A Report from the Federal Partners Meeting of the National Institutes of Health
Pathways to Prevention Workshop: Methods for Evaluating Natural Experiments in Obesity

September 21, 2018

Sponsored by:
National Cancer Institute
National Heart, Lung, and Blood Institute
National Institute of Diabetes and Digestive and Kidney Diseases
NIH Office of Disease Prevention

Introduction
The Pathways to Prevention (P2P) program of the National Institutes of Health (NIH) Office of Disease Prevention (ODP) promotes the use of evidence-based practices to address complex public health issues by identifying research gaps and needs in specific topic areas. The goals of the P2P workshops are to synthesize and interpret the current evidence, shape a research agenda, and develop an action plan. On December 5–6, 2017, the NIH convened the P2P Workshop: Methods for Evaluating Natural Experiments in Obesity. This workshop was co-sponsored by the National Cancer Institute (NCI); the National Heart, Lung, and Blood Institute (NHLBI); the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK); and the ODP. An independent panel from the workshop made recommendations for moving the field forward, and the workshop panel report was published on the ODP website and in the *Annals of Internal Medicine* in June 2018.[1]

As the final step in the P2P program process, the ODP convened a meeting on September 21, 2018, with representatives from federal government agencies (the Federal Partners) to identify strategies to address the recommendations in the P2P workshop panel report. This document summarizes the discussions and action items identified at the Federal Partners Meeting.

Background
Obesity is a major contributor to serious health conditions in children and adults. The prevalence of excess adiposity or obesity in the United States and globally has grown rapidly in the last 3 decades; thus, there is a pressing need to help people achieve and maintain a healthy weight.

In adults, obesity is commonly defined as having a body mass index (BMI) greater than or equal to 30.0,[2] and in children age 2 and older, as a BMI at or above the 95th percentile of a population growth chart (Centers for Disease Control and Prevention [CDC] growth charts are commonly used in the United States). In 2015–2016, more than one-third (39.8%) of U.S. adults age 20 and older and 18.5% of U.S. children and young adults under the age of 20 met the definition of having obesity.[3] There are also persistent disparities among socioeconomic and racial/ethnic groups in the prevalence of obesity and its health consequences.

Obesity and obesity-related conditions such as type 2 diabetes,[4] cardiovascular disease,[5] and certain types of cancers[6] contribute to increased morbidity and mortality across the lifespan, resulting in a significant public health and economic burden. Annual medical costs in the United States for adults and youth with obesity are about $1,354 to $2,741 higher per person than for those with normal weight,[7-9] resulting in total estimated annual medical costs of at least $147 billion.[9,10]

Much is already known about obesity, including many of its proximate causes:
- Poor-quality diet
- Overconsumption of calories
- Lack of physical activity
- Excessive sedentary time.

However, because multiple exposures—including diet, physical activity, stress, sleep, and other socioeconomic, contextual, and environmental factors—contribute to obesity, it remains an exceedingly complex condition to study and address.

Major gaps exist in our understanding of appropriate and effective societal and systems changes to achieve a healthier energy balance for individuals. In part, these gaps are related to the current state of the science and to methodological challenges, which range from measuring the diverse contextual and environmental influences that contribute to obesity to designing and implementing practical and rigorous evaluations of natural experiments, which are a commonly-used study design in obesity prevention research. Natural experiment studies can allow insights into the effects that programs, interventions, or policies have on health-related outcomes including obesity. In obesity prevention research, these include:
- Effects of investments in transportation infrastructure such as light rail or bike share programs
- Changes in the food environment, such as construction of new food retail outlets in food deserts or support for farmers' markets
- Consequences of economic policies such as taxes and subsidies, particularly those addressing low-income and at-risk populations
- Changes within organizations such as early care and education, schools, or workplaces
- Changes in health care systems related to the prevention and management of obesity.

P2P Workshop Key Questions
To better understand appropriate, high-quality natural experiment research designs in the field of obesity prevention and control and to assess the scientific evidence, the NCI, NHLBI, NIDDK, and ODP sponsored the P2P Workshop: Methods for Evaluating Natural Experiments in Obesity. Specifically, the workshop sought to address the following six questions:
1. What population-based data sources have been used in studies of how programs, policies, or built environment changes affect or are associated with obesity prevention and control outcomes?
2. What methods have been used to link different population-based data sources?
3. What obesity measures, dietary and physical behaviors, and other outcomes have been assessed in studies of how programs, policies, or built environment changes affect or are associated with obesity prevention and control?
4. Which experimental and non-experimental methods have been used in studies of how programs, policies, or built environment changes affect or are associated with obesity prevention and control outcomes?
5. What are the risks of bias in studies of how programs, policies, or built environment changes affect or are associated with obesity prevention and control outcomes?
6. What methodological/analytic advances (e.g., data system features, approaches to linking data sources, or analytic methods) would help to strengthen efforts to estimate the effect of programs, policies, or built environment changes on obesity prevention and control?

