

Nutrition and Childhood Obesity Science White Paper
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An obese person spends over \$1,530 more per year on health care than a person with normal weight spends (Congressional Budget Office, 2010). Those costs are rapidly increasing because rates of childhood obesity have more than tripled and rates of adult obesity have doubled in the past 30 years. The prevalence of obesity among children aged 6 to 11 years increased from 6.5 percent in 1980 to 19.6 percent in 2008. The prevalence of obesity among adolescents aged 12 to 19 years increased from 5.0 percent to 18.1 percent (Odgen & Carroll, 2010). At the same time, many low-income and elderly people are at greater risk for obesity, suffer from food insecurity, do not have adequate micronutrients, or face limited access to healthier food choices.

Obesity is a complex issue with no simple solution or answer. Preventive nutrition and physical activity strategies proven to be efficacious are required to reduce the incidence of obesity and related chronic diseases and thereby lower health care costs. Elimination of malnutrition will also be a significant challenge. Establishing a balance of food availability and adequate nutrition will be accomplished only by changing the food supply, the environment, and behaviors. This challenge will require research, monitoring, program evaluation, and translational activities to be conducted on a substantial scale in order to produce science-based and reliable results that can inform policies, nutrition assistance programming, and education/extension programs. This level of scale is best achieved through close coordination among the U.S. Department Agriculture's (USDA's) Research, Education and Economics (REE) agencies and partnerships with other governmental, nonprofit, and private entities. The REE agencies also coordinate with other USDA agencies that play a role in nutrition, including the Center for Nutrition Policy and Promotion, which leads USDA's dietary guidance promotion efforts and the Food and Nutrition Service, which is responsible for food and nutrition assistance programs. The National Collaborative for Childhood Obesity Research Partnership is one of several means by which USDA is collaborating and coordinating with the National Institutes of Health (NIH), Centers for Disease Control and Prevention (CDC), and other partners.

Current State of the Science

Recent emphasis on the consequences of the obesity epidemic in adults and children is underlined by numerous authoritative reports published in the last several years. Obesity affects all segments of society and may shorten the life expectancy of today's children. "Bridging the Evidence Gap in Obesity Prevention," an Institute of Medicine (IOM) report published in April 2010, sought to answer two fundamental questions: 1) How can evidence that is currently available about obesity prevention be identified, evaluated, and compiled in ways that will best inform decisions?; and 2) How can more evidence be developed that is of high quality and directly relevant to decision making on obesity prevention? (Kumanyika et al., 2010). REE contributes to both questions with the majority of effort on the second one. The IOM report makes clear the complex nature of the problem and the opportunities to generate new evidence, in contrast with the common perception that America is poised to implement a cure for the marked increase in obesity but simply doesn't have the collective will to implement an unpopular program.

In July 2010, childhood obesity and malnutrition was identified as a high priority for REE and six recommendations were developed to enhance the childhood obesity and malnutrition research endeavors within USDA (National Agricultural Research, Extension, Education, and Economics Advisory Board 2010). These included 1) collaboration with public and private partners to make most effective uses of resources; 2) increased behavioral research; 3) development of nutrient-dense and affordable foods; 4) simplification of current USDA nutrition education; 5) accelerating the transition of program outcomes to policies; and 6) communicating research findings to the public in a timely and consumer-friendly manner.

The Trust for America's Health issued its report "F as in Fat: How Obesity Threatens America's Future, 2010," with a high-level goal of continuing to invest in research and education to develop a set of evidence-based proven interventions (Levi et al., 2010). Four recommendations were included in that report: 1) translate research into practice; 2) focus on environmental and socio-cultural factors; 3) recognize that the benefit of physical activity goes beyond body mass index; and 4) improve surveillance data, especially for children.

An outgrowth of the First Lady's "Let's Move" initiative identified several key questions for future research, including those related to behavioral economics in schools, the effectiveness of school-based education for good nutrition and physical activity, and whether participation in USDA-sponsored school meals programs affects body weight status (White House Task Force on Childhood Obesity, 2010).

