

**The Relationship between Computer Expertise and Obesity
in the Black Belt Region of Alabama**

by

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Abstract

This study deals with the relationship between computer expertise and obesity in the Black Belt region of Alabama. On the surface these concepts may seem unrelated. However, access to the internet has been associated with a plethora of positive outcomes related to overall quality of life including increased civic engagement (Tolbert & McNeal, 2003) and social capital building activities (Kavanaugh & Patterson, 2001). Non-hispanic blacks, Hispanics, those who did not graduate from high school, low income individuals, and older adults are affected by obesity to a greater degree (CDC, 2010; Wang & Beydoun, 2007). Recent studies have indicated increased computer use among all segments of the population; however, minorities and low-income populations lag behind in adopting some of these technologies (Fox, 2011).

Data was collected from residents of the Black Belt region of Alabama. The assessment instrument was modified from a Computer Expertise (CE) questionnaire developed by Arning and Ziefle (2008). The instrument was modified by adding questions concerning demographics and obesity. A Pearson correlation indicated a small, negative relationship ($r(304)=-.161, p=.002$) between basal metabolic index (BMI) and CE score. When race/ethnicity was included in the model, regression analysis revealed that the CE score failed to explain a significant portion of the variance in BMI. However, search engine knowledge, laptop use, and obtaining health information from television were found to be significant predictors of BMI. The finding that search engine

knowledge was associated with reduced obesity indicates that information literacy may be an important factor in solving the complex obesity challenge. Since basic literacy is a foundation of both health literacy and information literacy, the results of this study emphasize the importance of various types of literacy in improving health and overall quality of life.

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Chapter 1

Introduction

Over the last several decades, obesity levels in the United States have risen dramatically. In 2010, Flegal and colleagues reported that 68% of adults were overweight (BMI >25) or obese (BMI>29.9) (Flegal, Carroll, Ogden, & Curtin, 2010) compared to 44.8% in 1962 (Wang & Beydoun, 2007). Obesity is considered a leading indicator of overall health and is associated with increased risk of coronary heart disease (Galanis, Harris, Sharp, & Petrovitch, 1998), endometrial cancer (Weiderpass, Persson, Adami, Magnusson, Lindgren, & Baron, 2000), diabetes, high blood pressure, high cholesterol, asthma, arthritis, and poor general health status (Mokdad, Ford, Bowman, Dietz, Vinicor, Bales, & Marks, 2003). In 2001, Sturm and Wells investigated the impact of obesity on health compared to other risk factors which were receiving a great deal of national attention at the time. These researchers found that obesity has a greater impact on health related quality of life than poverty, smoking, or drinking alcohol. In addition to increased morbidity, obesity is associated with higher mortality. An estimated 111,909 additional deaths occur each year in the United States due to obesity related illnesses (Flegal, Graubard, Williamson, & Gail, 2005). Furthermore, morbidity and mortality costs the United States economy 147 billion dollars a year (Finkelstein, Trogon, Cohen, & Dietz, 2009). In 2009, 26.7 % of individuals nationwide were obese (Centers for Disease Control and Prevention [CDC], 2010). In the state of Alabama the problem is even more prevalent. In 2009, 31% of the population was obese (CDC,

2009) and in the Black Belt region specifically, the obesity rate was 41.2% or 54% higher than the national average (CDC, 2008; U.S. Census Bureau, 2010).

Recently, several educators have made an effort to use technology to reach traditionally underserved audiences. In San Diego and New Orleans, the Centers for Disease Control and American Diabetes Association launched a mobile initiative to reach undiagnosed diabetics via text (Endocrine Today, 2011). This program was modeled after a nutrition program in which new mothers received tips and nutrition information via text. Whereas the use of web based information would have limited reach for this population, the use of texting shows that health outcomes can be improved when the right technology is targeted to specific populations.

Statement of the Problem

The reason for high obesity rates in the Black Belt is a complex combination of genetics, culture (behavior), and environment. Demographic differences can partially explain the elevated obesity rates. The Black Belt has a high proportion of minorities, low education levels, and high numbers of older adults compared to state and national averages (U.S. Census Bureau, 2010). Non-hispanic blacks, Hispanics, those who did not graduate from high school, low income individuals, and older adults are affected by obesity to a greater degree (CDC, 2010; Wang & Beydoun, 2007). Furthermore, the lack of availability of healthy foods can be a deterrent to healthy eating. Morland, Wing, and Roux (2002) studied the distribution of grocery stores in poor versus wealthy neighborhoods and Caucasian versus African American neighborhoods. These researchers found that there were four times more supermarkets in Caucasian neighborhoods and three times as many supermarkets in upper income neighborhoods.

Intuitively, increases in fruit and vegetable consumption were also found for individuals living in close proximity to a grocery store. Interestingly, they noted that the effect was more pronounced in the African American population, perhaps due to the saturation of grocery stores in Caucasian neighborhoods.

There is a lack of research examining the relationship between computer expertise and obesity. On the surface these things may seem unrelated. However, access to the Internet has been associated with a plethora of positive outcomes related to overall quality of life including increased civic engagement (Tolbert & McNeal, 2003) and social capital building activities (Kavanaugh & Patterson, 2001). Wikis, blogs, and podcasts used to provide the public with health information have been found to be easy to implement, easy to use, enhance learning experiences, and enhance collaboration and engagement (Boulos, Maramba, & Wheeler, 2006). For breast cancer patients, the use of an online support system resulted in increased social support, reduced negative emotions, increased participation in health care, and improved information competency (Gustafson, McTavish, Stengle, Ballard, Hawkins, Shaw, Jones, Julesberg, McDowell, & Chen, 2005). The literature reflects conflicting reports of the mechanism in effect. Those that are younger, more educated, and urban are more likely to have broadband and individuals with a broadband connection are more likely to use the Internet for health-related information (Rains, 2008).

Studies have found computer access to be the major limiting factor preventing the use of technology to improve health (Brodie, Flournoy, Altman, Blenton, Benson, & Rosenbaum, 2000; Gustafson, McTavish, Stengle, Ballard, Hawkins, et al., 2005). However, having access and being able to use a computer to enhance quality of life are

two different things. The later requiring a minimal level of computer expertise. Smith (2010) has reported that 80% of non-Internet users do not know enough about computers to use the Internet on their own. For these reasons, we have investigated the relationship among Internet access, computer expertise, and obesity as an indicator of overall health.

Theoretical Framework

This study adds to the growing body of information which suggests that technology is a key feature in quality of life. Recently, Mohr (2010) analyzed data collected for the PEW Internet and American Life Project and found a positive association between ownership of mobile devices, e.g. cell phones and lap top computers, and self-reported quality of life. Mohr (2010) further proposed that this association represents a psychological dependency that has been brought about by the rapid advancement of technology, specifically, the Internet. The current study, dealing with the relationship between technology and health, also has its roots in classical psychological theory. Technology may help individuals move through Maslow's hierarchy in several ways. First, having access to the Internet or possessing computer skills may help individuals by creating job opportunities and providing access to health services and information (Maslow's safety). Second, having access to the Internet and social networking opportunities may help individuals find friends and increase the number and quality of supportive relationships (Maslow's esteem). Finally, technology may facilitate self-directed learning opportunities and content creation (Maslow's self-actualization) (Maslow, 1943).

Knowles (1990) assumptions about adult learners can help explain the incredible success of the Internet as a mechanism of self-directed learning. Knowles theorized that andragogy, or the idea of helping adults learn, was based on the following six assumptions about the adult learner: 1) the need to know, 2) the learner's self-concept, 3) the role of the learner's experience, 4) readiness to learn, 5) orientation to learning, and 6) motivation. Technology may be applied to these assumptions in many ways and at many stages throughout a lifetime. For example, as the learner's self-concept evolves, the learner becomes more independent and better able to find solutions to the challenges of life. The Internet is a useful tool for acquiring information on one's own and thus increases an individual's independence. Likewise, the 24/7 information access that the Internet provides, facilitates the learner being able to access information when the learner is ready to learn.

Purpose of the Study

The purpose of this study was to examine the relationship between computer expertise and obesity as an indicator of health across race, age, gender, education level, and socioeconomic status. Fox (2011) indicated increased computer use among all segments of the population; however, minorities and low-income populations lag behind in adopting some of these technologies. Similar demographic trends exist for obesity rates (CDC, 2012; Jolliffe, 2011). Home broadband usage across all segments of the population averages 66% while only 56% of African American's, and 45% of low income families have broadband Internet access at home (Smith, 2010). Not knowing how to use a computer is cited as a common barrier to using the Internet (Smith, 2010).

Consecutively with the increase in obesity rates, the rise of technology has created additional disparities which affect the population of the Black Belt. Over the last 20 years, computer use has increased dramatically. According to Hampton, Sessions, Her, and Rainie (2009), 79% of adults in the United States are Internet users. This change in our society has brought about concern that technology may be affecting quality of life and may be creating a digital divide of computer savvy versus non-savvy community members. Similar to the problem of obesity, the digital divide cuts along ethnic, age, education, and income lines (Brodie, Flournoy, Altman, Blenton, Benson, & Rosenbaum, 2000).

Research Questions

The following research questions were examined in this study:

1. What is the relationship between computer expertise and obesity?
2. What is the relationship between high speed Internet access at home and obesity?
3. When demographic characteristics are controlled, to what extent does the type of Internet access predict obesity?
4. When demographic characteristics are controlled, to what extent does computer expertise predict obesity?
5. Is there a relationship between obesity and those who seek health information online?

Significance of the Study

Despite attempts to reduce obesity levels in the United States, the current trend indicates that levels continue to rise (CDC, 2010). This study explores the relationship between computer expertise, computer access, and health. As technology infiltrates every aspect of life, computer expertise becomes increasingly important. The information gained will help educators and policy makers reduce public health disparities which plague our most vulnerable citizens. Using the information gleaned from this study, educators will be better able to design curriculum to help members of our community become more information and computer literate. Working with disadvantaged populations to develop these skills will help reduce disparities associated with education and poverty.

Assumptions

The following assumptions were made:

1. The survey respondents are representative of the population of the Black Belt region in Alabama.
2. Participants answered the survey questions honestly, consistently, and accurately.

Limitations

This study has several limitations:

1. Data were collected in the Black Belt region of Alabama; therefore, inferences made herein may not be generalizable to groups in other areas.

2. Because the survey was administered in an English written format, generalizations may not be extrapolated to populations which are not literate in the English language.
3. Since variations in BMI do not account for individual differences in muscle mass, this measure may over or underestimate obesity in some individuals.

Definitions of Terms

The following terms are used throughout this document. Because some terms are unique to this field or can be used in multiple ways, they are defined in this section for clarity.

Andragogy refers to the process of helping adults learn. Andragogy can be traced to the early 1800's abroad, but was introduced to academia in the United States by Anderson and Lindeman in 1927.

Black Belt Region of Alabama includes 12 counties that share similar physical and cultural characteristics: Bullock, Choctaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Perry, Pickens, Sumter, and Wilcox. It is part of a larger region known as the Southern Black Belt spanning from Maryland to Texas (Winemiller, 2004).

Body Mass Index (BMI) is defined as body weight (kilograms) divided by the square of height (meters).

Broadband refers to a high speed Internet connection. In 2006, The Organization for Economic Co-operation and Development defined broadband as a speed of greater than 256 kilobits per second.

Computer Expertise (CE) encompasses both theoretical computer knowledge and practical computer application (Arning & Ziefle, 2008).

Digital divide refers to inequities in Internet access and use, ranging from the global level, to nations, communities, and individuals (Chen & Wellman, 2003).

Obese is used to describe adults with a BMI of 30 or higher.

Overweight is used to describe adults with a BMI between 25 and 29.9.

Quality of Life refers to general happiness with one's existence.

Summary

This chapter provides an introduction to the problem of health disparities in the Black Belt. It provides an overview of the challenges facing the region and the potential for technology to alleviate some of the issues. Additionally, the research questions are presented, the assumption and limitations of the study are described, and terms unique to the field are defined.

Organization of the Study

Chapter 1 is an introduction to the study and includes a presentation of the problem, purpose, research questions, assumptions, limitations, and definitions of terms. Chapter 2 presents a review of literature relevant to the problem of obesity, disparities in computer use, and how they are related to one another. Chapter 3 is a description of the population examined in this study, the methods used to collect data, and the data analysis. Chapter 4 is a report of findings. Finally, Chapter 5 includes a summary of the study, conclusions, implications, and recommendations for further research.

Chapter 2

Literature Review

The purpose of this study was to examine the relationship between computer expertise and obesity as an indicator of health across race, age, gender, education level, and socioeconomic status. Fox (2011) indicated increased computer use among all segments of the population; however, minorities and low-income populations lag behind in adopting some of these technologies. Similar demographic trends exist for obesity rates (CDC 2012; Jolliffe, 2011). Home broadband usage across all segments of the population averages 66% while only 56% of African American's, and 45% of low income families have broadband Internet access at home (Smith, 2010). Not knowing how to use a computer is cited as a common barrier to Internet use (Smith, 2010). This literature review will provide a foundation for the investigation into relationship between technology usage and health.

Research Questions

The following research questions were examined in this study:

1. What is the relationship between computer expertise and obesity?
2. What is the relationship between high speed Internet access at home and obesity?
3. When demographic characteristics are controlled, to what extent does the type of Internet access predict obesity?

4. When demographic characteristics are controlled, to what extent does computer expertise predict obesity?

Introduction

Health and Obesity

Obesity is considered a leading indicator of overall health (Healthy People, n.d.) and is associated with increased risk of coronary heart disease (Galanis, Harris, Sharp, & Petrovitch, 1998), endometrial cancer (Weiderpass, Persson, Adami, Magnusson, Lindgren, & Baron, 2000), diabetes, high blood pressure, high cholesterol, asthma, arthritis, and poor general health status (Mokdad, Ford, Bowman, Dietz, Vinicor, Bales, & Marks, 2003). More than one third of all adults are now considered obese (CDC, 2012). In addition to the currently high obesity rates, Wang and Beydoun (2007) found that obesity rates are increasing. Specifically, obesity rates increased from 13% to 32% from 1990 to 2006 and are expected to increase to 75% overweight and 41% obese by the year 2015 (Wang and Beydoun, 2007). The cost of obesity due to increased health care expenditures and lost productivity in the United States is estimated to be \$147 billion annually (Finkestein, Trogon, Cohen, & Dietz, 2009). The obesity problem is due to a complex interaction among genetics, behavior, and environment. Educators who embrace technology have the opportunity to make an impact on this societal challenge by making information available online and thereby increasing healthy behaviors.

Demographics of the Obesity Challenge

The Centers for Disease Control has conducted detailed studies on the demographic differences in obesity rates. They found that there is a greater prevalence

of obesity in the southern states for all ethnicities (CDC, 2009). Data shown in Figure 1, demonstrates that African American women and to a lesser degree Hispanic women are affected by obesity significantly more than other groups. A report published by the Robert Wood Johnson Foundation offers comparisons. Twenty years ago no state had an obesity rate above 15%. Fifteen years ago Mississippi had the highest obesity rate at 19.4%, which was lower than the lowest obesity rate in 2010 (Colorado, 19.8%) (Levi, Segal, Laurent, & Kohn, 2011). The report calls for providing empowering individuals by providing them with the resources to make healthier choices for daily life.