Systematic Evidence Review
A systematic evidence review of the scientific literature,[11] guided by the key questions, was conducted by the Johns Hopkins University Evidence-based Practice Center through a contract with the Agency for Healthcare Research and Quality (AHRQ) to facilitate the workshop discussion and was published in the *Annals of Internal Medicine*.[12] An additional article from the systematic evidence review has been published,[13] with one more peer-reviewed journal submission planned for publication. The purpose of the systematic evidence review was to characterize studies of programs and policies in obesity prevention and control in terms of data sources, data linkages, measures reported, study designs, and analytic approaches, and to identify needed methodological advances. Key findings from the review include:

- Relevant programs, policies, or built environment changes were evaluated in 156 natural experiments, 118 experimental studies, and 20 other studies published between 2000 and August 21, 2017.
- Criteria for a data system (source exists, is available for research, is sharable, and has outcomes of interest) were met by 106 data sources.
- A total of 37% of U.S. data systems were linked to secondary data.
- Outcome measures included dietary behavior (148 studies), physical activity (152 studies), childhood weight (112 studies), and adult weight (32 studies).
- Natural experiments most commonly used regression models comparing exposed and unexposed groups at one time.
- Natural experiments generally had moderate risk of selection bias and high risk of bias for losses to follow-up.
- Research could be advanced by more use of data dictionaries, reporting standards on data linkage, long-term obesity-related outcomes, and study designs with multiple pre- and post-exposure time points.

The review identified several areas that could be addressed to improve natural experiment research in obesity prevention and control:

1. Researchers need better access to various information sources, including commercially available data.
2. Better infrastructure is needed for the available data sources to help researchers decipher what is included in the data sets and how to make successful data linkages.
3. In communities that fund the collection of longitudinal data on health and behavioral outcomes, additional resources should be allocated so this information can be linked with medical, community, education, and other public health data sources.
4. Collaboration is needed between experts in non-experimental research methods and experts in obesity so that the field has more robust study designs available to conduct natural experiment studies with increased validity and rigor.
5. Researchers evaluating natural experiments in obesity need standards for how risk of bias in their studies should be uniformly reported in the scientific literature.
6. A compendium of exemplar research studies is needed to highlight best practices in the field for researchers to learn from and avoid common mistakes and from which policymakers and other program providers can draw upon to improve the health of their communities.

The systematic evidence review[11] also compiled an inventory of available data sets, which may serve as a resource and potential starting place for future data linkage efforts.

P2P Workshop Panel Report
A unique feature of every P2P workshop is the involvement of a multidisciplinary, independent panel comprised of non-federal representatives who have certified that they hold no scientific or personal conflicts with the subject matter of the P2P workshop for which they have volunteered their service. Workshop panel members are nominated by the federal scientists who plan the workshop in conjunction with the ODP and they are vetted for potential conflicts of interest. Panel members are charged with writing the P2P workshop panel report that (1) summarizes the key findings and research needs outlined in the systematic evidence review and discussed at the workshop, and (2) provides a set of recommendations to move the field forward. The Workshop Panel Report for the P2P Workshop: Methods for Evaluating Natural Experiments in Obesity[1] includes recommendations in four areas:
1. Increasing integration of population-based data sources.
2. Improving measurement of obesity-related outcomes.
3. Improving study design and analytic methods.
4. Addressing cross-cutting issues that could strengthen natural experiment research.

Federal Partners Meeting
The ODP convened a meeting on September 21, 2018, with representatives from federal government agencies (the Federal Partners) to strategize how to address the recommendations contained in the P2P workshop panel report (see Appendix A for the list of attendees). The objectives of the Federal Partners Meeting were to (1) review agency initiatives and resources relevant to obesity and natural experiment research (see Appendix B for this list of items), (2) prioritize research and programmatic ideas, and (3) identify products and action items for collaboration among the Federal Partners.

This report summarizes the discussions and action items identified at the P2P Federal Partners Meeting on Methods for Evaluating Natural Experiments in Obesity.

1. Summary of Discussion of P2P Panel Recommendations To Increase Integration of Population-Based Data Sources

Background: Public data systems that could inform research often contain sensitive information and therefore access to them is restricted to ensure that regulatory, privacy, and proprietary requirements are met. The workshop panel recommended that the NIH and other research funding agencies invest in data ecosystems that protect sensitive information and reduce burdensome requirements so that researchers can more readily access individual-level and geospatial data below the aggregated zip code level.[1] The field should leverage the research infrastructure that already exists to help integrate various data systems in obesity-related measurement; for example, the National Collaborative on Childhood Obesity Research (NCCOR) has compiled several tools for the research community, including a measures registry[14] and a catalog of various surveillance systems.[15] These efforts provide one model to be considered to support research on evaluation of natural experiments relevant to obesity policy and programs for populations of all ages. The panel also recommended linking electronic health record (EHR) data with data obtained by communities, given the advances underway to make EHRs interoperable with other data systems.

