

**“Study Designs and Analytic Strategies for Environmental and Policy Research on Obesity,  
Physical Activity, and Diet”**

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**Report on the Meeting**

**“Study Designs and Analytic Strategies for Environmental and Policy Research on Obesity,  
Physical Activity, and Diet”**

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James F. Sallis, Ph.D.\*

Active Living Research, Department of Psychology, San Diego State University, San Diego, California

Mary Story, Ph.D.\*\*

Healthy Eating Research, Division of Epidemiology, University of Minnesota, Minneapolis, Minnesota

Deborah Lou, Ph.D.

Active Living Research, San Diego State University, San Diego, California

\*,\*\* For correspondence, please contact Jim Sallis at [alr@projects.sdsu.edu](mailto:alr@projects.sdsu.edu) or Mary Story at [story001@umn.edu](mailto:story001@umn.edu).

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## **Background and Rationale**

The prevalence of obesity among United States youth and adults is high and continues to increase, with clear evidence of higher obesity rates among low-income and racial/ethnic minority population subgroups<sup>1,2,3</sup>. Obesity prevention and control is a high priority and a major challenge, and it is essential to ensure that solutions are relevant to the groups at highest risk of obesity. Though multiple genetic loci have created predispositions to obesity, it is widely believed that alterations of environments have caused changes in dietary and physical activity behaviors that have triggered the current epidemic<sup>4</sup>. For example, increased portion sizes, expansion of fast food outlets, neighborhood designs that prevent walking to destinations, and reduced physical education programs, have been proposed as among the environmental and policy changes that contribute to obesity and make it difficult for people to change their eating and physical activity habits. Numerous authoritative reports have identified environmental and policy interventions as the most promising strategies for creating population-wide improvements in eating, physical activity, and obesity, including the U.S. Surgeon General<sup>3</sup>, World Health Organization<sup>5</sup>, Institute of Medicine<sup>6,7</sup>, Centers for Disease Control and Prevention (CDC)<sup>8</sup>, and the International Obesity Task Force<sup>9</sup>.

Although environmental and policy factors are the least studied category of physical activity correlates<sup>10,11</sup>, and there are few studies of food environments<sup>12</sup>, findings to date are promising. Evidence is growing rapidly that attributes of built environments, including neighborhood design and access to attractive parks, are associated with obesity<sup>13</sup>, and physical activity<sup>14,15</sup>. Food environment attributes, such as access to supermarkets and concentration of fast food restaurants are related to food

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intake and obesity<sup>12,16-18</sup>. Progress in environmental and policy research has been stimulated by the Robert Wood Johnson Foundation’s investments through Active Living Research and Healthy Eating Research. Early grants have produced measures of park quality<sup>19,20</sup>, design of streetscapes<sup>21,22</sup>, and presence and cost of healthy foods in stores and restaurants<sup>23,24</sup> that will increase the rigor of subsequent research. Other grantees are conducting evaluations of policy and environmental interventions. Multiple National Institutes of Health (NIH) Institutes and the Centers for Disease Control and Prevention (CDC) sponsored the \$20 million Obesity and Built Environment initiative that is ongoing and will lead to further advances. Individual Institutes have supported environmental obesity interventions targeting worksites and communities. CDC supports the Physical Activity Policy Research Network. Unfortunately, these funding programs are insufficient to examine the broad range of environmental and policy factors that may be critical to obesity prevention and to create the evidence base needed to guide and improve interventions at the individual, social, institutional, physical environmental, and policy levels.

The need for evidence related to environment and policy influences and interventions regarding obesity prevention, diet, and physical activity is increasing in importance as government, philanthropy, communities, schools, and health professionals implement new programs and policies to address the obesity crisis<sup>3,6,25</sup>. It is clear NIH leadership has planned for a systematic approach to obesity research that addresses a wide range of topics using a variety of methods. The conference described in this report was directly responsive to the first theme of the Strategic Plan for NIH Obesity Research: “Research toward preventing and treating obesity through lifestyle modification.” The conference was designed to contribute to improving methodology for studies consistent with NIH Strategic Plan goals: “Under this theme, the goals and strategies for achieving them encompass identifying modifiable behavioral and environmental factors that contribute to the development of obesity in children and adults, and designing and testing potential intervention strategies.” The conference focused on methodologies central to both etiologic and intervention research on environmental and policy issues. The conference outcomes will contribute to improved studies supported by all funders.

