APPLICATION OF THE DIFFUSION OF INNOVATIONS THEORY AND THE HEALTH BELIEF MODEL TO DESCRIBE EMR USE AMONG ALABAMA FAMILY MEDICINE PHYSICIANS: A RURAL AND URBAN ANALYSIS

by

MELANIE TARA TUCKER

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ABSTRACT

The Alabama Black Belt region consists of twelve counties which are characterized by a high percentage of African Americans, acute poverty, rural decline, inadequate education programs, and significantly poor health outcomes. The Alabama Black Belt region suffers significantly with health disparities which, in part, may be attributed to low physician/patient ratio and physician isolation. These physicians tend to practice in private, solo establishments, which often lead to limited communication with other physicians and medical educators. Without continued communication and continuing medical education, rural physicians could lag behind their urban counterparts. In fact it has been shown that some physician practices lag as far as two decades behind their urban counterparts due to such things as limited access to new technologies. With the advent of the electronic medical record (EMR) this lag is likely to decrease exponentially for those in rural areas and could lead to an increase in quality of care for the rural communities.

The purpose of this study was to evaluate the adoption and implementation of electronic medical records (EMR) by rural and urban Alabama Family Medicine physicians. The Diffusion of Innovations Theory and Health Belief Model were used to guide the study and develop the survey questions. EMR adoption was assessed in rural areas and compared to their urban counterparts while evaluating the individual characteristic (gender, race, age, and years of practice), organizational characteristics (practice size, patients seen per day, practice location) and individual perceptions regarding adoption (perceived threat, perceived barriers and self-efficacy).

Thirty percent (30%) of the 1,205 Alabama Family Medicine physicians responded to the electronic or paper survey. Almost half (49.3%) of the physicians surveyed reported having EMR in their practice; however, 16.3% reported using it to its fullest capacity. Significant differences emerged with respect to EMR use among physicians based on age, years in practice, patients seen per day, practice size and with respect to elements of perceived threat, barriers to adoption and the self-efficacy. Throughout the analysis, differences emerged between Family Medicine physicians from urban Alabama settings and their counterparts from rural and Black Belt region practices.

DEDICATION

This dissertation is dedicated to my children: Meredith, Zach, Ryan, Max, Quin, Sophie and Liam. I hope you never give up on your dreams.

LIST OF ABBREVIATIONS AND SYMBOLS

ALMA	Alabama Medicaid Agency
BBAC	Black Belt Action Commission
BFP	Biomonitoring Futures Project
CCHIT	Certification Commission for Healthcare Information Technology
CDC	Center for Disease Control and Prevention
CFR	Code of Federal Regulations
df	Degree of Freedom
DOI	Diffusion of Innovations Theory
DRA	Disparity Reducing Advances Project
E-mail	Electronic Mail
EMR	Electronic Medical Records
GM	Genomic Medicine
HBM	Health Belief Model
HIPAA	Health Insurance Portability Accountability Act
HIT	Health Information Technology
IT	Information Technology
K-W	Kruskal-Wallis
M	Mean
MD	Medical Doctor
N	Total Number in the Sample

p	Probability
P	Percentage
RUCA	Rural-Urban Commuting Area Codes
SD	Standard Deviation
SPAM	Spamming
U	Mann-Whitney U Test
UA	The University of Alabama
USPS	United States Postal Service
X^2	Chi Square

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CHAPTER 1

INTRODUCTION

In W.E.B. Dubose's *The Souls of Black Folks*, (1903, p.71) he poignantly described the southern Black Belt region…**"**How curious a land is this, -- how full of untold story, of tragedy and laughter, and the rich legacy of human life; shadowed with a tragic past, and big with future promise!" Little did we know that over 100 years later his words would continue to ring true.

The entire U.S. Black Belt Region is comprised of over 200 counties that begins as far north as Delaware and extends as far south as Texas. These counties include some of the poorest counties in the United States and are characterized by a high percentage of African Americans, acute poverty, rural decline, inadequate education programs, and significantly poor health care. The Alabama Black Belt extends from Mississippi's border through the heart of the state and shares the same characteristics as the regional profile. The Alabama Black Belt region suffers significantly with health disparities which, in part, may be attributed to low physician/patient ratio and physician isolation. The Alabama Black Belt physicians tend to practice in private, solo establishments, which often lead to limited communication with other physicians and medical educators. Without continued communication and continuing medical education, rural physicians could lag behind their urban counterparts. In fact it has been shown that some physician practices lag as far as two decades behind their urban counterparts due to such things as limited access to new technologies and the like. With the advent of the electronic medical record (EMR) this lag is likely to increase exponentially for those in rural areas.

EMR, also known as computer-based medical records, has been touted for its ability to transform healthcare and improve patient safety and quality of care. Along with being able to be used for staff training and education purposes it has improved the skills of providers while increasing their marketability and pay (Athey & Stern, 1999). The use of EMR has been shown to allow medical providers to more efficiently bill for services and ensure payment from secondary sources (e.g. Medicare, Medicaid and private insurance). Implementing EMR could provide a myriad of solutions to rural Family Medicine physicians that care for their patients and community members while having limited personnel and assets at their disposal. Approximately 13-20% of solo physician practices have implemented and use EMR in their offices (Burt & Sisk, 2005; New England Journal of Medicine, 2008). The use of EMR in the Family Medicine practice could assist in patient education, improve patient safety, and increase quality of care. If technologically, innovative health care services are met with physician resistance then health disparities occur. The groups that are hit hardest by health disparities are those in racial and ethnic minorities and those in rural areas, all of which reside in our Alabama Black Belt.

Rural and urban areas have very different characteristics, many of which often affect the health of its community. Sixty-seven percent (67%) of Alabama counties are defined as rural and contain demographic profiles suggesting a high a concentration of elderly, children, uninsured, underinsured, minorities, and unemployed (ADPH, 2003). Some of these rural and urban differences also include high patient to physician ratio, low number of hospital beds, and lack of patient access to medical care (Bahensky, 2008). For example, the 212,000 residents that live in the twelve-county, Black Belt region of Alabama are served by 52 Family Medicine physicians and eight community hospitals which collectively total 534 beds (RHI, 2005). Each Family Medicine physician practicing in this area has the potential for caring for over 4,000

patients (MASA, 2007). These physicians and hospitals operate under the auspices of what could be considered modern America's "frontier medicine." Implementing the biomedical discoveries made in the past 10 years to these health care providers is the very definition of health education and promotion.

Advancing EMR implementation will lead to quality care for the rural community citizens. Although some progress is being made in the efforts to implement EMR there is a significant lag in rural medical practices. Being able to anticipate and predict EMS adoption in the Family Medicine practice arena will arm health care providers, as well as policy makers, with valuable information in order to make health-related decisions for their patients and community members, especially those living and working in rural, medically-underserved areas.

Using EMR to assist in eliminating health disparities in rural communities is an issue being addressed in multiple areas of health policy. The Healthy People 2010 (US-DHHS, 2000) objective 23-2 seeks to increase the number of health agencies that have personal health records available to the public. In April 2004, then President Bush (Bush, 2004) established a national program to ensure that every American will have a personal EMR by 2014. Now President Barak Obama has continued the initial plan for EMR establishment with the signing of the American Recovery and Reinvestment Act of 2009. Within the field of health education, the National Commission for Health Education Credentialing (NCHEC, 2006) identified Responsibility I as "Assess Individual and Community Needs for Health Education" which includes accessing health related-data, identifying diverse health related databases while being able to use computerized sources of health-related information.

Everett Rogers' Diffusion of Innovations Theory provides a fitting context for the divide between the implementation of EMR technology and the rural community. According to the

theory, geography plays a critical role in determining whether or not an innovation (e.g. EMR) will be adopted by a given social system (Family Medicine physicians). The rate of adoption generally follows an S-shaped curve, reflecting the relative degree of conformity or resistance to change of individuals within the system. This process of diffusion includes the spread of new ideas whether they are spontaneous or planned. Rogers identified that social systems (Family Medicine physicians) do not adopt new innovations at the same time and found that people can be placed in adopter categories based on certain characteristics: *Innovators, Early Adopters, Early Majority, Late Majority, and Laggards*.

For this study, the Health Belief Model (HBM) was used to support the Diffusion of Innovations Theory and assist in categorizing physician readiness toward EMR adoption. The HBM was developed in the 1950's by social psychologists to address an individual's perceptions of a threat posed by a health problem (Glanz, Rimer, & Lewis, 2002). The HBM uses six constructs that helps identify an individual's motivation to make a decision regarding a health behavior. The six constructs used in the HBM are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy. Health motivation is the primary concern of the HBM and is a good fit for addressing behaviors that involve health concerns such as EMR adoption.

Purpose

The purpose of this study was to evaluate the adoption and implementation of electronic medical records (EMR) by rural and urban Alabama Family Medicine physicians. This research study covered the state of Alabama with a focus on rural and urban EMR use within Alabama Family Medicine physician practices. Data was collected via electronic survey from Family Medicine providers. The Alabama Rural Health Association, in conjunction with the U.S. Office

of Management and Budget (OMB), designated and categorized the Alabama state counties into specific regions. For this study, four Alabama Regions were used to describe and categorize the Alabama counties. The four designations included North Rural, South Rural, and the Black Belt. We then compared EMR adoption in rural areas to EMR adoption in their urban counterparts while evaluating differences in individual and organizational characteristics.

Specific Aims

This investigation involves the following specific aims:

1. To determine the level of electronic medical record use, if any, that is currently used in Family Medicine practices in rural and urban areas of Alabama.
2. Based on the Diffusion of Innovations Theory, to determine the individual characteristics of early adopters compared to late adopters of EMR by Family Medicine physicians in Alabama.
3. Based on the Diffusion of Innovations Theory, to determine the organizational characteristics of early adopters compared to late adopters of EMR by Family Medicine physicians in Alabama.
4. Based on the Health Belief model, to determine the perceived threat, barriers and self-efficacy of Alabama Family Medicine physicians regarding adoption of the EMR.

Significance

Currently, there is no research or database that follows the trajectory for the dissemination of EMR technology to Family Medicine physicians in rural areas. After the completion of this study, researchers will be able to construct a model that will project a trend and timeline in regard to EMR implementation while identifying physician and practice characteristics that encourage and hinder adoption. The proposed model will use constructs from

the Diffusion of Innovations Theory and the Health Belief Model. This study will allow the plotting and categorizing of Family Medicine physicians in regard to their adoption characteristics while predicting if (or when) they will adopt EMR technology. We will then determine the likelihood of achieving EMR adoption in the near future and identify implementation barriers and how they can be overcome for the rural Family Medicine practitioner. Being able to anticipate and predict EMR adoption in the Family Medicine arena will arm health care providers, as well as policy makers, with valuable information in order to make health-related decisions for their patients and community members, especially those living and working in rural, medically-underserved areas. Our underinvestment in electronic medical records could have dire consequences for all residents in the Alabama Black Belt; therefore, it is imperative that we acknowledge and attempt to create a more consistent and equitable delivery of healthcare predicated at least in part through an efficient and effective electronic medical record system.

Limitations

Several factors may influence the results of this research study. First, the study sample is comprised of rural and urban Family Medicine physicians who practice in Alabama; no other physician specialty will be used. Therefore, the data collected may not be generalized to other physician specialties across the state or across the nation. Second, the self-report survey instrument may introduce bias as to the accuracy and level of EMR use among the Family Medicine physicians. Respondents could answer the questions in a way they think the researcher would like for them to answer or in a way that makes them look more innovative and contemporary. Third, the study uses a survey instrument that will measure one point in time in

order to produce descriptive data. This descriptive data will neither establish causality nor predict behavior change in regard to EMR adoption among Family Medicine physicians.

Definition of Terms

General Study Terms

Electronic Medical Records (EMR): An electronic method of collecting personal health information.

Family Medicine Physician: A physician whose specialty is centered on primary, comprehensive care for people of all ages (AAFP, 2006).

Health Disparities: The gaps that exist in the quality of health care and overall health that occur across racial, ethnic and socioeconomic lines (US-DHHS, 2000).

Health Information Technology (HIT): The comprehensive management of health information (CCHIT, 2008).

Innovation: An idea, product or practice that is perceived as new by an individual or system that is considering adoption (Rogers, 1983).

Region Definitions

Black Belt: An Alabama Region that consists of 12 counties characterized by racial and ethnic health disparities and extreme poverty (ARHA, 2003).

Rural: A non-metropolitan area that has less than 50,000 inhabitants (U.S. Census Bureau, 2000).

Rural North: An Alabama Region that consists of 26 counties located in the northern portion of Alabama (ARHA, 2003).

Rural South: An Alabama Region that consists of 17 counties located in the southern portion of Alabama (ARHA, 2003).

Urban: A metropolitan area that has at least 50,000 inhabitants (U.S. Census Bureau, 2000). Also, an Alabama Region that consists of 12 counties located throughout the state (ARHA, 2003).

Diffusion of Innovations Theory Definitions

Diffusion of Innovations Theory: A theory that follows the diffusion of an idea, technology, or product through communities or cultures (Rogers, 1983).

Relative Advantage: Construct of the Diffusion of Innovations Theory that refers to the ease of the use of a new product (Rogers, 2003).

Compatability: A construct of the Diffusion of Innovations Theory that refers to the level of which an innovation fits into its community (Rogers, 2003).

Complexity: A construct of the Diffusion of Innovations Theory that refers to how difficult it is for an individual to use a new product (Rogers, 2003).

Trialability: A construct of the Diffusion of Innovations Theory that refers to the degree to which a new product can be tested (Rogers, 2003).

Observability: A construct of the Diffusion of Innovations Theory that refers to the degree to which individuals can view the new product being used by others (Rogers, 2003).

Health Belief Model Definitions

Health Belief Model: A model designed to predict health behavior (Rosenstock, 1974).

Cues to Action: A construct of the Health Belief Model that refers to strategies or reminders that assist an individual in becoming ready to adopt a new innovation (Glanz, 2008).

Perceived Barriers: A construct of the Health Belief Model that refers to the belief of an individual that if they take steps to adopt a new innovation they could experience negative consequences. (Glanz, 2008).

Perceived Benefits: A construct of the Health Belief Model that refers to the belief of an individual that if they take steps to adopt a new innovation they will receive a benefit (Glanz, 2008).

Perceived Severity: A construct of the Health Belief Model that refers to the personal belief that if the individual were affected by a system change then it would disrupt their daily routine (Glanz, 2008).

Perceived Susceptibility: A construct of the Health Belief Model which refers to the personal belief that the individual could be affected by a new innovation, idea, or system change. (Glanz, 2008).

Perceived Threat: A combination of Perceived Susceptibility and Perceived Severity.