Specific Areas of Research Focus: The Federal Partners discussed ways to ensure the research community is aware of the different population-based data resources available for research. This discussion addressed issues such as the creation of a data resource webpage that would direct researchers to the available data sets, outline which variables are included, and the steps needed to gain access to the data. An examination of the available public health data sets would also pinpoint the ones

that can be linked with other types of data sets, including those not traditionally considered to be addressing health-related behaviors—such as those focused on school readiness, academic achievement, worker productivity, neighborhood safety, air quality, housing, built environment, promotion of active transportation, and use of outdoor recreational facilities. Use of this broad array of data systems would enable obesity prevention and control researchers to study obesity-related social determinants of health (SDOHs). The Federal Partners recognized that diet and physical activity are health behaviors that are not only associated with obesity, but also influence other health conditions, such as cardiovascular disease, cancer, and type 2 diabetes, and present opportunities for partnering with stakeholders who are not solely focused on obesity.

The Federal Partners discussed ways to facilitate researchers' ability to obtain data sets more rapidly and with less cost. They also discussed making use of "organic" data, or data that are not collected by design for research purposes, such as information gleaned from social media similar to the use of flu information per Google searches,[16] search engine and online BMI calculator queries, and other web-based tools. Federal agencies (and sub-units within those agencies) currently purchase proprietary data licenses (e.g., Nielsen data) individually and at full cost. The Federal Partners discussed establishing more cost-effective access to these types of data, such as purchasing licenses allowing multiple individuals or organizations access at discounted prices that could be shared among groups accessing the data for research and program evaluation purposes. The group also discussed creating a system to give researchers access to multiple data sets held by federal agencies after successfully passing an umbrella set of requirements related to issues such as privacy, confidentiality, and purpose of use—as opposed to the current involved process of having researchers individually certify that they are good data stewards for each data set they access.

In addition to gaining access to data sets, the Federal Partners discussed the need to increase the number of obesity researchers with computational competence to enhance their capacity to successfully link multiple data sets and utilize appropriate approaches for analysis. One approach would be to provide an online catalogue of the data sets that have been successfully linked together and are available to researchers. For those data sets that must be stored unlinked due to privacy concerns, it would be helpful to provide the statistical analysis and database code that was used to link data sets together so that other investigators can more easily merge the data for their specific analyses. The Federal Partners discussed the idea of providing a "matchmaking" type of service that would connect researchers with strong data linkage experience with colleagues new to this area. The Federal Partners also discussed partnering natural experiment researchers with federal agency subject matter experts who can help ensure the particularities of individual data sets are well understood early in the research process.

Opportunities for Collaboration Among Federal Agencies, Resource Development, and Next Steps:

The Federal Partners identified the following action items and available resources:

Create an online IT data system
- Develop an online resource that maps available data sets related to obesity prevention and control research with information on the exposure and outcome variables and whether the data sets have been linked with others.
- Review the U.S. Department of Health and Human Services (HHS) report Data Sources and Data-Linking Strategies to Support Research to Address the Opioid Crisis[17] and consider whether an approach such as used in that report has relevance for mapping the available data sets relevant to research on natural experiments in obesity.

- Assess whether the CDC's [Surveillance Data Platform](#)[18,19] can serve as a model for developing data sharing tools for obesity prevention and control researchers.
- Consider the National Science Foundation's [Resource Implementations for Data Intensive Research in the Social, Behavioral and Economic Sciences (RIDIR) program](#)[20] as an opportunity to support the development of data resources discussed at the Federal Partners Meeting.

Facilitate access to data systems
- Investigate how multiple agencies might take an economies of scale approach to purchasing data sets from the private sector.
  - The HHS Office of the Assistant Secretary for Planning and Evaluation agreed to lead this effort, which might include convening a meeting of interested stakeholders.
- Consider the feasibility of developing more streamlined access to privacy-restricted data. One step in this approach was NIH's development of a single Institutional Review Board (IRB) policy for collaborative research across academic and health care research systems. Another suggestion was to consider the potential to develop a screening and certification system to provide more streamlined access to data.
- Enhance accessibility of the National Center for Health Statistics' network of [Research Data Centers (RDCs)](#)[21] to researchers and graduate students conducting obesity-related research.
  - For example, organizations with RDCs (e.g., CDC in Atlanta, GA; HHS in Washington, DC) could promote the use of their RDCs with local doctoral students wishing to gain experience linking multiple data sets together as part of their dissertation research.

