

**Purdue Extension**  
**2018 Annual Accomplishment Report to USDA NIFA**  
**Impact Statements by Planned Program**

The Purdue Extension and Research outcomes and impact statements are organized into these seven Planned Programs:

- Childhood Obesity
- Climate Change
- Food Safety
- Global Food Security and Hunger
- Human, Family, and Community, Health and Well-being
- Natural Resources and the Environment
- Sustainable Energy

Outcomes provide the metrics that our Educators and Specialists report across research and Extension program efforts. The impact statements shared highlight a program or project addressing the outcomes and provide narrative on the issue, what has been done, and the results. There are impact statements for research projects, for Extension programs, and for integrated research and Extension activities.

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## ***Childhood Obesity***

### **Title**

**Health-related impacts of nutrition and exercise across the life span**

### **Research**

Wayne Campbell, Nutrition Science

### **Outcome**

50 - GSFH 4.5, 4.7, 4.8; FCS 1.3 - # of discoveries, innovations, technologies that relate to human health (including cancer), nutrition and well-being (including bioactivities and botanicals), chronic Diseases, and impacts of environmental factors on health

### **Issue**

2015 Dietary Guidelines Advisory Committee report emphasized several important points. First, most U.S. adults are overweight or obese; they consume excess energy and foods and beverages that are nutritionally poor. They also have health profiles characterized by high risks of developing cardio-metabolic diseases and cancer. Second, research supports the effectiveness of consuming healthy dietary patterns, including a Mediterranean-style diet or a Dietary Approaches to Stop Hypertension (DASH)-style diet, and improving body weight body composition through diet and exercise to counter obesity and disease. Third, there is ambiguity and inconsistency in scientific literature regarding the impact of red meats in diets designed to promote health. While the overall recommendation is to reduce consumption of red and processed meats, it is not well known whether this recommendation includes lean, minimally processed red meats. Fourth, national survey data show that the majority of dietary protein is obtained by consuming animal-based foods, including meats, poultry, dairy, eggs, and fish. Recommendations to change how much of these protein-rich foods and beverages are consumed may impact not only consumer health, but agricultural infrastructure and practices.

### **What has been done**

Collectively, four research studies are focused on these important aspects of the Dietary Guidelines Advisory Report, to assess the impact of dietary protein intake and protein-rich animal-based agricultural food commodities on the effectiveness of healthy diet patterns. Specific objectives include: 1) To assess the effects of within-day patterning of dietary protein intake (even vs. skewed) on energy-restriction and strength training-induced changes in body composition, skeletal muscle size, appetite, glucose response, and metabolic syndrome parameters. 2) To assess the

health effects associated with the inclusion of greater amounts of red meat (pork and beef) versus poultry and fish into a healthy Mediterranean-style dietary pattern, which recommends restricting red meat consumption. 3) To assess associations between the quantity and sources of protein intake and body composition in a nationally representative sample of U.S. adults aged 50 years and older.

## Results

For the within-day dietary protein patterning study, findings showed: 1) The effectiveness of dietary energy restriction combined with resistance training to improve body composition is not influenced by the within-day distribution of protein when adequate total protein is consumed; 2) Consuming a rapidly digested whey protein snack two hours after a slowly digested, lower protein breakfast resulted in a greater peak plasma essential amino acids (EAA) concentration but comparable plasma EAA availability than consuming a single higher protein breakfast. Further analyses showed: 1) Concurrently with resistance training, consuming protein supplements with meals, rather than between meals, may more effectively promote weight control and reduce fat mass without influencing improvements in lean mass; 2) Whey protein (WP) supplementation improves body composition of women by modestly increasing lean mass without influencing changes in fat mass. Body composition improvements from WP are more robust when combined with energy restriction. The Mediterranean-style dietary pattern study results supported that adults who are overweight or moderately obese may improve multiple cardiometabolic disease risk factors by adopting a Mediterranean-style eating pattern with or without reductions in red meat intake when red meats are lean and unprocessed. A review of dietary recommendations regarding consumption of muscle foods, such as red meat, processed meat, poultry or fish, found studies largely rely on current dietary intake assessment methods, including: 1) food frequency questionnaires; 2) food disappearance data from the USDA Economic Research Service; and 3) dietary recall information from the National Health and Nutrition Examination Survey data. These reported methods inconsistently classify muscle foods into groups, which creates discrepancies in estimated intakes. Researchers who classify muscle foods into these groups do not consistently consider nutrient content, leading to implications of scientific conclusions and dietary recommendations. These factors demonstrate the need for a more universal muscle food classification system. Further specification would improve accuracy and precision to classify muscle foods in nutrition research. Dietary protein intake and body composition results in elderly men who consumed diets containing at or below recommended dietary allowance (RDA) for protein and had skeletal muscle dysfunction were: controlled protein intake for six months exceeding the RDA did not increase lean body mass (LBM), muscle performance, physical function, or well-being measures. The RDA for protein is sufficient to maintain lean body mass, and protein intake exceeding the RDA does not promote lean body mass increase or augment anabolic response to testosterone. Also, findings from a study of older men and women who consumed a high-protein diet with whole eggs or a normal protein diet without eggs for 12 weeks showed a high-protein diet promotes lean mass retention with modest weight loss, but does not positively influence muscle composition, cardiometabolic health or systemic inflammation, compared to a normal protein diet void of eggs. The important, novel findings may be used by scientists, health practitioners, and nutrition and health policy and program officials to develop and implement dietary guidelines to help people improve their health by consuming within-day and infradian patterns of healthy foods and beverages.