The National Collaborative for Childhood Obesity Research (NCCOR) is a public-private partnership that was launched in 2009 by CDC, NIH, and the Robert Wood Johnson Foundation. USDA joined in 2010 to accelerate progress in reversing the epidemic of overweight and obesity among American youth. This partnership brings together four of the nation's leading research funders to improve the efficiency, effectiveness, and application of childhood obesity research and to produce positive changes more rapidly through better coordination and collaboration (www.NCCOR.org). In addition, the [USDA Strategic Plan](#) for fiscal years (FYs) 2010–2015 aims to promote healthy diets and physical activity behaviors (objective 4.2 in the strategic plan) by listing strategies such as promoting healthier foods via the application of behavioral economics in school cafeterias, expanding intramural and extramural behavioral research into obesity especially among children, and evaluating nutrition-promotion interventions (U.S. Department of Agriculture, 2010).

The World Health Organization published a [Global Strategy on Diet, Physical Activity and Health](#) in 2004 in response to the international recognition of the increasing burden of chronic diseases in both developed and developing nations resulting from unhealthy diet and physical activity choices (World Health Organization, 2004). It emphasizes that national governments should invest in research, evaluation, and surveillance activities and that long-term and continuous monitoring are essential for the proper implementation of national health strategies. The report specified that research into reasons for low levels of physical activity and poor diets will lead to better policies.

Likewise, in 2010, the Advisory Committee on the Dietary Guidelines for Americans issued a report emphasizing the high incidence of chronic disease in the U.S. population and changes that

should be made to diet, physical activity, and weight status to reduce disease and promote health (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Cardiovascular disease and cancer account for the majority of health expenditures and deaths in the United States. Obesity increases the risk for cardiovascular disease and some forms of cancer, but to lower the incidence of these diseases requires attention to more than caloric balance. Improvements in dietary quality, as recommended in the 2010 Dietary Guidelines for Americans (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010) and in other health behaviors are also needed. A number of important research questions were framed by the Dietary Guidelines Advisory Committee and are listed in an appendix of the report (<http://www.cnpp.usda.gov/DGAs2010-DGACReport.htm>). The 2010 dietary guidelines form the basis for Federal nutrition policy and have considerable effect on USDA nutrition assistance and education programs and on new products and reformulations by the food industry. A major research objective in the prior 2005 Dietary Guidelines Advisory Committee report was to identify the motivators and hindrances to following the guidelines.

In summary, the recommendations for effective research and education from multiple authoritative reports align to emphasize that we should determine what works, translate that to a larger scale, and maintain surveillance of the population to obtain both baseline and subsequent data. The USDA's REE mission area agencies currently address all these areas, and with plans for new efforts and enhancements to the existing areas outlined below, has a real opportunity to effect change.

Current Research Challenges and Proposed Research Program

Vision: That REE research will establish the evidence to show that changes in food consumption and physical activity are necessary to reduce malnutrition and obesity in children and high-risk populations, and that it will lead to effective education and extension activities to translate the research into practices that promote better health.

The REE research portfolio has shifted to emphasize obesity prevention in the last 5 years. The Agricultural Research Service (ARS) increased obesity research from less than 10 percent of its human nutrition program in 2007 to more than 30 percent in 2012. The National Institutes of Food and Agriculture (NIFA) chose prevention of early childhood obesity as the sole subject in its request for grant applications in 2011. The Economic Research Service (ERS) in 2011 awarded grants for behavioral economic studies to improve food selection in schools and developed the online *Food Environment Atlas*, an important tool for developing and monitoring strategies to resolve food deserts in the United States (Economic Research Service, 2011). While obesity is perhaps the nutrition-related issue of greatest concern in the United States, it is not the only important issue, and REE agencies are continuing their work in other areas such as prevention of chronic diseases and establishing human nutritional requirements. A balanced portfolio of research enables USDA to contribute to improving public health, assist consumers with making better food choices, and enable policymakers to develop science-based regulations that have the desired effect while simultaneously helping agriculture and the food industry give consumers healthier choices.