There are special challenges to conducting environmental and policy research that could both undermine the momentum in this area of study and compromise NIH’s advancements in understanding obesity-related environmental and policy etiologic factors and interventions<sup>26</sup>. The conference was designed to identify strategies for making progress in overcoming three of these challenges. In addition, the conference was distinct from, and built on, a series of 2007 NIH-sponsored workshops.

First, investigators rarely are able to control environmental or policy factors, so randomized controlled trials are impossible in most situations. For example, zoning codes, grocery store location decisions, and park renovations are outside the control of investigators. Thus, the vast majority of studies to date are cross-sectional, with a few quasi-experimental evaluations of interventions, such as trail building and school environment changes. The reliance on cross-sectional studies limits advancement of the science and credibility for guiding policy change. This conference developed recommendations for improving the designs used in environmental and policy research, with an emphasis on prospective and quasi-experimental designs, and opportunities for “natural experiments”.

Second, there are important analytic challenges. Most environmental studies have nested and other complex data structures, which presumably require multi-level or spatial statistics. Additionally, there is complicated confounding between the characteristics of residents of neighborhoods and characteristics of those environments – this presents a very difficult ‘selection’ problem in observational studies. More troubling still, members within contexts interact with one another, creating “spillover” effects that make inference difficult. Guidelines for the selection and application of proper statistical methods are not well known, and there is a need to develop innovative statistical models tailored to the demands of environmental and policy studies.

Finally, though development of built environment and food environment measures are proceeding, policy measures have lagged behind. Few investigators in this field are familiar with measurement of policy variables, so methods and perspectives need to be brought from outside experts. This conference generated recommendations for high-priority policy measures and methods for developing and evaluating new measures.

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All of these challenges were considered with a focus on high priority gaps in knowledge and the relevance of recommendations to contributing to understanding and eliminating disparities in obesity, diet, and physical activity. The conference built on three related NIH-sponsored workshops, and leaders of those workshops presented highlights to open the conference. We placed a high priority on involving new investigators and minority investigators in this conference, to expand the capacity of these investigators to conduct research in this demanding field.

There has been relatively little attention paid to solving the special methodological challenges of environmental and policy research, and NIH-sponsored workshops conducted in Fall 2007 focused on different issues from the conference. To respond to calls for improved environmental and policy research<sup>3-8</sup> and to make progress on the Strategic Plan for NIH Obesity Research, it is essential to consider these challenges in depth and provide guidance for both funders and investigators about promising strategies that can improve methodology and analysis strategies to advance this critical policy-relevant field of research.

The conference addressed four problems identified by the Organizing Committee of being highest priority.

1. The difficulty or impossibility of conducting randomized controlled trials requires that the best alternative designs be identified and used to improve the rigor of studies.
2. Statistical problems are related to multi-level, nested, and other complex study designs, as well as large numbers of variables used in studies. The most appropriate statistical solutions need to be identified and communicated to investigators.
3. Though a wide variety of policies are hypothesized to be etiologic factors for obesity or promising interventions, systematic policy measures are unavailable.
4. Especially because of the high prevalence of obesity among racial and ethnic minority and low-income groups in the United States, there is a need to increase the diversity of investigators in this field so professionals with personal experience and those working with diverse and underserved groups can help ensure the research is relevant and interventions are effective for the communities at highest risk. A substantial proportion of the invited attendees were new investigators who have personal and/or professional experience with the low-income populations and communities of color that are disproportionately affected by obesity. The goal was to incorporate their input into recommendations and expand their capacity to conduct this demanding type of research.