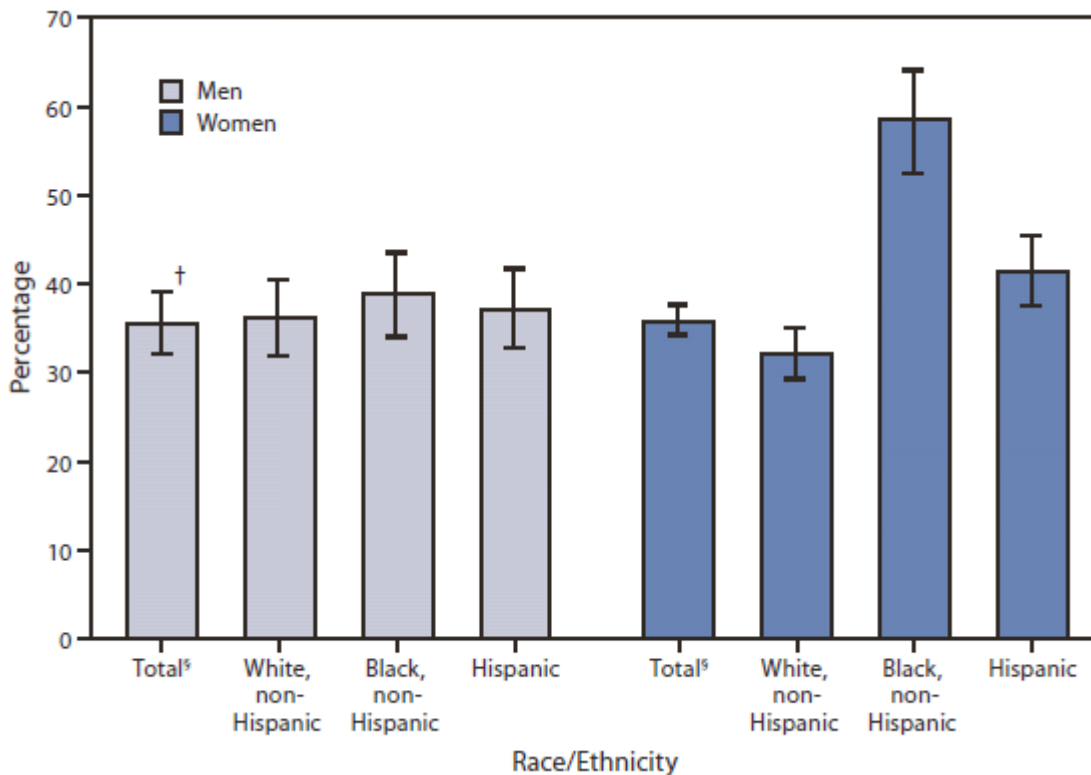


Figure 1. Obesity Rates by Race/ethnicity and Sex (CDC, 2012)

In a 2009 to 2010 study of adults ages 20 and older, the CDC reported differences in obesity rates by race/ethnicity and sex. Overall, 35.5% of men and 35.8% of women were obese. Among men, the greatest levels of obesity are found in the non-Hispanic black population (38%) followed by Hispanics (37%) and non-Hispanic whites

(36%). Among women, the trend was similar with the greatest levels of obesity found in non-Hispanic black population (59%) followed by Hispanics (41%) and non-Hispanic whites (32%) (CDC, 2012).

Income and BMI are negatively correlated in the upper quartile of the BMI distribution and positively correlated in the lower quartile (Jolliffe, 2011). From this relationship, Jolliffe (2011) infers that the severity of overweight is highest for those living in poverty. However, very low income individuals have the lowest BMI scores. For those in extreme poverty, as income increases so does BMI. For those in upper income brackets, the reverse is true; as income increases, BMI decreases.

Furthermore, those who did not graduate from high school, and older adults are affected by obesity to a greater degree even after controlling for other risk factors (CDC, 2010).

A 2003 report indicated that similar obesity rate trends exist among adolescents (Gordon-Larsen, Adair, & Popkin).

Cultural and Behavioral Influences

Given that obesity affects different populations to different degrees, investigation into strategies which would target minority and low income individuals is necessary. However, these differences are complex and socio-cultural factors should be considered. The root cause of this finding can partially be explained by cultural influences. The Centers for Disease Control notes that American Indian and Alaskan natives are most likely to be meeting fruit and vegetable consumption and activity recommendations followed by multiracial, white-non Hispanic, Asian, Hispanic, and black non-Hispanic (CDC, 2010). The Centers for Disease Control stresses the importance of reaching these minority populations with culturally appropriate messages.

The reason for these demographic differences is unclear and more research is needed in order to define the types of messages that would have the greatest impact.

Much of current dietary behavior research is based on expectancy-value theory and the early theoretical framework provided by Fishbein and Ajzen (1975). These authors proposed linkages between beliefs and attitudes, attitudes and intentions, and intentions and behaviors. It is important to note that these linkages are not behavior or object specific, but rather, based on a totality of beliefs and attitudes formed throughout one's life. It is this complexity which makes empirical research on health related behaviors extremely difficult.

Because health care professionals have expressed frustration at low levels of patient compliance with recommendations, the relationship among beliefs, attitudes, intentions, and behavior has been a focal point of health education research. Becker & Maiman studied the factors influencing a patient's decision to comply with the advice of a health professional (1975). From this work, the Health Belief Model was proposed to help explain the individual differences in compliance to health care recommendations. These researchers found that health beliefs (such as the patients' belief about the seriousness of their illness), health related motivation, costs of carrying out the recommended treatment, the doctor patient relationship, and social influences were the main forces influencing the decision to comply. A visual representation of this model is presented in Figure 2.

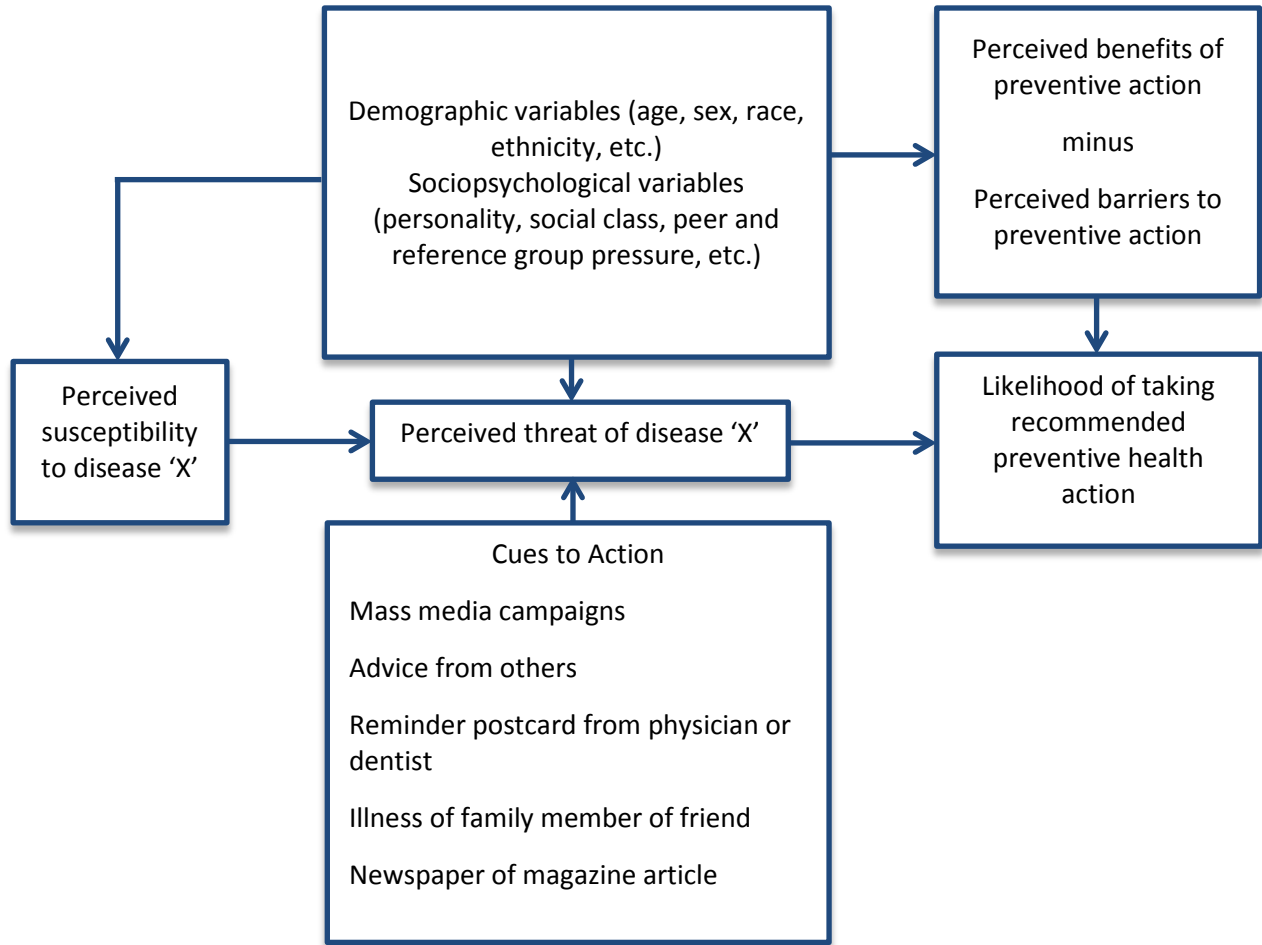


Figure 2. Health Belief Model (Becker & Miaman, 1975)

The health belief model has been used extensively as a framework for the investigation of health related behaviors by researchers who wish to develop more effective intervention strategies. However, dietary behavior differs from other health related behaviors because the effects of behavior change are seldom immediate. Additionally, dietary behaviors can be motivated by factors completely unrelated to health. For instance, peer pressure or body image may influence an individual's decision to eat more healthfully in order to lose weight (Fallon & Rozin, 1985). For these reasons, researchers in Michigan specifically studied the influence of attitudes and beliefs of mothers on their children's health and diet (Becker, Maiman, Kirscht,

Haefner, & Drachman, 1977). The mothers and children studied were referred to a major teaching hospital due to the recent diagnosis of obesity in the child. They found the application of the Health Belief Model to be a useful framework to explain behavior related to dietary choices.

Environmental Influence

It has been reported that African American women are more likely to eat fast food and fast food is directly associated with body weight, weight gain over time, and insulin resistance (Pereira et al., 2005). The results of this study conducted by Periera et al. demonstrate the linkages of race/ethnicity to diabetes. However, the authors do not account for outside factors that may be involved. In addition to the independent effects of race/ethnicity, culture, income, and gender, environmental influences may partially explain this finding. In part, the disparities in obesity rates among demographic groups may be explained by the lack of availability of healthy foods in predominantly minority neighborhoods. Morland, Wing, Roux, and Poole (2002) studied the distribution of grocery stores in poor versus wealthy neighborhoods and white versus African American neighborhoods. These researchers found that there were four times more supermarkets in white neighborhoods and three times as many supermarkets in upper income neighborhoods.

Vegetable intake and physical activity are also considered indicators of overall health and are closely tied to obesity. It has been shown that lower income women with less access to grocery stores consume fewer fruits and vegetables (Zenk, Schulz, Israel, James, Bao, & Wilson, 2005). There is an increase in fruit and vegetable consumption when living in close proximity to a grocery store. This effect was more

pronounced in the minority population compared to the white population probably due to the low level of overall access to fresh fruits and vegetables in minority neighborhoods (Morland, Wing, Roux, & Poole 2002). In contrast, in a national study of study of kindergarten age children, Lee (2012) found that although children who live in lower income neighborhoods did indeed have higher obesity rates and greater access to fast-food, they also had greater access to larger grocery stores. Additionally, there may be differences in the availability of fresh fruits and vegetables in grocery stores in different geographic areas. When grocery stores in an ethnic minority neighborhood in East Harlem were compared to largely white upper east side in New York City, 18% of Harlem stores carried healthy foods compared to 58% Upper East Side (Horowitz, Colson, Hebert, & Lancaster, 2004). The relationship between food access and obesity is complicated because no one environmental factor appears to have a direct causal relationship to obesity rates.

Not surprisingly, the number of farmers' markets in a county is negatively associated with poor health outcomes such as obesity (McFadden & Low, 2012). Although the analysis conducted by McFadden and Low did not account for regional variations in income and cultural conditions across the country, it adds to the evidence that indicates that the availability of fruits and vegetables is one of many factors contributing to high obesity rates.

Adler and Stewart (2009) propose the concept of behavioral justice in which individuals are held accountable for their obesity causing behavior. However, this would require society to take responsibility for providing a health-promoting environment. The environmental and social conditions which have led to the obesity epidemic must be

addressed. Minority groups must also have access to the information they need to make informed decisions regarding health and diet. Along with ensuring that low income and minority groups have access to healthy food, providing low socioeconomic and low education groups with computer literacy skills is consistent with a holistic approach to tackling community health challenges.

Literacy

According to the National Assessment of Adult Literacy, approximately 11 million adults in the U.S. are considered non-literate in English. An additional 19 million are unable to perform more than the most basic literacy tasks. Demographic differences in literacy rates are similar to the differences found in obesity rates and computer usage. Of the 30 million people with the lowest levels of literacy, 55% did not graduate from high school, compared to 15% of the literate population. Likewise, 39% are Hispanic (12% of literate population), 20% African American (12% of literate population), and 26% are age 65 or higher (15% of literate population) (Kirsch, Jungeblut, Jenkins, & Kolstad, 2002).

Researchers have suggested that poor literacy is a factor contributing to noncompliance with doctor's recommendations and that this noncompliance may be associated with reduced health overall (Weiss, Blanchard, McGee, Hart, Warren, Gugoon, & Smith, 1994). Additionally, literacy has been found to have a significant association with health knowledge and disease management skills (Williams, Baker, Honig, Lee, & Nowlan, 1998). Williams et al. stress the importance of the consideration of patient literacy skills in the process of providing care because patients do not always understand medical instructions. In another study, those with the lowest reading levels

had poorer physical and psychological health than those with better reading skills (Weiss, Hart, McGee, & D'Estelle, 1992). This finding held true even after adjusting for socio-demographic variables.

Basic literacy provides the foundation for an individual's ability to decipher health information. Unfortunately, patients need an advanced reading comprehension level to read the educational material typically provided by health care providers. Many patients also have difficulty understanding labels on medicine containers. Research shows that 40% of patients in public clinics read at or below a 5th grade level; however, typically pamphlets are written at a 11-14th grade level, and consent forms are written at a college level (Davis, Crouch, Wills, Miller, & Abdehou, 1990). In addition, patients who are unable to read may not drive to health services because they are unable read the highway signs (Smith, 1993). Clearly, basic literacy is an important factor in being able to care for one's self in our society.

Information Literacy

Because the pursuit of happiness is considered by most people in the United States to be a basic right, all people should have access to information they can use to improve their lives. In today's society, information literacy has the potential to correct or worsen long standing disparities in quality of life. To reap the benefits of online information, people must be information literate: able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information (American Library Association, 1989). The information literate know how to learn and are prepared for lifelong learning.

Information is available to individuals in many different ways including digital media such as websites, blogs, online video, 3D virtual environments, and traditional media such as books, newspapers, and magazines. Along with the rise of media driven by technology has come a change in the way individuals view the media. Users expect to help create and control the content of what they see. For example, the use of tags as an online classification system gives the individual the control to see the information the way they think it should be shown (Pence, 2007). Furthermore, the online encyclopedia, Wikipedia, allows users to constantly edit and refine content. Over time only the best information survives this thorough public vetting process (Darwkinism, n.d.). Because the Internet as a whole is open to anyone, it is important for learners to be able to evaluate the credibility of the information they find, i.e. information literacy is essential. As stated by Pence (2007): "The old web paradigm is an individual user accessing content. The new paradigm is communities creating and sharing ideas!" (p.348). When retrieving information online, learners need to be able to evaluate the information by checking the source of the information, reading reviews, and taking into consideration the date it was posted on the Internet.

Information literacy affects our lives in a multitude of ways. Cultural and educational opportunities are not available to those who do not know how to find information. The information illiterate find it more difficult to solve problems of everyday life if they do not know how to find information and use it. Information literacy may also be equated to personal empowerment and allows individuals to independently make decisions based upon their own arguments. The Presidential Committee on Information

Literacy reported that they felt there was a danger of a new elite forming in our society, the information elite (American Library Association, 1989).

According to the Association of College Research Libraries it is imperative for individuals to be able to decipher the authenticity, validity, and reliability of information (2000). Information literacy supports lifelong learning through skills that use technologies, but not at the exclusion of traditional literacy skills. According to the Association of College Research Libraries information literate persons should be able to evaluate all sources of information to:

- Determine the information needed
- Find the information
- Evaluate the information and the source for credibility
- Incorporate the knowledge
- Use the information
- Understand ethical and legal issues surrounding the use of the information

Clearly, it is necessary for an information literate individual to possess some skills in the use of technology. However, information literacy does not focus on technology. Two related literacies, metaliteracy and transliteracy, build upon information literacy by adding the technological and networked components of learning today. Transliteracy focuses on the tools used to gather knowledge while metaliteracy focuses more on the process.