ARS' intramural human nutrition research program occurs primarily at six internationally recognized human nutrition research centers; complementing this is the ARS program on Quality and Utilization of Agricultural Products, which devotes one-third of its resources to new technologies for food products. ERS carries out intramural research combined with funding a small number of competitive grants. NIFA awards grants through a competitive process, primarily through its flagship Agriculture and Food Research Initiative (AFRI), and formula funds to all States and territories for extension and education purposes. Coordination among the REE agencies leads to leveraging of investments and additive solutions to the problems of obesity and poor nutrition in the following ways:

1. Linking food systems with beneficial human health outcomes
2. Strengthening nutrition monitoring of the American population and evaluating policies that influence nutritional health
3. Building the scientific basis to establish dietary guidance to promote health and prevent disease throughout a person's lifetime
4. Developing and extending approaches to prevent obesity and related diseases, including translational activities to promote healthy eating and physical activity.

Strategy 1: Linking Food Systems to Beneficial Human Health Outcomes

Current USDA Science:

At a time when Americans are told to choose primarily nutrient-dense versions of foods and the greatest need in other countries is to alleviate dietary deficiencies, it is essential to link the concept of enhancing nutritional content with the production of foods. Most agricultural research on crop and animal production has focused on promoting greater productivity with limited attention to the nutritional value of the resulting commodities. ARS has the unique capability to conduct this kind of research with national research programs in crop production, animal production, and human nutrition. ARS already undertakes some research that focuses on mineral and phytonutrient enhancements in plant foods and on assessing the bioavailability of those components in model systems and humans. Studies on bioavailability are important for ensuring that phytonutrient enhancements are metabolically utilized. ARS plans to expand its research on linking enhancements in animal/plant foods with human health outcomes.

ERS produces information and analyses to understand the affordability of food, including how much food is available to consumers and how prices vary by region, by household income level, or with access to food assistance programs. ERS research examines how prices of healthier alternatives vary across markets and how these prices have changed over time. ERS research uses the food consumption data provided by ARS through the National Health and Nutrition Examination Survey (NHANES), which is linked with outside data sources, to understand how food choices and health outcomes are related to USDA's food assistance program participation and to community-level characteristics. Other research uses USDA's Supplemental Nutrition Assistance Program (SNAP) administrative data and regional variation in SNAP program rules to estimate the effect of SNAP on diet and health outcomes. SNAP used to be known as the Food Stamp Program, and is administered by USDA's Food and Nutrition Service.

The primary goal of this research is to enhance the health-promoting quality of the food supply by connecting food production with human health outcomes. This includes determining the availability and affordability of food for American consumers, including the impact of USDA's food assistance programs. It also means determining the factors related to food choices, including knowledge, skills, and attitudes related to food and physical activity behaviors, economic influences, and the effects of policies to improve diets.

Anticipated Outcomes:

- Discovery of new information about the effects of plant and animal production practices and environmental conditions on the nutritional quality of the U.S. food supply in terms of nutrient content and human bioavailability and health effects (ARS).
- Discovery of the individual genes that control the accumulation of essential nutrients or synthesis of health-promoting components in plant and animal source foods. This research will lead to the development of agricultural products and new plant cultivars with higher nutritional and health-promoting value (ARS).
- Development of new postharvest food quality and processing technologies that can be licensed to industry for healthier and more convenient consumer foods (ARS, NIFA).
- Annually updated information about food availability to help policymakers understand major trends in food consumption and overall progress toward healthier diets (ERS).
- Understanding the role of food access and food assistance in shaping diet and health outcomes for low-income people, which will inform policies and programs designed to improve health (ERS).
- Annually updated information about the prices of healthier foods and diets to inform consumers and policymakers (ERS).