## Title

**Contracting in Agriculture: Theory and Implications for Agribusiness Management and Public Policy**

## Research

Steven Wu, Agricultural Economics

## Outcome

4 - CO 1.9 - # Of discoveries, innovations, technologies that relate to economic and/or community policies that impact childhood obesity (e.g. serving sizes/products available in schools, legislation regulating drink sizes/refills such as in NY, etc.)

## Issue

A rigorous study of modern food marketing requires agricultural economists to adopt and make methodological improvements to economic tools, such as contract theory (the study of incentive and pricing design). The methodological toolkit currently used is based on older models appropriate for studying small producers and consumers.

Modern agribusinesses are large, sophisticated and characterized by substantial strategic interaction with suppliers and customers. Contracting is pervasive and essentially incentive mechanisms to coordinate marketing strategies. Contracting models are useful for studying strategic pricing schemes that provide incentives to consumers to purchase more or to self-select into different market segments. According to MacDonald and Korb (2011), use of contracts in agriculture has been increasing over the last several decades. In 1969, contracts governed only 12% of the total value of U.S. agricultural production, but this has increased to 39% in 2008. For specific commodities such as hogs, poultry, and many fruits and vegetables, contracts dominate most production. Contracts are pervasive between food manufacturers and wholesalers and/or retailers, yet agricultural economists have not studied these downstream contracts in a rigorous manner (Myers, Sexton, and Tomek 2010). Food retailers are using increasingly sophisticated marketing and strategic pricing schemes to market food to consumers. Lack of methodological development in contract theory within the agricultural economics community has limited ability of agricultural economists to study important contemporary policy issues.

#### What has been done

This research focused on food marketing and contract theory (the study of how incentives and strategic pricing mechanisms should be designed to induce people to enhance productivity, minimize costs, purchase products, and/or achieve social objectives in policy making). However, contract theory has limited real-world application. Activities were to: 1) Make methodology improvements to theoretical contracting models to be more robust for applied work - that is, imposing minimal critical assumptions. 2) Test the models and their robustness using experimental economics. 3) Use the models that have been successfully stress tested to investigate relevant contemporary agribusiness or food policy issues.

#### Results

The main accomplishment was completion of a theoretical model that makes predictions about how people will structure contracts across different contract enforcement institutions. A key distinguisher of different enforcement institutions is the availability of performance measurement technologies that can enable third-party verifiability (e.g. by courts or arbitrators) of contractual performance. Next, researchers examined how people structure contracts in different trading environments, including several thousand longitudinal trade observations. A key finding was that the contracting party with stronger bargaining position will design contracts that shift more risk onto the weaker party. Also, people tend to contract for lower performance objectives when they worry about counter-party risk. These results lend insight into how contracts should be structured to minimize counter-party risk especially when there is market power. Finally, research examined contracting models related to the New York City ban on sodas in large containers, taxes on soda, and who gains and who loses from the restriction. The key finding is that the size-restriction predicted to reduce the size of sodas across all size categories, actually caused a decrease in size of the large soft-drink only. Sellers will keep the size of smaller drinks unchanged. This should lead to a reduction in consumption only by heavy soda consumers, which appears politically desirable. Low-consumption consumers will largely be unaffected. Soft-drink consumers will suffer more welfare losses under the tax than the size restrictions because the price per ounce will increase under the tax. Not surprisingly, soft-drink sellers are likely to have their profits reduced. These studies provide insight into the marketing and contracting related to agribusinesses.