Self-Efficacy: A construct of the Health Belief Model that refers to the personal belief of an individual that they have the ability to adopt a new innovation (Glanz, 2008).

Assumptions

Polit and Hungler (1997) identified that research assumptions are basic components of the research study that are accepted without proof and assumed to be true. In this study five assumptions have been identified:

1. Theory assumption: It is assumed that the Diffusion of Innovations Theory and the Health Belief Model will adequately describe the Alabama Family Medicine physicians that use EMR within their practice.
2. Instrument assumption: It is assumed that the research survey instrument will adequately capture the data needed to categorize and describe the Alabama Family Medicine physician.

3. Topic assumption: It is assumed that the adoption of EMR among Alabama Family Medicine physicians is an issue relevant to the health education and health promotion field.
4. Respondent assumption: It is assumed that the physicians are able to read and understand the survey in order to complete it satisfactorily.
5. Distribution assumption: It is assumed that the Alabama Board of Medical Examiners, the organization that will provide the database of Family Medicine physicians, is the gatekeeper for physician demographic information such as physical addresses and email addresses, and these addresses are accurate and correct.

CHAPTER 2

LITERATURE REVIEW

Purpose

The overall purpose of this study was to evaluate the adoption and implementation of EMR by rural and urban Alabama Family Medicine physicians. This chapter focused on 1) describing the history of EMR; 2) identifying and discussing the state of health care in the Alabama Black Belt Region; 3) identifying national, state and local Calls to Action for EMR; and 4) identifying and discussing the theoretical backgrounds for fostering the adoption and implementation of EMR within Family Medicine practices.

History of EMR

The concept of the EMR was first described by Lawrence L. Weed, M.D., in the mid-1960s while he was teaching at the University of Vermont (Weed, 1964). Dr. Weed collaborated with information technologists in order to develop an automated electronic medical record system and formed the first EMR system called POMR (Problem-Oriented Medical Record) (Weed, 1998). The central idea of POMR was that the medical record was the main method of communication between health care providers for the identified patient. The individual medical record was developed by answering a list of questions in order to identify specific presenting problems of the patient. After the questions were completed, the reader would be able to see a complete picture of the medical history at any time of day or location (Weed, 1998).

Throughout the 1970s and 1980s the hospital EMR system progressed and incorporated more elaborate data entry procedures including the following: drug information which would allow physicians to check for drug actions/interactions, dosages, side effects, and potential allergies; vital signs; laboratory results; x-ray results; and diagnostic and treatment plans for over 1,000 medical conditions (Weed, 1998). During the 1990s advancements in computers made the EMR systems quite complex but navigable for the technologically sound physician, thus providing an avenue for the adoption of EMR in their own private practices.

EMR is widely available for private practice use; however, physicians have been slow to adopt the systems. Currently there are over 50 CCHIT (Certification Commission for Healthcare Information Technology) systems available for physician use (CCHIT, 2008). The implementation of EMR in physician practices initially represents a disruption in workflow and is not looked upon favorably by an already overworked staff. Recent studies have shown that 4-19% (DesRoches et al., 2008; Ford, 2006; Hing, 2007; HIMSS, 2003) of national physician practices have fully functional EMR systems. Menachimi et al. (2007) conducted a survey of rural and urban Florida physicians and found that 17.6% of rural vs 24.1% of urban physicians have fully operational EMR systems in their practice. Hing (2006) noted in the CDC report based on the National Ambulatory Medical Care survey that only 8% of larger physician practices (11 or more physicians) employed fully functional EMR systems, while 7.1% of solo practice physicians and 9.7% of practitioners with a partner had implemented the system. The primary barriers to rural physician use of EMR have been noted as overall cost of purchasing a system, lack of training, and too time consuming to learn.

The term “tipping point” was coined by Malcolm Gladwell in his book *The Tipping Point: How Little Things Can Make a Big Difference*. The “tipping point” is the moment a

disease, trend, product or idea takes off and spreads throughout a community or society to the point that it cannot be transcended. Gladwell (2000) described the "tipping point" as the moment change becomes unstoppable. A "tipping point" can be a moment in time for a positive or negative change within community. The spread of a flu virus reaches a "tipping point" just before it becomes a community epidemic, and the wireless phone hit a "tipping point" just before it found itself in the hands of 82% of all Americans (FCC, 2008). While many technological advances have met favorably with the "tipping point," one such advancement has not—the electronic medical record within rural medical practices.

The State of Health Care in the Alabama Black Belt Region

Significantly improving health care quality (Committee, 2001), eliminating health disparities (U.S. DHHS, 2000), and ensuring safe, effective use of medical products (U.S. DHHS, 2000) are identified as national health priorities. The use of Health Information Technology (HIT) has been established as a leading means to reach these goals. HIT has the potential to improve patient safety, increase quality of care, and enhance clinical research. The most common forms of Health Information Technology include electronic medical records (EMR), hand-held devices, clinical decision-making aids, as well as internet and e-learning resources. The integration and interconnection of HIT will allow for the construction of online communities which will play a central role in the development of integrated health care. Such online communities will also allow for the creation of Clinical Research Networks which have been identified by the NIH as an essential component in the testing of ideas in large-scale studies and the translation of proven concepts into medical practice.

There are few places within the United States which could benefit more from such integration and translation than the Black Belt. The Black Belt includes some of the poorest

counties in the United States. This region also experiences some of the most disparate health outcomes in the country. In the roughly two hundred counties comprising the Black Belt, over half the population is African-American (Chapman & Kemp, 2003). The Alabama portion of the Black Belt extends from the border of Mississippi through the heart of the state. It was here in the Black Belt that some of the most significant historical events occurred. The Black Belt is an area rich in cultural traditions and the strength of its people. Unfortunately, it is an area in dire need. This area is confronted with economic stagnation, declining population, and insufficient education and health care (RHI, 2005).

Many milestones of the Civil Rights Movement in the United States took place in Alabama during the 1950s and 1960s, from Rosa Parks' bus boycott to Reverend Martin Luther King Jr.'s "Freedom March" from Selma to the Alabama State Capital, Montgomery. Thus there has been, and continues to be, a concerted effort to secure equal access to the most basic human needs in the Black Belt region of Alabama. Historically, the lack of access to health care, public and private transportation, schools, voting booths, economic opportunities, and housing had caused tremendous social turmoil throughout the South and specifically the Black Belt region of Alabama. Despite advances in civil rights, a tremendous health care disparity persists in the Alabama rural community, particularly in the 12 counties that constitute the Alabama Black Belt (see Figure 1).

Originally named for its rich soil, the term Black Belt has grown to have socio-political implications. Inequality in health care in the Black Belt region is underscored by the fact that the region includes the city of Tuskegee, site of the U.S. Public Health Services' infamous Syphilis Study. These 12 counties share several characteristics that impact the health of their residents: they are located in rural areas, have high levels of poverty, and their populations are

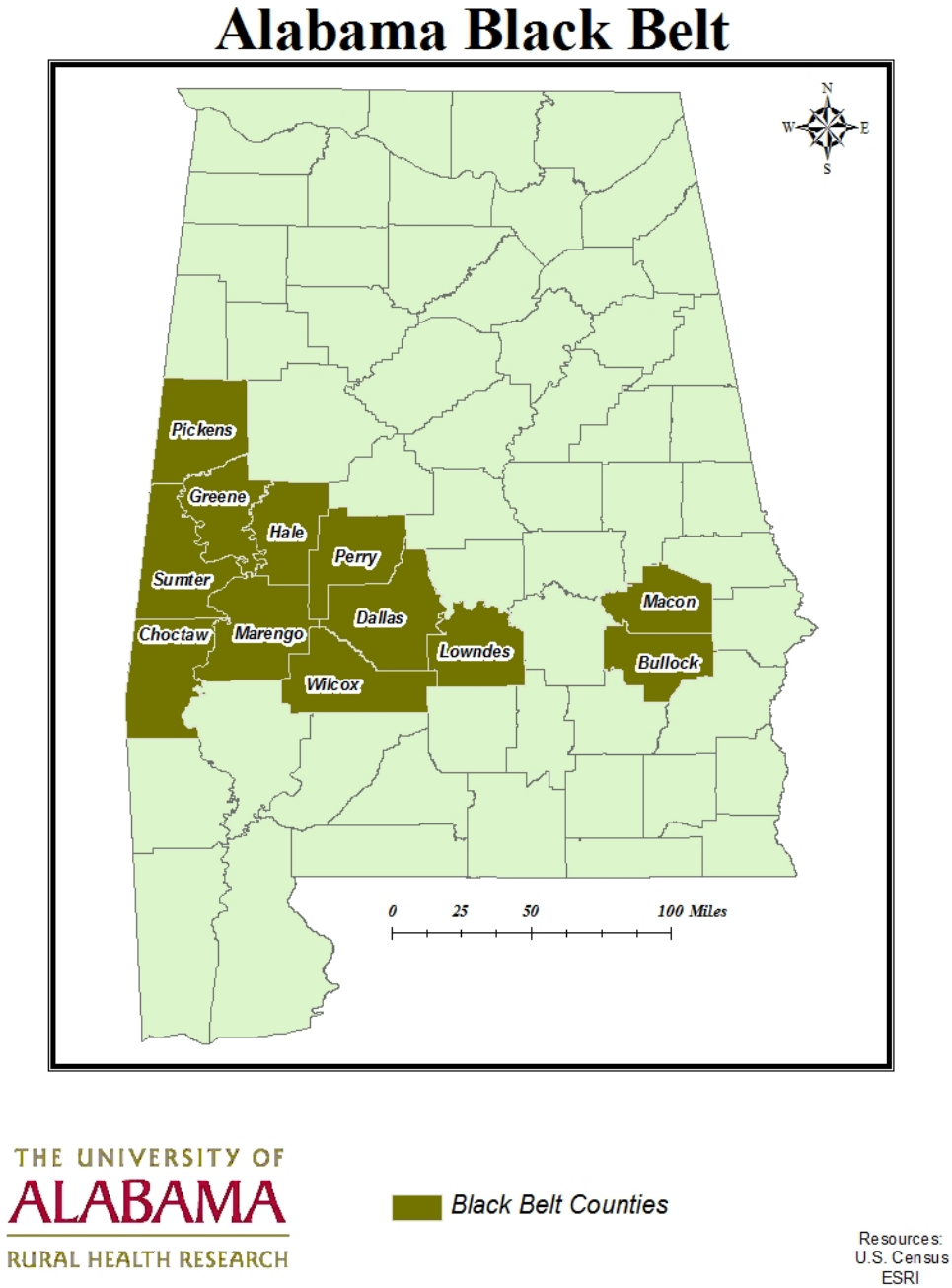

Figure 1. Twelve county Black Belt region (U.S. Census, 2008).

predominately African American (see Table 1), leaving Black Belt residents particularly vulnerable to the disproportionate disease burdens that accompany the existing national racial and ethnic health disparities.

Based on the 2000 census, the 12-county Black Belt region of Alabama had a population of 222,068 which represented 5% of the total population (see Table 2). The African American makeup was 64.14% of the regions populace. This compares to 26% statewide and 12.3% nationally. White, Hispanic or Latino, and Other races comprised a total of 46.09% respectively. This compares to 74% statewide and 87.7% nationally. The median household income in the Black Belt region was $22,301, and the median family income was $28,302. This compares to $34,135 & $41,657 statewide and $41,994 and $50,046 nationally.

The 12-county Black Belt Region of Alabama consists of the following counties: Bullock, Choctaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Pickens, Perry, Sumter, and Wilcox. The identified Black Belt counties were chosen based on their being part of the Alabama Black Belt Action Commission (BBAC). The Executive Order for the establishment of the BBAC was signed by Governor Bob Riley on August 14, 2004. The mission was to "measurably improve the quality of life in Alabama's Black Belt region by actively working with all citizens of Alabama and any other supportive parties" (Riley, 2004, Mission statement), therefore improving health, education, work force development, and the economy in the 12-county region.

The Black Belt region is currently served by 52 Family Medicine physicians (see Table 3) and eight community hospitals that, collectively, have 534 beds (RHI, 2005). Each primary care physician practicing in this area has the potential to care for 4,270 patients (MASA, 2007).

Table 1

Alabama Black Belt Region: Race

County	White	African American	Hispanic	Other*
Bullock	2,958	8,564	322	192
Choctaw	8,779	7,027	101	116
Dallas	16,496	29,332	290	537
Greene	1,904	8,013	58	57
Hale	6,866	10,131	157	210
Lowndes	3,484	9,885	85	104
Macon	3,365	20,403	173	337
Marengo	10,657	11,655	219	227
Perry	3,660	8,111	102	90
Pickens	11,720	8,999	147	230
Sumter	3,836	10,827	165	135
Wilcox	3,626	9,479	97	78
Total	77,329	142,426	1,922	2,313
Percent	34.82%	64.14%	0.87%	1.04%
Alabama	71.1%	26.0%	1.7%	1.2%
U.S.	75.1%	12.3%	12.5%	0.1%

Note. * Other category includes American Indian, Asian, Pacific Islander, and other races. Source RHI, 2005.

Table 2

Alabama Black Belt Region: Income

County	Median Household Income	Families Below Poverty*	
		Total	%
Bullock	$20,605	811	29.8%
Choctaw	$24,749	942	20.7%
Dallas	$23,370	3,438	27.2%
Greene	$19,819	804	29.9%
Hale	$25,807	1,030	22.2%
Lowndes	$23,050	953	26.6%
Macon	$21,180	1,483	26.8%
Marengo	$27,025	1,409	22.2%
Perry	$20,200	960	31.2%
Pickens	$26,254	1,180	20.1%
Sumter	$18,911	1,209	32.9%
Wilcox	$16,646	1,229	36.1%
Total	$22,301	15,448	27.1%
Alabama	$34,135	153,133	12.5%
U.S.	$41,994	30,589,337	9.2%

Note. Source: U.S. Census Bureau, 2000.

Table 3

Physicians and Hospitals in the Alabama Black Belt Region

County	Family Physicians	Hospitals	Beds
Bullock	1	1	41
Choctaw	4	0	0
Dallas	11	1	214
Greene	3	1	20
Hale	2	1	39
Lowndes	0	0	0
Macon	2	0	0
Marengo	12	1	99
Perry	3	0	0
Pickens	9	1	56
Sumter	2	1	33
Wilcox	3	1	32
Total	52	8	534

Note. Source: RHI, 2005.

These physicians and hospitals serve as modern American “frontier medicine” and bringing the biomedical discoveries made during the past decade to these health care providers is the very definition of translational medicine.