Strategy 2: Strengthen Nutrition Monitoring of the American Population and Evaluate Policies that Influence Nutritional Health

Current USDA Science:

Accurate and up-to-date food composition data are required to determine the nutrition Americans receive from foods. ARS compiles and maintains the USDA National Nutrient Databank that includes nutrient composition information for more than 7,500 commonly consumed foods and is considered the international gold standard. Special interest databases produced by ARS have led to expanded research on fluoride, choline, flavonoids, anthocyanins, and isoflavones, as some examples of both essential and nonessential nutrients. ARS also develops new analytical methodologies for measuring nutrients and other bioactive components in foods. Recently, a better method to incorporate vitamin D in foods developed by ARS facilitated updates to the USDA Nutrient Databank at a time of intense national focus on this nutrient. Currently, a new and more accurate method for simultaneous analysis of B vitamins is being developed as a result of stakeholder requests, and the "fingerprinting" of plant products is being applied to dietary supplements, which allows NIH to establish better standards for products studied by the researchers it funds.

ARS also conducts the only nationally representative food consumption survey, *What We Eat in America*, for NHANES, in partnership with the CDC. This continuous dietary survey tracks the food/nutrient consumption and dietary patterns of the American population. Several groups such as children, pregnant women, and some ethnic minorities with an increased risk for obesity, lower nutritional status, or both are oversampled to achieve greater statistical validity. The data are publically released on a biennial basis. These data have a broad range of stakeholders, including ERS, the Food and Nutrition Service, Center for Nutrition Policy and Promotion, Agricultural Marketing Service, Food Safety and Inspection Service, Food and Drug Administration (FDA) and other agencies in the Department of Health and Human Services (HHS), and the Environmental Protection Agency. In addition, the National Academies Institute of Medicine uses these data to set Dietary Reference Intakes for the U.S. and Canada; the expert advisory committee for the USDA/HHS Dietary Guidelines for Americans (DGA); the food industry; and many university researchers who generate hundreds of epidemiological analyses linking food and nutrient intake with health status, body weight, and chronic disease incidence. Building upon these data, ERS recently invested in a nationally representative survey of food acquisitions and purchases by American households called the Food Acquisition and Purchasing Survey (FoodAPS), which provides comprehensive data on foods consumed at and away from home. The survey also oversamples low-income households.

ERS publishes an annual statistical report on household food security in the United States, which provides the basis for research on determinants of food security and the role of food assistance programs on food security in the United States. ERS also conducts research to determine whether prices can be used to encourage healthier diets through, for example, offering hypothetical discounts for fruits and vegetables, and assessing the associations between meal cost and meal healthfulness through the National School Lunch Program. In addition to understanding prices and costs, ERS carries out research to understand how consumers use and respond to cues for healthier eating such as modifications to the school lunch environment (i.e., behavioral economics research) and alternatives for new “front of package” labeling for foods. For example, what type of format or information leads consumers to make healthier choices? Does the disclosure of information lead firms to offer healthier product formulations? These types of information are used by the food industry and by U.S. agencies with food labeling oversight responsibilities such as the FDA and the Food Safety and Inspection Service.

Primary Goals:

The goals of this research are to 1) compile and update U.S. food composition data for essential nutrients and biologically active food components; 2) determine food purchases, food/nutrient consumption, and dietary patterns of Americans, including “at-risk” populations; and 3) carry out analyses of the benefits and costs of policies of changing behaviors to improve diet and health through efforts such as nutrition education, labeling, advertising, taxes and subsidies, and regulations.

Anticipated Outcomes:

ARS expects to publically release annual updates to nutrient data on more than 7,500 foods in the USDA National Nutrient Databank (NNDB), new approaches for rapidly updating food

sodium values as requested by CDC and FDA, and better methods for analyzing the content of nutrients and bioactive food components in foods. Listed below are a few examples of how NNDB could be strengthened with added funding:

- a) Increase the number of foods included in the NNDB. In particular, ARS could do more with different cultivars of popular fruits and vegetables.
- b) Modernize the software for compiling and manipulating nutrient data. For example, update the NNDB Web interface to improve the user experience and allow nutrient comparisons of several foods.
- c) Provide better measures of variation in nutrient content based on season, geographic source, conventional vs. organic farming, etc.
- d) Release biennially the nationally representative food consumption data from the *What We Eat in America*/NHANES national dietary survey. Monitoring the diets of Americans on a continuing basis will inform future research needs, link dietary patterns with obesity and other health/disease conditions, guide food and nutrition interventions, and help create science-based policies to promote health and minimize disease (ARS). The survey could be strengthened with added funding by decreasing data and report turnaround time to provide timely application to policy evaluations.