Enhance collaboration among investigators
- Integrate data scientists more fully into obesity natural experiment evaluations to capitalize on the methods and models used by banks and other big data and technology companies to combine sensitive information on consumers while maintaining high levels of data security and consumer confidence.
- Consider the utility of requiring that investigators contact relevant federal/state/local subject matter experts to assure they understand the intricacies of public data systems when conducting natural experiment research and evaluations supported by Federal Partners.

2. Summary of Discussion of P2P Workshop Panel Recommendations for Improving Measurement of Obesity-Related Outcomes

Background: The workshop panel recommended that the research measures registries that exist for studying obesity in children should be expanded to include the psychometric properties of the measurement items if available in published literature.[1] They also recommended providing information outlining the best measures to use based on the intended research questions or the particular populations that are included. The registries should also include measures of exposure that research studies in obesity prevention and control typically collect, and very granular data dictionaries for both outcome and exposure variables should be included in these research resources. The panel also recommended that the measures registries for childhood obesity developed through the NCCOR collaborative be replicated for obesity research in adults.

Specific Areas of Research Focus: The Federal Partners discussed the complicated and fragmented landscape of obesity-related measures, which makes it difficult to decide how to improve measurement without first having an adequate understanding of all its components. For example, (1) NCCOR has a [measures registry](#)[14] for diet and physical activity measures relevant to some components of obesity

research in children; (2) the [PhenX Toolkit][22] includes measures for many diverse domains including diet, physical activity, and body composition, as well as other measures relevant to obesity; (3) the NCI developed [ACT-24],[23] a computer and phone-enabled 24-hour physical activity recall instrument; and (4) the [Accumulating Data to Optimally Predict Obesity Treatment (ADOPT) Core Measures Project][24] provides researchers with recommended individual-level, obesity-specific measures in behavioral, biological, environmental, and psychosocial domains that have been selected as potential predictors of successful weight loss in the context of weight loss trials. The NIH is encouraging investigators to utilize these measures within weight loss research. However, most of these sources of obesity measures do not provide guidance on which measures are the most appropriate for specific questions or contexts. This information would be of benefit to the research community. The Federal Partners also discussed how standardized measures will not address all issues relevant for research, particularly related to new or emerging questions where new constructs and measures are yet to be developed (i.e., new technologies or modes of physical activity that may impact obesity, such as the implementation of a new bike share program).

Given the diversity of questions being addressed in the field of natural experiments evaluation research relevant to obesity policy and programs, it is unlikely that one set of obesity-related outcomes and measures across all sectors could be identified or would even be useful per concerns of measurement sensitivity. In addition, time horizons of interest may vary by sector. For example, policymakers may be primarily interested in more immediate changes in programs and policies that occur over a shorter time horizon while health researchers may focus more on the health consequences of those policies, such as behavior change and maintenance over time and reduction in poor health outcomes that occur over a longer time horizon. This is further complicated by the complex and varied causal pathways leading to obesity, which may call for different measures and different timelines for specific subsets of the population. The need for multi-sector efforts to address this complex societal health problem calls for collaboration with different sectors to fully elucidate, measure the layering of effects (e.g., environmental change, communication or marketing exposure, financial incentives), and address the many contributors to obesity. The research community would further benefit from better conceptual models and measurement that account for the full spectrum of environmental and social determinants of obesity as well as the multi-level approaches that are required to address those determinants.

Opportunities for Collaboration Among Federal Agencies, Resource Development, and Next Steps:

The Federal Partners identified the following action items and available resources:

- Work with the HHS Office of the Assistant Secretary for Planning and Evaluation to convene a meeting on identifying measures relevant to research and evaluation of natural experiments for obesity programs and policies addressing adults; the meeting would complement and be coordinated with the planned NCCOR workshops on defining measures for obesity research in children. For adults, such an effort would include more measures relevant to treatment of obesity and associated comorbidities.
- Create an online resource for researchers and practitioners that catalogs in one place the obesity data systems, measures, and linked data systems available for use in natural experiment research and evaluation.
- The NIH, CDC, Transportation Research Board, and American College of Sports Medicine will hold an upcoming meeting at The National Academies of Sciences, Engineering, and Medicine (NASEM) on transportation and health that may identify ways to bring people from those different sectors together to advance research and evaluation in this area.

3. Summary of Discussion of P2P Workshop Panel Recommendations for Study Design and Analytic Methods

Background: The workshop panel recommended that researchers should use conceptual frameworks that map the causal relationships among variables to inform their decisions on study design and data analysis.[1] Additionally, the field should establish guidelines for the use of appropriate methods in natural experiment research studies and reporting research results in peer-reviewed journals. When designing a natural experiment, some researchers may benefit from guidance in selecting study designs that minimize bias, such as the choice of appropriate comparison groups.