The Family Medicine Physician

The Family Medicine physician naturally evolved from the generalist physician. From the beginning of medical time, generalists provided all medical care including performing surgery, the diagnosing and treatment of illnesses, the delivering and caring for babies, and palliative care for the dying. After World War II, the medical specialist came on the scene and many families found that they had several different doctors that cared for each of their specialized needs. It was not long until families began to express their dissatisfaction with the fragmented care their families were receiving. Therefore, the concept of the generalist was reevaluated and the Family Medicine physician was born.

According to the American Academy of Family Medicine physicians (2006), Family Medicine is the only board specialty centering on primary, comprehensive care for people of all ages (from birth to old age). Family Medicine physicians are unique in their ability to treat the full range of medical conditions seen in adults, children, and infants while focusing on the whole well being of their patients. Family Physicians are qualified to provide such care as they have completed three years of specialized training in Family Medicine after medical school. They re-certify in their field every seven years, more often than any other specialty.

Community-Based Research

In the past several years, a number of community-based research groups have been established in the United States. Unfortunately, the work of these groups rarely includes significant numbers of rural physicians, mostly due to the limited infrastructure in rural areas and

insufficient research education. While growth in clinical knowledge and technology has been profound over the last decade, many health care settings in the United States, including the Alabama Black Belt, lack access to basic computer systems that can provide this new clinical information or support clinical decision making through HIT. The development and application of more sophisticated information systems is essential to enhance quality and improve efficiency in health care and clinical research. Medicine cannot be classified as "transforming" until it can be accessed and utilized by many, especially those who do not have ready access to tertiary health care facilities. There is a great need to transform scientific and medical developments into tangible health benefits in the Black Belt region of Alabama.

CALL TO ACTION: ELECTRONIC MEDICAL RECORDS

The meticulous collection of personal health information throughout the life span of a patient can be one of the most important inputs to the provision of proper care. Yet for most individuals in the Alabama Black Belt region, that health information is dispersed in a collection of paper records that are poorly organized and often illegible, and frequently cannot be retrieved in a timely fashion, making it nearly impossible to manage many forms of chronic illness that require frequent monitoring and ongoing patient support.

Calls to Action for EMR implementation have been spotlighted in national, state, and local arenas, specifically 1) The Committee on Quality Health Care, 2) Executive Orders, 3) Healthy People 2010, 4) Commission on Systemic Interoperability, 5) Biomonitoring Futures Project, 6) The Art of Health Promotion, 7) The National Commission for Health Education Credentialing, 8) Public Health, and 9) the State of Alabama.

While the collection of personal health information is an issue that needs to be addressed immediately, it is not a new problem in healthcare. Florence Nightingale wrote in her 1863 book titled, *Notes on Nursing,*

> *"In an attempt to arrive at the truth, I have applied everywhere for information, but in scarcely an instance have I been able to obtain hospital records fit for any purpose of comparison. If they could be obtained they would show subscribers how their money was being spent, what amount of good was really being done with it, or whether the money was not doing mischief rather than good…"* (Nightingale, 1863, p. 117)

In March 2001, The Committee on the Quality of Health Care in America released "Crossing the Quality Chasm: A New Health System for the 21st Century." This report identified health information technology (HIT) as one of the four critical forces that could significantly improve clinical decision-making, patient safety, and overall quality of care in America. However, few medical practices across the United States, and less in the Alabama Black Belt, use health information technologies regularly to assist with clinical care.

Executive Orders

In April 2004, then President George Bush, by Executive Order, established the position of National Coordinator for Health Information Technology (Bush, 2004). The charge of the coordinator was to implement the presidential orders to achieve widespread availability of secure, interoperable Health Information Technology. As part of an aggressive health information technology plan, President Bush set the goal for every American to have a personal electronic medical record within 10 years. The Presidential vision will create a personal health record that physicians, patients, and other health care providers could securely access through the internet no matter where the patient is seeking care (HHS, 2005). One hundred sixty-nine million dollars for Health Information Technology was requested in the year 2007 for implementation by 2014 (HHS, 2007).

On February 10, 2009, the 111th Congress approved the plan presented by President Barak Obama titled "American Recovery and Reinvestment Act of 2009" which codifies and officially establishes the Office for Health Information and Technology, a component for the implementation of electronic health records. The new package will continue the goal of every American having an electronic health record by 2014 (Obama, 2009).

NIH Roadmap Initiative

In May 2002, the Director of the National Institutes of Health (NIH) developed the NIH Roadmap Initiative in order to identify opportunities and major gaps in health related research such as clinical trials (Zerhouni, 2003). Clinical trials are an important part of the medical research process. Through clinical trials and translational research, scientific discoveries can lead to better ways to prevent, detect, and treat diseases and medical conditions. Unfortunately, many physician researchers conduct their clinical trials simultaneously but independently of other researchers in the same field. Due to social isolation and lack of financial resources to communicate and share data, physician researchers often duplicate data that has previously been collected. Standardizing data reporting through electronic medical records would enable data sharing across research venues. Information Technology will allow researchers to broaden the scope of their research, thus enhancing the efficiency of their clinical research. Reduced duplication of studies will leave more time and funds to address additional research questions. Data collected through EMR systems can be used to support clinical trial recruitment, research collaboration, and retrospective studies.

Healthy People 2010

Eliminating health disparities is a major goal of Healthy People 2010. Health disparities are present in all states and areas; however, the Alabama Black Belt is one area that has been hardest hit. In order for public and private health providers to care for their patients it is imperative to have the infrastructure to provide services effectively and a national data system to track health changes.

Infrastructure

Public Health Infrastructure has been identified as an objective area for Healthy People 2010. Objective 23-2 seeks to "increase the proportion of federal, tribal, state, and local health agencies that have made information available to the public in the past year on the Leading Health Indicators, Health Status Indicators, and Priority Data Needs. More specifically, it seeks to ensure that health data is collected electronically at all levels and made available to the public" (Healthy People, 2003, p. 23-10). These data include "health outcomes; utilization statistics for managed care organizations; infrastructure data; health risk data; and community report cards that provide a snapshot of a community's health" (U.S. DHHS, 2000, p. 23-10).

National Data Collection

Objective 23-4 seeks to "increase the proportion of population based Healthy People 2010 objectives for which national data are available for all population groups identified for the objective" (U.S. DHHS, 2000, p. 23-11). Through the implementation and use of EMR it will be possible to report data for racial and ethnic groups that would not normally be collected. The implementation of EMR systems for data collection will assist in tracking individual, state, and national health objectives.

Commission on Systemic Interoperability

In October 2005, the Commission on Systemic Interoperability, authorized by the Medicare Modernization Act of 2003, released its recommendation that the federal government should lead an effort to offer financial incentives to health providers who employ electronic health records in their practice. Proponents suggest that such a system will lead to dramatically improved patient safety, quality of care, convenience, and satisfaction (Commission, 2005). The Chairman and CEO of Verizon Communications very passionately stated that "technology will transform the healthcare industry just as it has for every other business from travel to banking. This technology will minimize medical errors, improve patient care, and help drive down healthcare costs. When these changes are implemented, the American consumer will benefit."

Biomonitoring Futures Project

The Biomonitoring Futures Project (BFP) (2006) is part of the Disparity Reducing Advances Project (DRA) sponsored by the Institute for Alternative Futures and the Robert Wood Johnson Foundation. The goal of the BFP is to bring health gains to the poor and underserved while developing advances in health in order to reduce health disparities. The forecast of the BFP for 2015 is for all Community Health Centers to have Electronic Medical Records that are tied into advanced clinical management systems which will allow patients to access their personal health records. The personal health records will allow the patient to view their own health records while receiving personalized health information that is tailored to their own personal needs. The implementation of EMR and personal health records will help reduce disparities in health literacy and make it easier for patients to understand treatment options while empowering them to take an active role in their health.

The Art of Health Promotion

Goetzel et al. (2007) identified ten major trends that are presenting themselves in the area of health promotion. Information technology (IT) is among the trends that the health promotion field focuses. Goetzel and his team noted that electronic medical records, along with personal health records (PHR) and web-based health improvement programs will provide the opportunity for health professionals to educate patients about personal health matters, disease-management, and present a tool for enhancing health literacy.

The National Commission for Health Education Credentialing

The National Commission for Health Education Credentialing (NCHEC) has identified seven areas of Responsibilities along with their Competencies and Sub-Competencies for health educators. The implementation of electronic health records in the primary care physician offices of rural Alabama would assist health educators in becoming proficient while meeting the requirements for these responsibilities and competencies. Responsibility I of the NCHEC is to "Assess Individual and Community Needs for Health Education." In order to fulfill the requirements of Competency A (Access existing health-related data), the health educator must meet the sub-competency requirements: 1) identify diverse health-related databases; 2) use computerized sources of health-related information; 3) determine the compatibility of data from different data sources; and 4) select valid sources of information about health needs and interests. The establishment of electronic health records will assist physicians in providing better care to their patients while allowing health educators to foster the mission of NCHEC (2007) by improving the practice of health education and serve the public profession of health education.

Public Health

The American Journal of Public Health (Brown, 2007) published an article titled, "Use of Electronic Health Records in Disaster Response: The Experience of the Department of Veterans Affairs After Hurricane Katrina" which discussed the disastrous health effects in the aftermath of Hurricane Katrina. The experience of Brown et al. (2007) eloquently drives home the need for the establishment of a national electronic health record. Brown and his research team agreed with the previous research regarding electronic health records in that they improve access to patient history and records, improved legibility, and organization of patient care, etc.; however, they identified one aspect that had been missed in previous research—health care support during disaster. Brown et al. (2007) concluded that the current system of paper records and only electronic pharmacy records were not enough to provide proper care during a national or even community disaster. Brown et al. (2007) recommended that a more complete electronic health record system is crucial for improving the delivery of health care on a daily basis and will allow us to be better prepared during any future disasters.

State of Alabama

Governor Bob Riley formed *Alabama Together for Quality* and charged the group to improve health care outcomes for Medicaid recipients in the state of Alabama through the development and use of electronic medical records (ATQ, 2007). The Alabama Medicaid Agency (ALMA) is seeking to create a statewide electronic health system that links Medicaid, state health agencies, health care providers, and private payers (ATQ, 2007).

When technologically, innovative health care services are not met with community participation, health disparities occur. The groups that are hit hardest by health disparities are those in racial and ethnic minorities and those in rural areas, all of which reside in our Alabama

Black Belt. Implementing electronic health records in rural physician offices could lead to the development of a network of physicians who will focus on quality health and bring invaluable, expeditious care to their patients and citizens of their communities.

Theoretical Background

The theories used in this project were the Diffusion of Innovations Theory and the Health Belief Model. Each theory is discussed separately but used closely together in order to capitalize on the individual strength of the theory and provide additional support for the weaknesses. The Diffusion of Innovations Theory was used to understand the dynamic interaction between the Family Medicine physician and their individual and organizational characteristics. The Health Belief Model will be used to assess the perception of the physician toward the adoption of electronic medical records and the perception of adoption. In this study, two theories were used in order to evaluate the adoption of technology as an avenue for improving health care, health behavior, and health in general.

Diffusion of Innovations

In the 1940s, two researchers by the name of Bryce Ryan and Neal Gross conducted a hybrid seed corn study at Iowa State which focused on farmer adoption of a new type of corn seed. Ryan and Gross classified farmers based on the amount of time it took them to adopt the use of the hybrid seed corn. This research study alone revived the interest and excitement around the diffusion of new innovations, thus making Iowa State one of the centers for diffusion research and the future home of the leading researcher of the Diffusion of Innovations Theory, Everett M. Rogers.

The Diffusion of Innovations Theory was formalized by Everett M. Rogers after he became interested in the diffusion of agricultural innovations by watching farmers in his home

state of Iowa. Rogers was quite intrigued by the fact that many farmers blatantly refused to adopt new farming equipment while knowing the new product could benefit them economically. While the diffusion process was not a new concept, the understanding of "why" farmers made their decisions was yet to be understood. Researchers quickly understood that the diffusion of innovations was a communication process that could be predictive and a very valuable tool for advertisers and marketers.

While Rogers was the formalizer of the Diffusion of Innovations (DoI) Theory, it was Gabriel Tarde, a French sociologist, who conducted the original diffusion research in the early 1900s. Tarde was the first to identify that the diffusion of new products (innovations) takes on an S-shaped curve. Some new products are adopted quickly, therefore making the steep curve; while others are more slow to be accepted and the curve is rather flat.

Everett Rogers' well-regarded Diffusion of Innovations (DoI) Theory provides both a fitting context for the historical divide between the implementation of electronic health records and the rural community. According to the theory, geography plays a critical role in determining whether or not an innovation (e.g. technology, practice, and concept) will be adopted by a given social system. The rate of adoption generally follows a predictable curve, reflecting the relative degree of conformity or resistance to change of individuals within the system.

Rogers defines diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system. This process includes the spread of new ideas whether they are spontaneous or planned (Rogers, 2005). The four main elements are innovation, communication channels, social systems, and time. These elements are the mainstay of every diffusion research, practice, or program.

Elements

An *innovation* is an idea, product, or practice that is perceived as new by the individual or system that is considering adoption (Rogers, 1983). The new innovation does not have to be an actual new idea, product, or practice; rather, it just has to be considered new by the potential adopter. Newness also goes beyond knowledge of the product. An individual could have knowledge of the product but not consider it a viable option for themselves and have no feelings one way or another toward the innovation.

Communication Channels are the means by which people create and share information, with the ultimate goal of understanding each other (Rogers, 1983). Diffusion is a unique type of communication where the message exchange is regarding a new innovative idea, product, or practice. The essence of communication in the Diffusion of Innovations Theory is how one individual communicates the values and attributes of a new innovation to other members of the social system, in order to persuade them to adopt the innovation as well. Interpersonal channels involve a face-to-face interaction between two or more individuals regarding a new product and appear to be more successful in the persuasion process. Other types of communication channels include mass media and interactive communication through the internet. Diffusion research (Rogers, 2005) has shown that most individuals do not evaluate a new innovation based on scientific research; rather, they base their decision on the evaluation of individuals that have previously adopted the product.

The *social system* is the third element of the diffusion process. The social system refers to the group or groups of people through which the innovation is diffused. Members of these groups may be individuals, informal groups, or organizations such as solo practice physicians, group practice physicians, or physicians in a multi-specialty health center. Diffusion of a new

innovation occurs within a social system, and the structure of the social system can affect the diffusion process.