Other anticipated outcomes include the following:

- Speed up data analysis and release the NHANES results to make them more useful to researchers and USDA assistance programs. This will happen only with additional resources and cannot be achieved through redirections (ARS).
- Discover whether participation in food assistance programs influences food purchases, including the types and cost of foods that SNAP participants buy. This new knowledge will be used to inform food assistance programs and policies (ERS).
- Compile new information on how prices, income, nutrition knowledge and attitudes, and changes in food labeling regulations influence food choices and the dietary quality of food purchases of Americans across all income levels (ERS).
- Establish relationships between food acquisition decisions and food security and determine whether programs or policies (e.g., economic development initiatives for retail food market development) mitigate the effects of low access to affordable and nutritious foods. Such information for at-risk populations will inform State and National policy decisions and help reduce health disparities (ERS).
- Give policymakers annual updates on the progress toward alleviating food insecurity, especially among households with children. Understanding the reasons why some low-income households are at greater risk for food insecurity will inform policies and programs (ERS).

Strategy 3: Build the Scientific Basis for Dietary Guidance for Health Promotion and Disease Prevention across the Lifecycle

Current USDA Science:

All the work within the ARS human nutrition program at the six research centers potentially contributes to this strategic goal by focusing on dietary and physical activity approaches, whether the research is at the level of the molecule, gene, cell, or whole organism. Historically, ARS research has contributed at least half of all data used to establish Dietary Reference Intakes (DRIs), the nutritional standards for people in the United States and Canada and the standards that undergird the Dietary Guidelines for Americans. The current cycle (2009–2013) of the ARS research program emphasizes the capability of ARS to continue contributing to this inherently governmental strategic goal. Three ARS initiatives for FY 2012 target the scientific basis for dietary guidance. The first initiative focuses on new ways to determine the nutrient requirements of children rather than relying upon the flawed approach of extrapolating them from adult values. The research will build upon the unique expertise and capacity at the two ARS centers that focus on the nutritional needs of children. The second initiative investigates human genetic variations that can alter physiological responses to dietary and physical activity interventions that focus on ethnic minorities at highest risk for obesity and related health complications. The Diet and Genomics Laboratory at the ARS Human Nutrition Research Center on Aging in Boston, Massachusetts is acknowledged as the world leader in this field. A large number of discoveries made there have significantly influenced other researchers and advanced the field of personalized nutrition. The third initiative applies the cutting-edge science of metabolomics to establishing health-promoting properties of specialty crops and whole grains, and will build upon existing expertise and capacity at the ARS Human Nutrition Research Center in Davis, California.

NIFA's extramural research programs, AFRI and the Small Business Innovation Research (SBIR) competitive grants program, also fund projects that improve our understanding of the role of nutrients and other bioactive components found in foods in promoting health as well as projects to improve food processing technologies. In FY 2011, AFRI solicited projects that focused on the role of bioactive components in food in preventing inflammation or promoting gastrointestinal health and on the development of technologies to address storage, processing, and packaging of fresh fruits and vegetables. NIFA also administers formula funds at the State agricultural experiment stations, the 1890 colleges, and Tuskegee University to support research in human nutrition and food science; a portion of these funds are spent on projects that focus on the requirements and functions of nutrients and other food components and on improving food processing technologies.

Primary Goals:

The primary goals of this research are to undergird the scientific evidence base for updating national dietary standards and guidelines; identify the roles of foods, nutrients, dietary patterns, and physical activity in promoting health and preventing disease across the lifecycle; and determine mechanisms such as genetic and epigenetic factors by which nutrition promotes healthy development and function from conception to old age.

