## V(A). Planned Program (Summary)

**Program # 4**

**1. Name of the Planned Program**

Childhood Obesity

☑ Reporting on this Program

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 701 | Nutrient Composition of Food | | | 10% | 10% |
| 702 | Requirements and Function of Nutrients and Other Food Components | | | 5% | 5% |
| 703 | Nutrition Education and Behavior | | | 10% | 10% |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources | | | 5% | 5% |
| 724 | Healthy Lifestyle | | | 25% | 25% |
| 802 | Human Development and Family Well-Being | | | 10% | 10% |
| 805 | Community Institutions, Health, and Social Services | | | 5% | 5% |
| 806 | Youth Development | | | 25% | 25% |
| 903 | Communication, Education, and Information Delivery | | | 5% | 5% |
| | **Total** | | | 100% | 100% |

## V(C). Planned Program (Inputs)

**1. Actual amount of FTE/SYs expended this Program**

| Year: 2012 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 0.0 | 0.0 | 10.0 | 10.0 |
| Actual Paid Professional | 0.0 | 0.0 | 14.0 | 10.0 |
| Actual Volunteer | 0.0 | 0.0 | 0.0 | 0.0 |

**2. Institution Name:** Auburn University

**Actual dollars expended in this Program (includes Carryover Funds from previous years)**

| Extension | | Research | |
|---|---|---|---|
| **Smith-Lever 3b & 3c** | **1890 Extension** | **Hatch** | **Evans-Allen** |
| 0 | 0 | 784000 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 784000 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

**2. Institution Name:** Alabama A&M University

**Actual dollars expended in this Program (includes Carryover Funds from previous years)**

| Extension | | Research | |
|---|---|---|---|
| **Smith-Lever 3b & 3c** | **1890 Extension** | **Hatch** | **Evans-Allen** |
| 0 | 0 | 0 | 232075 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 0 | 377013 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

**2. Institution Name:** Tuskegee University

**Actual dollars expended in this Program (includes Carryover Funds from previous years)**

| Extension | | Research | |
|---|---|---|---|
| **Smith-Lever 3b & 3c** | **1890 Extension** | **Hatch** | **Evans-Allen** |
| 0 | 0 | 0 | 679973 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 0 | 0 | 0 | 651824 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

This program was named Childhood obesity, but the program was expanded to include all human health-related issues.

Research was conducted to study of molecular and cellular mechanisms of obesity, mapping of obesity-related traits in the genomes using animal models, surveys on lifestyle habits (food choice, exercise) of citizens, evaluation of underlying reasons for these habits, program development for improvement, and measuring adoption of improved diets and activity levels. Research will also be conducted on, for example, animal production such that meat products are healthier. In addition, research activities explored non-traditional means of delivery of nutritive components. Research results were shared with extension personnel for further dissemination, particularly to county agents, consumers, and community leaders. Additional dissemination of results are through direct contact (such as survey participants and community gatherings), through publications (experiment station bulletins, on-line reports, press releases, as well as scientific journal articles), and may include non-traditional efforts, such as working through community and faith-based groups.

Specifically some highlights of activities included using avatars as a part of a multi-faceted intervention program to prevent childhood obesity in Alabama; studies for linkages between identity development and romantic relationship beliefs and experiences in a sample of rural and urban African-American and white communities; studies to demonstrate sleep as a support for social, emotional, and cognitive development in children; and a number of studies of food additives, functional foods in prevention of diabetes and obesity.

Studies were conducted to assess the Influence of forest cover on incidence of West Nile Virus. A project in the School of Forestry and Wildlife Sciences, led by Dr. Graeme Lockaby, is focused on the relationships among forest cover, climate variability, and mosquito vectored diseases such as West Nile Virus (WNV). The USDA funded project includes collaboration with the US Forest Service and the Epidemiology Department at the University of Alabama at Birmingham. Mosquito vectored diseases such as WNV, malaria, dengue, and yellow fever are responsible for killing the most people in history. West Nile virus, the most important mosquito transmitted pathogen in the US, has infected cc. 3 million people and sickened at least 780,000 in the US since its arrival in 1999 and, in 2012, reached very high incidence rates in the southeastern US. Mosquitoes depend very heavily on their environment for their survival and reproduction and, in the Southeast, much of that environment is influenced by the presence or absence of tree cover. Mosquitoes lay their eggs on or near natural water bodies and artificial containers, in which their larvae develop. This association with water explains the importance of precipitation and temperature for these insects, factors which vary widely between forested vs. non-forested cover. Also, water pollution and unstable hydrology, two factors which are associated with loss of forest cover and increases in impervious surfaces, contribute to larval success. In this project, the hypothesis that hydrologic changes and reduced water quality lead to increased mosquito populations, and therefore an increased risk of transmission of WNV is being tested. A combination of field and laboratory studies were used to uncover the mechanisms that cause incidence to increase as urbanization takes place. Both environmental (e.g. forest structure) and socio-economic (e.g. income) factors were analyzed in unison. Preliminary results suggest that mosquitoes can reproduce in water quality levels associated with land use conversion from forest to urban and that transmission risk increases with increasing impervious cover and decreases as incomes rise.