### **Contributions to the Strategic Plan for NIH Obesity Research**

The conference contributed to the first theme of the Strategic Plan for NIH Obesity Research: “Research toward preventing and treating obesity through lifestyle modification.” (<http://www.obesityresearch.nih.gov/About/strategic-plan.htm>). The conference contributed to improving methodology that will facilitate studies consistent with NIH Strategic Plan goals: “Under this theme, the goals and strategies for achieving them encompass identifying modifiable behavioral and environmental factors that contribute to the development of obesity in children and adults, and designing and testing potential intervention strategies.” The conference focused on methodologies relevant to etiologic and intervention research, both relevant to environmental and policy factors.

The conference also was consistent with several cross-cutting themes described under Research Theme 4:

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- *Studies on specific populations, especially those at high risk.* Presenters and discussion groups were instructed to make sure their recommendations were relevant to understanding and reducing disparities in obesity, diet, and physical activity.
- *Fostering interdisciplinary research teams.* The speakers and invited participants were drawn from a broad range of disciplines. Active Living Research, Healthy Eating Research, NIH's Obesity and the Built Environment grants, and CDC have all stimulated the development of interdisciplinary research teams, and many of these teams have drawn accomplished investigators into health research for the first time.
- *Translational research, including evaluations of policy innovations.* Improving methodology for translational studies is a primary goal of the conference. An explicit goal is to identify priority environmental and policy topics that are most relevant to interventions for obesity prevention, then identifying methodological advances that are needed for the next generation of studies in these areas.

**The conference built on related NIH-sponsored workshops:**

The conference was consistent with the work of the Environment and Behavior Work Group, and several members of the Work Group contributed to the planning for the conference. The conference extended, but did not duplicate, the work of three 2007 workshops sponsored by multiple NIH institutes.

1. “Working Group on Future Research Directions in Childhood Obesity Prevention and Treatment.” August 21-22, 2007. Sponsored by NHLBI and chaired by Dr. Charlotte Pratt.
2. “Beyond Individual Behavior: Multidimensional Research in Obesity Linking Biology to Society.” October 10-12, 2007. Sponsored by NICHD and co-chaired by Dr. Terry Huang from NICHD and Dr. Thomas Glass from Johns Hopkins.
3. “Measures of the Food and Built Environments.” November 1-2, 2007. Sponsored by NCI and chaired by Robin McKinnon.

Several NIH Institutes held recent workshops to identify priorities for research and intervention on obesity control, and there was a strong emphasis on multi-level approaches that included environmental and policy topics. The goals of the NHLBI and NICHD workshops were primarily to identify promising intervention strategies and study priorities, with methodology being a minor focus. The present conference identified strategies to overcome the special methodological challenges of environmental and policy research that are relatively unfamiliar to most NIH investigators. The NCI workshop focused on environmental measurement methodology, and the present conference complemented it by focusing on measurement of policies rather than environments. Thus, the present conference continued the momentum of the workshops toward a multi-level research and intervention agenda that will meet the goals of Strategic Plan for NIH Obesity Research.

**Conference Objectives**

1. Identify highest priority gaps in knowledge on environment and policy factors that contribute to obesity, diet, and physical activity.
2. Identify promising study designs to enhance the quality and rigor of environmental and policy research on obesity, diet, and physical activity.
3. Identify promising analytic strategies that can be applied to improve environmental and policy research on obesity, diet, and physical activity.
4. Identify policy measures of particular relevance to obesity prevention that can be used in research or that need to be developed.
5. Identify other strategies that can advance the field, such as commissioned papers, think tank meetings, curriculum design, and training.
6. Build the capacity of new investigators to make important contributions to environmental and policy research on obesity, diet, and physical activity.

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## **Meeting Format**

The one-day invitation only meeting brought together staff from multiple funding agencies and senior and junior investigators from diverse fields to identify research priorities based on gaps in the literature and public health needs. The meeting’s interactive format was successful in soliciting input from participants to identify study designs, analytic strategies, and needed measures for the next generation of environment and policy studies that can inform improved obesity prevention. NIH staff from multiple institutes participated in the planning of the conference to ensure the meeting produced results that will contribute to the Strategic Plan for NIH Obesity Research. The Organizing Committee represented numerous groups and helped identify a diverse invitation list. The attendance was limited to approximately 50 participants to facilitate active engagement in small group discussions and consensus development. At least 20 new investigators and minority investigators with expertise in nutrition or physical activity were invited to participate in the conference, including as discussants and discussion group leaders. Several minority investigators received scholarships to attend the conference.