All individuals in a social system do not adopt a new innovation at the same time. The Diffusion of Innovations Theory (Rogers, 2003) identifies that people fall into one of five categories when it comes to adopting a new product or behavior. Each of these adopter categories has individual characteristics that describe its members and is based on their innovativeness. As seen in Figure 2, the five categories are *Innovators, Early Adopters, Early Majority, Late Majority, and Laggards*. Rogers described the *Innovator* (2.5%) as the first member of a group to adopt a new innovation. These people tend to be more educated, adventurous, and are able to cope with a higher level of uncertainty than their peers. The *Early Adopters* (13.5%) are also educated but are less able to deal with uncertainty. Members of the *Early Majority* (34%) group will adopt a new innovation a little earlier than the average person and is more likely to deliberate the innovation's usefulness prior to acceptance. This category consists of about one third of the members in the system. The l*ate majority* (34%) adopters also consist of about one third of the system and tend to adopt new innovations later than their early adopter counterparts. This group tends to require some form of peer pressure prior to adoption. The final group is the *laggards* (16%) or the last adopters and is characterized by being suspicious of any new product or innovation, and they take a great deal of time making their decisions regarding the adoption.

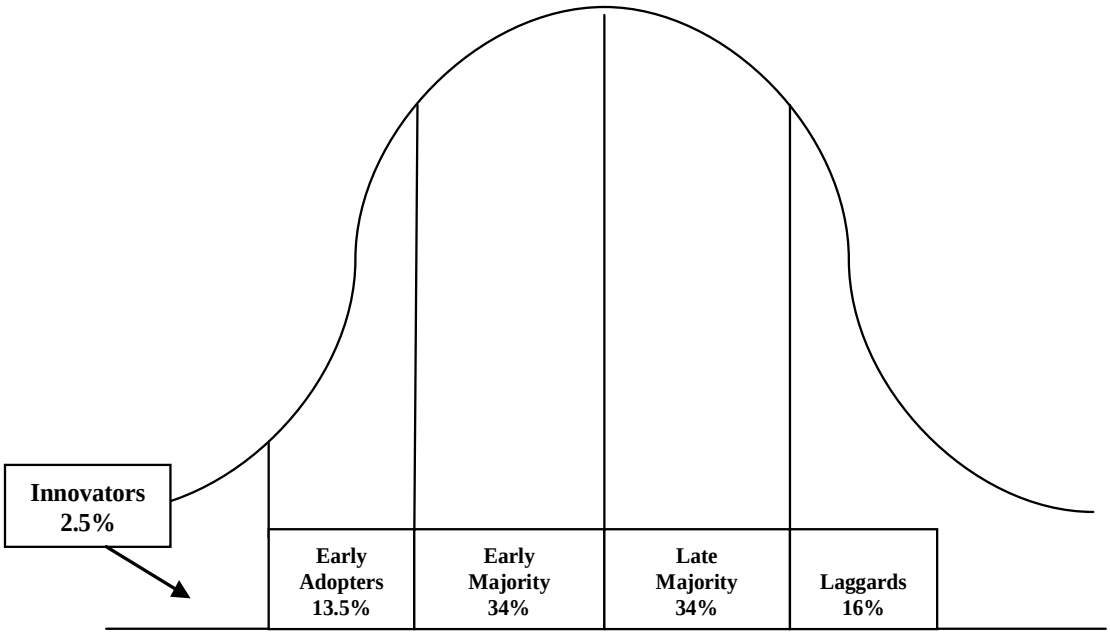

Figure 2. Adopter categories (Rogers, 1983, 1995, 2003).

According to Rogers (1983), the decision to adopt or reject a new innovation is based on several different factors. These factors can be grouped into four different adopter characteristics (Haider, 2005; Leung, 1999): personality traits, socioeconomic influences, communication behavior, and perceived attributes of the innovation. Each group of adopters possesses certain characteristics that are partly responsible for the adopter group to which they belong.

The fourth element of the diffusion process is *time*. Rogers (1983) described the time element in the process as (1) the innovation-decision process when an individual moves from first-knowledge of an innovation through its adoption or rejection, (2) how early or late a person is in the adoption system, and (3) the innovations rate of adoption in the system which can be measured by the number of people in the system that adopts the innovation in a given time period.

Rogers (1983) defines the innovation-decision process as the "process through which an individual (or decision-making unit such as a group, society, economy, or county) passes through the innovation-decision process. There are five stages in this process: (1) first *knowledge* of the innovation, (2) forming an attitude toward the innovation (*persuasion)*, (3) a *decision* to adopt or reject, (4) *implementation* of the new idea, and (5) *confirmation* of this decision.

Knowledge occurs when an individual learns of the innovation and gains some understanding of how it functions. In this stage an individual will attempt to reduce uncertainty about the cause-effect relationship related to the innovations capacity to solve their problems. This phase would capitalize on focusing on the spread of information by means of mass-media channels, as a way to introduce an innovation to a community.

Persuasion occurs when an individual forms a favorable or unfavorable attitude toward the innovation. This phase would focus on diffusion of the innovation through interpersonal

channels of communication that would have the potential to convince late adopters and laggards to adopt the innovation. During this stage is when a change agent is often introduced to the process. A change agent is an individual who influences the potential adopter regarding the innovation. This person will often use their leverage to help in the decision making process. This individual is a very powerful person in the process and can persuade the adopter to accept the new idea or slow the process of adoption and often prevent the adoption from taking place.

Decision takes place when an individual engages in activities that lead to a choice to adopt or reject the innovation. In the persuasion and decision stages, an individual seeks information about the advantages and disadvantages of the innovation, thus attempting to reduce their uncertainty about the innovation.

Implementation occurs when the adopter utilizes an innovation. This stage involves overt behavior change, and the new idea is actually put into practice.

Confirmation occurs when the adopter seeks reinforcement of an innovation-decision that has already been made but may be reversed if the individual is exposed to conflicting messages about the innovation. The adopter can either decide to make full use of an innovation or choose not to adopt it.

Rogers (1995) noted that the time element of the diffusion process allows us to classify adopters and place them on an S-Shaped curve known as the diffusion curve (see Figure 3). The adoption of an innovation generally follows a normal, bell-shaped curve and when adopters are plotted over time, the curve takes on an S-shape. The S-shape adopter distribution rises slowly at first as the innovators begin use of the innovation. As Early Adopters begin the process, the curve makes a marked acceleration and continues to rise until half of all adopters are using or participating in the new innovation. Then the acceleration slows as less adopters join the

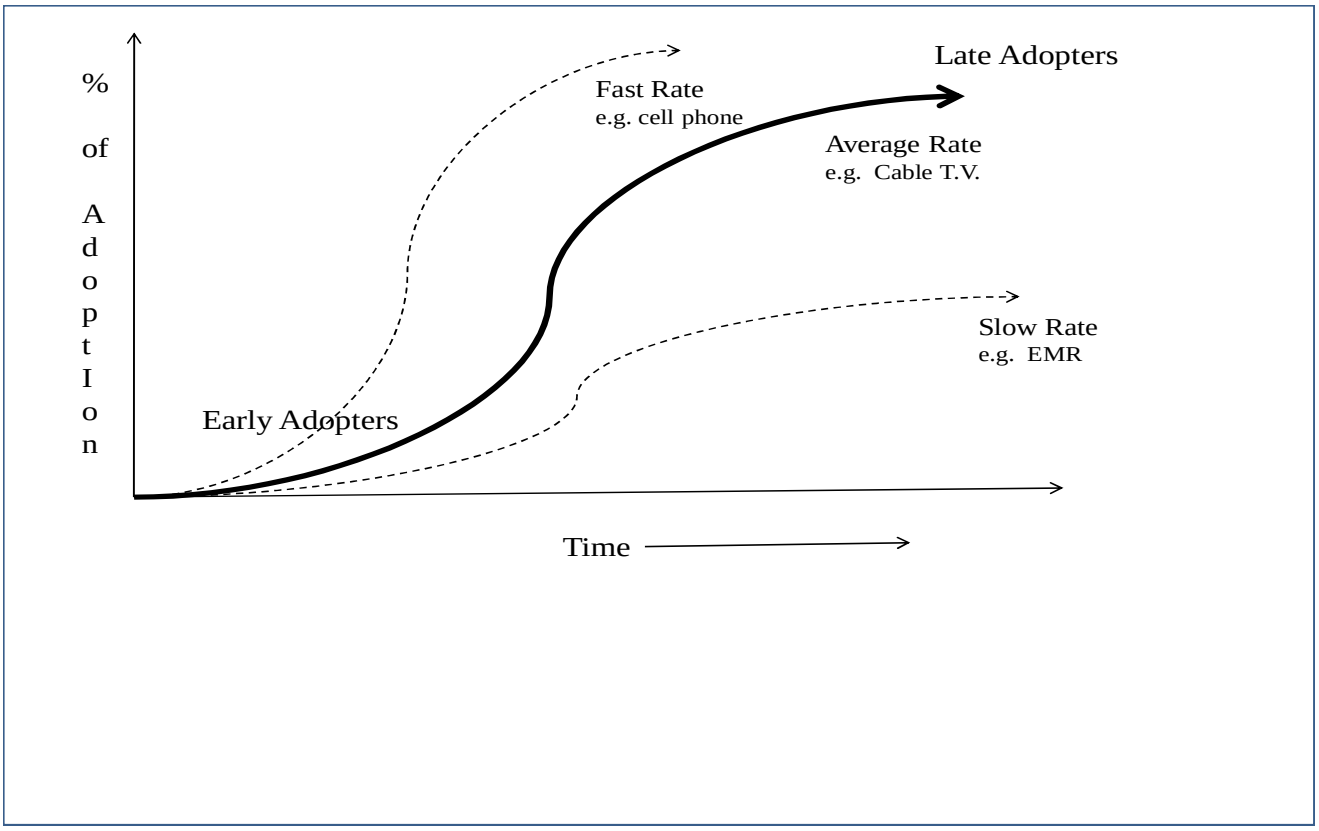

Figure 3. Diffusion of Innovations s-curve (Rogers, 1983, 1995, 2003).

process. Rogers noted that the S-shaped curve is specific to each innovation and social system, therefore only follows a successful innovation. If an innovation is not accepted by a social system, the S-shaped curve will not form.

Characteristics of the Innovation

The characteristics of the innovation, as perceived by the adopters, also help to explain the different rates of adoption. The five characteristics are relative advantage, compatibility, complexity, trialability, and observability (see Figure 4). The innovation does not have to be better or easier to use; it must only be perceived to be better and/or easier to use by the potential adopter. Each characteristic affects the rate of adoption differently. A fine example that describes the characteristics of an innovation is the study conducted by Lee (2004) entitled *Nurses' Adoption of Technology: Application of Rogers' Innovation- Diffusion Model.* Lee's research identifies each characteristic in detail as they analyzed a nurse's perception toward the implementation of a new electronic health record system.

Relative Advantage of an innovation refers to the ease of use and to what extent the new product is better than the one it is replacing. Relative advantage can be evaluated by its price, potential profit, ease of use, and storage. Lee (2004) identified that the new computer system made charts and reports easier to read and some felt a sense of pride with the reduction of wasted paper.

Compatibility is the level to which an innovation fits into the specific community. A new innovation will not be successful if it does not take into consideration the local values and customs of the adopters, no matter how superior the product. The smoother the transition into the new community the faster the product will be adopted and accepted in the social system. In

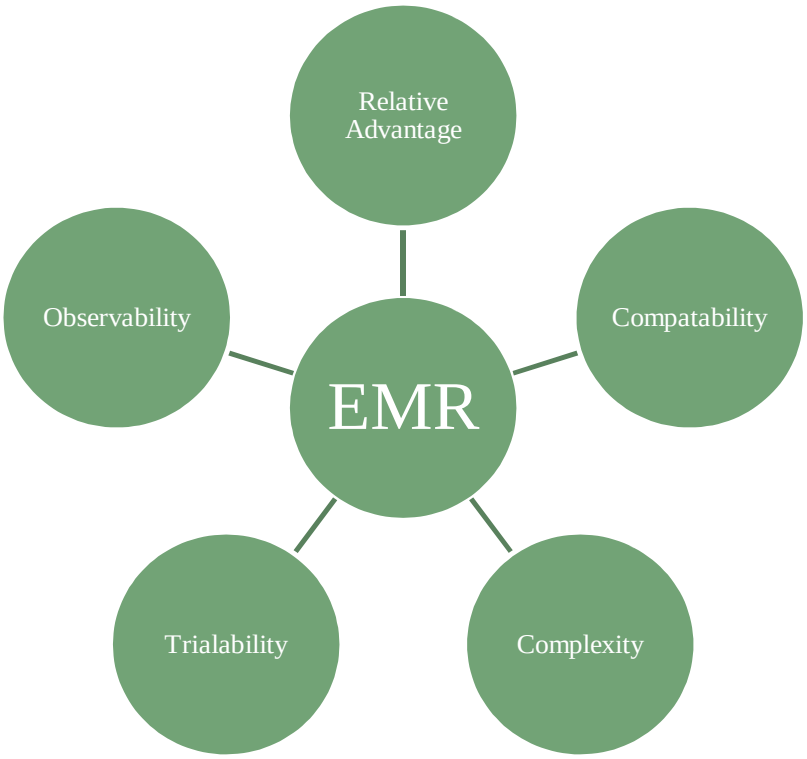

Figure 4. Characteristics of an innovation (Rogers, 1983, 1995, 2003).

Lee's (2004) research, the nurses reported that with the new EMR they spent less time with shift reports and more time in patient care.

Complexity is how difficult it is for an adopter to use the new innovation. The adopter's perception of the complexity is a critical point to take into consideration. If the innovation is difficult to use then the rate of adoption will be low, all other characteristics being equal. The EMR system in Lee's (2004) research was well accepted by the nurses due to the system requiring "little writing and little thinking."

Trialability is the degree to which the new innovation can be tested and used prior to adoption. New innovations are more likely to be accepted when an individual has an opportunity to experiment with it on a trial basis. Lee (2004) noted that the more innovative nurses had input on the structure of the reports and format in which they used.

Observability is the degree to which others in the community or social system can view the new innovation being used. If the adopter can see the results of the innovation then they are more likely to adopt. In Lee's (2004) study, nurses expressed a sense of pride in that their hospital had moved to the more technical system while some felt it would help with accreditation of their hospital.

Application of the Diffusion of Innovations Theory

The adoption of Electronic Medical Records (EMR) is influenced by a complex set of factors, involving socio-economic, demographic, psychological, and communication related characteristics. Investigations by Everett Rogers, with the Diffusion of Innovations Theory, have proven to be an excellent predictor of adoption. The Diffusion of Innovations Theory has been used to describe how physicians accept and use medical technology such as electronic medical records (Ash, 2001), interactive video (Versweyveld, 2000), and rural telemedicine (Helitzer,

2003). In a study conducted by Marshall (1989), it was found that Family Medicine physicians were less likely than physicians in other specialties to be early adopters of IT products. The reason for this finding was purported to be that family physicians tend to spend more time on patient care, thus having less time to learn about IT innovations. Chew, Grant, and Tote (2004) revealed that innovation attributes of the Diffusion of Innovations Theory (relative advantage, trialability, observability, and compatibility) can act as a predictor of Internet use among family physicians, while demographic factors like gender and residency training have no influence on Internet use. Chew, Grant, and Tote (2004) suggested that physician internet use could increase if the physician was provided CME for further education as well as additional office time for internet use. Unfortunately, these studies were based in predominately urban settings.

