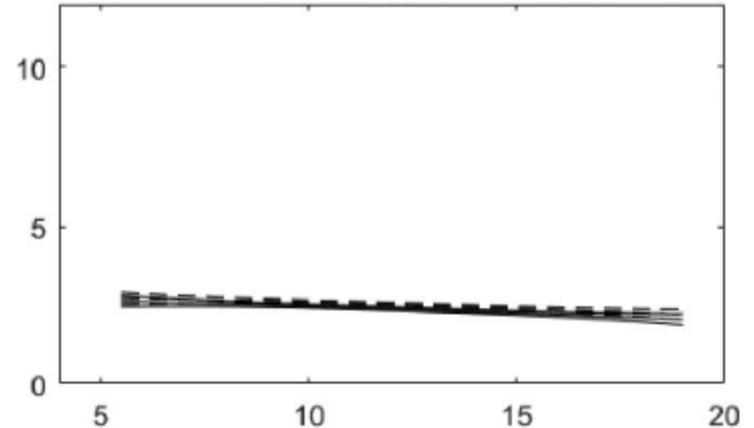
(Clevenger et al.; Ondrak & McMurray; Sasaki et al.; Schuna et al.; Trost et al.)

- Trost et al. examined longitudinal modeling of energy expenditure

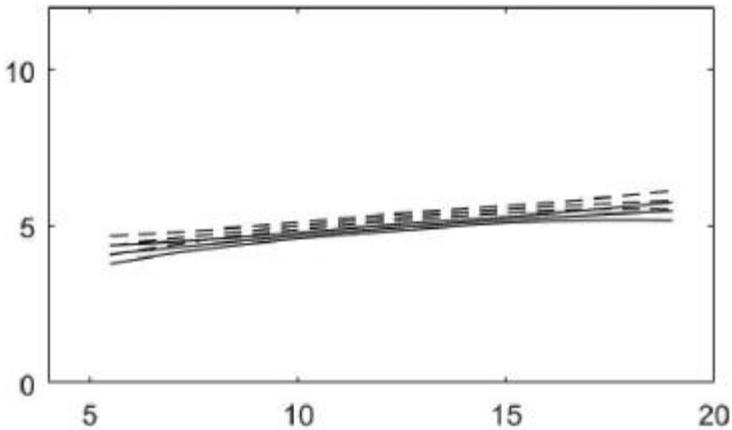
Summary: Special Issue



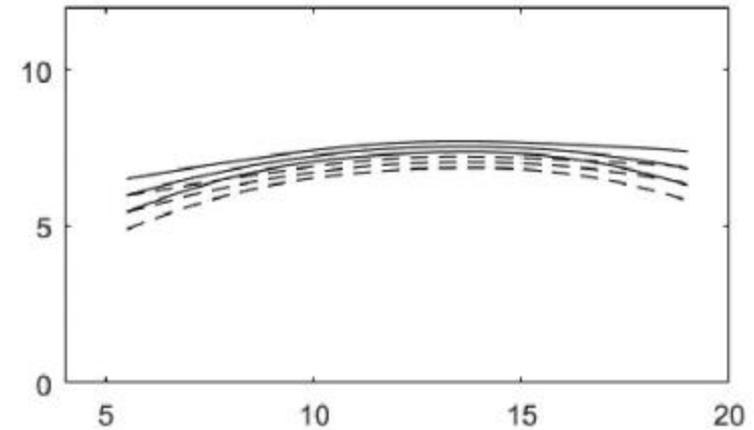
(b) hand writing



(d) throw and catch



(l) treadmill walk



(j) basketball

Summary: Special Issue

- Wide range of activities covered
 - Sasaki et al. included 70 activities, many of which were children's games
 - (e.g., Capture the Flag, Steal the Bacon, Monkey in the Middle, Scatter Ball)
 - Tennis practice and matches (Ondrak & McMurray)
 - Rollerblading and riding a scooter (Ridley & Olds)
 - Relay races (Clevenger et al.)

Summary: Special Issue

- Wide range of activities covered (cont'd.)
 - Radio gymnastics (Gao et al.)
 - Hopscotch (Innerd and Azevedo)
 - Playground games (MacIntosh et al.)
 - Hand weight exercises (Lee et al.)
 - Different playing modes of active video games (Barkman et al.)