Research was conducted to determine the relationship of snacking and overall diet quality among adults. It was found that snacking was not associated with poorer overall diet quality, but was associated with a slightly more nutrient-dense diet. Total fruit, whole fruit, whole grains, milk, oils, and sodium component scores were positively associated with snacking frequency. This study is the first to show that snacking is positively associated with overall diet quality. Contrary to expectation, snacking was associated with a slightly more nutrient- dense diet. Much of the literature on snacking has focused on the contribution it may have on single nutrient intakes; however, this focus may overlook the total nutritional impact of snacking.

Research was conducted to assess impact of emotional health on development of infants and toddlers when they are in full day, non-parental childcare settings. Longitudinal results indicate that negative emotions are experienced more frequently, at greater intensity, and for a longer period of time

than is generally suggested from past theory/research. The findings have implications for child-care providers, teachers, and parents.

Research was conducted to determine Biopsychosocial Factors in Economically Disadvantaged Preschool Children's Adjustment. Responses to stress were measured with physical responses, including changes in heart rate, vagal tone (which reflects a person's ability to physiologically calm himself or herself), speed of heart contractions (which reflects the intensity of the fight or flight response), and stress-hormone levels. Associations were made between children's responses to stressful situations and to interactions with their parents. Evidence for cross-generational continuity in risk is being accrued.

Research was conducted to study peer stress in preadolescence: psychophysiological and coping responses. Longitudinal research found that some children show suggested maladaptive patterns of over-responsiveness to peer stress. In particular, socially anxious preadolescents who experienced elevated levels of peer victimization were particularly susceptible to physiological indices of emotional arousal (e.g., higher heart rate, lower respiratory sinus arrhythmia) in the context of common peer stress experiences, as well as higher aggressive and lower pre-social behavior. Other analyses have suggested maladaptive patterns of under-responsiveness to peer stress. For example, associations between peer victimization and aggressive behavior were stronger among preadolescents who exhibited lower levels of electrodermal reactivity to peer stress, compared to preadolescents who exhibited higher levels of electrodermal reactivity. In addition, preadolescents who exhibited lower levels of respiratory sinus arrhythmia reactivity and reported higher levels of disengaged coping were rated by teachers as particularly low in social competence, compared to preadolescents with more engaged physiological or coping responses.

Studies were carried out using avatars to assist children in determining healthy weight and size. Eighty six percent of the students reported that seeing the avatar change in size helped them think about maintaining a healthy weight. Seventy-six percent of the students reported that seeing the avatars could help them think about their own best, healthy body size. Children in the intervention group showed an increase in their overall knowledge, attitudes, and beliefs about nutrition over time compared to the other children. The intervention group substantially improved on their overall knowledge after involvement in the intervention, and improved their intentions to choose healthier. Intervention children also showed improvement in choosing the correct responses about which food items had more fat when compared to the other children. Finally, the intervention group increased their general nutrition knowledge regarding fat, sugar, food labels, and smart food decisions.

Dr. Mathews' research showed that serum phosphorylated fetuin A concentrations were significantly elevated in diet-induced obese mice compared to their lean counterparts, and showed a positive correlation with insulin resistance. In response to an oral glucose challenge, plasma concentrations of phosphorylated fetuin-A levels demonstrated a temporal increase in mice fed regular chow. However, in the diet-induced obese mode, plasma phosphorylated fetuin-A levels showed a significant temporal decrease. These findings suggest that phosphofetuin-A may be dynamically involved in the insulin response.

Dr. White's work found that hepatic glucose production from lactate is inhibited in diabetic rats chronically treated with leptin in an isolated perfused liver system, as well as in primary hepatocytes cultured from livers of leptin-treated diabetic rats. In addition, a large dose of IP glucagon did not increase the absolute blood glucose concentrations of leptin-treated diabetic rats to levels observed in vehicle-treated diabetic rats. Therefore, it appears that leptin-treated diabetic rats are resistant to the effects of glucagon, which may help explain why leptin treatment of diabetic rats normalizes blood glucose concentrations to that of nondiabetic rats. Glucagon did not increase or maintain blood glucose concentrations in leptin-treated diabetic rats as it did in vehicle-treated diabetic or nondiabetic rats. Leptin treatment appears to decrease the responsiveness to glucagon, contributing to the normalized blood glucose concentrations of leptin-treated diabetic rats.