According to Rogers (1986), the decision to adopt or reject a new innovation is based on several different factors which can be grouped into three different adopter categories (Leung, 1999; Haider, 2004; Rogers, 1983): personality traits, socioeconomic influences, and communication behavior. Moore (1993) looked at the Texas Tech MedNet project where two remote medical sites connected to the Lubbock medical center; one site was very successful and the other failed. Moore identified that users at the successful site were characterized as recent medical graduates, assertive, energetic, and displayed higher educational aspirations.

The goal of Kozyrskyj, Raymond, and Racher's (2007) research was to test if the Diffusion of Innovations Theory could predict the use and prescription of a newly marketed drug. Kozyrskyj, Raymond, and Racher identified that physicians were more likely to fall in the "early prescriber" category (early adopter) based on their specialty and place of training. Majority and late adopters tend to be general practitioners and received their training outside of

the U.S. or Canada, while early adopters were in a specialty field and received their training within the U.S. or Canada and were affiliated with a hospital.

The predictive nature of the Diffusion of Innovations Theory was shown in the Suther and Goodson (2004) study published in the Journal of Clinical Genetics. This study focused on the integration of genomic medicine in the family practice office. Genomic medicine is characterized by implementing a thorough family history, genetic testing, and genetic counseling. Suther and Goodson (2004) found that the strongest predictors of adoption of genomic medicine (GM) were the physician's perception of its complexity and its observability. Family Medicine physicians that reported being willing to adopt GM into their practice were characterized as open-minded and willing to embrace change.

Research suggests that Rogers' generalizations regarding the adopter characteristics can be used to assess physician attitudes and predict adoption.

Health Belief Model

The Health Belief Model (HBM) was designed as a psychological model to help explain and predict the adoption of a health behavior. Developed in the 1950s, the Health Belief model has been one of the most used health behavior change theories in research and practice. The model was developed by a group of social psychologists in the U.S. Public Health Service in order to help understand the reason that people did not participate in tuberculosis disease detection and prevention programs (Hochbaum, 1958; Rosenstock, 1960, 1974). Concepts from the HBM were derived from Lewin's field theory (Lewin, 1951) and hypothesized that an individual's behavior depends on two variables: the outcome of the behavior change will have value to the individual, and the individual believes that their behavior change will result in the identified outcome.

The Health Belief model has been categorized as an expectancy-value theory. Expectancy-value theories were originally created in order to explain and predict an individual's attitudes toward the adoption of a new behavior. The expectancy-value constructs slowly evolved and were redesigned to provide a focus on the adoption of health behaviors rather than behaviors in general. For this project we will return to the original roots of the Health Belief Model and focus on behavior change of the Family Medicine physicians (EMR adoption) rather than a personal health behavior change. The HBM proposes that if an individual does not value their health then a health education program will have a difficult time working to bring about a targeted health behavior change. In this study, we will assume that if a Family Medicine physician does not value technology then the adoption and/or implementation of an EMR system will be slow or totally rejected.

The HBM consists of six main constructs that influence an individual's decision to act upon a certain behavior change. These constructs, as shown in Figure 5, include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

According to Glanz (2008), *perceived susceptibility* is an individual's belief that they could be affected, positively or negatively, by a new innovation, idea, or system change.

Perceived severity refers to an individual's belief that if they were affected by a system change, it could be serious and cause a disruption in their daily routine.

Perceived benefit refers to an individual's belief that if they take steps in implementing a program or new innovation they will receive a benefit.

Perceived barrier refers to an individual's belief that there could be negative consequences to implementing the health behavior or new innovation.

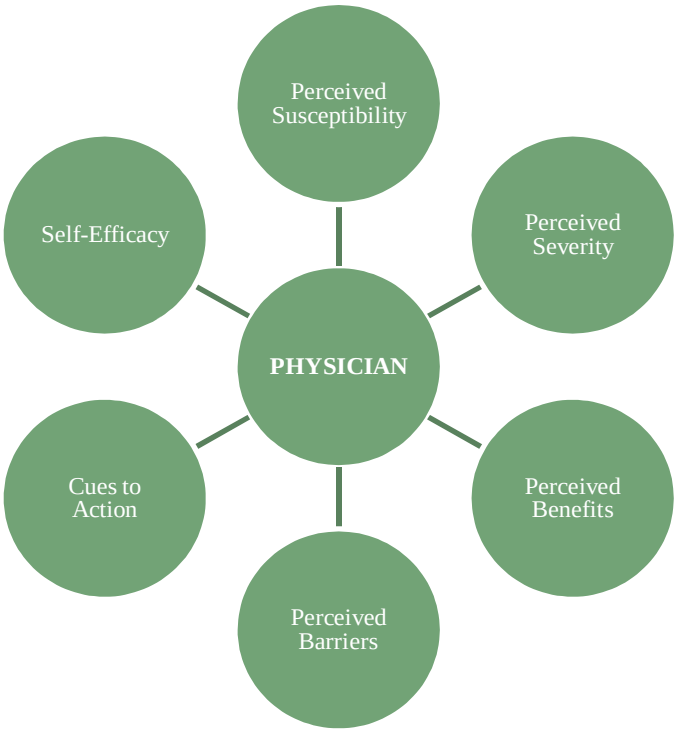

Figure 5. Health Belief Model (Hochbaum, 1958 and Rosenstock, 1960, 1974).

A *cue to action* refers to strategies or reminders that assist an individual in becoming ready to implement or adopt the new innovation or idea.

Self-efficacy is the individual's belief that they have the ability to take action in adopting the new innovation or idea.

The constructs of the Health Belief Model in the following scenario explain physician implementation of EMR.

Dr. Jones, a Family Medicine physician in rural Alabama, attends a medical conference (*cue to action*) and begins a casual discussion (*cue to action*) with Dr. Miller, a fellow physician whose medical practice is in downtown Chicago. They begin discussing the EMR system that Dr. Miller implemented in his medical practice over a year ago. He identified that the EMR system is helping him track individual patient health issues, along with their prescribed medications and has found that it is easier to diagnose and treat his patients (*perceived benefits*). Dr. Miller also noticed that his practice is becoming more efficient and is finding it easier to bill and receive payments from Medicare, Medicaid, and private insurance companies (*perceived benefits*).

Dr. Jones begins to wonder if EMR would be appropriate for his practice in rural Alabama. He remembered hearing that President Bush mandated electronic medical records for all citizens by the year 2014 and assumed that insurance payments would soon be tied to the mandate as well (*perceived susceptibility*). Jones worried that if he did not implement EMR then he could not bill for his medical services, and his practice would suffer and could even lead to bankruptcy (*perceived severity*). However, he was concerned that using an EMR system would lead to a decrease in autonomy as a physician (*perceived susceptibility and perceived severity*) and did not want a computer telling him how to practice medicine.

As Jones thought about the possibilities of EMR, he wondered if his staff could be trained using the new EMR system (*perceived barrier*) or if he had the funds to purchase a system that met all the required governmental standards (*perceived barrier*). However, he was encouraged that the EMR system could help him provide more thorough care to his patients (*perceived benefit*) and liked the idea of not having to wade through files of paper for each patient (*perceived benefit*); plus, he was very good at navigating the internet and certain he could learn the intricacies of an EMR system (*self-efficacy*). Dr. Jones decided to purchase and install an EMR system in his practice.

Conclusion

The purpose of this chapter was to discuss the history of EMR, identify and discuss the state of health care in the Alabama Black Belt region, and to identify national and state Calls to Action. The theories used in this project were the Diffusion of Innovations and the Health Belief Model. The Diffusion of Innovations was used to understand the dynamic interactions between the Family Medicine physicians' individual and practice characteristics, and the Health Belief model was used to assess the physicians' perception toward the adoption of electronic medical records.

CHAPTER 3

METHODS

The purpose of this study was to evaluate the adoption and implementation of EMR by rural and urban Alabama Family Medicine physicians. This chapter focused on the survey design, survey sampling, survey measurement, and the plan for data analysis

This investigation utilized both qualitative and quantitative methods. Often referred to as mixed methods, this form of research seeks to intertwine both forms of data throughout the research process (Creswell, 2003). The reason for using this form of investigation is that the use of either research method alone is insufficient to answer the research question(s) (Creswell, 2003). Therefore, in order to bring about a robust form of investigation, both methods will be used.

Design

Qualitative

With qualitative research, the goal is to enter the environment or field without any preconceived notions as to what direction the research will take (Flick, 1998). A focus group was chosen as the preliminary research technique to explore the ideas and beliefs of the physicians regarding EMR. The Delphi method was utilized to frame the direction of the focus group. The focus group method, as well as the Delphi method, assumes that group judgments are more valid than individual judgments (Brown, 1968).

The Delphi method seeks to use “experts” in the field to gather information about a topic and use that knowledge to develop a product; in this case, the questions for the focus group. The members of the Delphi process were a physician, an epidemiologist, an expert in physician office systems, and an expert in healthcare management. The use of the Delphi method is one attempt at proving face and content validity of the survey. Face validity is described as whether or not the instrument or study looks like it will measure what it says it will measure (Cook & Campbell, 1979), while content validity is described as whether or not the instrument represents all aspects of the concept it is measuring (Cook & Campbell, 1979).

The focus group consisted of physicians whose medical practice is located in the Black Belt Region of Alabama. Thirty physicians were invited to participate in the focus group via a letter from the Dean of the College of Community Health Sciences. The physicians were chosen based on their medical practice (Family Medicine) and the location of their practice (rural Black Belt). The goal of this focus group was to evaluate the physician’s knowledge, attitudes, and beliefs about the future of EMR within their practice. The data gathered in the qualitative section was used to develop the quantitative survey in the next section.

Typically, a focus group gathers 6-20 people to meet in a conference type environment and uses informal, conversational interview that allows for follow-up questions (Mason, 1996). In this case, the focus group facilitator was given a list of questions and encouraged the physician group to express their knowledge and beliefs as they arose. The group facilitator was cautious to monitor each member’s participation and encourage a time limit on answers. A time limit was used to prevent powerful opinion leaders from unduly influencing the answers and beliefs of the other group members. Such activity is often considered to lead to a response bias which is a threat to the study’s validity (Mason, 1996).

Fourteen Family Medicine physicians met at the College of Community Health Sciences at The University of Alabama and answered four open-ended questions in regard to EMR implementation and Quality Improvement. The focus group facilitator was an external researcher and used in order to decrease the potential for researcher bias (Mason, 1996), such as asking leading follow-up questions. The focus group was audio taped and transcribed by an external person. The focus group topics were pre-determined, but the physicians were encouraged to expand their thoughts in order to express their knowledge, attitudes, and behavior in regards to the upcoming Medicare-Medicaid requirement changes for electronic medical records.

The focus group topics were presented in the form of four questions:

- What does Quality Improvement mean?
- Do physicians understand Pay for Performance and do they know how to prepare for quality improvement?
- How can The University of Alabama assist physicians?
- What are the potential problems or obstacles to implementing EMR?

Design

Quantitative

In the quantitative portion of this study a cross-sectional study design was used. According to Kleinbaum, Kupper, and Morgenstern (1982), a cross-sectional study is also referred to as a prevalence study that assesses a single target population (i.e., Family Medicine physicians practicing in Alabama's Black Belt). Prevalence studies are commonly used in epidemiological studies to determine the pervasiveness of a particular trait, whether it be a disease or the current use of the electronic medical records, within a population at a given time

(Kleinbaum, Kupper, & Morgenstern, 1982; Szklo, 2004). These studies observe a group of individuals and compare their similarities and differences (age, gender, group affiliation, etc.) at a single point in time (Kleinbaum, Kupper, & Morgenstern, 1982; Szklo, 2004). Cross-sectional study designs are similar to longitudinal studies in the type of data they collect; however, longitudinal studies have a follow-up period whereas cross-sectional studies do not. A cross-sectional study takes a "slice" of the identified target group and assumes that the characteristics are indicative of the entire target group (Kleinbaum, Kupper, & Morgenstern, 1982; Szklo, 2004).

In this study, prevalence referred to the number of physicians that used an EMR system within their practice during the data collection period via a questionnaire. The survey questions were developed for this investigation and all questions, except for demographic questions, were constructed using the Diffusion of Innovations Theory and the Health Belief Model. This survey sought to determine physician characteristics more accurately and investigated physician characteristics and EMR use.

Sampling

This investigation sought to survey licensed Family Medicine physicians practicing in the state of Alabama. Physicians' contact information (physical address, phone number, and e-mail address) was obtained through the Alabama Board of Medical Examiners. For any physician to practice medicine in the state of Alabama, they must be licensed through this board and maintain their license through re-certification at intervals determined by their specialty. Therefore, this listing was considered the most thorough and current available.

Following approval of the project by The University of Alabama's Institutional Review Board, the survey was distributed to all licensed Family Medicine physicians in the state of Alabama.

Prior to the survey being sent to the Alabama Family Medicine physicians, the survey was pilot tested with The University of Alabama Medical Center physicians located in the Pediatric, Internal Medicine, Obstetrics and Gynecology, and Psychiatry departments. No surveys were pilot tested with physicians in the Family Medicine clinic due to their being asked to participate in the research study.

As rural versus urban comparisons were a predominate issue in this investigation, such designation will be assessed by determining the appropriate Rural-Urban Commuting Area Codes (RUCA) classifications (WWAMI, 2006). These ten codes will be used in order to allow for analysis across the full rural-urban continuum.

RUCA codes are a census-based classification for rural and urban status based on census tracts (WWAMI, 2006). The United States Department of Agriculture has also combined census tract data to designate a RUCA code for each zip code. Data will be collected from 10 RUCA code classifications; however, the focus of analysis will be on the four Alabama regions: Rural North, Rural South, Black Belt, and Urban counties (see Table 4). The Alabama regions were determined by the Alabama Rural Health Association and used for county and state research purposes (ARHA, 2003). Figure 6 further describes the Alabama region distinction.