Metaliteracy

Mackey and Jacobson (2011) argue that information literacy must be connected to other literacies that address new technologies. The authors describe metaliteracy as promoting “critical thinking, and collaboration in a digital age, providing a comprehensive framework to effectively participate in social media and online

communities” (Mackey & Jacobson, 2011 p. 62). Information literacy is simply not sufficient to encompass all that technology adds to the learning environment.

Metaliteracy is an all-encompassing framework that informs the other literacy types.

McBride (2012) makes a clear distinction between metaliteracy and information literacy.

He states that information literacy is concerned with the information and becoming an informed citizen while metaliteracy is bringing all the information networks together to create meaning and collaboratively build understanding. Metaliteracy provides the foundation for the study of learning in a digital age by including multiple document types, media formats, and collaborative environments (Mackey & Jacobson, 2011).

Lotherington (2004) recommends that traditional literacies should be promoted along with new literacies that are framing learning and communication.

Transliteracy

Similar to metaliteracy, transliteracy incorporates elements of the digital learning environment. Transliteracy is the ability to read, write, and interact using diverse media tools including handwriting, TV, radio, and digital social media networks (Thomas, Joseph, Laccetti, Mason, Mills, Perril, & Pullinger, 2007). Transliteracy emphasizes which tools are used and how they are used in the learning environment. Similar to other authors, Ipri (2010) emphasizes that each literacy should not be considered in isolation, but rather, it is the interaction among them that is important. Both transliteracy and metaliteracy have evolving definitions. For some, these new literacies challenge authority by promoting knowledge sharing and deemphasizing traditional forms of teaching (Ipri, 2010). Traditional, hierarchical structures of teaching and learning

disintegrate with the inclusion of social media and collaborative knowledge building into the learning framework.

Connectivist Learning Theory

Along with new literacies, scholars have proposed a new way of learning, connectivist learning theory. According to Siemens (2005), behaviorism, cognitivism, and constructivism learning theories were developed before technology began to infiltrate our lives. Therefore a new learning theory is necessary to explain how technology affects how we communicate and learn. According to McBride (2012), metaliteracy and transliteracy specifically address how connections take place and provide a learning bridge to collective knowledge expansion. Connectivist learning theory draws on elements of transliteracy and metaliteracy to explain how learning is affected by digital tools and networks. In this way, connectivism specifically addresses the networked culture. According to Dunaway (2011), "The connectivist model posits that learning takes place when learners make connections between ideas located throughout their learning networks, which are composed of numerous information resources and technologies" (p. 676). Connectivism embraces networked technologies as a significant portion of the learning process and builds upon earlier learning theories. Understanding how people think and learn is an integral part of developing curriculum and facilitating learning, thus considering how technology impacts learning is essential.

Principals of connectivism (Siemens, 2005)

- Diversity of opinions is key to learning.
- Learning is a process of connecting sources and may come from non-humans.
- Our capacity to learn is more important than what we know now.
- Maintaining connections is essential for continued learning.

- The ability to see connections between ideas and concepts and think critically is a key skill.
- Decision-making is a learning process. What is correct now may not be correct as new information on the topic emerges.

Health Literacy

Health literacy has been defined as a measure of patients' ability to read, comprehend, and act on medical instructions (Schillinger et al., 2002). Health literacy is dependent on basic literacy, information literacy and the skills associated with it. Patients lacking basic literacy skills have less exposure to traditional health education and also less ability to act on the information they receive from their health care provider (Nutbeam, 2000). Because traditional health education tends to reach populations that are already more health literate, Nutbeam (2000) supports the development of targeted interventions with more personal forms of communication through community based educational outreach in order to achieve public health goals. These researchers found that patients with adequate health literacy skills were better able to control their blood sugar and reported fewer incidences of retinopathy. Nutbeam (2000) calls for the development of diabetes interventions which focus on this disadvantaged population. The results of a multistate study of patients with infectious diseases yielded similar results to that of Nutbeam. Those patients with lower health literacy scores were less likely to have been treated for their disease (Fortenberry, McFarlane, Hennessy, Bull, Grimley, St. Lawrence, Stonner, & VanDevanter, 2001). The authors drew the conclusion that low literacy was a barrier to seeking treatment for their disease. Young, Weinert, and Spring (2012) conducted an intervention study to improve health literacy among older rural residents in Montana. A key component of the intervention was

instruction in computer literacy to teach participants how to find, evaluate, and use online health information. The researchers found that computer skills, confidence in searching for health information, and overall health knowledge increased. Targeted intervention programs can play a critical role in improving health literacy and overall well-being.

Just as the 1989 Presidential Report stressed the importance of information literacy, health literacy is central to improving one's health and general well-being. Students should be taught how to find information, evaluate it, and use it effectively. (American Library Association, 1989). According to a Pew Internet and American Life Project report from 2010, 62% of Americans believe that lacking broadband is a disadvantage when it comes to getting health information (Smith, 2010). Of the non-users, 48% do not find content relevant, six in 10 would need assistance getting online and only 1 in 5 know enough about computers to use the Internet on their own (Smith, 2010).

People with low health literacy use more health care services, are more likely to be hospitalized, and have longer hospital stays (Fact Sheet, n.d.; Parker et al., 1999). It is estimated that low literacy skills increase health care costs by \$73 billion. In addition, increased healthcare costs and health literacy are more of a problem in populations that rely on government funding for health care (Parker et al., 1999). Patients, Medicare, Medicaid, and employers share the burden of these increased costs. Individuals with the greatest need for information due to their health condition tend to have the least ability to read and comprehend (Parker et al., 1999). Furthermore, these individuals may have other communication difficulties that negatively affect health outcomes.

There is a gap between what health care professionals think patients know and what they actually know is significant. Parker et al. (1999) called for simpler reading materials to improve the knowledge of low literacy patients. Health literacy may also be considered a public policy issue because low literacy individuals are unable to function as participants in our society as well as more healthy individuals. Finally, health literacy is a moral issue since patients who do not understand their medical condition or how to best treat it are not receiving quality care.

The vast resources of health information now available on the Internet are of little use to those who lack the skills to use them. Although the opportunities available to the general population are considerable, health literacy requires users to have a specific set of skills to use the resources. Norman and Skinner proposed a model of eHealth literacy (health literacy online) taking into consideration portions of other literacy skills: traditional literacy, information literacy, scientific literacy, media literacy, and computer literacy (Norman & Skinner, 2006). Figure 3 is a graphic representation of this relationship. The authors postulate that individuals must have components of each of these skills sets in order to take full advantage of the health resources available on the Internet.

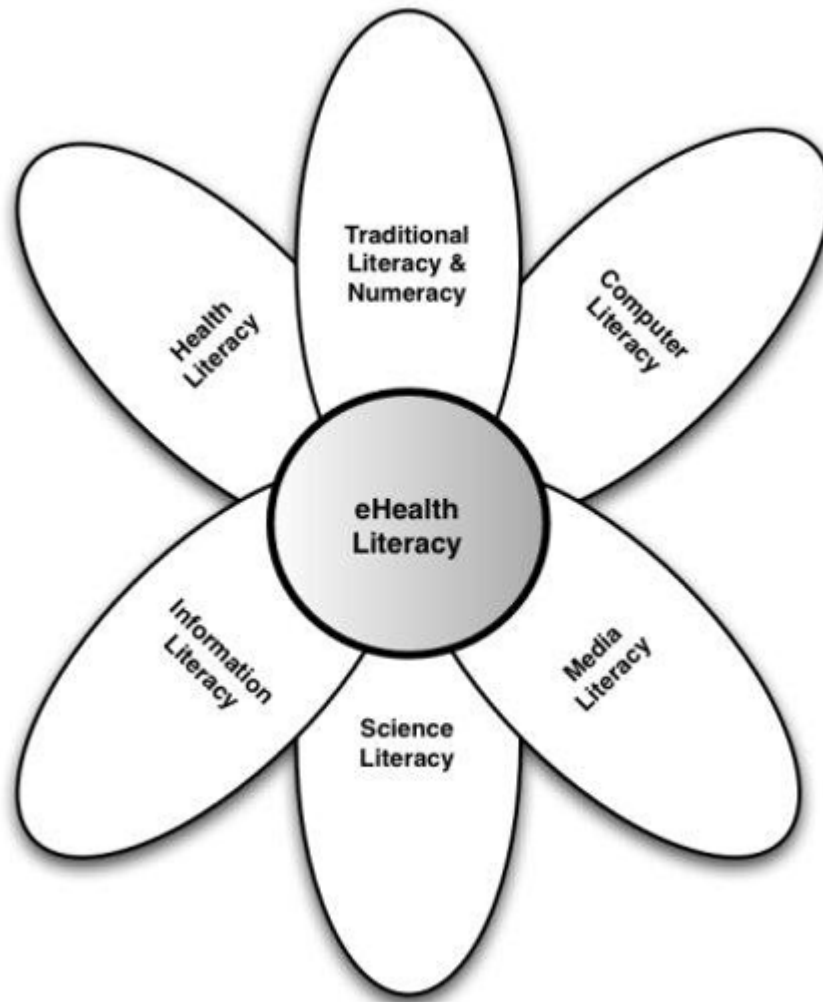


Figure 3. eHealth Literacy Model (Norman & Skinner, 2006)

Norman and Skinner (2006) argue that moderate skills across each literacy type are necessary for successful learning to take place. Taken together, the six literacies are necessary for an individual to take full advantage of the resources available online.

- Traditional literacy and numeracy is necessary because the information available on the Internet is predominantly text. Basic literacy skills are essential for comprehension.
- Information literacy is necessary because of the vast amount and varying quality of health related information. The ability to locate credible sources is imperative.

- Media literacy is a way of critically thinking about the media in the social and political context. This skill becomes important when considering the source of health related information.
- Health literacy is necessary because, as discussed earlier, an individual needs to be able to read, comprehend, and act on medical instructions in order to reap the benefits of the information they encounter online.
- Computer literacy is intuitively important because having the skills necessary to access online information is a precursor to being able to act on the information.
- Scientific literacy enables individuals to consider health related research and its appropriate implications and limitations.

Andragogy and Online Learning

The words andragogy and pedagogy originate from Greek roots literally meaning man-leading and child-leading respectively. The term pedagogy has evolved as a general term to mean instruction. However, there are considerable differences between the methodology that is considered appropriate for the instruction of youth and the methodology that has developed over the last half century for the instruction of adults. The idea that adults learn differently from youth has important implications for online instruction for the general population with health messages. While pedagogical methods are generally teacher centered with one way communication from instructor to pupil, andragogical methods focus on the learner and emphasize the teacher as facilitator rather than dictator. The term andragogy can be traced to the early 1800's abroad, but was introduced to academia in the United States by Anderson and Lindeman in 1927. Knowles (1970) popularized the term in his work about the assumptions of adult learners. Knowles (1990) theorized that andragogy was based on the following assumptions about adult learners.

The need to know. Adults need to understand how a given skill or piece of information will apply to their lives before being willing to spend time and energy learning. This is in contrast to the pedagogical model which emphasizes the acquisition of knowledge without the understanding of how it applies to the life of the learner. This assumption of adult learners was added to the original four assumptions proposed by Knowles (1970), after Tough (1979) reported that adults are heavily concerned with finding out the benefits or detriments to learning or not learning a specific task. Tough reported that many adults will even write down pros and cons to learning while making the decision to begin a learning project. Modern adult educators have embraced this assumption and typically begin instruction with a presentation of why the material is important enough to spend time learning. Because the Internet is nonlinear, it is an ideal venue for self-directed learning. Learners can skip sections that they do not need and return later when the need arises.

The learner's self-concept. This assumption is associated with stages of psychological development. According to Erikson (1978), as we progress through the psychological stages of becoming an adult, we become less dependent on others and more responsible for our own lives. As we pass through infancy and early childhood we begin to do things for ourselves. By the time we reach adolescence, we are identifying who we are as individuals. Because of this identity acquired by our experiences through our lives, adult learners tend to resist the attempts of others to impose their views, as such is the case with the pedagogical approach. Today's adult educators can incorporate this assumption into their work by engaging learners in dialog. This two-way communication, as opposed to one-way communication from instructor to student,

makes the learner feel valued and allows his identity to remain intact. In recent years, technology has opened a new venue for learners to openly share ideas and opinions. With this new technology have come new opportunities for educators.

The role of the learner's experience. Adults come into an educational setting with a multitude of life experiences compared to children. They will have diverse experiences, some positive and some negative. For these reasons, involving adult learners in their own instruction and allowing them to share their experiences tends to improve the learning environment. In an online learning environment, learners typically have the ability to leave comments, share ideas, and learn from the experiences of others who have visited the website.

Readiness to learn. Early work reported by Thorndike and colleagues tells us that adults are capable of learning but other factors may be involved other than this capability (Thorndike, Bregman, Tilton, & Woodyard, 1928). These researchers reported that adults must have some reason to learn a task or trait in order to embark on the learning process. Knowles elaborated on this and termed this characteristic of adult learners "Readiness to Learn". The concept of readiness to learn is reliant on the timing of the learning opportunity to the necessity of learning a given skill. Although this assumption is largely tied to the developmental stage of the learner, Knowles suggests that the educator can influence a learners' readiness through counseling and simulation. Because of the wealth of information available online, a facilitator of online learning can easily adapt to learners needs by offering the right information at the appropriate time and asking questions of learners to stimulate their interest in a given subject.

Orientation to learning. Adults tend to be more task centered in their learning as opposed to the subject centered pedagogical approach. This assumption is associated with the assumptions “need to know”, and “readiness to learn” since a learner will not become aware of the benefit to learning a task until they are psychologically ready for the task. By using a problem centered course design, an instructor can successfully tap into a learner’s orientation to learning and their need to know. For instance, a class titled “How to make Jam and Jelly” may not attract as much interest as one titled “What to do with your extra summer squash” or “How to turn your summer garden into extra cash”. While most people never really wanted to know how to preserve fruits and vegetables, they may take in interest if it will help them solve the problem of having extra summer squash, or needing a little extra spending money.

Motivation. In contrast to youth who may be motivated by external sources such as grades and rewards, adults learn best in response to internal motivators such as self-esteem and quality of life. When barriers such as cost, transportation, and low self-esteem are removed, the internal motivation of the learner is exposed. Knowles assumption of motivation is consistent with Houle’s Typology in that adult learners are typically goal, activity, or learning oriented in their motivations (Houle, 1988). Although the goal oriented learner may sometimes be motivated by some external factor such as a degree, the activity and learning oriented are internally motivated. The Internet offers all types of learners opportunities to participate in social networking, obtain degrees or accreditation, and solve problems to improve quality of life.

Although the development of the term andragogy into a theory separate from pedagogy is debated by some academics, the theory provides adult educators with a

set of principles on which to differentiate themselves. Adults set out on an educational session with their own life experiences, more psychological maturity compared to youth, and different motivations for learning. Taking these differences into consideration, is key to the development of effective curriculum and health education messages.

Knowles assumptions of andragogy have had a far-reaching influence on the development of on the job training programs, vocational education, and our academic understanding of lifelong learning. These principles taken together with the design of technology based learning systems have the potential to create an environment that meets the unique needs of adults and maximizes the advantages of technology.

Due to the abundance of information available on the Internet, it is even more important for educators of adults to shift their role to that of facilitator. Blondy (2007) recommended this shift to the role of facilitator. Using Internet and communications technologies to educate adults has natural advantages. An educator can place information online in good form for adults to access as they need it. Blondy (2007) suggested learners to be actively involved in the process of learning by making decisions that affect their own learning and thriving in collaborative learning environments. The shift from instructor to the role of online facilitator is consistent with constructivist and connectivist learning theories. An adult education facilitator should be able to give up control of the course and allow learners to prosper. Along this line of thinking, educators should allow learners to discover on their own, help them translate content, and enable them to acquire new knowledge (Blondy, 2007).