Research conducted by Dr. Huggins has shown that SDA inhibits adipocyte differentiation by decreasing expression of adipogenic transcription factors and adipogenic lipid-accumulation genes in a dose-dependent manner in 3T3-L1 cells. SDA also inhibited triglyceride accumulation in a dose-dependent manner. Similar effects were seen with the omega-3 fatty acids DHA and EPA. The omega-3 fatty acid, ALA, did not inhibit adipocyte differentiation of 3T3-L1 cells to the same extent as SDA. Dr. Huggins work

has shown that SDA inhibits LPS-induced inflammation to a similar extent as fish-oil omega-3 fatty acids (DHA and EPA). SDA decreased gene expression of tumor necrosis factor-alpha and interleukin-6.

Dr. Jeganathan's work has addressed 1) the interaction of p62 with IRS-1 on insulin stimulation, 2) mapped the interaction domain of p62 with IRS-1, 3) analyzed the involvement of p62 in insulin signaling. His studies demonstrate that IRS-1 interacts with p62 on insulin stimulation. Mapping studies demonstrated that the SH2 domain at the amino terminus of sequestosome 1 / p62 interacts with IRS-1 upon insulin stimulation. Further, IRS-1 interacts with p62 through its YMXM motifs at Tyr-608, Tyr-628, and/or Tyr-658 in a manner similar to its interaction with p85 of PI-3 kinase. Overexpression of p62 increased phosphorylation of Akt, GLUT4 translocation, and glucose uptake, providing evidence that p62 participates in the insulin-signaling pathway through its interactions with IRS-1.

Dr. Bub's findings speak to the importance of children's physical and emotional well-being for their academic success. In particular, she has documented the effects of sleep problems on children's academic and adjustment outcomes. Her research also is improving understanding of how social skills are related to achievement (and thus address whether a whole child approach to education is more effective than targeted academic reform efforts).

Drs. Kwon's and Chattaraman's findings of the usability testing of the prototype conversational agents show a significant role of the use of conversational agents in enhancing the interactivity and social presence of an Internet interface for older users. Preliminary results demonstrate that for older users, agents that play the role of a doer by performing actions on behalf of the users may more effectively enhance their interactivity with an Internet interface than do agents that play a mere helper or facilitator role. The findings also provide insight into potential effects of the increased interactivity and social presence through the use of agents in eliminating cognitive and socio-psychological barriers older users may face in adopting Internet applications.

At Tuskegee University, research physical activities and healthy food choices is focused on pre K and K students in underserved communities particularly, the Black Belt counties. A Color Me Healthy curriculum is being implemented in the classes to learn about healthy food choices. Fruits and vegetable gardens planted by the students are used to provide practical lessons of healthy food choices.

**2. Brief description of the target audience**

All state citizens, particularly targeted groups of children and high-risk citizens. Students (K through 12; college groups). Food producers and marketers.

**3. How was eXtension used?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2012 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 50000 | 200000 | 10000 | 60000 |

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2012 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 10 | 86 | 96 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- publications

| Year | Actual |
|---|---|
| 2012 | 96 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Optimal nutritional recommendations made available to citizens |
| 2 | Public awareness of the relationship of healthy food and wellbeing and obesity |
| 3 | Reduction in obesity and overweight rate (66.6% in 2008) in population and children, and reduction of the level of obesity |
| 4 | health care cost will be lowered as a result of obesity reduction. |

**Outcome #1**

**1. Outcome Measures**

Optimal nutritional recommendations made available to citizens

Not Reporting on this Outcome Measure

**Outcome #2**

**1. Outcome Measures**

Public awareness of the relationship of healthy food and wellbeing and obesity

**2. Associated Institution Types**

- 1862 Research
- 1890 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2012 | 100500 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The public need to know the relationship of the food they consume and the obesity

**What has been done**
A serious of research projects, educational programs and extension programs were developed to provide awareness in an effort to reduce obesity.

**Results**
Alabama is still one of the most obese states in the country. However, the public awareness has been enhanced. A number of educational and outreach programs targeted to reduce obesity in the state has been extremely successful.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 701 | Nutrient Composition of Food |

| | |
|---|---|
| 703 | Nutrition Education and Behavior |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 724 | Healthy Lifestyle |
| 802 | Human Development and Family Well-Being |
| 805 | Community Institutions, Health, and Social Services |
| 806 | Youth Development |
| 903 | Communication, Education, and Information Delivery |

**Outcome #3**

1. **Outcome Measures**

Reduction in obesity and overweight rate (66.6% in 2008) in population and children, and reduction of the level of obesity

Not Reporting on this Outcome Measure

**Outcome #4**

1. **Outcome Measures**

health care cost will be lowered as a result of obesity reduction.