Anticipated Outcomes:

- New methods for establishing actual nutrients and quantities required by children rather than extrapolating them from adult values—a critical gap in human nutrition research (ARS).
- New knowledge on whether the intrauterine influence on mitochondrial metabolism contributes to the widely researched theory called the “fetal origins of disease” and whether it affects one’s risk for obesity, diabetes, cardiovascular disease, and related disorders (ARS).
- Evidence that epigenetic factors observed in animal models, heritable alterations in gene expression not resulting from modification of DNA, also occur in humans (ARS).
- New knowledge on human genetic variations, which will lead to more accurate nutrient requirements and better dietary recommendations (ARS).
- New knowledge about the bioavailability, function, efficacy, and safety of nutrients and other beneficial food components from fruits, vegetables, nuts, and whole grains and improved processing technologies to improve consumer acceptance and health benefits of these foods (ARS, NIFA).
- More precise knowledge on recommended intakes for required nutrients and nonessential health-promoting food components such as carotenoids or polyphenols. This is expected, for example, to promote optimal growth in children, optimal intellectual performance, optimal physical performance, foster resistance to disease, and reduce the risk for cardiovascular disease, diabetes, and cancer. Disease prevention helps lower healthcare costs and improves and extends quality of life (ARS).
- Effective strategies to delay the onset of age-related disorders in adults such as cognitive decline and sarcopenia (muscle loss) through diet, nutrition, and physical activity interventions. These strategies will contribute toward lowering healthcare costs and improving and extending quality of life (ARS).

Strategy 4: Develop and Extend Approaches to Prevent Obesity and Related Diseases Including Translational Activities to Promote Behavioral Change Related to Healthy Eating and Physical Activity

Current USDA Science:

Approximately one-third of the ARS budget for human nutrition is devoted to obesity prevention in children and adults. ARS scientists are generating knowledge on the relationships among demographic, social, environmental, economic, psychological, biological, and behavioral variables leading to unhealthy weight gain and obesity. The ARS Children’s Nutrition Research Center at Baylor College of Medicine in Houston, Texas, has the largest pediatric behavioral nutrition program in the world and leads in a number of child obesity prevention areas such as development of new media to stimulate better diet and physical activity behavior and understanding how parenting styles affect childhood food choices. Another important ARS focus is the role of the Dietary Guidelines for Americans in preventing obesity and related diseases. For this, enhancements in dietary quality need to occur hand in hand with balancing caloric intake and expenditure. Multicenter studies focusing on the efficacy and effectiveness of the DGA for obesity prevention were proposed in the FY 2012 budget. The first budget initiative proposes to study barriers and facilitators to DGA adherence among multiple population groups to promote greater acceptance and adoption of healthier dietary and activity

patterns in children and adults. Currently, few Americans adhere to the DGA. Because efficacy of the DGA has never been tested, the second initiative proposes to investigate their efficacy in preventing obesity. Another FY2012 budget initiative proposes to enhance the capacity of Nutrition.gov, the Number 1 nutrition Web site on Google searches, to distribute new and evolving childhood obesity prevention information directly to the American population.

The ERS *Food Environment Atlas* is an annually updated, Web-based mapping tool that allows users to compare U.S. counties according to their “food environment” (i.e., the set of factors that help determine and reflect a community’s access to affordable, healthier food). Indicators of the food environment currently included in the atlas cover a wide range of demographic, health, and food access characteristics, most at the county level. Development of this important tool continues for the purpose of mapping so-called food deserts and the health consequences associated with low access to nutritious foods.

Childhood obesity remains one of five critical issues to be addressed by NIFA’s AFRI competitive grants. AFRI funds projects that conduct research to identify behavioral and environmental factors that influence the development of obesity in children aged 2–19 years. In FY 2011, AFRI solicited projects targeting children aged 9–14 years; in FY 2012, AFRI is soliciting projects targeting children aged 15–19 years. AFRI competitive grants fund projects that integrate research, education, and extension components to develop effective obesity prevention strategies, develop valid behavioral and environmental instruments for measuring progress in childhood obesity prevention, and provide interdisciplinary training for the next generation of researchers and educators who will be faced with the challenge of preventing obesity. This is in essence translational research that starts with behavioral and educational research and continues through the development and testing of interventions that involve formal education of researchers and practitioners or informal interventions (extension) that involve education, environmental, or policy changes. Many projects bring together multi-State, multi-institutional and multidisciplinary teams. Obesity prevention methods include promoting a healthy diet and physical activity, following Federal nutrition policy as expressed in the DGA. Priority is given to projects that target limited-resource audiences that are eligible for USDA’s food assistance programs. NIFA’s Community Food Project competitive grant program grew out of the ethic of community self-reliance and attempts to rally local communities to unite and develop practical solutions to challenging food-related problems. Improvements in food availability and accessibility often focus on fruits and vegetables that can help improve dietary quality and lower dietary caloric density.