The meeting emphasized improving the quality of evidence from the current reliance on cross-sectional studies to prospective and intervention trials that can be more readily translated into changes in policy and practice. Eminent external scientists made focused presentations with slides, specific recommendations, and brief written summaries. Discussants provided an additional perspective on each topic, with slides and specific recommendations. Slides, summaries, and recommendations from presenters and discussants are posted along with this summary report.

This was a highly transdisciplinary meeting with attendees representing the fields of: public health, behavioral and social sciences, nutrition, exercise science, city planning, policy studies, evaluation, biostatistics, transportation, recreation, economics, and others. A major theme was to address disparities in obesity related to race-ethnicity and socioeconomic status. Research related to both youth and adults was covered.

## **Method for Generating Recommendations**

The following five topics were introduced by presenters and discussants; then recommendations were generated in small group discussions:

- 1) Research status and gaps related to environment, policy, and physical activity;
- 2) Research status and gaps related to environment, policy, and diet;
- 3) Promising study designs for environmental and policy research and evaluation;
- 4) Developing policy measures for obesity, diet, and physical activity; and
- 5) Statistical approaches for environmental and policy research.

Participants formed into small groups to discuss the target question from each presentation in order to refine recommendations, generate additional recommendations, and set priorities. Each small group was facilitated by one of the meeting presenters and assigned a recorder. The groups were instructed to recommend anything that can advance the field (e.g. research, conferences, systematic reviews, think tank meetings).

Small groups were instructed to build upon each presentation by developing consensus lists of recommendations, with brief rationales for each. Depending on the topic, one to three lists were created. List one consisted of three to five promising methods that can be recommended for current use to improve the rigor and quality of environmental and policy obesity research. List two consisted of five to seven research priorities to recommend to NIH and other funders (including methodological or capacity-building opportunities). A third list, Funding and Communicating Research, was generated for some topics.

Recorders summarized the discussions, and ALR and HER staff processed the recommendation lists to eliminate redundancies, combine similar points, and send to the meeting presenters for their review. The presenters reviewed for final edits and added key recommendations, if any were missing. HER staff then administered an online survey to all meeting participants. The survey consisted of five

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sections, with each section pertaining to one of the meeting's five topic areas. Recommendations were listed for each topic and sub-question, and participants were asked to rate each recommendation on importance. Recommendations were rated on a 1 to 5 scale, with “5” being the highest priority. The results of the online survey are included in this final report.

## **Survey Results and Discussion**

The entire list of recommendations and their average ratings are provided in Table 2. Surveys were completed by 41 of 53 conference participants, for a 77% response rate. The following sections highlight the top-ranked recommendations and the lesser-ranked but notable recommendations for each topic. The highest average rating was 4.17, but ratings of 2.5 and above were considered relatively strong support.

### **Topic 1: Research Status and Gaps Related to Environment, Policy, and Physical Activity**

#### **Promising Research Methods**

Several promising research methods were identified that could advance knowledge of obesity-related environmental and policy factors but were under-utilized due to limitations of funding mechanisms or lack of familiarity among investigators. The highest priority was to increase use of quasi-experimental evaluations of “natural experiments” to advance this field that has relied mainly on cross-sectional studies. The second highest-rated recommendation was to use existing measures to conduct surveillance of built environments that could advance both research and public health practice. Other highly-rated research methods were to study individual and environmental variables simultaneously, evaluate policy processes that can affect physical activity environments, and document how physical activity environments are related to ecological sustainability.

#### **Research Priorities**

Eleven research priorities were identified that had strong promise for informing approaches to reverse the obesity epidemic. Funding of prospective studies and evaluations of “natural experiments” was considered the highest research priority to advance the field. The second highest priority was multi-level studies of environmental correlates of physical activity that assessed interactions across levels of correlates (e.g., individual and environmental). The third priority was to develop population-specific measures of environmental factors and physical activity that would be appropriate for the needs of populations at high risk of obesity. The fourth priority was to evaluate strategies to mobilize local communities to initiate policy change. The fifth research priority was to improve understanding of policy change processes as they relate to physical activity. Additional research recommendations with relatively strong support included incorporating questions related to environmental justice and racism in this area of research and including secondary outcomes of interest to policy makers in multiple sectors, such as academic achievement and work productivity.