#### Title

Jackson and Lawrence Counties Address Obesity with Evidence Based Interventions

#### Extension

Donna Vandergraff, Martha McDavid, Timothy Gavin, Molly Marshall, Tanya Hall

#### Outcome

48 - # of counties that have active health coalitions

#### Issue

In 2012, Jackson and Lawrence Counties had an adult obesity rate over 40%, the highest in Indiana. Obesity is linked to negative health outcomes like diabetes, heart disease and some cancers. Regular physical activity and healthy eating can help reduce these risks but, citizens of rural areas and from low-income backgrounds are less likely to have access to

recreation opportunities, and fresh and healthy food retail. Amenities and services that promote healthy behaviors tend to be primarily available residents in particular geographic areas. Rural communities often have limited resources (e.g., capital, leadership) which may fuel negative perceptions that there is little support to improve health outcomes or improve health promotion efforts.

#### What has been done

With six counties added in 2018, now Indiana has a total of 48 counties with one or more active health coalitions. In Jackson County, the Healthy Jackson County Coalition, and in Lawrence County, the Live Well Lawrence Coalition, represented small groups of individuals who saw a need to develop new opportunities for health in their communities. The Healthy Jackson County Coalition aims to: 1) lead efforts focusing on communication, education, access, sustainability, and collaboration among community members, 2) provide and promote access to healthy foods, 3) provide education and promotion on how to use and consume healthier foods, and 4) provide opportunities for all community members to participate in physical activity. The Live Well Lawrence Coalition aims to: 1) establish a community voice for health across the entire county, 2) enable and support local organizations to integrate healthier food options, and 3) promote the many free physical activity opportunities across the county to community members. Both coalitions were motivated to pursue projects and programs but, general support had waned over the past few years. Both coalitions were poised for a revitalization and redirection to pursue policy, system, and environmental (PSE) changes to foster long-lasting health benefits in their communities. To avoid common pitfalls of coalitions (members focus on leading single, short-term activities and programs, and ignoring operating structures and processes) and to support a long-lasting coalition that initiates sustainable change, considerable time and resources were devoted to supporting coalition function, partnerships, and leadership. The work of these coalitions provided the context to seek Centers for Disease Control and Prevention (CDC) funding for the health of Jackson and Lawrence County citizens. A vital aspect of the partnership between the CDC and Purdue was to ready citizens in both counties to support healthy lifestyles in their hometowns long after the grant period ended. Purdue Extension team members focused on building coalitions that used evidence-based practices to pursue their aims. Purdue Extension led initial meetings on establishing trust, building partnership, and learning about organizations and people that share common interests and goals, focusing members on sustainability by educating them on the importance of PSE changes, facilitating transition to more community-led leaders by establishing committee chairs and mentoring potential leaders, and building momentum for coalition activities by pursuing quick victories to keep members energized and committed. Many activities required onboarding of new partners and community leaders. The coalitions steered clear of hosting single events (e.g., half marathons) and, instead, worked to educate the public, change environments, and make policy changes to instigate longer lasting change.

#### Results

Community accomplishments for Healthy Jackson County Coalition included: 1) Safety activities: new downtown crosswalks and bike lanes in Seymour, updated and additional crosswalks near schools and public pool in Brownstown, and, purchase of the comprehensive CATCH health promotion curriculum for after-school and preschool nutrition and physical activity programs in Seymour, Brownstown, Medora and Crothersville. 2) Increasing healthy food consumption activities: School wellness policy for over 6,900 students in Seymour, Medora, Brownstown, and Crothersville schools, Farmers Market SNAP benefit promotion, distribution of healthy food donation guidelines, gardening projects led at youth clubs, healthy concession stands at schools and youth sport leagues for over 32,000 residents and at city recreation facilities for over 76,000. 3) Physical activity efforts: exercise ideas signage on Refuge Trails with 170,000 annual visitors, "walk your city" signage in Seymour with 48,000 visitors per year, and improved crosswalks, bike lanes, and new fitness equipment in Seymour for over 48,000 potential users. Community accomplishments for Live Well Lawrence Coalition included: 1) Safety activities: National Walk to School Day, active routes to school, and reflective paint on crosswalks in Mitchell, complete streets policy in Bedford, and continued work to establish Mitchell as a Trail town. 2) Increasing healthy food consumption activities: school wellness policy for 6,200 students, healthy concession stands for over 6,000 participants, and healthy food pantry donation guidelines for facility with 19,000 people served. 3) Physical activity efforts: established the Blue Jacket Trail for 45,000 residents with 1.1 miles of marked walking trail with signage, online map of trail system, adult outdoor exercise equipment for Mitchell, Judah, Fayetteville, and Springville, and installation of bike racks, benches, and active transportation signage on Main Street in Mitchell. As demonstrated by the reach and leveraged funds, the coalition influence extends beyond the activity and serves as a mobilizer of new people and places to support the health of citizens.