NIFA’s SBIR program solicits projects that develop affordable food formulations to help prevent obesity and projects that use information technology for nutrition educators and teachers to increase nutrition awareness. NIFA also administers formula funds at the State agricultural experiment stations, the 1890 colleges, and Tuskegee University to support research in human nutrition; a portion of these funds is spent on nutrition education research. As States align their plans of work with NIFA’s five societal challenge areas, the proportion of funds spent on nutrition education are expected to increase.

NIFA’s Expanded Food and Nutrition Education Program (EFNEP) operates through the 1862 and 1890 land grant universities in every State, the District of Columbia, and the six U.S.

territories. Using a research-based, interactive approach, peer educators from the communities reach more than 500,000 new, limited-resource families and youth each year. Through the Supplemental Nutrition Assistance Program—Education (SNAP-Ed), SNAP-eligible individuals and families gain knowledge and skills to select, prepare, and eat a healthier diet. SNAP-Ed is largely carried out by the Land-Grant University Cooperative Extension System, which is a NIFA partner. SNAP-Ed's success depends on the collaboration of Federal, State, and local partners. The cost is shared by USDA's Food and Nutrition Service through national SNAP administrative dollars and by States through public and private funding. NIFA serves as a liaison for the land grant university system and facilitates system-wide program development and reporting.

Primary Goals:

The primary goals are to 1) determine the causes and consequences of obesity and related disorders; 2) develop, evaluate, and support the implementation of viable strategies for changes in food environments and behaviors to encourage healthier food choices and prevent obesity and related diseases at the individual and community levels; 3) evaluate the efficacy and the effectiveness of the DGA and nutrition education programs built upon the DGA in preventing obesity and promoting health; and 4) improve and evaluate the effectiveness of existing educational programs to elevate the health of low-income families and youth through nutrition, physical activity, and food resource management.

Anticipated Outcomes:

- A more comprehensive knowledge base of the biology underlying the development and consequences of obesity and related disorders, including the role of food and food components, various levels of physical activity/exercise, gene-diet interactions, neuroendocrine and metabolic pathways, inflammation, and gut environment (ARS).
- Discovery of the interplay between biology and behavior and the contribution of behavioral and environmental factors to the development of obesity and related disorders in the diverse American population (ARS, ERS).
- New knowledge to develop effective behavioral, environmental, and educational interventions that result in wider acceptance and use of the DGA recommendations by the American population, leading to a lower prevalence of overweight and obesity and parallel reductions in the prevalence of chronic diseases and health care costs in the United States (ARS, NIFA).
- Assemble statistics on food environment indicators to facilitate research on the determinants of food choices and diet quality and to inform local, State, and Federal policymakers of the capacity of communities in the United States to successfully access healthier food (ERS).
- Improved evidence-based nutrition education materials that can be distributed through EFNEP, SNAP-Ed, and Nutrition.gov, which will improve dietary and physical activity behaviors and help prevent obesity of food and nutrition assistance program participants and the American public (ARS, NIFA).
- Individuals, families, and communities report greater knowledge and to demonstrate better planning, purchasing, and food preparation skills related to nutrition and healthier

eating. Using the findings from research and practice, community leaders and public officials are expected to make changes that will foster healthier diets and physical activity and improve food security and sustainability (NIFA).

- More educators, practitioners, and researchers receiving better training to address the complex problem of childhood obesity prevention (NIFA).

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