In recent years, the assumptions of adult learners in some circumstances have been extrapolated to the enrichment of youth education. A study of 32,000 middle and

high school students in Canada revealed that the youth were disengaged from school much of the time which led to disappointing learning outcomes (Willms, Friesen, & Milton, 2009). The authors recommended redesigning the curriculum and the learning environment to be more relevant to the youth and promote engagement. They said that “Learning can no longer be understood as a one-way exchange where we teach, they learn.” (p. 39). Andragogy and pedagogy are not mutually exclusive constructs, but rather, some elements of each school of thought are applicable depending on the circumstance. The principles of andragogy may apply to youth in certain circumstances or at a specific stage of psychological development. When youth begin a process of self-directed learning online, they seem to enjoy many of the elements viewed as key components in adult education. Youth spend a great deal of time skipping from one page to another as their interests change. They also leave comments, share opinions, and help others solve problems.

Technology Adoption

Internet based technologies, such as email, online videos, and social networks, provide substantial increases in effectiveness productivity and access to relevant information. Some researchers believe that an information elite may be forming made up of those who have knowledge and access and those who do not. Income, education, and racial gaps were noted many years ago with the establishment of Internet based technologies such as email (Anderson, Bikson, Law, & Mitchell, 1995). Since they found that immediate convenient access was the single most important predictor of use, the authors recommended universal home access to reduce the digital divide (Anderson, Bikson, Law, & Mitchell, 1995). Universal access is a challenge that

our rural areas still face today since low population density makes it unprofitable for private Internet providers to expand coverage into these areas (Steverson, 2011). On the other hand, access is not the only barrier to technology adoption.

The rate of adoption of Internet and communications technologies differs across income, race, and gender. Income appears to be one of the most significant factors. Martin and Robinson (2007) showed that once the Internet was available at home, upper income households gained access to the Internet at home more rapidly than did lower income households. Eighty-seven percent of those who earn more than \$75,000 per year shop, sell, and find health information online (Jansen, 2010). Usage in families with incomes lower than \$30,000, showed the slowest change in Internet use over the period studied (1995-2003). Families with incomes lower than \$15,000 appear to be losing ground compared to their high income counterparts. The data also show inequities in ethnicity and education level. Interestingly, Martin and Robinson showed that this difference in adoption rate was not apparent in the majority of European countries.

As part of a research project in rural Wisconsin a computer and Internet access were provided to low income breast cancer patients (Gustafson et al., 2005a). The researchers found that urban African Americans used online services more than rural Caucasians. In addition, low income individuals used the Internet more than upper income individuals when Internet was provided to them as part of the study (Gustafson et al., 2005a). It is important to note that participants in the study were provided with a mentor to help them navigate the online resources.

Kolko studied the economic impact of broadband Internet access across the country (2010). Not surprisingly, Kolko found that there is a correlation between broadband expansion and economic growth. Additionally, the results of the research indicated that this effect was more noticeable in industries tied to information technology and in low population density areas. This suggests that the expansion of broadband Internet access into the sparsely populated Black Belt region, could have a positive economic impact on the area. Kolko also notes that the economic impact on individuals seems to be limited. Although broadband has been found to be strongly linked to employment on the state level (Crandall, Lehr, & Litan, 2007), community level wages and unemployment rates do not necessarily increase when broadband is introduced (Lehr, Osorio, Gillett, & Sirbu, n.d.). It is hypothesized that this may be due to low education levels and computer literacy levels of the residents in rural areas.

Adoption of Technology by Individuals

Youth and young adults born after 1993 do not remember a time when they were not connected to the Internet. The Internet seems to infiltrate every aspect of our lives including our work, social life, and politics. Tapscott and Williams (2006) wrote:

...the participation revolution now underway opens up new possibilities for billions of people to play active roles in their workplaces, communities, national democracies, and the global economy at large. This has profound social benefits, including the opportunity to make governments more accountable and lift millions of people out of poverty. (p.17)

This statement describes the power that computer access and literacy can give to an individual or society. Those who fail to keep up with technology will be left behind and in danger of failure (Tapscott & Williams, 2006). In 2010, 66% of adults in the United States had broadband Internet access at home (Smith, 2010). Of those who do

not have access few believe it should be a top priority for our society (Smith, 2010). In contrast, many Americans believe it places non users at a disadvantage in the areas of job opportunities and career skills, access to health related information, learning new things to improve and enrich life, government services, keeping up with news and information, and keeping up with what is happening in their communities (Smith, 2010). Non Internet users cite relevance and ease of use as major barriers to going online.

Internet access has been shown to improve quality of life in communities by facilitating communication between neighbors and mobilizing community members around local issues (Hampton & Wellman, 2003). Internet access is also necessary for communities to reach their economic and social goals (Lentz & Oden, 2001). In the U.S., many rural areas remain without broadband Internet service because private Internet providers compete for metropolitan customers. However, rural areas fail to make such competition economically viable for the providers (Grubestic & Murray, 2004).

In addition to availability of the Internet, many other factors influence an individual's likelihood to adopt new technology such as Internet based technology. According to Canadian researchers who investigated the relationship between adult literacy skills and the use of information and communications technologies, age, gender, education level, and literacy predict high intensity computer use. Not surprisingly, the researchers found that computer use declined at age forty-five in all the countries studied. In Europe, but not in North America, gender was a predictor of computer use. Additionally, attitudes toward computers improve with literacy level (Veenhof, Clermont, & Sciadas, 2005).

Technology Acceptance Model

Current theory related to technology adoption is drawn from the behavioral research of early psychologists such as Thorndike, Hull, and Watson, and later by Bandura. A high degree of self-efficacy, or belief in one's ability to accomplish a task, can relate positively to coping behaviors, stress reactions, and self-regulation of behavior (Bandura, 1982). Furthermore, Bandura (1982) proposed that even when an individual is confident in their abilities, challenging environmental influences can affect their level of self-efficacy. Using a similar line of thought, Davis (1989) proposed the Technology Acceptance Model (TAM) to explain how perceived usefulness of a new technology and perceived ease of use interact to predict user acceptance of technology. He found perceived usefulness of the technology has a significantly greater correlation with user acceptance than how easy the technology was to use (ease of use). It has been hypothesized that ease of use may be an antecedent to perceived usefulness, that is a user must believe that using the technology is possible before exploring its usefulness (Davis, 1989). An individual is advised to understand the benefits of adopting a technology and believe that they are capable of learning to use it before they will attempt to adopt. Furthermore, Davis' concept of ease of use is closely tied to individuals beliefs about a task. Davis is criticized for not taking into consideration social factors and physical barriers to adoption (Mathieson, Peacock, & Chin, 2001; Parboteeah, Parboteeah, Cullen & Basu, 2005). Mathieson and colleagues suggested that sociocultural and physical barriers may also have an effect on an individual's ability to adopt new technologies (Mathieson, Peacock, & Chin, 2001). Thus these researchers suggested the addition of perceived user resources to Davis' TAM model to

account for how users view the external barriers to adopting a technology. For example, an individual who lacks monetary resources may perceive tablet technology as not useful to them because they believe tablets are expensive to own and enjoy. Likewise, Parboteeah and colleagues suggested the addition of social institutions and national culture dimensions to help capture differences in Internet usage across cultures (Parboteeah, Parboteeah, Cullen & Basu, 2005). The researchers also proposed that sociocultural barriers affect higher and lower classes differently. In some situations, individuals in the lower classes are unable to reap the benefits of technology, thus it is more difficult for them to believe that it is useful. Figure 4 is a graphical representation of Davis' original technology acceptance model with the addition of access, socio-cultural, and physical barriers (Musa, 2006).

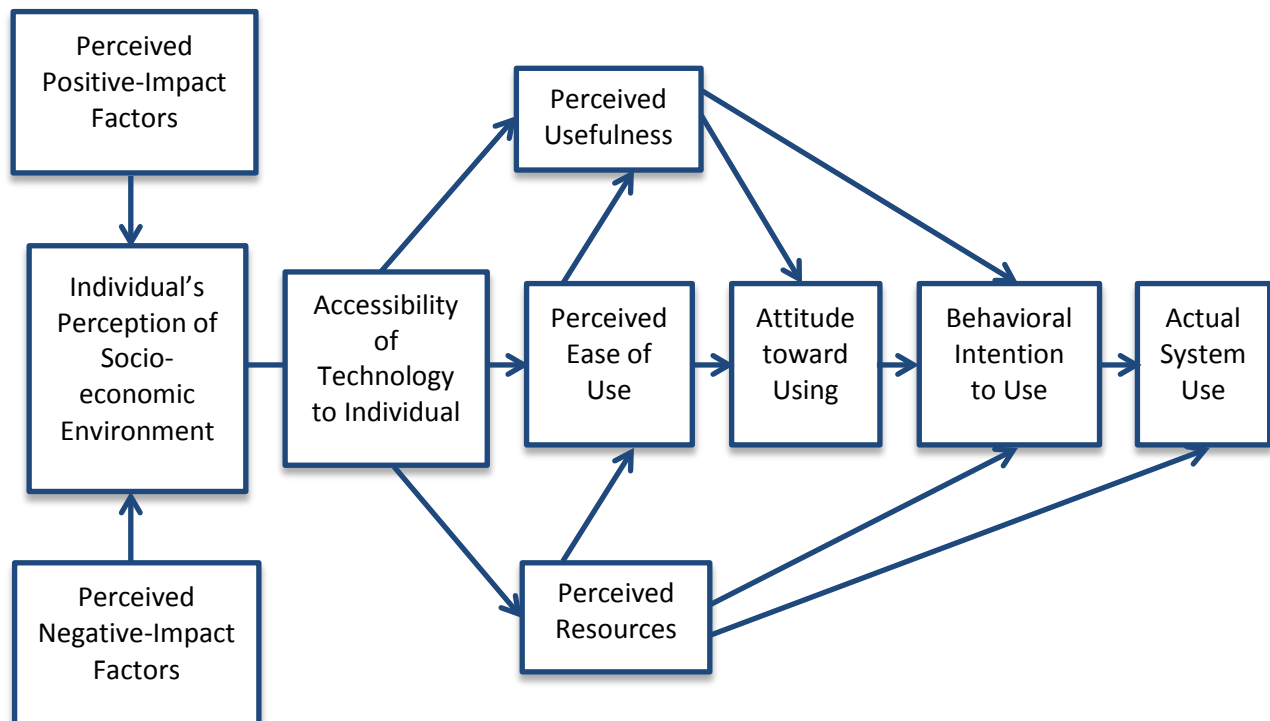


Figure 4. Technology Acceptance Model (TAM) (Musa, 2006)

The TAM forms the foundation of behavioral research on technology adoption around the world. Researchers in sub-Saharan Africa studied the diffusion of mobile technology (Meso, Musa, & Mbarika, 2005). These researchers found that access to mobile technology and cultural influences strongly influence perceptions of the usefulness and ease of use of the technology. These researchers also found that accessibility of technology did not have a direct influence on the perceived usefulness of the technology, but rather worked through perceived ease of use. Similar to Parboteeah and colleagues, the research suggests that saturation of the area with access and hardware is not enough to encourage use. However, when access to technology is limited, people are more likely to perceive the technology as not being easy to use (Meso, Musa, & Mbarika, 2005). Accessibility accounted for the majority of the influence on perceptions of ease of use while perceived ease of use and accessibility were found to be the main influences on perceived usefulness (Meso, Musa, & Mbarika, 2005). This finding implies that for successful adoption of technology to take place, experience with technology over time is imperative. The results from the African study may be applicable to certain circumstances that exist in the United States. Technological advances that seem commonplace for most of the United States, may be complex challenges for underdeveloped areas of our country such as the Black Belt region in Alabama.

Xia and Lee (2000) investigated the effect of training and experience on the adoption of Internet technology. They found that initial training provided the user with a more realistic expectation of perceived usefulness of the technology. With time and experience, users perceive technology as more useful to them and their intent to adopt

technology increases (Xia & Lee, 2000). While access to the Internet is a prerequisite to adopting its use, personal choice, individual differences, and capabilities also have influence (Alampay et al., 2003).

Alampay and colleagues (2003) stressed the importance of providing alternative sources of information due to limited Internet access and knowledge of computers. Although these researchers conducted their study in the Philippines, much of their findings seem applicable to the Blackbelt area of Alabama. Owning a computer and having Internet access does not guarantee that everyone in the house knows how to use it. However, they found that it does make everyone in the household more likely to know how to use it compared to those who do not have a computer in the house (Alampay et al., 2003). Similar to Meso et al. and Davis, these researchers found that awareness of what computer programs could do was essential before people would attempt to use them.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB), though more general than the TAM, may also help explain the various factors affecting the ability of an individual to adopt new technologies. Because of its broad nature, this theory also helps explain health related behaviors, discussed earlier. In contrast to TAM, this theory places more importance on social factors such as an individual's self-efficacy, normal mode of conduct, and attitude (Ajzen, 1991). An individual's belief in their ability to control behavior can be directly linked to behavioral achievement. According to the TPB, intentions to perform behaviors, along with an individual's perception of their ability to control a behavior play an important role in predicting behavior (Ajzen, 1991). Similar to the way that self-

efficacy relates to TAM, Ajzen proposes that the resources available in an individual's environment and their perception of their ability to control behavior is of great importance to intentions and actions (Ajzen, 1991).

Adoption of Technology through Social Change

Rogers (2003) examined the diffusion of innovations through communities as catalysts of social change. After reviewing the diffusion of innovations in many cultures across many different types of technology, Rogers theorizes that the diffusion of innovations involves a general process of social change. By studying the process of technological adoption in other areas, barriers to the adoption of Internet technology can be elucidated. Like Davis (TAM), Rogers proposes that individuals need to see the relative advantage of technology adoption before they are willing to try it (p. 14). He also recognizes that an individual's past experience with a technology may influence their likelihood to try a new technology (p. 15). For example, a frustrating experience with a first generation computer may discourage older users today from trying to use the Internet on a tablet.

Rogers (2003) describes the perceived attributes of innovations as they relate to the decision to adopt:

- Relative advantage is the degree to which the innovation is better than the current way of doing things. The perceived advantage is more important than the actual advantage.
- Compatibility is the degree to which the innovation is consistent with the values and past experiences of the community.
- Complexity is how difficult it is perceived to understand and learn to use the technology.
- Trialability is the ability of users to try the technology before fully adopting it. Technologies that can be experimented with in this way are more likely to be

adopted. Access to Internet cafés and libraries may allow potential adopters to experiment with Internet technology.

- Observability is how visible the use of the technology is to others. Individuals who see others in their community using a technology are more likely to adopt it. Home computer use is relatively low in observability. In contrast, cell phone use is extremely obvious.