Specific Areas of Research Focus: The Federal Partners discussed the workshop panel's call for guidelines and other standards to improve the study designs and analytic methods in natural experiment research, but the group was reluctant to prescribe a narrow set of methods from which researchers should select when developing their studies because this might stifle novel scientific pursuits. However, the Federal Partners were more comfortable highlighting the common components of successful natural experiment studies; this would help build capacity given that many investigators have not traditionally conducted evaluations of natural experiments. Multiple nomenclatures complicate the reporting and pooling of findings. Researchers should be careful choosing their research terms, because some terms have different meanings in different fields or contexts. Researchers should fully define their research terms and use them consistently to help increase clarity and replicability in this field. The group also addressed the benefit of working with editors of key journals and the extramural community to develop common reporting best practices, as has been done for many other fields of research.

Opportunities for Collaboration Among Federal Agencies, Resource Development, and Next Steps:

The Federal Partners identified the following action items and available resources:
- Adapt existing guidance on the common components of successful natural experiments and how bias and confounding variables should be addressed (see Craig et al.[25]).
  - Consider developing a list of common variables for researchers to consider, including when evaluating natural experiments for obesity and the need to be accounted for when analyzing hierarchical data from these studies.
  - Consider efficient approaches for developing such guidance, including referral to reviews and other publications or online resources that have addressed this issue.
- Convene a group of experts (including relevant journal editors) to develop best practices for reporting results of natural experiments (see Craig et al.[25]).
  - Work with interested groups that conduct natural experiment research within and outside of the field of obesity prevention and control to maximize the applicability and eventual uptake of this effort by the wider research community.
  - Consider potential models for reporting best practices that fit the needs of natural experiment research in obesity. Some examples of models include the Transparency and Openness Promotion (TOP) guidelines[26] and the Consolidated Standards of Reporting Trials (CONSORT) Statement[27] for RCTs.
  - Once developed, the NIH and other funders should encourage or require use of the reporting guidelines in funding opportunity announcements.
- Support training in design and analysis.

- o Develop a matchmaking service to pair inexperienced natural experiment mentees with mentors who have been successful in conducting evaluations of natural experiments and can guide mentees in the use of appropriate study designs and data analyses.
  - o Enhance training for interdisciplinary research and collaboration. One example of such an approach is the Johns Hopkins University Global Obesity Prevention Center that paired obesity scientists with system scientists as part of the dual training component the center provided with their rapid response funding mechanism for natural experiments.
  - o Trainings related to natural experiments could be funded through the trans-NIH funding opportunity announcement RFA-OD-19-012.[28]
  - o Additional NIH training opportunities are available to enhance the skillsets of the research community; for example, the NHLBI offers training for conducting obesity-related research that includes a component on natural experiments.
- Consider best approaches for enhancing uptake of relevant resources, such as the following:
  - o The NIH Office of Behavioral and Social Sciences Research held a workshop focused on the selection of comparison groups that is summarized in Freedland et al.[29] and will inform the development of an educational tool on this topic.
  - o The HHS Office of the Assistant Secretary for Planning and Evaluation staff are in the process of publishing a primer on evaluation, which will include information on the appropriate selection of comparison groups, and related trainings may be developed that serve as resources to help researchers avoid common mistakes related to study design and data analysis in the context of program evaluation. The primer will likely be published as a textbook in 2019.

4. Summary of Discussion of P2P Workshop Panel Recommendations for Cross-Cutting Issues That Could Strengthen Natural Experiments

Background: To enhance the rigor of natural experiments in obesity prevention and control, the workshop panel recommended that the NIH expand its training programs in modeling studies and causal inference to include the methodological and analytic strategies needed to address the complexity inherent in natural experiments and other quasi-experimental designs.[1] Also, natural experiment researchers need to take a more community-based participatory research approach so that research findings are more valid and represent the heterogeneity of a community. It is important for many natural experiment studies to incorporate community-level contextual factors that may impact the outcomes of interest as well as include individuals from a broader array of subpopulations within the communities undergoing the natural experiment being evaluated. The panel also recommended that the nation's important health surveillance systems be maintained and expanded to have more local-level data as resources for natural experiment research. In addition, they recommended that the NIH and other funders create ways to allow researchers to conduct longer follow-up periods to assess whether specific policy interventions have long-term effects on obesity-related outcomes.

Specific Areas of Research Focus: The Federal Partners discussed several cross-cutting areas that could improve the ability of researchers to conduct rigorous evaluations of natural experiments. The group identified crowdsourcing and other technology-based data collection as opportunities to collect more insightful data directly from individuals. This would allow researchers conducting evaluations of natural experiments to take a more community-engaged approach that actively involves the community in identifying the problem, designing the study, collecting the data, presenting the results, and initiating

the next project that continues the cycle of empowering communities to affect the change that is most salient to them.