Table 4

Alabama Regions

Alabama Regions	Counties
Rural North	Bibb, Blount, Chambers, Cherokee, Chilton, Clay, Cleburne, Colbert, Coosa, Cullman, DeKalb, Elmore, Fayette, Franklin, Jackson, Lamar, Lawrence, Limestone, Marion, Marshall, Randolph, St. Clair, Talladega, Tallapoosa, Walker, and Winston
Rural South	Autauga, Baldwin, Barbour, Butler, Clarke, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Monroe, Pike, Russell, Washington
Black Belt	Bullock, Choctaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Perry, Pickens, Sumter, Wilcox
Urban	Calhoun, Etowah, Houston, Jefferson, Lauderdale, Lee, Madison, Mobile, Montgomery, Morgan, Shelby, and Tuscaloosa

Note. Source: ARHA, 2003.

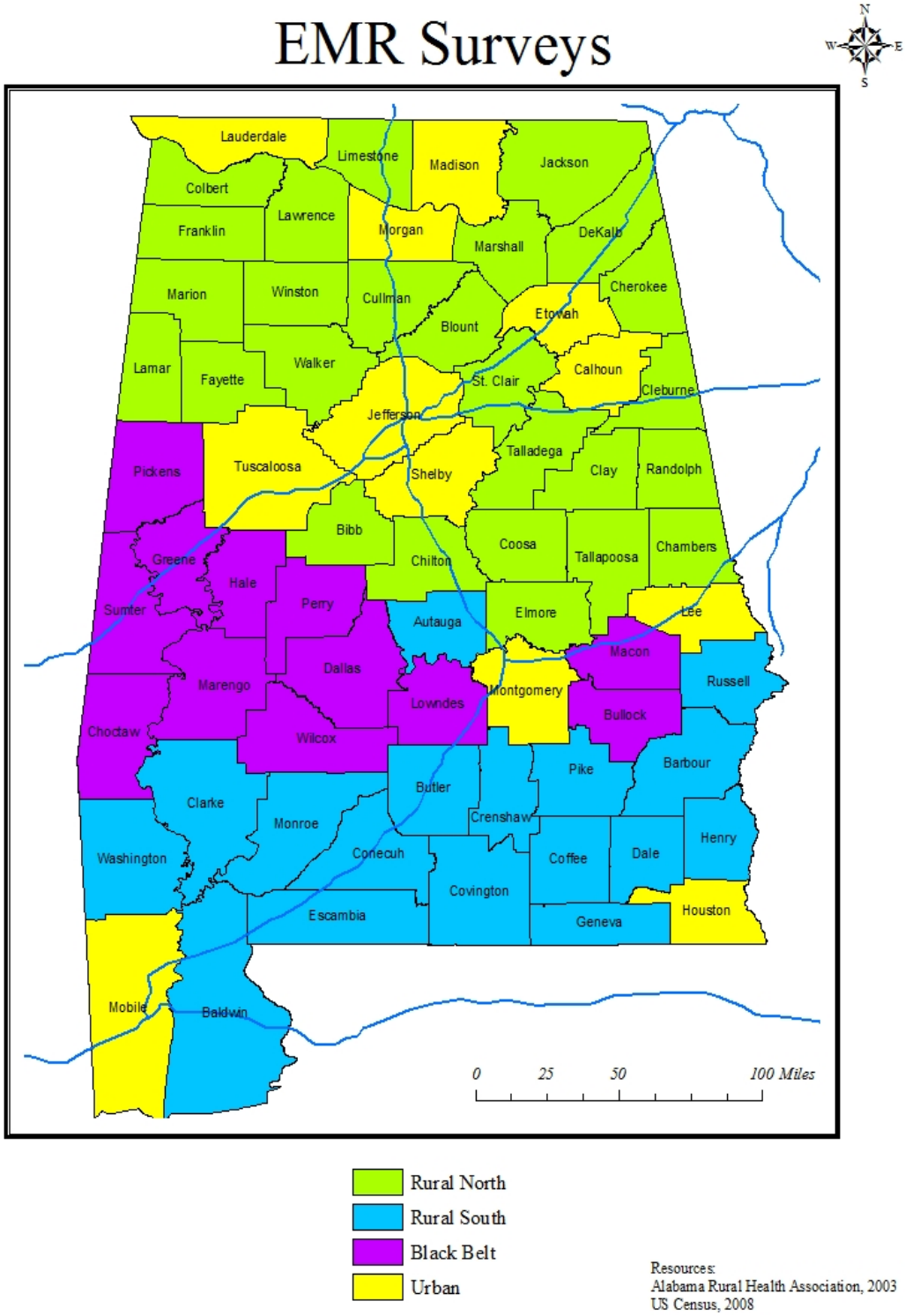

Figure 6. Alabama counties and regions.

The inclusionary and exclusionary criteria for this investigation are described below:

Inclusion

- Physician who has obtained an M.D. with a specialty of Family Medicine
- Family Medicine physician whose practice is located in Alabama
- Family Medicine physician who holds an Alabama medical license
- Agreed to complete the survey

Exclusion

- Physician whose specialty is not Family Medicine
- Physician whose practice is not located in Alabama
- Did not consent to participate in this survey

Data was collected from the 1,205 Family Medicine physicians who held a medical license through the Alabama Board of Medical Examiners. The initial database consisted of 1,246 physicians; however, 41 were removed from the database due to being retired or the contact information being incorrect.

Power was determined using the Power and Precision (2008) software. This statistical power software has been used to determine sample size in research studies.

Human Subjects Research

This protocol was submitted and approved by The University of Alabama Institutional Review Board (see Appendix A). The protocol qualified for expedited review based on *45 CFR 46.101*(14), which states, "R*esearch on individual or group characteristics or behavior (including but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs, or practices and social behavior) or research employing survey,*

interview, oral history, focus group, program evaluation, human factor's evaluation, or quality assurance methodologies."

Risks and Benefits

There were no foreseeable risks associated with the participation in this research study. The participants may not have personally benefited from their involvement in this research; however, participation could have provided valuable information to the medical community about their technological needs and how this could lead to improvement of the quality of patient care.

HIPAA and Informed Consent

A HIPAA waiver was requested and received due to the study not collecting any personal health information from the physicians. Completion of the survey implied consent; therefore, no formal consent form was completed. Each potential participant received a consent letter describing the survey and explaining that completion was completely voluntary.

Incentives

Each participant who completed the survey received a certificate for admission to the 2009 Rural Health Conference; admission included admission fee, conference meals, and the opportunity to earn 15 CMEs.

Measurement

The Diffusion of Innovations Theory and Health Belief Models were used to develop a survey instrument and guide the analysis and interpretation of the data. The use of theory in research is a distinguishing and essential component of the health education profession (Taub, 1998). In a review of the literature, Debarr (2004) found that over seventeen different behavior

theories were used in articles published by the *American Journal of Health Education*, the *American Journal of Health Behavior*, *Health Education and Behavior*, *Health Education Research*, and the *International Electronic Journal of Health Education*, in 2003 alone. The Diffusion of Innovations Theory was cited by five different articles and the Health Belief Model was cited by four, each of which is considered in this investigation.

The survey instrument for this study was developed from the information obtained in the focus group, based on the constructs of the Diffusion of Innovations Theory in order to evaluate the physician's attitudes and beliefs regarding the EMR system (innovation characteristics). The survey also used constructs from the Health Belief Model to examine perceived severity, perceived threat, perceived benefits, perceived barriers, and self efficacy.

The first section of questions (#1 and #2) asked about the physicians' use of the internet in their home, at work, and how they spend their time when online. These questions evaluated the physician's knowledge of the internet and how comfortable they felt on the computer.

The second section (question #3) asked about their primary method of collecting personal health information within their practice. This question was asked in order to see which method of data collection the physician was using in their practice. The choices for this question were Dictation, Handwriting, Typing, EMR, or Other. If the respondent answered "Other," they were then prompted to write an answer.

The third section (question #4; 19 total questions; see Table 5) evaluated the physician's perceptions regarding the EMR system. The questions evaluated each physician's response on a five-point, likert scale with answer options being "Strongly Agree," "Agree," "Neutral,"

Table 5

Survey Question #5: Theory Constructs

Question	Diffusion of Innovations Theory	Health Belief Model
Question a	Relative Advantage	Perceived threat; Benefits
Question b	Relative Advantage	Perceived threat; Benefits
Question c	Relative Advantage	Perceived threat; Benefits
Question d	Relative Advantage	Perceived threat; Benefits
Question e	Relative Advantage	Perceived threat; Benefits
Question f	Relative Advantage	Perceived threat; Benefits
Question g	Relative Advantage	Perceived threat; Benefits
Question h	Relative Advantage	Perceived threat; Benefits
Question i	Complexity	Barrier
Question j	Complexity	Barrier
Question k	Complexity	Barrier
Question l	Compatibility	Benefit
Question m	Complexity	Barrier
Question n	Observability	Benefit
Question o	Trialability	Self-Efficacy
Question p	Trialability	Self-Efficacy
Question q	Complexity; Compatibility	Self-Efficacy
Question r	Trialability	Que to Action
Question s	Trialability	Self-Efficacy

"Disagree," and "Strongly Disagree." The likert scale, also called summated rating scale, (Rossi, Wright, & Anderson, 1983) is the most widely used scale in survey research and is popular because it allows further assessment of the respondent's feelings on a particular topic beyond the general "yes/no" or "agree/disagree" answers (Babbie, 2005).

Section four (question #5) asked the physicians who use EMR to check all tasks they complete using their EMR system. These questions sought to evaluate the level physicians use their EMR system. For example, if a physician used the EMR system to only view medical records and collect basic data then they were categorized as a basic user. Physicians were categorized based on their level of EMR use: Non User (0 tasks), Basic User (1-6 tasks), Moderate User (7-11 tasks), and Complete User (12-16 tasks).

Questions #6, #7, #8, #11, #12, #13, and #14 provided demographic data regarding the respondent's individual and organizational characteristics.

Questions #9 & #10 collected data regarding the respondent's innovativeness in continuing their education.

Distribution

A consent letter (see Appendix B) and survey (see Appendix C) were sent via electronic mail (e-mail) or United States Postal Service (USPS) mail to all 1,205 Family Medicine physicians who are practicing in rural and urban areas of all 67 counties in Alabama. Olson, Schneiderman, and Armstrong (1993) identified that achieving a high response rate with any survey can be quite a challenge; however, physicians' rates of response (18%-54%) (Asch et al., 1997; Delnevo, Abatemarco, & Steinberg, 2004; Menachemi & Brooks, 2006) are typically lower than the general population (68%) (Asch et al., 1997). In order to counter the low response rate by physicians, many researchers turn to web-based surveys or a combination of

web-based and paper surveys. Schleyer & Forrest (2000) evaluated the internet use of dentists within their clinical practice. The total response rate for their survey was 74.2% with 84% of the participants completing web-based survey, and 16% returned their survey by fax or email. Web-based surveys are estimated to cost 38% less than regular mailed surveys (Schleyer & Forrest, 2000).

In order to increase the response rate, web-based and mail surveys were employed. Choice of survey modality was determined by information provided by the Alabama Board of Medical Examiners. That is, those for whom an email address was given received the email version, and those for whom only a mailing address was given received the mailed version.

One week prior to the survey being sent to participants a pre-notification (see Appendix D) card was mailed via USPS or email. The pre-notification cards let the participants know that the survey was arriving and provided details about the survey; such cards have been used to establish the legitimacy of the study. Previous studies that used pre-notification letters or cards found that they increased their response rate by 7.7% - 28.5% above response rates when not using such letters (Essex, Welsch, Fletcher, & Crew, 2004; Fox, Crask, & Kim, 1988; Yammarino, Skinner, & Childers, 1991; Yu & Cooper, 1983).

The Alabama Family Medicine physicians for whom an email address had been provided (N=718) was sent an e-mail from the UA Medical Research email account (UAMedicalResearch@cchs.ua.edu). This account was set up in order to provide credibility to the study and prevent the email from being mistaken for SPAM. The email contained information about the survey along with a link to the survey website. The website discussed the survey in detail and directed participants to complete the survey. Completion took

approximately five minutes. If the email was returned or "bounced back" then the physician will received a paper survey for completion.

The email survey included an opening consent screen that included instructions on survey completion and the contact number for questions or concerns. The emailed survey took approximately five minutes to complete.

Those Alabama Family Medicine physicians who did not have an email address provided (N=582) were sent a letter via USPS describing the study along with a paper survey for completion. If the letter was returned due to "undeliverable" the physician was removed from the sample. It was assumed that since the Alabama Board of Medical Examiners was the regulatory and licensing board for all Alabama physicians they would have correct addresses for their members.

The paper survey included a detachable consent cover page that included instructions on survey completion and the fax number for return, as well as the contact number for questions or concerns. The survey took approximately five minutes to complete.

If the physicians did not respond to the survey within one week, the survey was resent via email and/or USPS. Olson, Schneiderman, and Armstrong (1993) found that higher response rates were to be expected with a second wave of surveys. However, diminishing returns were anticipated with the addition of other waves so a third USPS mail survey was not sent.

Data Collection

Data were stored on a secured server that was backed up on a daily basis using the Vovici survey software. Vovici, an online survey tool, has been used to conduct and analyze web surveys in a secure environment (Vovici, 2008). The Vovici system assisted with survey reliability in that it tracked the I.P. address of respondents to ensure there were no multiple

responses to the survey. With the Family Medicine physician population, it was highly unlikely that multiple physicians used the same computer to complete the survey.

On return of the faxed survey the data was manually input into the Vovici system. Manually populating the Vovici system ensured that the data collection systems were the same and thus less likely for error. For those that completed the survey electronically, the Vovici system automatically downloaded the data into the SPSS data file, Version 16.0. Surveys were collected for a total of 8 weeks (see Table 6).

In order to increase reliability of data, 10% of all mailed surveys were compared with the manually entered data in the Vovici system. If errors were found then a check of the entire database was completed for accuracy. No errors were found.

The paper surveys were stored in a locked cabinet at the University Medical Center, Room B108 until the end of the analysis. After all analyses had been completed, the paper surveys were shredded and the electronic data collected was kept in a password protected database.

Plan for Analysis

The purpose for the plan for analysis section was to discuss how the study data was managed and analyzed.

Preparing the Data for Analysis

The first step in preparing the data for analysis was to take 10% of the mailed surveys and check for data input accuracy. If an input error was found then 100% of the mailed data were double-checked. No input errors were found.

The second step in preparing the data for analysis consisted of looking for outliers in the data and checking for accuracy. An outlier was defined as an observation that was distant from

Table 6

Study Flow Chart

Procedure	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	EOS
Send Notification Cards	X								
Send surveys		X							
Re-send to non-responders			X		X	X	X	X	
Collect Data			X	X	X	X	X	X	
Data Analysis								X	X

Note. Wk signifies week. EOS signified End of Study.

the other data. Outliers were possible indications of data errors. If outliers were found, then the entire record was examined for errors.