#### **Funding and Communicating Research**

Priorities for funding and communicating research included set-aside funding and special study sections; finding ways to accomplish a more timely translation of results to policy and practice; and increasing the funding period for natural experiments. Recommendations of lower priority included increasing “rapid response” funding opportunities and performing ongoing assessments of knowledge gaps that can lead to targeted funding mechanisms.

### **Topic 2: Research Status and Gaps Related to Environment, Policy, and Diet**

#### **Promising Methods**

Six promising research methods were identified that could be used now to advance knowledge of diet-related environmental and policy factors. The top priorities were highly consistent with priorities identified for physical activity policy and environmental research. The highest priority was quasi-experimental evaluations of “natural experiments” to improve food environments and policies. The

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second priority was using existing measures to conduct surveillance of food environments and industry practices. The third priority was multi-level studies of interactions across environmental, social, and individual factors to improve understanding of individual factors that increase susceptibility to environmental influences. The fourth priority was to examine the influence of multiple environmental domains, such as community food sources, schools, workplaces, and homes, and their interactions on obesity rates and eating behaviors. The last two priorities emphasized the value of collecting qualitative data, particularly among those populations at highest risk for obesity.

**Research Priorities**

Seven research priorities were identified that had strong promise for informing approaches to reverse the obesity epidemic. The highest priority was to evaluate policies designed to reduce or eliminate disparities in access to healthy foods. The second priority was to develop standardized food environment and policy measures that could improve comparability of results across studies. The third priority was to examine how motivations for food choices interact with environmental factors. The fourth priority was to improve understanding of home food environments, and the fifth priority was to apply systems theory to achieve a better understanding of the interplay among environmental and policy influences on eating behaviors.

**Funding and Communicating Research**

None of the recommendations in this section were rated above 2 on the 5-point scale. The top-ranked recommendations included creating special funding mechanisms for conducting time-sensitive natural experiments and collaborative research; encouraging cross-disciplinary collaborations and mentoring of junior scientists by more senior researchers; and developing guidelines and models for science and industry partnerships.

**Topic 3: Promising Study Designs for Environmental and Policy Research and Evaluation**

**Promising study designs**

There are specific challenges for study designs when conducting policy and environmental research because the interventions are often not controlled by the investigators, and it is rarely possible to assign participants to conditions. Thus, it is important to consider the most appropriate designs for this area of research. The top three recommendations for promising study designs for environmental and policy research and evaluation were promoting rapid evaluation of natural experiments, developing policy surveillance measures and data collection systems, and promoting Health Impact Assessment techniques. Meeting attendees also recommended international research to expand the range of environments and policies assessed, practice of agencies to set aside funding for methods/design research, and exploiting existing cohort and panel data to add environmental and policy study questions. Other priorities received relatively low ratings.

**Topic 4: Developing Policy Measures for Obesity, Diet, and Physical Activity**

Nine recommendations related to policy measurement were identified, and all of them received ratings greater than 2.5. The top rated priority was a general recommendation to develop measures to support surveillance of food and physical activity related policies. The second priority was to develop a measurement rubric to assess strength of policy, policy enforcement, and policy implementation that would be comparable across policy domains. The third priority was to improve measures of valuation (i.e. what do different communities value?) of various policy options, because results of valuation studies could inform policy makers. Two recommendations tied for fourth place. One was to develop measures of community support for policy options, because public perceptions were seen as an important source of information by policy makers that could complement other evidence. The other was to develop Health Impact Assessment methods and funding mechanisms. Other priorities included multi-component cost-benefit analysis methods (e.g. health, real estate, healthy food access, pollution, and traffic congestion); offering an interdisciplinary policy scholars training program for obesity policy research; developing community tools for policy self-assessment so that communities can produce a “healthy policy report

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card”; and establishing a networking and information-sharing mechanism on policy measurement research that would include a compendium of measures.