Summary: Special Issue

- Different types of sedentary activities
 - Classroom instruction (Honas et al.)
 - Board games (Sasaki et al.)
 - Drawing (Innerd & Azevedo)
 - Reading (Lee et al.)
 - Playing handheld e-game (van Loo et al.)
 - Coloring (Schuna et al.)
 - Sorting beads and telephoning (Lau et al.)

Summary: Special Issue

- Different types of study purpose
 - Comparison of sex, age, and body size patterns in energy expenditure (Lee et al.)
 - Predictive validity of the ActivPal monitor (van Loo et al.)
 - Examination of classroom-based physical activity (Honas et al.)

Important Findings

1. Sedentary and low-intensity activities: Energy cost remained stable across age
2. Moderate-to-vigorous activities: Energy cost increased with age
3. Activities relying on motor skill performance or motivation: Energy cost varied with age
4. Sex differences in energy cost were often not apparent
5. BMI differences may play a role in energy cost for some activities

Working Group: Current Status

- Completed tasks
 - Chose a metric
 - Youth MET
 - Literature review
- Tasks underway
 - Determining best method to account for age
 - Imputation project

Future Directions

- Youth Compendium will be published late 2016-early 2017?
- Missing values in age groups for some activities
 - Imputation underway to assist
- Future research
 - May need to collect data on more activities specific to particular age groups
 - Robust process must be in place

Potential Youth Compendium Layout

Activity	METs by Age Group ^b			
	6-9 years	10-12 years	13-15 years	16-18 years
Sedentary				
Computer games	1.44	1.41	1.38	1.35
Television viewing	1.16	1.19	1.22	1.25
Light-intensity				
Housework	2.92	3.00	3.06	3.13
Sweeping	3.44	3.35	3.26	3.18
Wii® Play	2.59	2.62	2.65	2.67
Non-weight bearing				
Cycling ~10 mph	4.75	5.41	5.98	6.54
Moderate- to vigorous-intensity				
Aerobics	3.38	3.82	4.20	4.58
Dance	3.19	3.48	3.72	3.97
Walk - 2 mph	3.34	3.51	3.66	3.81
Run - 4 mph	6.89	7.83	8.64	9.45
Skilled				
Basketball	5.79	6.95	7.94	8.93
Rope Skipping	7.01	7.73	8.34	8.96
ACTIVITY X	3.75	GAP	4.70	GAP

The Working Group

The Working Group on Youth Energy Expenditure:

- Barbara Ainsworth, PhD, MPH (Arizona State University)
- David Bassett, PhD (University of Tennessee)
- David Berrigan, PhD (NCI)
- Nancy Butte, PhD (Baylor College of Medicine)
- Scott Crouter, PhD (University of Tennessee)
- Janet Fulton, PhD (CDC)
- Stephen Herrmann, PhD (Sanford Health/Research)
- Kate Ridley, PhD (Flinders University, Australia)
- Robert McMurray, PhD (University of North Carolina)
- Karin Pfeiffer, PhD (Michigan State University)
- Stewart Trost, PhD (Queensland University of Technology)
- Kathleen Watson, PhD (CDC).

Acknowledgements

We wish to acknowledge the valuable contributions of those who attended the initial Youth Energy Expenditure Workshop:

- Bridget Borgogna (CDC)
- David Brown, PhD (CDC)
- Susan Carlson, PhD (CDC)
- Dianna Carroll, PhD (CDC)
- Kong Chen, PhD (NIDDK)
- Joan Dorn, PhD (CDC)
- Ginny Frederick, MS (CDC Foundation)
- Deb Galuska, PhD (CDC)
- Carmen Harris, MPH (CDC)
- Kristin Issacs, PhD (US Environmental Protection Agency)
- Sarah Lee, PhD (CDC)
- Robert Malina, PhD (Tarleton State University)
- Mindy Millard-Stafford, PhD (Georgia Institute of Technology)
- Don Morgan, PhD (Middle Tennessee State University)
- Chantelle Owens, MS (CDC)
- Prabasaj Paul, PhD (CDC)
- Russell R. Pate (University of South Carolina)
- Anne Rodgers (Science Writer)
- Tom Rowland, MD (Baystate Children's Hospital)
- MinKyoung Song, PhD (CDC)
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