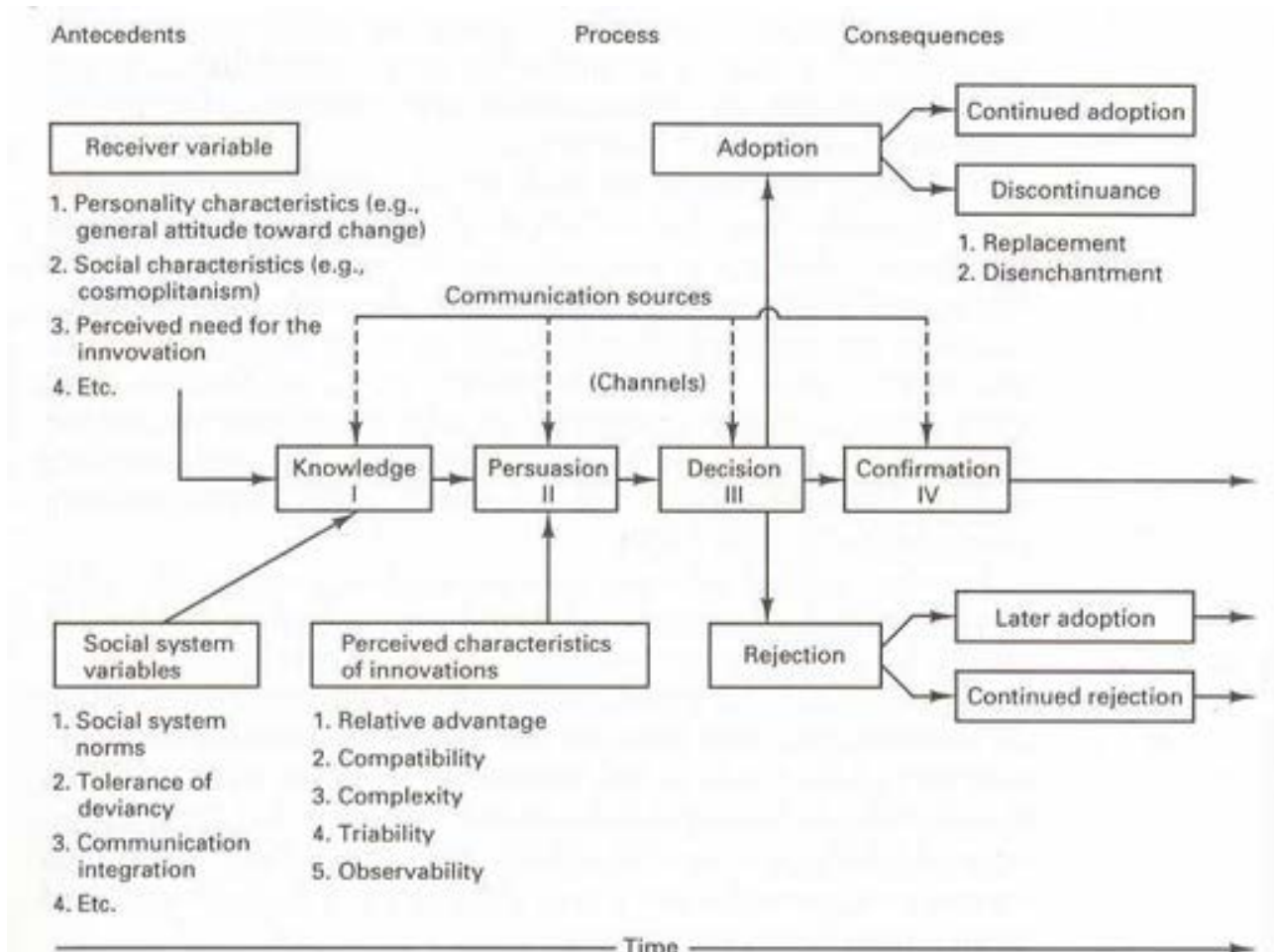


Figure 5. Diffusion of Innovation (Rogers, 2003)

According to Rogers (2003), interpersonal channels are more effective at influencing an individual’s decision to adopt, especially when the information is coming from an individual who is similar in socioeconomic status and education. He introduces the concept of heterophily, or the degree to which individuals are different as a major barrier

to technology diffusion. Early adopters are usually higher in socioeconomic status and education and, therefore, later adopters are not as influenced by them as they would be someone who is homophilious or more like themselves. Figure 5 is a graphical representation of Rogers' innovation-decision process: knowledge, persuasion, decision, implementation, and confirmation. Rogers also proposes that socioeconomic status is associated with the amount of contact that an individual has with motivators of change. For example, a person of low socioeconomic status has less contact with gyms, grocery stores, and doctor's offices which would encourage the adoption of healthy eating behaviors.

According to Rogers (2003), adoption of Internet based technology may speed up the rate of adoption of later innovations. Therefore, not having this ability places individuals and communities at a relative disadvantage for the adoption of later technologies. For example, as we find more and more government transactions conducted online, non-users have less access to the new services and information. Also non-users are at a disadvantage on the job. Van Dijk and Hacker (2003) predict a disparity in skills and usage to unfold as computer access increases to saturation. Computers are more heavily relied on in the workplace now than they were just a few years ago (Autor, Levy, & Murnane 2003; Borghans & ter Weel 2006). A survey of workers from 1984 to 1989 found that those who use a computer on the job earn 10 to 15% higher wages compared to those who do not use computers on the job (Krueger, 1993). Government clerks at unemployment offices are increasingly sending the unemployed to online portals. Paradoxically, 60% of the unemployed do not have adequate skills to search for jobs online. Furthermore, older workers tend to prefer face

to face meetings, which can be a challenge when younger workers, who prefer email and text messaging, are doing the hiring (Johnson, 2010).

The usefulness of the Internet in our society cannot be measured by numbers of connected individuals alone, but rather its effect on alleviating poverty, improving access to health care, improving access to education, and strengthening the democratic process (Madon, 2000). These are compelling reasons to improve access and provide learning opportunities to those who are lacking the necessary technology skills.

The Potential of Technology to Impact Health

A 2010 survey for the Pew Internet and American Life project revealed that 80 % Internet users look for health information online (Fox, 2011). Specifically, health information was the 3rd most popular search overall and diabetes was the ninth most popular search on WebMD.com in 2010. However, fewer than half of minorities, low education, and low income households look for health info online (Fox, 2011). Fox also noted that past Pew studies have shown that mobile device users are more engaged than other users and that the use of these devices is growing more rapidly for minority groups (Horrigan, 2009). Even though the vast majority of Americans are online, physicians should not assume that everyone has access to health information online. Those that may need the information the most are least likely to have access at all.

Lack of interest is cited as a predominant deterrent for the lack of Internet use among low income populations (Chen & Wellman, 2003). In contrast, Brodie and colleagues showed the potential for the Internet to be used to reach diverse audiences. They found that disparities do exist among people from different age, ethnicity, income, and education groups, however when the groups attain Internet access, they are

similarly likely to access the Internet for health information (Brodie, Flourney, Altman, Blenton, Benson, & Rosenbaum, 2000). A majority of those searching for health information online are looking for information on how to treat a specific disease, information about medicine, and ways to prevent illness (Brodie, Flourney, Altman, Blenton, Benson, & Rosenbaum, 2000).

Results of research conducted between 1993 and 1997 indicated differences in computer ownership, access at home, and network use based on income and education. The study also found that fewer differences existed when participants were asked about their network usage. The authors proposed that some low income workers have access through their employer and some use mobile technologies. The authors have found low income individuals more likely to use Internet services for health when they have access (Gustafson, McTavish, Stengle, Ballard, Jones, et al., 2005b). Not surprisingly, age, income, and education were also found to be determinants of seeking health information online (Cotten & Gupta, 2004).

When a group of individual's is provided free Internet access (with no prior access) were compared to a group with same demographics that had access, 40% of those in the group that had prior access used Internet more for health information compared to 24% of those with no prior access. Both groups reported gaining valuable information about their health care. Specifically, the Internet users reported improved understanding of illness and possible treatments. These findings indicate that Internet access can only partially explain the digital divide (Wagner, Bundorf, Singer, & Baker, 2005).

Although the benefits of technology are clear, some authors find that the changes in our lifestyle due to the increased use of computers in the workplace and in our personal lives are to blame for the obesity epidemic (Chatterjee & DeVoll, 2012). Chatterjee and DeVoll claim that “the main culprit (of rising obesity rates) is the knowledge based society” (p. 4). These economists from the Milken Institute, a nonprofit, economic think tank, argue that there is a 1.4 percentage point rise in obesity for every 10 percent increase in technology infrastructure investment. However, the economists fail to account for differences in obesity rates associated with income, age, race/ethnicity, and education level. Chatterjee and DeVoll site a direct effect of sedentary lifestyle and an indirect effect of increased caloric consumption during screen time activities. They fail to differentiate between different types of on screen activities. That distinction may be important since the Internet does not have as many food advertisements and the user is generally actively engaged with the keyboard, mouse, or touchscreen and less likely to be snacking compared to the television watcher.

The variety, amount of information available, 24/7 access, and up to date nature of the information on the Internet make it different from traditional forms of health communication media (Cotten & Gupta, 2004). Understanding the relationship between technology and health, will improve society’s potential to reach vulnerable populations.

Chapter 3

Methods

The purpose of this study was to examine the relationship between computer expertise and obesity as an indicator of health across race, age, gender, education level, and socioeconomic status. Fox (2011) indicated increased computer use among all segments of the population; however, minorities and low-income populations lag behind in adopting some of these technologies. Similar demographic trends exist for obesity rates (CDC, 2012; Jolliffe, 2011). Home broadband usage across all segments of the population averages 66% while only 56% of African American's, and 45% of low income families have broadband Internet access at home (Smith, 2010). Not knowing how to use a computer is cited as a common barrier to Internet use (Smith, 2010). The items included on the survey instrument used in this study are meant to help elucidate the relationship between computer expertise, obesity, and how people attain their health information. This chapter describes how the study was carried out and how the data was handled.

Research Questions

The following research questions were examined in this study:

5. What is the relationship between computer expertise and obesity?
6. What is the relationship between high speed Internet access at home and obesity?

7. When demographic characteristics are controlled, to what extent does the type of Internet access predict obesity?
8. When demographic characteristics are controlled, to what extent does computer expertise predict obesity?
9. Is there a relationship between obesity and those who seek health information online?

Methods

Permission was obtained from Arning, a senior research assistant in the Human Technology Center of RWTH Aachen University, to use the computer expertise questionnaire (see Appendix A). The original survey instrument developed by Arning and Ziefle (2008) was written in German. The survey was translated into English by a native German speaker and then checked for clarity. The original survey consisted of 18 total items. Nine items were used to operationalize theoretical computer knowledge. Nine items were used to operationalize practical computer knowledge. The theoretical and practical computer scores were summed for the computer expertise (CE) score. Demographic questions were added to obtain information on age, race/ethnicity, gender, socioeconomic level, and education. Additionally, six questions were added to elucidate how participants obtained health related information, one question was added to give an estimate of general quality of life, and participants were asked their height and weight to calculate BMI.

The research questions refer to associations between obesity and other factors. It was not practical to measure the height and weight of each participant. Therefore, participants were asked to self-report height and weight on the written survey. Basil

metabolic index was chosen because it can be easily calculated from height and weight. Unfortunately, BMI is an imperfect indicator of obesity. Shah and Braverman (2012) reported that BMI may underreport obesity in certain segments of the population by up to 38%, however, when used for the purpose of generalizing associations within a population it is still useful.

Permission was obtained from the Auburn University Institutional Review Board (see Appendix B) to administer the written survey at events in which Extension was a partner. Likewise, permission was obtained from the Extension Director to administer the surveys at events in which Extension was a partner (see Appendix C). The surveys were administered at farmers markets, community meetings, and educational programs from May to August 2012 in the 12 target counties.

After the data were collected and entered into an Excel spreadsheet, statistical analysis was executed. Analysis of variance was conducted to reveal differences in computer expertise scores and BMIs among groups. A factor analysis was conducted to determine the relationship between individual survey questions and the construct they operationalized. Multiple regression was conducted to reveal relationships among the grouping variables, BMI, and computer expertise scores. A two way chi square with Pearson phi coefficient was used to identify differences between groups. Residuals were used to identify differences between groups when the Phi coefficient indicated differences existed. Differences were considered significant when the probability value of .05 or smaller was obtained.

Sample

The target population for the survey was adult residents of the Black Belt region of Alabama. The Black Belt region of Alabama includes 12 counties that share similar physical and cultural characteristics: Barbour, Bullock, Butler, Choctaw, Crenshaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Montgomery, Perry, Pike, Sumter, and Wilcox. Participants were recruited at events in the target counties in which the Alabama Cooperative Extension System was a partner. Extension events were chosen because this organization strives to serve all demographic groups in its programming. Thus, the sample is not meant to be a stratified random sample, but rather a sample purposefully intended to represent all demographic groups. The population in this region is unique in that the Black Belt has a greater proportion of minorities, low education levels, and higher numbers of older adults compared to state and national averages (U.S. Census Bureau, 2010). Non-Hispanic blacks, Hispanics, those who did not graduate from high school, low income individuals, and older adults are affected by obesity to a greater degree than other demographic groups (CDC, 2010; Wang & Beydoun, 2007).

Instrumentation

The research is based on responses from written surveys administered by Extension staff at community events. The purpose of the survey was to assess the relationship between computer expertise and obesity in the Black Belt region of Alabama and gather information on how residents acquire their health information. The survey is based on research conducted by Arning and Ziefle (2008) and was designed to assess the computer expertise of older adults. The survey instrument (see Appendix D) contained nine questions about theoretical computer knowledge and nine questions

about practical computer knowledge followed by demographic and grouping questions. The correct responses to the theoretical and practical questions were summed for the computer expertise score. The total computer expertise score measures declarative and procedural knowledge of computers. The 18 questions that assessed computer expertise were multiple-choice with five choices. In order to discourage guessing, the fifth answer for each question was "I don't know".

Arning and Ziefle (2008) assessed the reliability and validity of the instrument. These researchers found the instrument to be appropriate for older adults with limited computer knowledge and experience. The mean index of difficulty for older adults was $M=.55$ ($SD=0.23$). The indices of discrimination were reported to be between $r=-0.1$ and $r=0.4$ with an internal consistency of $\alpha=0.84$ indicating an acceptable degree of homogeneity of the survey scale and indicating satisfactory reliability. Arning and Ziefle (2008) assessed external validity by relating the survey scores to performance outcomes. Computer expertise and performance were found to be strongly correlated ($r=0.77$, $p<0.01$).

Data Collection

Following approval of the research protocol by the Institutional Review Board at Auburn University, written surveys were administered by Extension Agents in the 12 target counties. Participants were asked for their participation at community meetings, one-on-one meetings with clients, and at business locations when Extension agents were providing information or assistance to businesses. Upon agreeing to participate, the survey was administered with the information sheet describing the project. The information sheet also informed participants that their responses were both voluntary

and anonymous. The completed surveys were returned to the Extension Agent upon completion. In a few cases the researcher was not present for survey collection. Thus, the completed surveys were returned by the Extension agent who collected them by mail. Data obtained from the surveys was entered into a spreadsheet and written surveys were stored in a secure location during and upon completion of data collection. A total of 352 participants attempted to complete the survey. Thirty-one surveys were discarded because the participants lived outside the target area, the survey was less than 50% complete, or participants did not report their height and weight. Three hundred twenty-one surveys were used in the analysis.

Data Analysis

Data analysis was carried out using PASW Statistics for Windows, Version 18.0 (SPSS Inc., 2009). The first 15 questions on the survey were analyzed using descriptive statistics. The first five questions related to demographics: age, sex, race/ethnicity, education, and income. Questions six through 11 related to how people obtain their health information. Question 12 related to quality of life. Questions 13 and 14 were used to calculate BMI. Basil Metabolic Index was calculated for each participant by multiplying weight in pounds by 703 and dividing by height in inches squared ($BMI = (\text{pounds} * 703) / \text{inches}^2$). Question 15 related to county of residence. This question was included to ensure that participants resided in the target region. The second section of the survey consisted of nine questions related to computer knowledge followed by nine questions related to computer skills. Correct responses to the first nine questions were summed for the computer knowledge score. Correct responses to questions 10 through 18 were summed for the computer skills score. A paired samples

t-test was conducted to determine differences in knowledge and skills scores. Finding none, the computer knowledge and skills scores were summed for the computer expertise score. The computer expertise scores were analyzed with the data gathered from the responses to other survey questions using regression analysis and analysis of variance.

Descriptive statistics revealed an outlier in reported income data. The skewness and kurtosis statistics were 4.413 (SE=.145) and 39.831 (SE=.290) respectively. The outlier, a data point of \$500,000 was 220.06 standard deviations away from the mean of the remaining data. Subsequent to removing the outlier, the skewness was 1.081 (SE=.146) and kurtosis .95 (SE=.290). For these reasons, it was deemed appropriate to remove the outlier.

The first research question is related to the relationship between computer expertise and obesity. A standard regression using the calculated BMI and computer expertise scores were used to assess this relationship.

The second research question is related to the relationship between Internet access and obesity. A standard regression using BMI and Internet access categories was used to assess this relationship.

The third research question is related to the relationship between obesity and the type of Internet access when other demographic variables are controlled. A multiple regression was used to assess this relationship. The dependent variable was BMI. The independent variables were type of Internet access, age, sex, race/ethnicity, education, and income. Betas were used to identify the contribution of each independent variable

to the dependent variable. The p-value of the Betas was assessed to determine if the contribution was significant ($p \leq .05$).