**Topic 5: Statistical Approaches for Environmental and Policy Research**

Eight priorities related to improving statistical practices for environmental and policy research were identified, and almost all were rated relatively highly. The top priority was the development and use of common environmental measures and training in appropriate statistical strategies for environmental and policy research. The second priority was training in the design and analysis of multi-level studies. The third recommendation was to combine use of quantitative and qualitative methods and expand support of case studies. The fourth priority was to facilitate collaboration of between statistical and methodological experts to develop an expanded set of methods for environmental and policy research. The fifth priority was to teach investigators about appropriate statistical approaches for small-unit studies, such as those with few schools or communities. Meeting participants also requested guidance in determining how much environmental variability was sufficient to test hypotheses and supported improvements in the communication of results in this area of research.

**Conclusion**

The continuing obesity epidemic is one of the most serious threats to health in the United States and globally<sup>1-6</sup>. Though public health authorities have identified environmental and policy changes as essential to controlling the obesity epidemic<sup>4-10</sup>, research to generate evidence-based solutions is hampered by methodological challenges. The conference described here engaged a diverse group of investigators and funders to recommend strategies for advancing environmental and policy research related to obesity, diet, and physical activity. Contributing to reduced racial, ethnic, and income disparities in obesity, diet, and physical activity was an explicit goal. Through a systematic process, specific recommendations were identified for making better use of current methods, improving measures and methods for future studies, enhancing capacity of investigators to conduct challenging environmental and policy studies, supporting collaboration among diverse disciplines, and accelerating the application of research to changes in policy and practice. Evaluation of ongoing environmental and policy changes, improved surveillance of obesity-related environments and policies, and more studies to examine interactions of behavioral correlates across multiple levels of analysis were identified as particularly high priorities. To overcome the challenges, funding agencies were encouraged to take actions that would result in a greater priority given to environmental and policy research, develop measures to assess policies and population-specific environmental factors, support combined use of quantitative and qualitative methods, increase emphasis on studying populations at high risk of obesity, and offer additional training and support for investigators regarding study designs, measures, and statistical approaches that can advance environment and policy studies. The results of this conference can be used to improve the quality and quantity of environmental and policy research, as well as its translation to action to control obesity, which is consistent with the goals of major funding organizations, including the National Institutes of Health<sup>27, 28</sup> (<http://www.nhlbi.nih.gov/meetings/workshops/child-obesity/index.htm>), Centers for Disease Control and Prevention<sup>8</sup>, and the Robert Wood Johnson Foundation ([www.activelivingresearch.org](http://www.activelivingresearch.org) and [www.healthyeatingresearch.org](http://www.healthyeatingresearch.org)). The recommendations of this group of experts merit careful consideration by investigators and research funding agencies.



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Dr. Charlotte Pratt of the National Heart, Lung, and Blood Institute was the primary Program Officer for this conference at the National Institutes of Health and made major contributions to the conceptualization and implementation of the Conference.

The staff of Active Living Research and Healthy Eating Research were instrumental in implementing the conference and the participant survey.

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**Table 1. Conference Organizing Committee**

Tanya Agurs-Collins, PhD, RD. National Cancer Institute, Program Director/Nutritionist, Health Promotion Research Branch. Bethesda, MD.

Audie Atienza, PhD. National Cancer Institute, Program Director, Health Promotion Research Branch. Bethesda, MD.

Carlos J. Crespo, DrPH, MS, FACSM. Professor and Director, School of Community Health, Portland State University. Portland, OR.

Lori Carter-Edwards, PhD. Representing AACORN: African American Collaborative Obesity Research Network. Based at University of Pennsylvania and directed by Vikki Lassiter, MS.

Terry Huang, PhD, MPH. National Institute of Child Health and Human Development, Director of Pediatric Obesity and Metabolic Syndrome Research. Bethesda, MD.

Shiriki Kumanyika, PhD. Professor, University of Pennsylvania. Philadelphia, PA. Representing AACORN: African American Collaborative Obesity Research Network. Based at University of Pennsylvania and directed by Vikki Lassiter, MS.