The third step in preparing the data for analysis was to construct a stem-and-leaf plot to look for patterns in the data. Stem-and-leaf plots were used to show the shape and distribution of the data. The stem-and-leaf plot displayed the frequency for each interval, as well as displayed all of the individual values within that interval (Daniel, 2004).

The fourth step used in preparing the data for analysis was to identify frequencies in order to help determine legitimate data. A frequency refers to the number of times an event occurs during a study (Daniel, 2004).

Descriptive Statistics

Descriptive statistics were used to organize and summarize data in order to easily determine what information they contain and describe what the data shows (Daniel, 2004). Descriptive statistics were used to determine frequencies, counts, and proportions which described the respondents' demographic features (age, gender, county, and years in practice) and described the outcome variables.

In an attempt to determine the instrument's reliability, Cronbach's alpha, an internal consistency analysis, was conducted. Internal consistency is a measure based on the correlation between items on the survey (Daniel, 2004). Determining internal consistency was one way to determine the validity of the test instrument (Black, 1993; Cook & Campbell, 1979; Cronbach & Meehl, 1955). An alpha coefficient of >.7 was considered acceptable (Nunnaly, 1978).

Inferential Statistics

For means of this investigation an alpha level of .05 was used, thus determining that there was a 5% chance a Type 1 error will occur. The alpha level was the pre-determined level of

acceptance that helped determine the likelihood of Type 1 errors. Type 1 error happens when the researcher reports there is a difference in the study when none is actually present. For example, in this study a Type 1 error would be a report that there was a difference in urban and rural physicians in regard to their adoption of EMR, when in actuality there was no difference.

Inferential statistics were applied to the study's specific aims:

1. *Determine the level of electronic medical record use, if any, that is currently used in Family Medicine practices in rural and urban areas of Alabama.*

Specific aim #1 was tested by using the information obtained in questions #3 and #4 of the survey, while question #14 was used to determine rural/urban designation.

The Chi-Square and Mann-Whitney U tests were used for statistical analysis due to the ordinal nature of the data. This test was used to determine if a difference exists between the urban and rural physicians. A t-test was not used due to the use of continuous and non-normally distributed dependent variables.

2. *Based on the Diffusion of Innovations theory, determine the individual characteristics of early adopters compared to late adopters of EMR by Family Medicine physicians in Alabama.*

Specific aim #2 was tested using the information obtained in questions #6 and #9-14.

A Chi-Square and Mann-Whitney U tests were used to determine if differences exist between early and late adopters compared to each individual characteristic.

3. *Based on the Diffusion of Innovations theory, determine the organizational characteristics of early adopters compared to late adopters of EMR by Family Medicine physicians in Alabama.*

Specific aim #3 was tested using the information obtained in questions #7, #8, and #14 of the survey.

A Chi-Square and Mann-Whitney U tests will be used to determine if differences exist between early and late adopters compared to each organizational characteristic.

4. *Based on the Health Belief model, determine the perceived threat, barriers, and self-efficacy of Alabama Family Medicine physicians regarding adoption of the EMR.*

Specific aim #4 was tested using the information obtained in questions #4, #5, and #14 of the survey.

A Mann-Whitney U, Kruskal-Wallis, and a factor analysis were used to identify the perceived threats, barriers, and self-efficacy of Alabama Family Medicine physicians.

CHAPTER 4

RESULTS

The overall purpose of this study was to evaluate the adoption and implementation of electronic medical records (EMR) by rural and urban Alabama Family Medicine physicians. The results of the data analysis are reported in three sections: 1) Overview of the study population, 2) inferential statistical analysis and evaluation of specific aims, and 3) result summary.

Overview

The study began with 1240 Family Medicine physicians whose names and contact information were obtained through the Alabama Board of Medical Examiners. As the study was conducted, 35 physicians were removed due to the physicians being retired or having the incorrect contact information. The final target population consisted of 1205 Family Medicine physicians who practiced in Alabama.

Prior to the survey being sent to the Alabama Family Medicine physicians, it was pilot tested with The University of Alabama Medical Center physicians located in the Pediatric, Internal Medicine, Obstetrics and Gynecology, and Psychiatry departments. These physicians were selected for pilot testing for convenience and because they help train Family Medicine residents; therefore, they have an understanding from that perspective without reducing the potential participant pool. No surveys were pilot tested with a physician in the Family Medicine clinic. The survey was evaluated for readability and understanding as well as the functioning of the Vovici system (see Methods for a more thorough description) and fax number. The pilot survey was sent to 17 physicians, and 13 responses were received. Physicians reported that the

survey took approximately 5 minutes to complete, and two typographical and one grammatical error were noted.

The revised surveys were sent to the Family Medicine physicians via the Vovici system or through the United States Postal Service mail. The initial survey was sent via the Vovici system on December 8, 2008, and four reminder emails were sent on December 15, 2008, December 29, 2008, January 14, 2009, and January 23, 2009. The mailed surveys were sent on two occasions: December 9, 2008 and January 8, 2009.

Survey questions that were not answered were treated as missing data and omitted from the overall number of respondents (total N) for individual questions. Therefore, the total responses (N) are different for multiple questions.

Descriptive Statistics

A total of 365 surveys were returned for a response rate of 30%. Five hundred eighty-two (582) surveys were mailed and 623 were emailed to the Alabama Family Medicine physicians. One hundred fifty-seven of the mailed surveys (43%) were returned via fax and 208 (57%) emailed surveys were returned via the electronic Vovici system. Significantly more surveys were returned via email (34%) than mail (27%) (χ^2 =5.86; p<.05). Table 7 shows that 38.3% of the physician responders have their practices in rural Alabama, while 61.7% of the physician responders have their practices in urban Alabama.

Of the physician respondents, 25.3% were from Rural North, 16.8% were from Rural South, 8.3% were from the Black Belt Region, and 49.6% were from the Urban setting. Figure 7 and Figure 8 further show where the survey responders' and non-responders' practices are located.

Table 7

Physician Response by Alabama Region (N=363)

Counties	Frequency	%
Rural North	92	25.3
Rural South	61	16.8
Black Belt	30	8.3
Urban	180	49.6

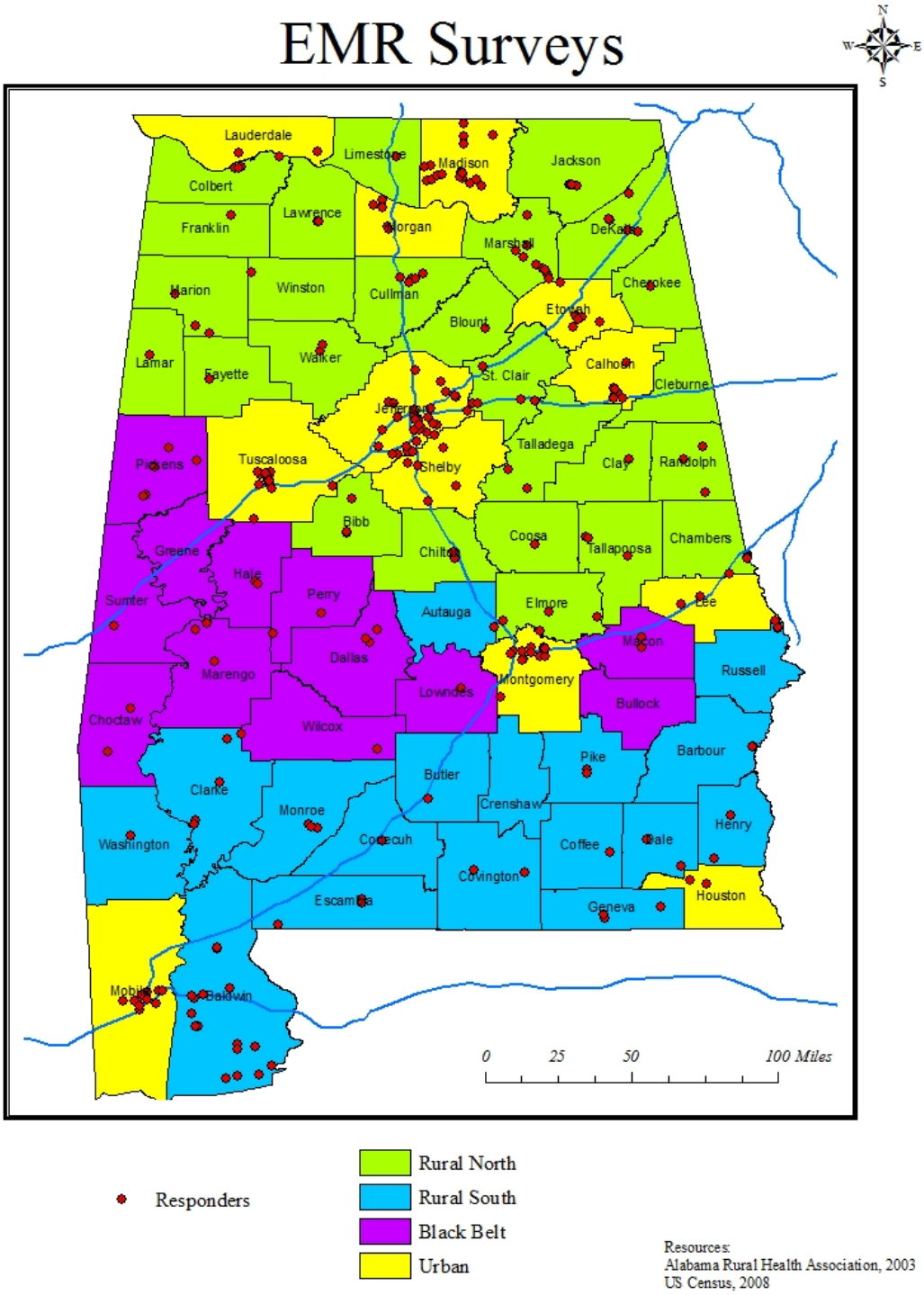

Figure 7. EMR survey responders.

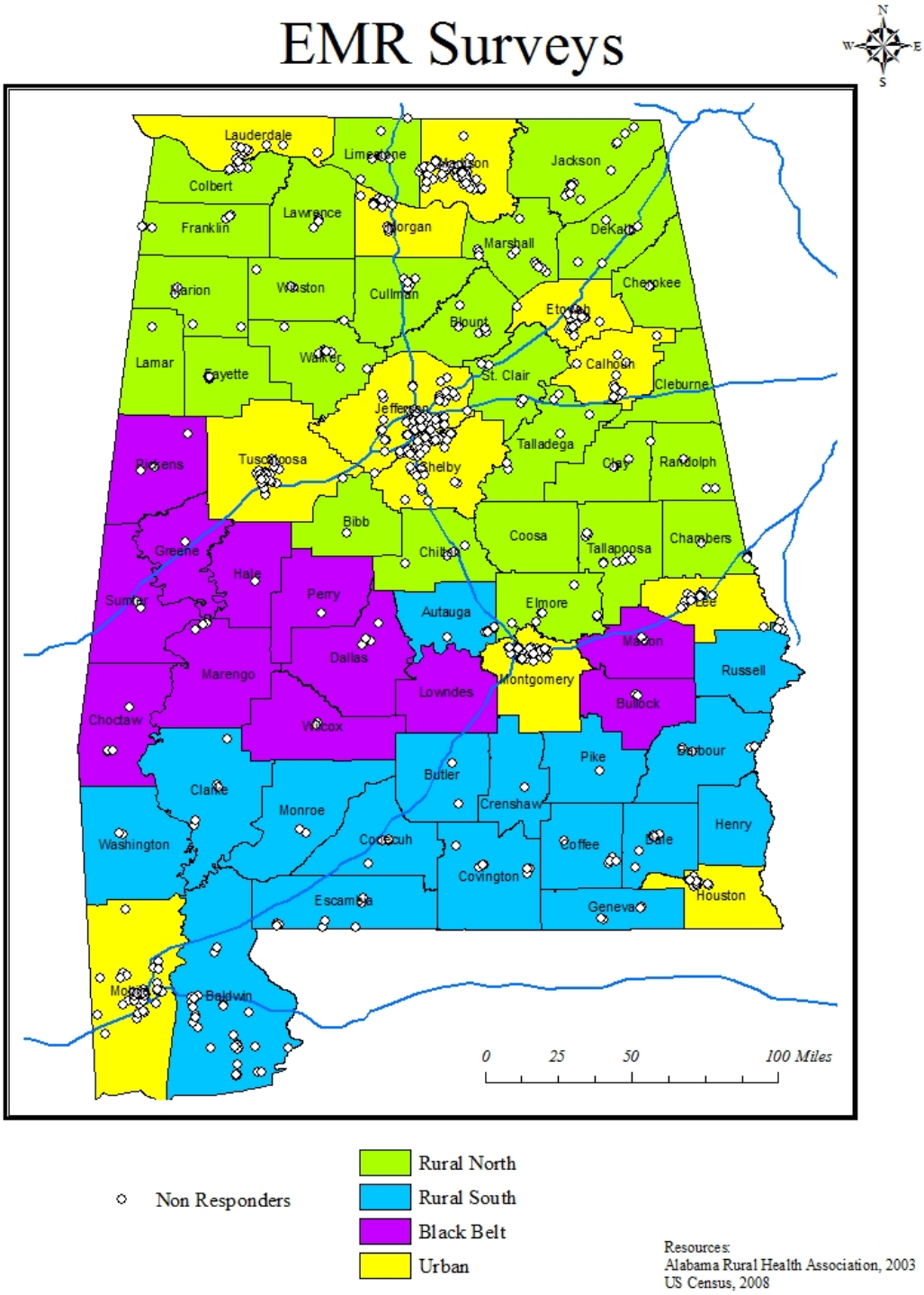

Figure 8. Survey non-responders.

Survey responses were received from physicians representing 62 of the 67 counties. Counties (see Table 8) that did not have physician responses were Bullock, Cleburne, Coffee, Crenshaw, and Greene. All of the non-responding counties are located in rural areas of Alabama, two being in the Black Belt (Bullock and Greene), one in the Rural North (Cleburne), and two in the Rural South (Coffee and Crenshaw).

The individual characteristics (see Table 9) of the study respondents consisted of 27.7% female and 72.3% males between the ages of 29 and 83 years with the mean age 51 years (*SD*=11.0). Respondents indicated that 84.9% were white, 8% were African American, and 7.1% reported Other. The Other category included Asian (14), Hispanic (5), multiracial (2), Caribbean, Native American, and Arabic.