The fourth research question is related to the relationship between obesity and computer expertise when other demographic variables are controlled. A multiple regression was used to assess this relationship. The dependent variable was BMI. The independent variables were computer expertise, age, sex, race/ethnicity, education, and income. Betas were used to identify the contribution of each independent variable to the dependent variable. The p-value of the Betas was assessed to determine if the contribution was significant ($p \leq .05$).

The fifth research question is related to the relationship between obesity and seeking health information online. Univariate analysis of variance was used to determine if significant differences in BMI existed among those who looked online for health information and those who did not. The dependent variable was BMI. The independent variable was whether or not the participant looked online for health information.

An overarching goal of this study was to investigate the relationships described in the research questions to further elucidate how people get their health information in this technological era. For this reason, analysis of variance was used to identify differences in obesity and computer expertise for the categorical data derived from survey questions six through 12.

Summary

This study focused on the relationship between computer expertise and obesity. The instrument used to operationalize computer expertise was developed and validated

by Arning and Ziefle (2008). The data were collected at community events in which Extension was a partner in an effort to include all demographic groups in the sample. The data were collected and handled in accordance with Auburn University Institutional Review Board policies.

Chapter 4

Results

The purpose of this study was to examine the relationship between computer expertise and obesity as an indicator of health across race, age, gender, education level, and socioeconomic status. Fox (2011) indicated increased computer use among all segments of the population; however, minorities and low-income populations lag behind in adopting some of these technologies. Similar demographic trends exist for obesity rates (CDC 2012; Jolliffe, 2011). Home broadband usage across all segments of the population averages 66% while only 56% of African American's, and 45% of low income families have broadband Internet access at home (Smith, 2010). Not knowing how to use a computer is cited as a common barrier to Internet use (Smith, 2010).

Research Questions

The following research questions were examined in this study:

1. What is the relationship between computer expertise and obesity?
2. What is the relationship between high speed Internet access at home and obesity?
3. When demographic characteristics are controlled, to what extent does the type of Internet access predict obesity?
4. When demographic characteristics are controlled, to what extent does computer expertise predict obesity?

5. Is there a relationship between obesity and those who seek health information online?

The survey instrument (see Appendix D) used to examine the research questions contained nine questions related to theoretical computer knowledge and nine questions related to practical computer knowledge followed by demographic and grouping questions. Average scores for theoretical and practical computer knowledge were assessed for differences using a paired samples t-test. The scores were not significantly different, $t(320)=.53$, $p=.594$. Additionally, Pearson correlation showed that knowledge, $r(320)=.925$, and practical, $r(320)=.940$, scores were highly correlated with the computer expertise (CE) score. For these reasons, the correct responses to the theoretical and practical questions were summed for the CE score and the CE score was used in subsequent analysis. The CE score measures declarative and procedural knowledge of computers. Demographic questions were added to obtain information on age, race/ethnicity, sex, socioeconomic level, and education. Additionally, six questions were added to elucidate how participants obtained health related information, one question was added to estimate general quality of life, and participants were asked their height and weight to calculate BMI.

Organization of Data Analysis

This chapter is organized into three sections. The first section describes the demographic characteristics of the sampled population. In this section, the sampled population is identified by age, sex, race/ethnicity, education, income, and county of residence. In order to draw comparisons among demographic groups, the data from questions related to age and income were converted to categories. In order to compare

the results of this study with those published by the PEW Research Center, the categories used are consistent with those used by the PEW Research Center. For age, the categories were 19 to 24, 25 to 25, 36 to 49, 50 to 65, and over 65. For income, the categories were less than \$30,000, \$30,000 to \$49,999, \$50,000 to \$74,999, and over \$74,999. Mean BMI and CE Score are reported for age, sex, race/ethnicity, education, and income categories. Differences were determined by analysis of variance ($p \leq .05$). For demographic variables that have more than two groups (age, race/ethnicity, education, and income), Fisher's least significant difference (LSD) test was used to identify differences between individual groups.

The second section specifically addresses the research questions. Results from Pearson correlation statistics are presented for research questions that deal with relationships between single variables and BMI (Research Questions 1 and 2). Regression analysis is presented to assess more complex relationships (Research Questions 3, 4, and 5).

The third section includes a presentation of differences in BMI and CE score for responses to the questions asked to help elucidate the relationship between where people get their health information and obesity. This section includes results from Pearson correlations, analysis of variance, and multiple regression that indicate relationships and differences among groups.

Demographic Results

Participants in this study were residents of the 12 Alabama Black Belt counties. The number of participants from individual counties ranged from 14 to 46. The distribution of participants is graphically represented by Figure 6.



Figure 6. Participants per County

The distribution of male and female participants along with average BMI and CE scores by sex is presented in Table 1. Approximately two thirds (62%) of the population sample was female. When male and females were compared, analysis of variance showed no differences between mean BMI, $F(1, 304)=.48, p=.488$) or CE scores, $F(1, 304)=1.14, p=.320$).

Table 1

<i>Average BMI and CE Score by Sex</i>				
Sex	% of sample	M BMI (SD)	M CE Score (SD)	<i>n</i>
Female	62.3%	29.93 (6.75)	9.63 (4.20)	200
Male	32.7%	29.39 (5.39)	9.15 (4.92)	105
Total	100%			305

The distribution of participant race/ethnicity along with average BMI and CE score by race/ethnicity is presented in Table 2. When all races/ethnicity groups were compared, analysis of variance showed differences between mean BMI, $F(5,304)=4.66, p<.001$) and CE scores, $F(5,304)=6.56, p<.001$). Post hoc tests were not appropriate because several groups had less than three individuals in a group. Participants were predominantly African American and Caucasian (96%). A t-test was performed to identify differences in BMI and CE scores between these two groups specifically. The analysis revealed differences in BMI, $t(304)=4.56, p=.042$) and CE scores, $t(304)=4.94, p=.009$). Caucasian participants had significantly lower BMI and higher CE scores. A more detailed analysis of the data reveals that the race/ethnicity difference in BMI is primarily accounted for by differences between African American (M=31.23, SD=6.83) and Caucasian (M=27.03, SD=5.71) women. In men, the difference in BMI between

African Americans (M=30.46, SD=5.99) and Caucasians (M=28.50, SD=4.64) was smaller.

Table 2

Average BMI and CE Score by Race/Ethnicity

Race/ethnicity	% of sample	M BMI (SD)	M CE score (SD)	<i>n</i>
Asian or Pacific Islander	.3%	24.41	10	1
African American	62.3%	31.26 (6.69)	8.42 (4.54)	200
Hispanic	.6%	29.53	3 (1.41)	2
Native American	.6%	24.72	15.5 (.71)	2
Caucasian	34.0%	27.83 (5.26)	10.99 (4.07)	109
Other	.3%	27.57	8	1
Total	98.1%			315

The distribution of participant income along with average BMI and CE scores by income category is presented in Table 3. About a third (34%) of the participant population was low income. When income categories were compared, analysis of variance showed no differences in mean BMI, $F(279)=1.74, p=.158$. Significant differences in CE scores were found, $F(279)=24.19, p<.001$. Post hoc analysis showed that lower income participants had significantly lower CE scores than participants who reported higher incomes.

Table 3

BMI and CE Score by Income

Income	% of sample	M BMI (SD)	M CE score (SD)	<i>n</i>
<\$30,000	34%	30.86 (6.39)	6.95 (4.48)	109
\$30,000- \$49,999	18.4%	30.73 (6.64)	10.42 (3.97)	59
\$50,000- \$74,999	17.4%	29.30 (6.27)	11.34 (3.29)	56
>\$74,999	17.4%	28.79 (6.15)	11.34 (3.40)	56
Total	87.2%			280

The distribution of participant age along with average BMI and CE scores by age is presented in Table 4. The average age of participants was 46.09 (SD=15.25). When age categories were compared, analysis of variance failed to reveal differences in mean BMI, $F(4,303)=1.34$, $p=.257$. Significant differences in CE scores were found, $F(4,317)=17.08$, $p<.001$. Post hoc analysis indicated a general trend toward lower scores for older participants. Participants that were 65 years of age or older had significantly lower scores compared to other age groups.

Table 4

BMI and CE Score by Age

Age	% of sample	M BMI (SD)	M CE score (SD)	<i>n</i>
19-24	5.6%	28.45 (6.07)	10.11 (4.31)	18
25-35	23.7%	29.45 (6.60)	10.96 (3.54)	76
36-49	25.5%	30.56 (7.27)	10.59 (3.65)	82
50-65	34.9%	30.78 (6.07)	8.36 (4.68)	112
>65	9.3%	28.40 (5.73)	4.4 (4.70)	30
Total	99%			318

The distribution of participant education level along with average BMI and CE scores by education level is presented in Table 5. When education categories were compared, analysis of variance failed to detect differences in mean BMI, $F(6,298)=1.85$, $p=.104$). Significant differences in CE scores were found, $F(6,313)=31.59$, $p<.001$). Post hoc analysis showed that CE scores were significantly higher for participants with a college degree. Participants who did not finish high school had significantly lower scores compared to all other groups.

Table 5

BMI and CE Scores by Education

Education	% of sample	M BMI (SD)	M CE score (SD)	<i>n</i>
Some high school	7.2%	30.55 (7.99)	2.04 (3.07)	23
High school graduate	23.1%	31.79 (5.84)	7.34 (4.51)	74
Technical degree	6.5%	28.92 (3.79)	9.00 (3.61)	21
Some college	25.2%	29.42 (6.05)	9.8 (3.8)	81
College graduate	21.5%	29.73 (6.23)	11.77 (2.72)	69
Post graduate degree	14.3%	28.62 (7.57)	11.73 (3.93)	46
Total	97.8%			314

In order to further define the relationship between obesity and the demographic variables, Pearson correlations were calculated and a multiple regression analysis was completed. Pearson correlation statistics are presented in Table 6. Pearson correlations revealed that race/ethnicity, education, and income were negatively associated with BMI. Additionally, some of the demographic variables were related to one another. Sex was positively associated with race/ethnicity and income. Income, race/ethnicity, and education were all positively associated. However, multiple regression revealed that only race/ethnicity was a significant predictor of BMI when all demographics were taken into consideration together, $B=-1.17$, $t(250)=-3.89$, $p<.001$.

Table 6

Pearson Correlations for Demographic Variables and BMI

Variable	Age	Sex	Race	Education	Income
BMI	.003	-.049	-.267***	-.126*	-.112*
Age		-.009	.013	-.062	.056
Sex			.184**	.018	.159**
Race/ethnicity				.228***	.467***
Education					.471***

* $p < .05$ ** $p < .01$ *** $p < .001$

Research Questions

The first research question dealt with the relationship between computer expertise and obesity. Pearson correlation indicated a small, but statistically significant negative relationship ($r(304) = -.161$, $p = .002$) between BMI and CE score. Regression analysis revealed that CE score was a significant predictor of BMI, $B = -.23$, $t(302) = 2.84$, $p = .005$. Furthermore, CE score explained a statistically significant portion of the variance in BMI, $R^2 = .03$, $F(1, 302) = 8.12$, $p = .005$.

The second research question dealt with defining the relationship between Internet access at home and obesity. Pearson correlation failed to detect a relationship between type of Internet access and BMI, $r(305) = -.02$, $p = .375$. Regression analysis indicated that the type of Internet access failed to predict BMI, $B = -.13$, $t(303) = -.32$, $p = .751$. Furthermore, the type of Internet access failed to explain a significant amount of variance in BMI, $R^2 < .01$, $F(1, 303) = .10$, $p = .751$.

The third research question dealt with the extent to which the type of Internet access predicts obesity when demographic characteristics are taken into consideration. Since the type of Internet access at home was not found to have a significant relationship to BMI, no further analysis was necessary.

The fourth research question dealt with the extent to which CE score predicts obesity when demographic characteristics are taken into consideration. A multiple regression analysis was conducted to identify the contribution of CE score to BMI when race/ethnicity was included in the model. Age, sex, income, and education were not included because they were not found to be significant predictors of BMI in this study. Multiple regression statistics are presented in Table 7. CE score failed to predict BMI when race/ethnicity was included in the model, $B=-.12$, $t(299)=-1.49$, $p=.137$.

Table 7

Summary of Multiple Regression Analysis for Variables (CE score and Race/ethnicity) Predicting BMI

Variable	<i>B</i>	<i>SE B</i>	β
CE score	-.122	.082	-.086
Race/ethnicity	-1.027	.256	-.233***
R^2		.087	
<i>F</i>		3.853***	

* $p<.05$

** $p<.01$

*** $p<.001$

The fifth research question dealt with whether or not there is a relationship between obesity and those who seek health information online. Pearson correlation failed to detect a relationship between looking online for health information and BMI, $r(304)=.03$, $p=.275$. Regression analysis indicated that seeking health information online failed to predict BMI, $B=.49$, $t(302)=.60$, $p=.549$. Furthermore, the seeking health

information online failed to explain a significant amount of the variance in BMI, $R^2 < .01$, $F(1,303) = .36$, $p = .549$.

The Relationship between Health Literacy and Obesity

Participants were asked where they obtained health information the last time they had a health issue. The distribution of sources from which participants get their health information is presented in Table 8. The majority (91%) of participants obtain their health information from a doctor or other healthcare professional. Pearson correlations indicated that none of the items was significantly associated with BMI. A multiple regression was performed to determine relationships between sources of health information and BMI. Sources of health information failed to explain a significant amount of the variation in BMI, $R^2 = .003$, $F(3,303) = .27$, $p = .884$.

Table 8

<i>Distribution of Where Participants get their Health Information</i>		
Source of health information	% of sample	<i>n</i>
Doctor or healthcare professional	90.7%	277
Friends and family	30.8%	94
Others with the same health condition	16.5%	50
Total	138%	421

Participants were asked what type of media they received information the last time they had a health issue. The distribution of the type of media that participants use to obtain health information and multiple regression statistics for these variables and

BMI is presented in Table 9. The majority (73%) of participants obtain their health information in person. Pearson correlations showed relationships between BMI and three types of media. Obtaining information online was negatively associated with BMI, $r(301)=-.13, p=.011$. Obtaining information from television was positively associated with BMI, $r(301)=.13, p=.014$. Obtaining information by other means was positively associated with BMI, $r(301)=.10, p=.042$. Comments indicated that those who obtained information from other sources use support groups and coworkers as sources of health information. This means that obtaining information online was associated with lower BMI, while obtaining information from television or in groups was associated with higher BMI. Multiple regression of the three ways to obtain health information that were associated with BMI shows that where participants get their health information explains a significant portion of the variance in BMI, $R^2=.04, F(3, 299)=4.34, p=.005$.

Table 9

Summary of Multiple Regression Analysis for Variables Predicting BMI (Media Type)

Preferred media	% of sample	B	SE B	β
Online	33.3%	-1.678	.796	-1.21**
In person	73.2%			
In print	8.4%			
Television	5.3%	3.910	1.648	.135**
Other	5.9%	2.537	1.671	.087
R^2			.042	
F			4.343**	

* $p<.05$

** $p<.01$

*** $p<.001$

Participants were asked what type of Internet connection they had at home. The distribution of participant Internet connection speed along with average BMI and CE score by type of Internet connection at home is presented in Table 10. The majority (66%) of participants had high-speed Internet access. When connection categories were compared, analysis of variance showed no differences in mean BMI $F(3,304)=.21$, $p=.809$). Significant differences in CE scores were found, $F(3,320)=22.07$, $p<.001$). Post hoc analysis showed that CE scores were significantly higher for participants with high-speed Internet access.