Not Reporting on this Outcome Measure

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (catastrophic food poisoning)

**Brief Explanation**

The economic down turn may have had a negative impact on human health, wellbeing, and happiness, which may have increased the level of obesity.

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

Research in this area has allowed a better understanding of the factors that influencing human health, wellbeing, and happiness. Other than nutrition, a number of social factors are also very important to child development and their eventual success. In particular, a number of studies have documented the impact of stress, child relationship with day care, sleep and other factors on success of the children.

Seniors are increasingly finding the necessity to engage in Internet technology (e.g., online healthcare management, banking, shopping, and trading). Despite its usefulness, the adoption of the Internet among a large majority of the older population has been limited. Dr. Kwon's AAES research projects have allowed for discovery of the physical, cognitive, and social issues which lead to impediments in technology usability among older users. Further, Dr. Kwon and her collaborators have developed web-based interfaces incorporating innovative intelligent virtual agent technology that significantly reduces older users' physical, cognitive, and social barriers to Internet adoption. This research have significant implications for qualify of life among the elderly community by fostering greater independence and empowerment, facilitating social interactions and communications, and bolstering self-efficacy and morale among seniors.

• Associations between individuals' frequency of eating occasions (meals and snacks) and their total energy intake was found. The prevalence of obesity has been found to be especially high among those individuals with low-incomes and subsequently having a low-income is one of the most important determinants of food insecurity (the absence of access at all times to enough food for an active, healthy life).

• Children in full-day preschool/daycare programs are (on average) suffering a sleep deficit during the work week (i.e., when they would be attending the child care program) and this deficit is not made up by daytime naps (El-Sheikh et al., in press). Children's overall sleep organization (e.g., duration, time awake while in bed, number of times waking after initial sleep onset) are significantly correlated (that is, children with less optimal night time sleep tended to have less optimal daytime sleep as well). Importantly, sleep disturbances (either in duration or in overall sleep quality and organization) interfere with children's adaptive functioning in the preschool setting. Children whose sleep quality-sleep

Training sessions for youth on developing competencies in nutrition and healthy leaving showed that majority of the students after the training programs have shown willingness to make positive change in their eating habits and healthy life style.

Organization is disturbed at night were less able to organize story narratives in a coherent and meaningful way than were children whose night time sleep was less disturbed. Children who had less overall night time sleep received lower scores on standard tests of vocabulary knowledge, were less accepted by their peers, understood less about the causes of emotion states in others, and were described by their teachers as less well adjusted in the classroom, in comparison to children who had relatively more night time sleep.

• Children who experience harsh or insensitive care are at greater risk for development of social, psychiatric, and physical health disorders. A key to understanding the long reach of early relationships appears to be activity of the stress-response systems, including the hypothalamic-pituitary-adrenal (HPA) axis and its primary end product in humans, cortisol. Poorer quality care in early childhood leads to dysregulation of the HPA axis, which in turn triggers a wide range of maladaptive processes. This work is likely to have high impact because the most salient sources of stress in the lives of young children are poor quality relationships with care givers. Decades of research document increased risk for children who grow up in persistent poverty or with harsh or insensitive parents, particularly if those adverse circumstances are present very early in the child's life. Only now, however, are researchers beginning to identify the biological processes that link early adversity to life-long health. Research linking parent-child and teacher-child relationships with key components of the

stress response will be key in understanding of biochemistry and social success.

**Key Items of Evaluation**

• Research at Auburn in this program area has focused on the relationship of a number of factors affecting human health, wellbeing, and obesity. In particular, researchers have focused on eating habbits such as individuals' frequency of eating occasions (meals and snacks) and their total energy intake, sleep patterns and health, stress and social development, and the adoption of the Internet communications with the happiness and wellbeing of the eldly. The following are some of the key findings:

• The prevalence of obesity has been found to be especially high among those individuals with low-incomes and subsequently having a low-income is one of the most important determinants of food insecurity (the absence of access at all times to enough food for an active, healthy life).

• Children in full-day preschool/daycare programs are (on average) suffering a sleep deficit during the work week (i.e., when they would be attending the child care program) and this deficit is not made up by daytime naps (El-Sheikh et al., in press). Children's overall sleep organization (e.g., duration, time awake while in bed, number of times waking after initial sleep onset) are significantly correlated (that is, children with less optimal night time sleep tended to have less optimal daytime sleep as well). Importantly, sleep disturbances (either in duration or in overall sleep quality and organization) interfere with children's adaptive functioning in the preschool setting. Children whose sleep quality-sleep organization is disturbed at night were less able to organize story narratives in a coherent and meaningful way than were children whose night time sleep was less disturbed. Children who had less overall night time sleep received lower scores on standard tests of vocabulary knowledge, were less accepted by their peers, understood less about the causes of emotion