J. Michael Oakes, PhD. Professor, University of Minnesota. Minneapolis, MN.

C. Tracy Orleans, PhD. Senior Scientist and Distinguished Fellow, Robert Wood Johnson Foundation. Princeton, NJ.

Charlotte A. Pratt, PhD, RD. National Heart, Lung, and Blood Institute, Program Director, Division of Prevention and Population Studies. Bethesda, MD.

James F. Sallis, PhD. Professor, San Diego State University. San Diego, CA. (co-chair)

Thomas L. Schmid, PhD. Centers for Disease Control and Prevention, Physical Activity and Health Branch. Atlanta, GA.

Mary Story, PhD. Professor, University of Minnesota. Minneapolis, MN. (co-chair)

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**Table 2. Complete List of Recommendations (ranked according to survey results)**

**TOPIC 1: RESEARCH STATUS AND GAPS RELATED TO ENVIRONMENT, POLICY AND PHYSICAL ACTIVITY**

**1. Promising methods that can be used in research now. Rating Average**

Natural experiments with good measures, that are practical, and cost-effective 3.97

Surveillance systems with good measures of environmental variables 3.44

Define individual and environmental factors using mixed methods and other new models to study both simultaneously 3.08

Evaluation of policy process 2.93

Opportunity to study synergies of environmental factors with health outcomes and ecological sustainability (e.g. carbon reduction and walking/bicycling) 2.78

Advanced qualitative methods for neighborhood ethnography process measures (not just outcomes) 2.63

Community-based participatory research 2.52

Longitudinal cohort studies with biological outcome measures 1.58

**2. Research Priorities**

Prospective studies and evaluations of ‘natural experiments’ are needed to improve evidence of causality 4.14

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Test multiple levels (2-3) of social/ecological model and evaluate interaction of variables across levels (e.g., environment and social)	3.54
Develop appropriate measurement tools for target population, particularly those at high risk for obesity (PA and correlates)	3.35
How can local communities be mobilized to initiate policy change?	3.25
How are local (and other) policies implemented; how does implementation vary across different locales or populations; what factors affect implementation?	3.05
Environmental justice and racism: How do these issues influence adoption and implementation of policies relevant to physical activity?	2.67
Assess other outcomes of physical activity such as stress, work productivity, academic performance that are of interest to policy makers.	2.63
Why do people vary in being unresponsive vs. responsive to environments? Why are some people active in unsupportive environments and vice versa.	2.61
Perception of environments, relation of perceptions to objective measures, and relation of both to physical activity, particularly in minority and high risk communities.	2.20
Resource allocation in policy implementation: How can equity of resource distribution be ensured? (e.g., funding for parks, physical education)	2.13
Evaluate generalizability of existing environmental measurement tools across population subgroups, especially those at high risk for obesity	2.00

**3. Funding and communicating research**

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Dedicated funding and study sections for multi-level, environmental, and policy studies.	2.64
Speed-up dissemination of results so they can be translated more quickly to policy and practice changes (alternatives to journals, including blogs, working papers, websites)	2.57
Expand timeline for funding of natural experiments	2.50
Rapid response research funding	2.39
Ongoing assessment of gaps in knowledge that can lead to targeted Requests for Applications	2.27

**TOPIC 2: RESEARCH STATUS AND GAPS RELATED TO ENVIRONMENT, POLICY AND DIET**

**1. Promising methods that can be used in research now**

Policy change evaluations that assess (a) implementation, (b) enforcement, (c) community acceptance, and (d) impact over time on rates of obesity or obesogenic nutrition behaviors	3.78
Surveillance research to track changes in food industry activities with the potential to impact nutrition behaviors (e.g., packaged portion sizes, reduced-calorie options) would allow researchers to (a) identify opportunities for natural experiments; (b) examine the influence of industry activities on nutrition behaviors and obesity; and (c) determine how industry activities shift in response to policy changes	3.08
Observational multi-level studies, including research designed to examine interactions between individuals and food environments (e.g., What individual factors increase susceptibility to obesogenic food environments?)	2.89
Studies designed to examine (or quantify) the influence of multiple environmental domains and their interactions on rates of obesity (or obesogenic nutrition behaviors)	2.79