Table 10

BMI and CE Score by Type of Internet Connection at Home

Type of Internet connection at home	% of sample	M BMI (SD)	M CE Score (SD)	<i>n</i>
No Internet	39.18%	30.29 (7.16)	6.98 (5.20)	89
Dial-up	5.25%	29.18 (5.04)	7.95 (3.36)	16
High-speed Internet	65.57%	29.98 (6.51)	10.43 (3.89)	200
Total	110%			305

Participants were asked if they had a desktop computer, laptop, smartphone, or tablet. The distribution of types of computers used by participants is presented in Table 11. Participants predominantly used desktop computers, laptops, and smartphones. A multiple regression was performed to identify relationships between type of computer owned and BMI. While laptop use was slightly negatively associated with BMI, $r(301)=-.12$, $p=.019$, type of computer use overall failed to explain a significant amount of the variation in BMI, $R^2=.02$, $F(4, 298)=1.29$, $p=.274$.

Table 11

<i>Type of Computer Owned</i>		
Type of hardware	% of sample	<i>N</i>
Desktop computer	48.9%	157
Laptop computer	53.9%	173
Smartphone	40.5%	130
Tablet	15.9%	51
Total	159.2%	511

Pearson correlation revealed that laptop ($r(312)=.21, p<.001$) and smartphone ($r(312)=.15, p=.007$) use was associated with race/ethnicity. Caucasian participants were more likely to use these devices. No significant differences were found for desktop or tablet use. Additionally, Pearson Chi-square statistics, presented in Table 12, show that Caucasian participants use laptops more than African American participants.

Table 12

<i>Use of Devices by Race</i>				
Device	African American Use	Caucasian Use	Pearson Chi-square	<i>p</i>
Desktop	46.7%	54.6%	5.621	.345
Laptop	47.7%	68.5%	15.920	.007
Smartphone	35.7%	51.8%	10.441	.064
Tablet	16.6%	15.7%	2.481	.779
Total	146.7%	190.6%		305

Participants were asked to rate the quality of life for them and their families. The average BMI and CE score by self-reported quality of life is presented in Table 13. The majority (90%) of participants reported that their quality of life was good, very good, or excellent. When quality of life categories were compared, analysis of variance showed no differences in mean BMI ($F(5, 302)=1.51, p=.198$). Significant differences in CE scores were found, $F(5, 302)=10.67, p<.001$). Post hoc analysis revealed that CE scores were significantly higher for those who reported a higher quality of life. Regression indicated similar results. Quality of life failed to explain a significant amount of the variation in BMI, $R^2=.01, F(1,303)=1.44, p=.23$. Quality of life explained a significant amount of variation in CE score $R^2=.09, F(1,317)=29.87, p<.001$.

Table 13

<i>BMI and CE Scores by Quality of Life</i>				
Quality of life	% of sample	M BMI (SD)	M CE score (SD)	<i>n</i>
Excellent	18.4%	29.97 (6.39)	10.78 (4.05)	59
Very Good	35.2%	29.66 (6.95)	9.83 (4.52)	113
Good	36.4%	29.95 (5.71)	9.21 (4.27)	117
Fair	8.1%	31.18 (6.99)	5.04 (3.74)	26
Poor	.9%	38.39 (14.28)	2.33 (2.08)	3
Total	99%			318

The average CE score by weight category is presented in Table 14. The majority (77%) of participants were overweight and nearly half (48%) were obese. When weight categories were compared, analysis of variance showed significant differences in mean CE score, $F(4,297)=3.28, p=.021$). Post hoc analysis showed that CE scores were

significantly higher for normal weight participants compared to overweight and obese participants. Regression indicated similar results. Weight category accounted for a significant amount of variation in CE score, $R^2=.02$, $F(1,297)=6.56$, $p=.001$.

Table 14

<i>CE Scores by Weight Category</i>			
BMI Status	% of sample	M CE score (SD)	<i>n</i>
Underweight	1.34%	8.75 (6.13)	4
Normal	21.48%	10.91 (4.06)	64
Overweight	29.19%	9.08 (4.68)	87
Obese	47.99%	8.87 (4.44)	143
Total	100%		298

Participants were asked if they looked online for health information. The average BMI and CE score by whether or not the participant looked online for health information is presented in Table 15. The majority (72%) of participants looked online for health information. When participants who looked for information online were compared to those who did not, analysis of variance showed no differences in mean BMI, $F(1,303)=.36$, $p=.549$. Significant differences in CE scores were found, $F(1,319)=129.53$, $p<.001$. Those who looked online had significantly higher CE scores.

Table 15

BMI and CE Scores by Looking Online for Health Information

	% of sample	M BMI (SD)	M CE Score (SD)	<i>n</i>
Did not look online	27.4%	29.588 (5.92)	5.31 (4.73)	88
Looked online	72.3%	30.082 (6.52)	10.80 (3.45)	232
Total	99.7%			320

When responses to individual questions that make up the CE score were analyzed for relationships with BMI, three relationships were identified. Search engine knowledge was found to be negatively associated with BMI, $r(304)=-.20$, $p<.001$. Knowing how to use the address bar was negatively associated with BMI, $r(304)=-.13$, $p=.013$. Knowing how to send photos was negatively associated with BMI, $r(304)=-.13$, $p=.011$. When these items were included in a multiple regression, the items related to knowing how to send photos and use the address bar failed to predict BMI. However, search engine knowledge was found to predict BMI, $\beta=-2.26$, $t(301)=-2.99$, $p=.003$. A summary of multiple regression statistics is presented in Table 16. Those who exhibited search engine knowledge were more likely to have a lower BMI.

Table 16

*Summary of Multiple Regression Analysis for Variables (Individual Item Responses)
Predicting BMI*

Questions	B	SE B	β
A "Search engine" is:	-2.262	.768	-.170**
You want to go to a specific address...	-.821	.889	-.059
You want to send a photo...	-.973	.845	-.073
R^2		.050	
F		5.315***	

* $p < .05$

** $p < .01$

*** $p < .001$

Because the knowledge question directly related to search engines was associated with BMI, multiple regression analysis was then completed with this variable and race/ethnicity. Multiple regression statistics are presented in Table 17. Search engine knowledge was found to predict BMI when race/ethnicity was included in the model, $B = -1.96$, $t(299) = -2.68$, $p = .008$. Having search engine knowledge and being Caucasian was associated with having a lower BMI.

Table 17

Summary of Multiple Regression Analysis for Variables (Search Engine Knowledge and Race/ethnicity) Predicting BMI

Variable	B	SE B	β
Search engine knowledge	-1.964	.734	-.150**
Race/ethnicity	-1.015	.734	-.150***
R^2		.098	
F		4.438***	

* $p < .05$
 ** $p < .01$
 *** $p < .001$

Of the factors included in this study, race/ethnicity, search engine knowledge, obtaining information online, and obtaining information from television were found to predict BMI when included in a multiple regression with similar factors. The factors were then included in a multiple regression equation together. The results are presented in Table 18. Search engine knowledge, race/ethnicity, and obtaining health information from television explained a significant portion (11%) of the variance in BMI, $R^2 = .11$, $F(4, 295) = 8.64$, $p < .001$.

Table 18

Summary of Multiple Regression Analysis for Variables Predicting BMI

Variable	B	SE B	β
Search engine knowledge	-1.949	.730	-.149**
Race/ethnicity	-.910	.257	-.206***
Obtaining information online	-.857	.780	-.063
Obtaining information from television	3.435	1.567	.121*
R^2		.105	
F		8.637***	

* $p < .05$
 ** $p < .01$
 *** $p < .001$

Summary

In summary, computer expertise failed to significantly predict obesity when demographic variables were taken into consideration. However, relationships were identified between BMI and several potential predictor variables: CE score, race/ethnicity, where participants get their health information, laptop use, and several individual items that make up the CE score. A multiple regression identified three factors that were significant overall predictors of BMI: search engine knowledge, race/ethnicity, and obtaining information from television. Participants who lacked search engine knowledge, were African American, and obtained health information from the television were more likely to be overweight compared to participants not in those groups. The summary of results, conclusions, implications, and recommendations for further investigation are presented in Chapter 5.

Chapter 5

Summary, Conclusions, Implications, and Recommendations

The purpose of this study was to examine the relationship between computer expertise and obesity as an indicator of health across race, age, gender, education level, and socioeconomic status. Fox (2011) indicated increased computer use among all segments of the population; however, minorities and low-income populations lag behind in adopting some of these technologies. Similar demographic trends exist for obesity rates (CDC, 2012; Jolliffe, 2011). Home broadband usage across all segments of the population averages 66% while only 56% of African American's, and 45% of low income families have broadband Internet access at home (Smith, 2010). Not knowing how to use a computer is cited as a common barrier to Internet use (Smith, 2010).

Research Questions

The following research questions were examined in this study:

1. What is the relationship between computer expertise and obesity?
2. What is the relationship between high speed Internet access at home and obesity?
3. When demographic characteristics are controlled, to what extent does the type of Internet access predict obesity?
4. When demographic characteristics are controlled, to what extent does computer expertise predict obesity?

5. Is there a relationship between obesity and those who seek health information online?

Summary

Despite attempts to reduce obesity in the United States, the current trend indicates that levels continue to rise (CDC, 2010). Simultaneously with the increase in obesity rates, the rise of technology has created additional disparities which affect the population of the Black Belt. Over the last 20 years, computer use has increased dramatically. According to Hampton, Sessions, Her, and Rainie (2009), 79% of adults in the United States are Internet users. This change in our society has brought about concern that technology may be affecting quality of life and may be creating a digital divide of the computer savvy versus the non-savvy. Similar to the problem of obesity, the digital divide cuts along ethnic, age, education, and income lines (Brodie, Flournoy, Altman, Blenton, Benson, & Rosenbaum, 2000). This study explores the relationship between computer expertise, computer access, and BMI as an indicator of health.

In this study, relationships were identified between BMI and several variables: computer expertise (CE) score, race/ethnicity, where participants get their health information, laptop use, and several individual items that make up the CE score. Multiple regression identified three factors that were significant overall predictors of BMI: search engine knowledge, race/ethnicity, and obtaining information from television. Participants who lacked search engine knowledge, were African American, and obtained health information from television were more likely to be overweight compared to participants who were not in these groups. Although computer expertise failed to significantly predict obesity when demographic variables were taken into consideration,

the relationships identified in this study help elucidate the complex issue of how people get their health information and how that impacts their overall health.

Conclusions

The first research question dealt with the relationship between computer expertise and obesity. Pearson correlation indicated a small, but statistically significant negative relationship between BMI and CE score. Regression analysis revealed that CE score was a significant predictor of BMI and explained a statistically significant portion of the variance in BMI. These results are not surprising since both lack of computer use and obesity are associated with low income and low education (Fox, 2011; Wang & Beydoun, 2007). In contrast, Chatterjee and DeVol (2012) predict an increase in BMI with more time spent on screen time activities such as playing video games, watching television, and using computers. Since computer expertise was associated with lower levels of obesity in this study, it may be important to make a distinction between watching TV and using computers. It is plausible that computer users are more engaged with the activity and less likely to snack compared to television watchers.

The second research question dealt with defining the relationship between Internet access at home and obesity. Pearson correlation failed to detect a relationship between type of Internet access and BMI. It is possible that in this age of rapidly changing technology, having Internet access at home is less important than it once was. According to Fox (2011), minorities are more likely than Caucasians to use a cell phone to look up health information. Since the majority of participants in this study were

African American, it is reasonable to conclude that they may be accessing the Internet using mobile technology and not necessarily at home. The third research question dealt with the extent to which the type of Internet access predicts obesity when demographic characteristics are taken into consideration. Since the type of Internet access at home was not found to have a significant relationship to BMI, no further analysis was undertaken.

The fourth research question dealt with the extent to which CE score predicts obesity when demographic characteristics are taken into consideration. CE score failed to predict BMI when race/ethnicity was included in the model. The computer expertise questionnaire may have been too broad an instrument to measure the computer skills specific to finding health information on the Internet. However, the finding that search engine knowledge was associated with reduced obesity indicates that information literacy may be an important factor in solving the very complex obesity challenge. Just as Davis, Crouch, Wills, Miller, and Abdehou (1990) noted that basic literacy is key to patient understanding of written health information materials, the findings in this study support the idea that information literacy is key to finding health information online. In a similar study investigating the relationship between health literacy and glycemic control, Schillinger and colleagues (2002) found that an increase in health literacy was associated with better control of diabetes even after adjusting for age, sex, education, race and other variables. Schillinger and colleagues (2002) specifically studied patients' ability to read and comprehend health information. Participants were from the San Francisco area and their demographic profile was very different from the demographic profile of participants in this study. The largest ethnic group was Latino. The

demographic differences in participants and the fact that Schillinger and colleagues (2002) studied skills very specific to understanding health information, may account for the differences in the results.

The fifth research question dealt with whether or not there is a relationship between obesity and those who seek health information online. Pearson correlation failed to detect a relationship between looking online for health information and BMI. Regression analysis indicated that seeking health information online failed to predict BMI. Since CE score was associated with BMI and participants with computer expertise are more likely to look online for health information, it is difficult to explain these results. It is possible that because the majority of participants looked online for health information there were not enough participants in the groups that did not look online to detect differences in BMI. It is also possible that participants are not necessarily able to differentiate credible sources of information, or that they are unable to use the information that they are finding online.

When the relationship between demographic variables and BMI was assessed, Pearson correlation initially revealed that race/ethnicity, education, and income were associated with obesity. However, multiple regression indicated that only race/ethnicity accounted for a significant amount of variation in BMI. These results are consistent with other studies which suggest that where BMI is concerned race is robust to the effects of education and income (Burke & Heiland, 2008; Burke & Heiland, 2011). Additionally, Lovasi, Hutson, Guerra, and Neckerman (2009) found that even after controlling for socioeconomic status and education, African Americans tended to live in areas with fewer grocery stores and places to exercise. These environmental factors may lead to

further disparity in obesity rates. In this study, the association among race/ethnicity, education, and income indicated that in the population sampled, African Americans had a lower level of education and income. This relationship may have masked independent effects of income and education on BMI.

Similar to the results of this study, the Centers for Disease Control reported that among women the greatest levels of obesity were found in the non-Hispanic black population (59%) and lower levels were found in whites (32%) (CDC, 2012). The reason for this is unclear. In this study, the finding that race was a significant factor may also reflect the unique nature of the cultural situation in the Black Belt: generational poverty and poor access to nutritious foods combined with differences in the sociocultural conditions and behaviors between African Americans and Caucasians in this region of the country. The differences in sociocultural conditions is exemplified by Cawley (2004) who studied the effects of weight gain on earnings and found similar racial-gender differences in BMI compared to this study. Cawley found that wages were lower for Caucasian women with higher BMI, but wage disparities were not seen in other gender or racial groups, leading the author to conclude that other groups do not face significant social pressures with weight gain.

The population sampled in this study included more women and more obese individuals compared to the general population and the population of the Black Belt region (see Table 19). In this study nearly 48% of participants were obese compared to 31% in the general population and 41% in the Black Belt (CDC, 2009; U.S. Census Bureau, 2010). The high levels of obesity found in this study may reflect increases in obesity over the last few years. Moreover, the predominantly female sample could

account for the increased obesity found in this study since African American women have the highest obesity rates overall (CDC, 2012). This study also included more participants with higher education and income than is typical of the Black Belt population. This reflects the nature of the sampling protocol. It is theorized that members of the general population seeking learning opportunities from Extension may have a general affinity for education and thus a higher level of formal education. Because of the differences between participants in this study and the Black Belt population, it is important to note that caution should be used when generalizing the results of this study to the population of the Black Belt. For instance, the population of this study was younger and more educated, thus may be in general more computer literate than the population of the Black Belt. Additionally, the sample population was almost two thirds women. Because African American women tend to have higher BMIs compared to men, judgment should be used before generalizing the results of this study to the Black Belt population.

Table 19

Population Differences

Demographic	This study	Black Belt	United States
Age 65 +	9.4%	15.5%	13.3%
Male	32.7%	47.5%	49.2%
Female	62.3%	52.5%	50.8%
African American	62.3%	65.8%	13.1%
Caucasian	34.0%	32.5%	78.1%
Hispanic	.6%	1.5%	16.7%
Native or American Indian	.6%	.16%	1.2%
Asian	.3%	.21%	5.0%
High school diploma	90.6%	74.3%	85.4%
College degree	35.8%	13.3%	28.2%
Median income	\$40,000	\$27,790	\$52,762

Implications

Since basic literacy is a foundation of both health literacy and information literacy, the results of this study emphasize the importance of various types of literacy in improving health and overall quality of life. Governments and consumer groups tackling the obesity challenge should pay specific attention to information availability and the ability of the clientele to access the information.