In addition to maintaining federal surveillance systems, the group discussed the importance of regularly assessing and updating the background infrastructure that makes these data useful (e.g., USDA Food Composition Databases,[30] Food Patterns Equivalents Database[31]). For example, the National Health and Nutrition Examination Survey (NHANES) collected large amounts of accelerometer data in 2014, but release of research usable data was delayed until the agreements were reached on the safety of releasing such data and the data were reformatted to facilitate analysis. In addition, federal surveillance systems should not only be maintained, but they also should continue to innovate and evolve to ensure they can be used to address the new challenges related to obesity prevention and control.

The Federal Partners discussed the workshop panel's recommendation to develop NIH-sponsored training programs in modeling studies and causal inference. They agreed that relevant training for this cross-sectoral research exists across the federal government and is not limited to the NIH. Therefore, a more comprehensive approach would tap the diverse sectors of the government that manage programs relevant to obesity and might consider the development of joint trainings. The group also discussed the diversity of modeling approaches relevant to this area of research and how they might be included in these trainings.

Opportunities for Collaboration Among Federal Agencies, Resource Development, and Next Steps:

The Federal Partners identified the following action items and available resources:
Enhance use of and linkages between existing data resources
- Leverage the U.S. Environmental Protection Agency's (EPA) efforts to link crowdsourcing data with community demographic information.
- Obtain more information on which underlying elements of federal surveillance systems should be updated to ensure linkages are possible and data are maximally usable.
- Use the Pathways to Prevention Workshop: Methods for Evaluating Natural Experiments in Obesity evidence report[11] as a starting point to map gaps or limitations in the existing surveillance systems and identify approaches to address those gaps.
- Review the HHS report Data Sources and Data-Linking Strategies to Support Research to Address the Opioid Crisis[17] for models or approaches from this effort that can be applied to monitoring obesity prevention and control activities.

Advance the collection of new data
- Explore innovative approaches to enhance the collection of state- and community-level data on policy adoption and maintenance to enhance the ability to learn about policy changes over time and the extent to which they are being implemented. Examples include the use of electronic health record data as has been done in Wisconsin,[32] Florida,[33] and Denver, Colorado.[34]
- Review the recommendations from the 2017 NASEM panel on surveillance of physical activity in children[35] and a subsequent CDC-sponsored panel in October 2018 addressing implementation of those recommendations to identify relevant actions for research and evaluation of natural experiments in obesity.

Promote the use of innovative funding opportunities
- Utilize federal prize competitions (e.g., Challenges[36]) to engage non-traditional partners in obesity research; this might encourage citizen scientists to submit an application to fund their research project. The Health Resources and Services Administration (HRSA) recently released

[10 awards](#)[37] to encourage use of new technology to prevent childhood obesity in low income families and communities.

- Consider using supplemental awards from the NIH and other funders as a mechanism for extending the follow-up periods of exemplar natural experiment studies.
- Identify approaches used by different Federal Partners to provide funding for research projects that require longer support than that provided by the usual 3- to 5-year funding timeline of many federally sponsored grants. Disseminate information on these approaches to the research community.

Support cross-sectoral workshops, collaborations, and training

- Consider convening a meeting with the housing, education, transportation, food assistance, and other federal sectors that monitor SDOHs related to obesity for a discussion on the data and methodological needs for complex system modeling in obesity research and for recommendations on future directions for the field.
  - Possible discussion topics could include (1) developing resources such as test data sets to make difficult data elements more accessible or (2) establishing a practice of building models in parallel with a natural experiment to forecast potentially unanticipated effects.
- Develop a catalog of the existing training programs in modeling methodologies and causal inference relevant to obesity control and prevention, and document whether they include training across sectors. Some examples include:
  - The NIH funds multiple trainings in modeling (e.g., Short Courses on Innovative Methodologies in the Behavioral and Social Sciences [[R25](#)][28]; Predoctoral Training in Advanced Data Analytics for Behavioral and Social Sciences Research [[T32](#)][38]).
  - The CDC supports a number of training programs, including courses in [economic modeling](#).[39]
  - The EPA funds modeling training programs through cooperative research agreements with universities.
  - The U.S. Department of Transportation supports training in modeling through the [University Transportation Centers](#).[40]
  - The U.S. Geological Survey (USGS) has training programs in hydrological modeling (see [USGS course catalog](#)[41]).
  - The National Oceanic and Atmospheric Administration funds [training for climate adaptation modeling](#).[42]

Concluding Remarks

While the Federal Partners Meeting represents the conclusion of the P2P program activities related to methods for evaluating natural experiments in obesity, efforts to enhance the ability of researchers to study policies that influence health behaviors related to obesity are ongoing. This report presents a set of prioritized research and programmatic strategies that could be advanced through collaborations across the federal government and with private-sector partners. As a resource for the larger obesity research community, this report will be publicly available and distributed to key stakeholders, as well as to public-private partnerships, such as NCCOR.