## Title

Food systems, health, and well-being: Understanding complex relationships and dynamics of change

## Research & Extension

Bhagyashree Katare, Agricultural Economics

## Outcome

5 - HHS 1.3 - # of discoveries, innovations, technologies relation to Health Disparities

## Issue

Major health issues arise from the American food system, as prevalence reports show food-related issues: chronic disease (such as diabetes, cancer, and heart disease), obesity and food insecurity. Understanding why and how obesity rates are stabilizing among some groups while increasing in others is key to developing strategies for decreasing obesity across populations. One link is the connection between obesity and food insecurity. Nearly 15% of households (over 50 million people) were food insecure in 2008 (up from 11% in 2007), meaning that at times they did not have enough money for food. Many food-related health problems disproportionately affect children, women, ethnic minorities, and low-income people. Addressing food insecurity, nutrition, and food-related diseases, requires understanding of the processes of institutional change, structural conditions, perceptions, and decision-making. As the obesity epidemic dominates healthcare, prevention and treatment, and as food insecurity increases, nutritionists are beginning to understand that efforts must move beyond individual behavior change. New and community-engaged approaches to conceptualization, study, outreach and integration are needed to address constraints to health and well-being including obesity, food insecurity, diabetes and other chronic diseases.

## What has been done

This project examines family, community, and institutional dynamics to better understand how the food system influences individual and population health. This includes investigating the interaction between food consumption by families and how family food selections are influenced by interactions family members have with one another and with their food environments. Activities included: 1) Analyze best practices proven effective at increasing individual, household, and community food and nutrition security, and identify individual and systemic strategies for developing and disseminating initiatives to improve food and nutrition security. 2) Utilize food systems approaches to assess and address nutrition, health, and wellness challenges of vulnerable population groups (e.g., children, elderly, low income, immigrant, minority) with focus on food availability, appropriate policy systems and environmental changes. 3) Assess key strengths and weaknesses of current public and private emergency food assistance systems relevant to improving food security and addressing the health and nutritional needs of program participants.

## Results

Researchers developed an innovative, reliable, and validated tool to measure perceptions of participants of direct education programs that affect their access to food and physical activity. Results showed a classroom nutrition education program was able to increase student knowledge about fruits and vegetables, recognition and nutrition content, but there was no effect on increasing consumption of fruits and vegetables. For individual perception of the environment on health outcomes, Extension educators collected data from 1,743 SNAP-Ed participants from seven Northern and Central states about food, physical environment, and self-reported health characteristics. Participants were: 78% females, average age 44.43 years. 42% married, 41% employed, 55% reside in urban areas, and 59% non-Hispanic white. There were 43% classified as obese and 74% overweight. More than 68% agreed there is a large selection of fresh fruits and vegetables available, while 82% agreed there are plenty of opportunities for purchasing fast food. 75% shop for most of groceries at supermarkets or super stores, and these stores were, on average, 4.5 miles from their homes. Preliminary analysis shows individual perception about food environment is associated with health outcomes (obesity and BMI). For SNAP effect on nutrition, several groups of participants and non-participants were studied. Findings do not suggest a large impact of SNAP on food choice, and do not support a claim that SNAP has a negative effect on nutrition. For a study on effectiveness of an unobtrusive method (nudge) to encourage choice of healthier food items in a client-choice food pantry, food items were given a zero to three stars for nutritional value. Before entering, clients were randomly assigned to treatment or control groups. Treatment group clients completed a

survey with nutritional rating sheet for pantry items, and clients indicated likelihood of selecting them. Control group clients completed the survey only. After clients selected pantry items, researchers recorded selected food items. All of these research activities will help to increase understanding of problems and solutions in systems of the food, nutrition and health in our communities.