The results of this study support the conclusions and recommendations given by Nutbeam (2000) who argued that improving access to health information and the ability to use the information was key to empowering people to improve their own health. Nutbeam recommended that community based outreach efforts focus on better equipping people to overcome barriers to better health. Clearly information literacy is important to improving access to health information. One way to empower individuals might be to teach community members the specific skills associated with information literacy thereby enabling participants to find the information that they need to improve their health and quality of life.

The data presented in Table 12 suggest that significant numbers of African Americans are using emergent technologies such as smartphones and tablet computers. This finding is consistent with Fox (2011) and Kellogg (2011) who reported that minorities are more likely to use mobile devices to gather information. The use of these devices is important in respect to reaching minority audiences with Internet based health related communications. Webpages and applications should be designed for use with mobile technologies such as smart phones and tablets in order to reach all segments of the population.

Recommendations for Future Research

Future research is needed to investigate the relationship between basic literacy in the Black Belt and how this skill affects health literacy and the ability to use information and communications technology. In a study of adolescents in the United Kingdom and the United States, researchers Gray, Klein, Noyce, Sesselberg, and

Cantrill (2005) found that many students had difficulty accessing health information online due to basic literacy issues. Students had a difficult time spelling terms, forming questions and being able to discern which sites to trust and which not to trust. As more and more health information and services become available online, it becomes increasingly important for disadvantaged populations to be able to access it.

Research is needed to define the effect of various types of screen time on differences in BMI. For instance, is there a difference between consuming video or watching television versus being actively engaged on a computer or mobile device? Additionally, the emerging active gaming technologies, such as Wii and Xbox Kinect, may mediate higher obesity levels generally seen with increased screen time by burning calories while playing games.

In addition to investigating the effects of literacies and screen time, the availability of nutritious diet also deserves some exploration. Access to affordable, nutritious food is a problem for low income and rural residents in the United States (Ver Ploeg et al., 2009). Ver Ploeg and colleagues reported that about 6% of the population lives more than a half mile from a grocery store and does not have a vehicle. About 23 million people live in low-income areas and live more than a mile from a grocery store. Lack of access to affordable, nutritious food is likely to be a significant contributor to obesity. Future research should take environmental factors into consideration along with culturally accepted dietary patterns, lifestyles, and information literacy.

The population of focus in this study was predominantly African American and Caucasian, with the highest levels of obesity found in African American women.

Minority non-black populations have varying cultural influences, education and economic situations. Although each population struggles with obesity, the cultural factors surrounding the issue may be different. Therefore, investigation into the relationship between computer literacy and obesity in minority non-white populations is recommended. Specifically, determinants of obesity in African American women and possible intervention strategies for each unique population should be addressed. Because the participants in this study were more highly educated, higher income, and predominantly women, repeating this study using random sampling of participants would help further define the obesity causing parameters involved in the Black Belt population.

The variety, amount of information available, 24/7 access, and up to date nature of the information on the Internet make it different from traditional forms of health communication media (Cotten & Gupta, 2004). Understanding the relationship between technology and health will improve society's potential to reach vulnerable populations with health related information. This area of study has the potential to break through current barriers in health communication and engage learners in a new way.

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Appendix A

Survey Use Approval

Sehr geehrte Frau Woods,

leider gibt es den Fragebogen nur als deutsche Version - Sie finden ihn im Anhang dieser Mail.

Mit freundlichen Grüßen

Katrin Arning

Am 28.01.2011 um 04:07 schrieb Kristin Woods:

- > Sehr geehrter Dr. Arning,
- >
- > Ich bin Studentin im Graduiertenstudium an der Universität von Auburn
- > (Alabama, USA), wo ich Erwachsenenbildung studiere.
- > Ich bin gerade damit beschäftigt, die Forschungen zu meinem
- > Dissertationsthema - Der Zusammenhang zwischen Computerkenntnissen
- > und Lebensqualität - zu beginnen. Vor Kurzem habe ich Ihren Artikel
- > "Development and validation of a computer expertise questionnaire for
- > older adults" aus dem Jahr 2008 gelesen. Ich denke, dass der
- > Fragebogen, den Sie entwickelt haben, auch auf die Bevölkerung mit
- > niedrigem Einkommen hier in den USA anwendbar wäre und hoffe,
- > dass Sie mir erlauben, den CE-Fragebogen in meiner Forschung zu
- > verwenden. Wären Sie damit einverstanden, mir den Fragebogen zu
- > schicken? Natürlich werde ich sicher gehen, Ihre Arbeit mitanzugeben.
- >
- > Vielen Dank,
- >
- > Kristin Woods
- >
- >
- > Kristin Woods Williams, M.S., Ed.S.
- > Regional Extension Agent, Food Safety
- > Alabama Cooperative Extension System
- > Clarke County Office
- > 120 Court St./PO Box 40
- > Grove Hill, AL 36451
- > cell: (251) 753-1164
- > fax: (251) 275-3122

Appendix B

Research Approval by Institutional Review Board

Office of Research Compliance
115 Ramsay Hall, basement
Auburn University, AL 36849



Telephone: 334-844-5966
Fax: 334-844-4391
irbadmin@auburn.edu

May 3, 2012

MEMORANDUM TO: Ms. Kristin Woods
Alabama Cooperative Extension Service

PROTOCOL TITLE: "The Relationship between Computer Literacy and Obesity as a Leading Health Indicator in the Black Belt Region of Alabama"

IRB FILE NO.: 12-166 EX 1205

APPROVAL DATE: May 1, 2012
EXPIRATION DATE: April 30, 2013

The referenced protocol was approved "Exempt" by the IRB under its FederalWide Assurance, # 0001104, and per 45 CFR 46.101 (b)(2):


- (2) "Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
- (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
 - (ii) any disclosure of the human subjects' response outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation."

Note the following:

1. CONSENTS AND/OR INFORMATION LETTERS: Only use documents that have been approved by the IRB with an approval stamp or approval information added.
2. RECORDS: Keep this and all protocol approval documents in your files. Please reference the complete protocol number in any correspondence.
3. MODIFICATIONS: You must request approval of any changes to your protocol before implementation. Some changes may affect the assigned review category.
4. RENEWAL: Your protocol will expire in April 2013. Submit a memo requesting renewal a month before expiration. If your protocol expires it will be administratively closed.
5. CLOSING THE PROTOCOL: When your study is complete, please notify the Office of Research Compliance, Human Subjects.

If you have any questions concerning this Board action, please contact the Office of Research Compliance.

Sincerely,


Christopher Correia, Ph.D.
Chair of the Institutional Review Board #2
for the Use of Human Subjects in Research

cc: Dr. James Witte

Appendix C

Permission to Conduct Research at Extension Events



Alabama A&M and Auburn Universities

Office of the Director
109 Duncan Hall
Auburn, AL 36849
Phone: 334-844-5546
Fax: 334-844-5544

March 28, 2012

Auburn University Institutional Review Board
c/o Office of Human Subjects
307 Samford Hall
Auburn, AL 36849

To Whom It May Concern:

The Alabama Cooperative Extension System (ACES) grants Ms. Kristin Woods, Auburn University Graduate Student, permission to conduct research at ACES events in Bullock, Choctaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Perry, Pickens, Sumter, and Wilcox Counties. A listing of addresses for ACES offices in these counties is provided as follows:

Bullock Co. Ext. Office 132 N. Prairie St. Union Springs, AL 36089	Choctaw Co. Ext. Office 218 S. Hamburg Street Butler, AL 36904	Dallas Co. Ext. Office 429 Lauderdale St. Selma, AL 36701
Greene Co. Ext. Office 107 Harris Avenue Eutaw, AL 35462	Hale Co. Ext. Office 701 Hall St. Greensboro, AL 36744	Lowndes Co. Ext. Office 125 Tuskeena St. Hayneville, AL 36040
Macon Co. Ext. Office 207 North Main Street Tuskegee, AL 36083	Marengo Co. Ext. Office 101 N. Shiloh Linden, AL 36748	Perry Co. Ext. Office 1710 S. Washington St. Marion, AL 36756
Pickens Co. Ext. Office 155 Reform St. Carrollton, AL 35447	Sumter Co. Ext. Office 106 Hospital Drive Livingston, AL 35470	Wilcox Co. Ext. Office 12 Water Street Camden, AL 36726

Ms. Woods will inform ACES program attendees of their option to participate in her study at the conclusion of certain ACES programming. After the announcement, ACES program attendees may volunteer to participate by accepting an information packet. The packet will include a survey which will be completed and returned to her on-site at the ACES program location. Her plan is to have all surveys administered and completed by the end of July 2012.

Ms. Woods is welcome to administer the survey at the ACES offices listed in this letter or off-site locations where ACES programs are conducted. She has agreed not to interfere with the implementation of ACES programming. Ms. Woods also has agreed to provide my office with a copy of the Auburn University IRB-approved, stamped consent document before participants are recruited. When available, a copy of aggregate survey results will be provided to my office as well.

We hope that the results of her research concerning the relationship between obesity and computer literacy will be of benefit to our communities.

Sincerely,

A handwritten signature in black ink that reads "Paul W. Brown".

Paul W. Brown, Ph.D.
Associate Director

The Alabama Cooperative Extension System (Alabama A&M University and Auburn University) is an equal opportunity educator and employer.
www.aces.edu

Appendix D

Computer Expertise Survey Instrument

Dear participant,

This questionnaire is used to measure "computer expertise", i.e. the theoretical and practical knowledge of computers. Below you will find 18 multiple choice questions and some additional questions for our research project. Your response to all questions is voluntary. Please choose the best answer from the choices. Circle the letter next to your response. You should only mark one answer for each question. If you do not know the answer, you should not guess, but rather, mark "I'm not sure".

1. What is your age? _____
2. What is your gender? Male or Female
3. What is your race/ethnicity?
 - a. Asian or Pacific Islander
 - b. Black or African American
 - c. Hispanic
 - d. Native American or American Indian
 - e. White or Caucasian
 - f. Other
4. Which category best describes your level of education?
 - a. Some high school, but not complete
 - b. High school graduate or GED
 - c. Technical degree AFTER high school
 - d. Some college or Associates degree
 - e. College graduate (B.S. or B.A.)
 - f. M.S., Ph.D., or other post graduate degree
5. Last year, in 2011, what was your total family income from all sources before taxes?

6. At home, do you connect to the Internet through (circle all that apply):
- a. Dial-up telephone line
 - b. DSL phone line
 - c. Cable TV
 - d. Wireless connection
 - e. FIOS
 - f. T-1
 - g. None of the above
7. Have you ever looked online for information about diet, exercise, or any healthy issue?
- a. Yes
 - b. No
8. The last time you had a health issue, did you get information, care, or support from (circle all that apply):
- a. A doctor of other healthcare professional
 - b. Friends and family
 - c. Others who had the same health condition
9. The last time you had a health issue. Did you get information (circle all that apply):
- a. Online
 - b. In person
 - c. In print (newspaper, book, magazine, etc.)
 - d. TV
 - e. Other _____
10. Do you have (circle all that apply):
- a. A desktop computer
 - b. A laptop computer
 - c. Blackberry, iPhone, or other smart phone
 - d. iPad or tablet
11. Which of the devices in question 10 are you most likely to use to look up health information?
- _____

12. How would you rate the quality of life for you and your family today?

- a. Excellent
- b. Very good
- c. Good
- d. Fair
- e. Poor

13. What is your height in feet and inches? _____

14. What is your weight in pounds? _____

15. What county do you live in?

Bullock
Choctaw
Dallas
Greene

Hale
Lowndes
Macon
Marengo

Perry
Pickens
Sumter
Wilcox

Other _____

Computer Expertise Questions:

1. "Save" means:
 - a) collect multiple documents in a folder
 - b) stop a program
 - c) to manipulate data in a program
 - d) to store data permanently on the computer hard drive, flash drive or CD
 - e) I'm not sure

2. In a program "Exit" means:
 - a. permanently remove the program from the computer
 - b. move the program from the monitor and hide it
 - c. work is completed with the program (e.g. Word)
 - d. work is finished with document (e.g. a letter)
 - e. I'm not sure

3. "Delete" means:
 - a. modify a file
 - b. a file is no longer visible
 - c. move a file to another location to save
 - d. permanently remove a file from a flash drive or the hard disk of a computer
 - e. I'm not sure

4. "Open" means:
 - a. begin using a program or a file
 - b. copy a program or data from a flash drive to the computer memory
 - c. display something on the monitor
 - d. find information
 - e. I'm not sure

5. A "View" is:
 - a. a picture or photo that you can see on the screen
 - b. detailed representation of the different features in a program
 - c. different ways to solve a computer problem
 - d. a reference to important information in a program
 - e. I'm not sure

6. A "search engine" is:
 - a. a special robot for automatically locating objects
 - b. a special program for searching the Internet
 - c. a program to locate files on your computer
 - d. a database for finding information on the web
 - e. I'm not sure

7. "Java" is:
 - a. a program that automatically calls web pages
 - b. an Internet search engine
 - c. a protocol that can be transferred with the files of all kinds on the Internet
 - d. a programming language
 - e. I'm not sure

8. To receive and send e-mails:
 - a. you have to have a connection to the Internet
 - b. the computer to which you send the e-mail, must be switched on
 - c. you have to have a very fast computer
 - d. you have to have a computer that other computers are compatible with
 - e. I'm not sure

9. If you delete files in Windows:
 - a. there is no way to access it again
 - b. the last 100 deleted files can be restored
 - c. the deleted files are sent to the trash and kept
 - d. deleted files can be restored as long as the computer was not switched off
 - e. I'm not sure

10. You want to go to a specific address (e.g. www.xyz.de) on the Internet. What do you do?
 - a. type the address into the address bar of my Internet browser and press the "Enter" key
 - b. type the address into an Internet Address Directory
 - c. use a search engine and type in the address in the search line
 - d. use my browser menu item "Go to address" and give the address"
 - e. I'm not sure

11. If Your computer crashes and you want to restart it, you should
 - a. press the "reset" button
 - b. press the key combination Ctrl + Alt + Del
 - c. press the key combination end +Enter
 - d. turn the computer off and on again
 - e. I'm not sure

12. You have been working on a document (e.g. a letter) and are briefly interrupted and no longer know where the document is stored in the computer. How do you go about searching?
 - a. look in all files
 - b. look in the paper basket
 - c. type a new document
 - d. look in the program under "recent files "
 - e. I'm not sure

13. You want to send a photo via e-mail. How do you begin?
- choose an image editing program in the e-mail
 - attach the file as an attachment to an ordinary e-mail
 - convert the graphic into the email format and send it
 - copy the photo in my word processing program and send it off
 - I'm not sure
14. To write a letter on the computer. How do you begin?
- open the program "Word" by clicking on its icon and start writing
 - open the e-mail program and start writing
 - open an already written letter and type on it
 - open the editor and start typing
 - I'm not sure
15. You're surfing the web. How do you get back to the page that you have just seen before?
- retype the address of the page
 - press the "Shift" key
 - press the "Back" button
 - close Internet Explorer and open it again
 - I'm not sure
16. What happens when you press "Ctrl" + "V" while working on a document?
- I copy something from the document
 - I print the document
 - I save the document
 - I paste something into the document
 - I'm not sure
17. When using Windows, you want to add a program that you use frequently to the task bar.
- right-click and chose "pin to task bar"
 - put it under "Favorites"
 - install the program directly to the desktop again
 - in the Explorer program add a shortcut
 - I'm not sure

18. You are working on a project in Word and need to look up something quickly on the Internet to include in the project. How would you do this?
- a. close Word, open the browser and look up the information, close the browser, and open Word to finish the project
 - b. minimize Word, open the browser to look up the information, switch back to Word by clicking the icon at the bottom of the screen
 - c. go to another computer to look up the information so that you do not lose the project
 - d. look up the information by clicking on the “?” within Word
 - e. I’m not sure