The Federal Partners have already taken steps toward addressing the recommendations outlined above. A number of Federal Partners provide data resources, funding opportunities and trainings for natural experiment research and evaluation that is relevant to obesity research. In addition, Federal Partners support workshops and other types of outreach to inform the research and practice community of

advances in the field. These include the convening of a [symposium on the Use of Natural Experiments in Obesity Prevention Research—Addressing Research Gaps and Use in Programs and Policy](#)[43] on November 12, 2018, at Obesity Week, which is the joint annual meetings of the American Society for Metabolic and Bariatric Surgery (ASMBS) and The Obesity Society (TOS). In addition, the NCCOR collaborative is planning a series of meetings in 2019 to define next steps in efforts to enhance measures relevant to childhood obesity research, and the evaluation of natural experiments in childhood obesity programs and policies. Further progress in this topic area requires increased cooperation and engagement across relevant Federal Partners. Considerable interest was expressed in focused meetings on specific topic areas.

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73. FDA. FDA Nutrition Innovation Strategy.

74. NSF. Research Areas.

75. NSF. HDR @ NSF.

76. NSF. Computer Systems Research (CSR).

77. NSF. Cyber-Human Systems (CHS).

78. NSF. Methodology, Measurement, and Statistics (MMS).

79. NSF. Smart and Connected Communities (S&CC).

80. NSF. Smart and Connected Health (SCH).

81. NSF. Statistics.

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84. HUD. Aging Research and Resources.

85. HUD. NCHS - HUD Data Linkage.

86. HUD. Moving to Opportunity for Fair Housing.

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89. GSA. Every Kid in a Park.

90. NPS. Green Parks.

91. NPS. Healthy Parks Healthy People.

92. NPS. Night Skies.

93. Institute at the Golden Gate. ParkRx.

94. NPS. Quiet Parks Program.

95. Federal Highway Administration (FHWA). Bicycle and Pedestrian Program.

96. FHWA. Health in Transportation Working Group.

97. FHWA. Pedestrian and Bicycle Funding Opportunities.

98. FHWA. Congestion Mitigation and Air Quality Improvement (CMAQ) Program.

99. FHWA. Federal Lands Access Program (FLAP).

100. FHWA. Federal Lands Transportation Program (FLTP).

101. FHWA. Recreational Trails Program.

102. FHWA. Surface Transportation Block Grant Program (STBG).

103. FHWA. Fixing America's Surface Transportation Act or "FAST Act".

104. FHWA. Proven Safety Countermeasures.

105. U.S. Department of Transportation. Transportation and Health Tool.

106. FHWA. Youth Workforce Development Resources.

107. U.S. Environmental Protection Agency (EPA). Greening America's Communities.

108. EPA. Local Foods, Local Places.

109. EPA. Smart Growth Tools.

110. EPA. Smart Location Mapping.

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Appendix B: Federal Partner Initiatives and Resources Relevant to Obesity and Natural Experiment Research

National Institutes of Health (NIH)
Funding Opportunity Announcements (FOAs)[44] Selected Active FOAs Related to Obesity: • PA-16-165: Obesity Policy Evaluation Research (R01) • PA-18-356: Population Health Interventions: Integrating Individual and Group Level Evidence (R01 Clinical Trials Not Allowed) • PAR-18-854: Time-Sensitive Obesity Policy and Program Evaluation (R01 Clinical Trial Not Allowed) Additional FOAs for Evaluating Natural Experiments (Not Related to Obesity): • PA-17-135: Public Policy Effects on Alcohol-, Marijuana-, and Other Substance-Related Behaviors and Outcomes (R01) • PAR-17-178: Evaluating Natural Experiments in Healthcare to Improve Diabetes Prevention and Treatment (R18) • PAR-19-064: Mechanism for Time-Sensitive Drug Abuse Research (R21 Clinical Trial Optional) • RFA-ES-16-005: Mechanism for Time-Sensitive Research Opportunities in Environmental Health Sciences (R21)
Healthy Communities Study[45]
NIH Obesity Research Grantees Network[46]
P2P Workshop: Methods for Evaluating Natural Experiments in Obesity[47]
Strategic Plan for NIH Obesity Research[48]
Workshop on Considerations for Obesity Policy Research[49]
Centers for Disease Control and Prevention (CDC)
Childhood Obesity Data Initiative (CODI) pilot project
Childhood Obesity Research Demonstration (CORD) Project 2.0[50]
Electronic Information Standards to Support Obesity Prevention[51]
High Obesity Program (HOP)[52]
Nutrition and Obesity Policy Research and Evaluation Network (NOPREN)[53]
Nutrition, Physical Activity, and Obesity: Data, Trends and Maps interactive database[54]
Physical Activity Policy Research Network Plus (PAPRN+)[55]
Racial and Ethnic Approaches to Community Health (REACH) Program[56]
State Physical Activity and Nutrition (SPAN) Program[57]
Surveillance Data Platform (SDP) with Shared Services Program[18,19]
National Collaborative on Childhood Obesity Research (NCCOR) *NCCOR is a public-private partnership supported by NIH, CDC, USDA, and the Robert Wood Johnson Foundation (RWJF)*
Catalogue of Surveillance Systems[15]
Childhood Obesity Declines Project[58]
Measures Registry[14]
Measures Registry User Guides[59]
Webinar: Evaluation Tools for SNAP-Ed Populations and Needs[60]
White Papers and Other Publications[61] (e.g., food systems,[62] green health design in schools,[63] evaluating health care-community collaborations[64])
Health Resources and Services Administration (HRSA)
Bright Futures Program[65]