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Cross-disciplinary and transdisciplinary collaborations that incorporate complementary methodologies (e.g., qualitative and quantitative approaches) 2.76

The collection of qualitative data relating to food environments and policies, especially in communities with high rates of obesity 2.50

**2. Research Priorities**

Conduct research in minority and low-income populations, such as the evaluation of policies to reduce/eliminate disparities in access to food (e.g., tax incentives for stores in low-income neighborhoods) 3.86

Develop standardized food environment and nutrition policy measures (for various types of environments and contexts) to improve the comparability of findings across studies 3.67

Examine motivations for food choices, including tensions between internal and external (environmental) factors on behavior 2.94

Conduct research relating to home and family food environments 2.76

Conduct research guided by Systems Theory 2.60

Conduct community-based participatory research 2.38

Examine the use of nutrition claims by the food industry (e.g., What claims are being made? Are nutrition claims valid or misleading?) 1.91

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**3. Funding and communicating research**

Create special funding mechanisms for conducting time-sensitive natural experiments and collaborative research 1.73

Encourage cross-disciplinary collaborations and mentoring of junior scientists by those experienced in this area 1.57

Develop guidelines and models for science and industry partnerships (i.e., to avoid conflicts of interest) 1.56

Accelerate the peer review process and publication process for research relating to the food environments and nutrition policy 1.45

Support the specialization of researchers and research teams in rapidly responding to opportunities to conduct policy evaluations 1.06

**TOPIC 3: PROMISING STUDY DESIGNS FOR ENVIRONMENTAL AND POLICY RESEARCH & EVALUATION**

**1. Promising Study Designs**

Promote rapid evaluation of natural experiments 4.17

Develop policy surveillance measures and data collection systems 3.84

Promote ‘Health Impact Assessment’ techniques 3.38

Support international research and comparisons to expand range of environments and policies assessed 2.95

Exploit and promote analysis of cohort/panel data 2.85

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Encourage special, set-aside funding for methods/design research	2.74
Promote interdisciplinary research	2.43
Investigate usefulness of data simulations (e.g., agent-based models)	2.28
Adopt community-based participatory research approaches for the appropriate research questions	2.25
Inventory current successful and failed designs, ensuring the design is matched with the research question	2.00

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**TOPIC 4: DEVELOPING POLICY MEASURES FOR OBESITY, DIET, AND PHYSICAL ACTIVITY**

**1. Policy Measures**

Measures to support surveillance of food- and activity-related policies	3.54
Measures of strength of policy, policy enforcement, policy implementation that can be compared across policy domains	3.50
Improved measures of valuation: What do different communities value? Valuation models in the health field	3.07
Develop measures of community support for policy changes	3.00
Development of Health Impact Assessment (HIA) methods and funding mechanisms	3.00
Develop consensus of multi component cost benefit analysis methods, including for example: health, real estate, healthy food access, pollution, traffic congestion.	2.95
Offer an interdisciplinary policy scholars training program because many scientists do not have training in this area	2.81
Develop community tools for policy self-assessment, so communities could produce a “Healthy Policy Report Card”	2.67
Establish a networking and info-sharing mechanism on policy measurement and research that would include a compendium of measures	2.53

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**TOPIC 5: STATISTICAL APPROACHES FOR ENVIRONMENTAL & POLICY RESEARCH**

**1. Statistical Approaches**

Develop an accessible compendium of ‘metrics’ or indicators derived from available environmental measures	3.43
Conduct training workshops in designing and analyzing multi-level studies	3.14
Use both quantitative and qualitative methods, including case studies	3.13
Facilitate collaboration between statistical and methodological experts	3.00
Learn more about analytic techniques tailored for small-samples	2.95
Consider variability of environmental and policy factors in designing studies: how much variability is necessary?	2.89
Improve methods for understanding and communicating results accurately	2.88
Develop mechanism to promote and publish ‘null’ findings	2.26