	Childhood Obesity Grand Challenge[37]
	Children's Healthy Weight Collaborative Improvement and Innovation Network (CHW-CoIIN)[66]
	Healthy Start Program[67]
	Maternal and Child Health (MCH) Nutrition Training Program[68]
	Maternal, Infant, and Early Childhood Home Visiting Program[69]
	Pediatric Obesity Mini Collaborative Improvement and Innovation Network (CoIIN)
	Pregnancy Related Care Research Network (PRCRN)[70]

Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services

	Health and Human Services (HHS) Data Council[71]
	Report on Addressing the Opioids Crisis: Data Sources and Linking Strategies[17]

U.S. Food and Drug Administration (FDA)

	Continuing Education Programs[72]
	Nutrition Innovation Strategy[73]

National Science Foundation (NSF)

	Core Disciplinary Programs (across all NSF Directorates[74])
	Harnessing the Data Revolution (HDR)[75]
	Selected programs that support basic research in data science, technology development, and improved methodology and measurement • Resource Implementations for Data Intensive Research in the Social, Behavioral and Economic Sciences (RIDIR)[20] • Computer Systems Research (CSR)[76] • Cyber-Human Systems (CHS)[77] • Methodology, Measurement, and Statistics (MMS)[78] • Smart and Connected Communities (S&CC)[79] • Smart and Connected Health (SCH)[80] • Statistics[81]

U.S. Department of Agriculture (USDA), Economic Research Service (ERS)

	Economic Research Report on the Association Between Restaurant Menu Label Use and Caloric Intake[82]
	ERS Project on the Role of Restaurant Menu Labeling Laws in the Relationship Between Food Away From Home and Caloric Intake (manuscript submitted for publication)
	ERS Project on the Short- and Longer-Run Effects of Soda Taxes on Consumption and Health (manuscript submitted for publication)

U.S. Department of Housing and Urban Development (HUD)

	HUD USER: Resource for Housing and Community Development Research[83]
	Opportunities for HUD administrative data linkages: • HUD-CMS (Medicare/Medicaid) data linkages[84] • HUD-NCHS (National Health Interview Survey/National Health and Nutrition Examination Survey) data linkages[85]
	Moving to Opportunity for Fair Housing (MTO) Program[86]

U.S. Department of the Interior, National Park Service (NPS)

	Arts in the Parks Program[87]
	Building Healthy Military Communities Pilot Program[88] (NPS is partnering with the U.S. Department of Defense to promote national parks in this program)

	Every Kid in a Park Program[89]
	Green Parks Plan[90]
	Healthy Parks Healthy People (HPHP) 2.0 Program[91]
	Night Skies Program[92]
	Park Prescriptions Program[93]
	Quiet Parks Program[94]

U.S. Department of Transportation, Federal Highway Administration (FHWA)

	Bicycle and Pedestrian Program[95]
	Health in Transportation (HinT) Working Group[96]
	Pedestrian and Bicycle Funding Opportunities[97]
	Possible funding sources for trails and for active transportation: • Congestion Mitigation and Air Quality Improvement Program (CMAQ)[98] • Federal Lands Access Program (FLAP)[99] • Federal Lands Transportation Program (FLTP)[100] • Recreational Trails Program (RTP)[101] • Surface Transportation Block Grant Program (STBG)[102] • Transportation Alternatives Set-Aside[103]
	Proven Safety Countermeasures Initiative[104]
	Transportation and Health Tool[105]
	Youth Workforce Development Resources for Transportation-Related Projects[106]

U.S. Environmental Protection Agency (EPA)

	Greening America's Communities Program[107]
	Local Foods, Local Places Program[108] (sponsored by USDA, EPA, CDC, the Delta Regional Authority, and the Northern Border Regional Commission)
	Smart Growth Tools[109]
	Smart Location Mapping Database[110]