The characteristics of the study non-responders consisted of 72.1% (N=606) males and 27.9% (N=234) females. Thirty percent (30%) of the respondents fell into the 50-59 year old range with the average age being 51 years. Of the non-responders, 27.4% (N=230) practice in the rural areas while 72.6% (N=610) practice in urban areas. When categorized by Alabama regions, the Rural North represented 22% (N=185) of the non-responders, the Rural South represented 16.3% (N=137) of the non-responders, the Black Belt represented 3.7% (N=31) of the non-responders and 58% (N=487) were from the Urban areas. Demographic data for race and years of practice was not available due to the fact that this data is not collected by the Alabama Board of Medical Examiners.

The years of practice (Table 10) for the survey respondents ranged from 1-58 years with a mean of 20.35 years (*SD*=12.0). The majority of surveyed physicians (57.3%) had been in practice between 10 and 29 years. The Family Medicine physicians reported that

Table 8

Non-Responding Counties (N=14)

Counties	Total Physicians	Region
Bullock	3	Black Belt
Cleburne	0	Rural North
Coffee	9	Rural South
Crenshaw	1	Rural South
Greene	1	Black Belt

Table 9

Individual Physician Characteristics

Demographics		Frequency	%
Gender	Male	259	72.3
N=358	Female	99	27.7
Age	29-29 years	1	.03
N=360	30-39 years	65	18.1
M=51	40-49 years	107	29.7
SD=11.0	50-59 years	115	31.9
	60-69 years	49	13.6
	70-79 years	19	5.3
	80-89 years	4	1.1
Race	African American	28	8.0
N=352	White	299	84.9
	Other	25	7.1

Table 10

Individual Physician Characteristics Continued

Demographics		Frequency	P
Years of Practice *N*=359 *M*=20.35 *SD*=12.0	0-9 years	72	20.1
	10-19 years	105	29.2
	20-29 years	101	28.1
	30-39 years	53	14.8
	40-49 years	20	5.6
	50-59 years	8	2.2
Travel for CME (trips per year) *N*=358	0	94	26.2
	1-3	257	71.8
	4-7	7	2.0
	8-10	0	0.0
	>10	0	0.0
Travel for Vacation / Business (trips per year) *N*=358	0	20	5.6
	1-3	261	72.9
	4-7	58	16.2
	8-10	8	2.2
	>10	11	3.1

71.8% participate in 1-3 out-of-state CME trainings per year while 72.9% travel out of state for vacation or business 1-3 times per year.

The practice characteristics (see Table 11) of the survey respondents showed that 30.8% of the Family Medicine physicians reported practicing in a solo practice, while 20.6% reported having one additional Family Medicine physician and 12.7% reported having two Family Medicine physicians in their practice. Of the respondents, 20.3% are partners in a practice with three to five other physicians with the remaining physicians (15.6%) being in practice with greater than six Family Medicine physicians. The mean practice size was 3.68 (*SD*=6.9). The majority of the Family Medicine physicians (52.1%) reported seeing 26-50 patients a day, while 35.3% see 11-25 patients per day.

The practice locations were divided into rural and urban settings based on the zip code distinctions of the Rural Urban Commuting Area, which allowed for dichotomous variable analysis. The physician response, by RUCA codes, shows that 38.3% of the practices are located in a rural setting while 61.7% reported being in an urban setting. The practice zip codes were then used to place the physician practice in their respective county which allowed for a further categorization of the rural variable. The counties were classified as Rural North, Rural South, Black Belt, and Urban based on the Alabama Rural Health Association distinctions. Of the 67 Alabama counties, 26 (38.8%) are located the in Rural North, 17 (25.4%) are in Rural South, 12 (17.9%) are in the Black Belt, and 12 (17.9%) lie in the Urban areas (see Table 12).

Upon examination of the differences in practice size between Family Medicine physicians in urban areas compared to those in the Rural North (U=6349.5, p=.004), Rural South (U=3834.0, p=.006), and the Black Belt (U=1898.0, p=.023), it was determined that the urban

Table 11

Physician Practice Characteristics

Demographics		Frequency	P
Practice	0	109	30.8
Size	1	73	20.6
N=354	2	45	12.7
M=3.68	3	27	7.6
SD=6.90	4	29	8.2
	5	16	4.5
	6	6	1.7
	7	9	2.5
	8	2	0.6
	9	5	1.4
	10	7	2.0
	11-20	13	3.7
	21-30	6	1.7
	>31	7	2.0
Patients Seen	0-10	18	5.0
Per Day	11-25	126	35.5
N=357	26-50	186	52.1
	51-75	20	5.6
	>75	7	2.0

Note. Practice Size refers to the number of partners.

Table 12

Alabama Counties (N=67)

Counties	Frequency	P
Rural North	26	38.8
Rural South	17	25.4
Black Belt	12	17.9
Urban	12	17.9

Note. Source: Alabama Rural Health Association, 2003.

physicians worked with significantly more partners ($\bar{x}$ =3.68) than any of the other regions. Table 13 delineates the differences.

Upon examination of the differences in patients seen per day between Family Medicine physicians in urban areas compared to those in the Rural North, Rural South, and the Black Belt, it was determined that the urban physicians see about the same number of patients per day as do physicians in the Black Belt (U=2540.5, p=.923) and Rural South regions (U=2657.0, p=.753). Table 14 delineates the differences.

Figures 9-14 further describe the differences in the Alabama Regions in regard to the number of patients seen per day in the Alabama Family Medicine practice.

The combined review of Figures 9-14 provides an interesting observation of practice size and patients seen per day. As noted previously there was no significant difference between patients seen among Black Belt and Urban physicians. However, a significant difference did emerge between practice sizes and these physicians.

Use of Technology

The survey participants were asked about their use of the internet at home and at work. Almost sixty-seven percent (66.7%) use a computer at home on a daily basis (see Figure 15) and 80.5% at work on a daily basis (see Figure 16). On contrast, 4.4% and 6.7% reported that they do not use the computer at all at home or at work, respectively.

Study respondents were asked how they spend their time when using the internet, and 86.8% reported reading emails was their top priority with 64.9% researching medical information and 53.2% looking up general information.

Table 13

Practice Size and Alabama Regions

Variable:	Rural North		Rural South		Black Belt	
Practice Size	*U*	*p*	*U*	*p*	*U*	*P*
Rural South	2545.0	.843				
Black Belt	1259.0	.701	804.5	.835		
Urban	6349.5	.004**	3834.0	.006**	1898.0	.023*

Note. * *p<.05,* ** p<.01.

Table 14

Patients Seen Per Day and Alabama Regions

Variable:	Rural North		Rural South		Black Belt	
Patients Seen Per Day	*U*	*p*	*U*	*p*	*U*	*p*
Rural South	2657.0	.753				
Black Belt	1031.0	0.43*	675.5	.062		
Urban	6280.5	.001**	4120.0	.004**	2540.5	.923

Note. *$p<.05$. **$p<.01$.

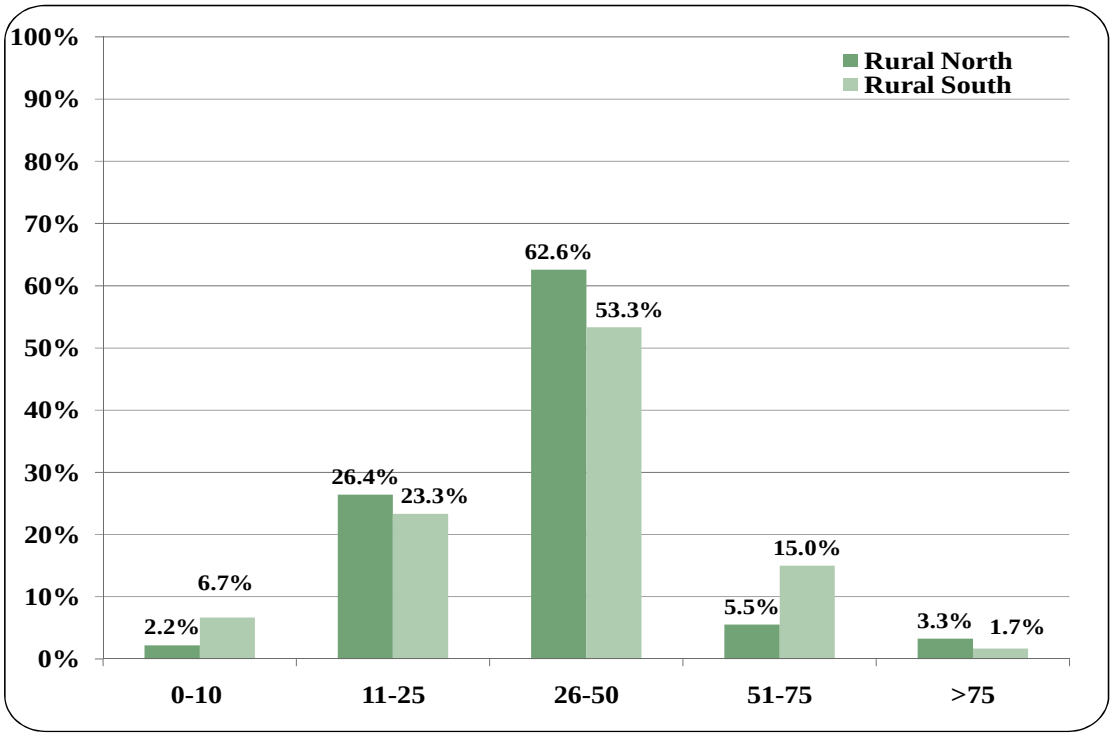

Figure 9. Patients seen per day (Rural North and Rural South comparison) (U=2657.0, p=.753).

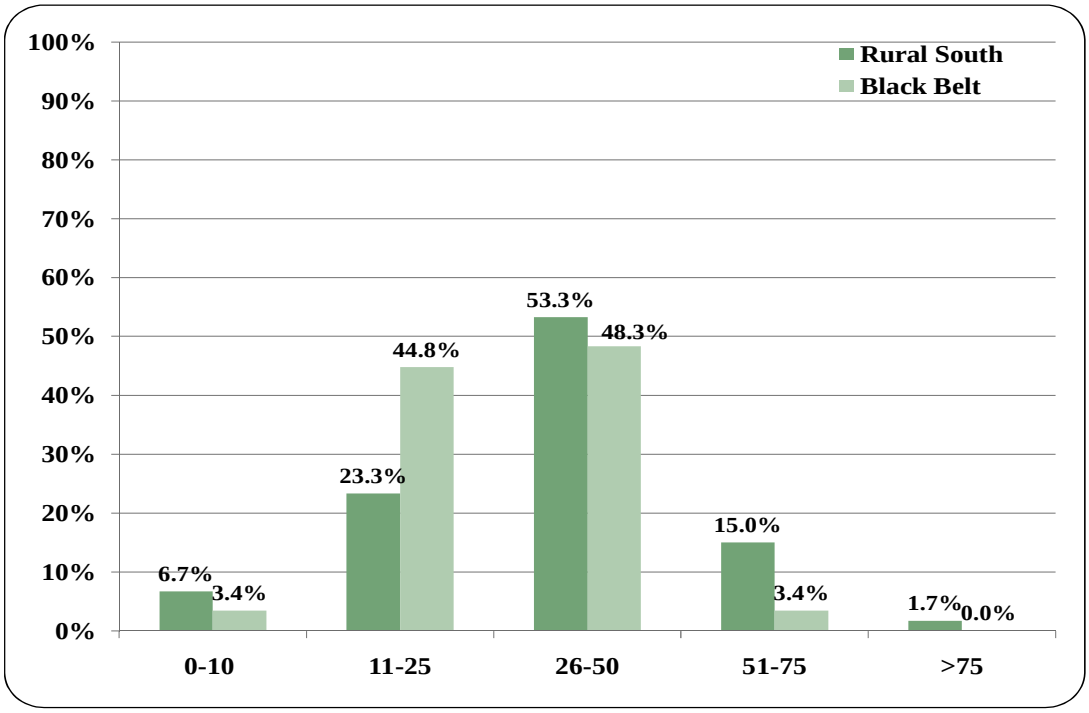

Figure 10. Patients seen per day (Rural South and Black Belt comparison) (U=675.5, p=.062).

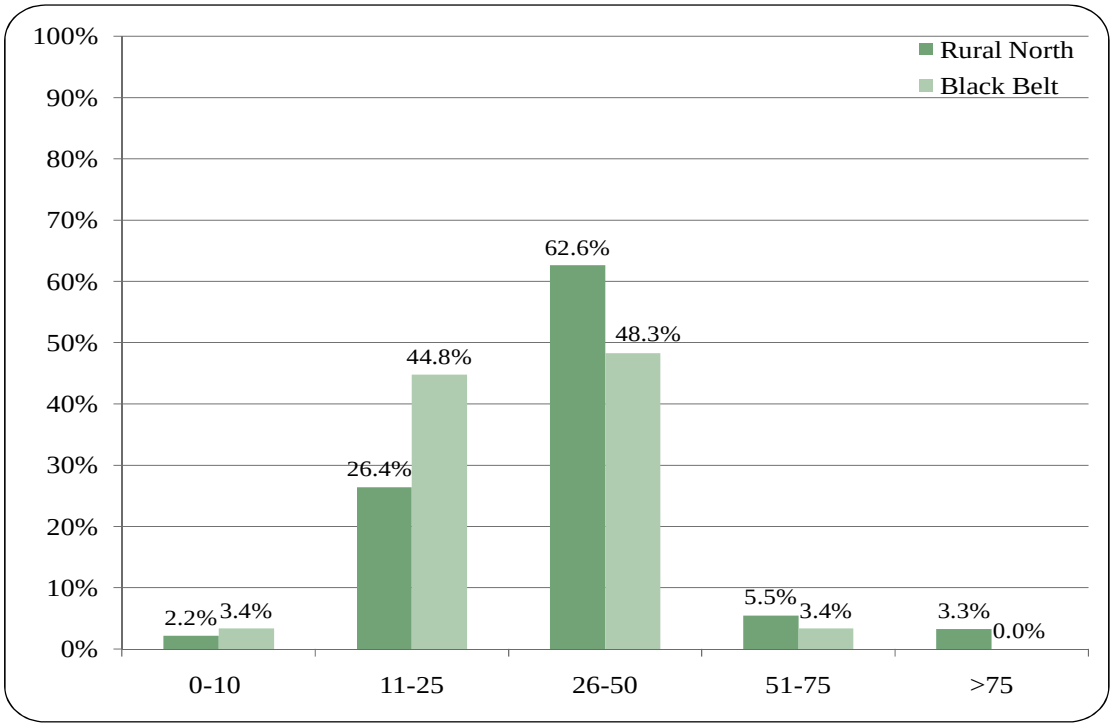

Figure 11. Patients seen per day (Rural North and Black Belt comparison) (U=1031.5, p=.043).

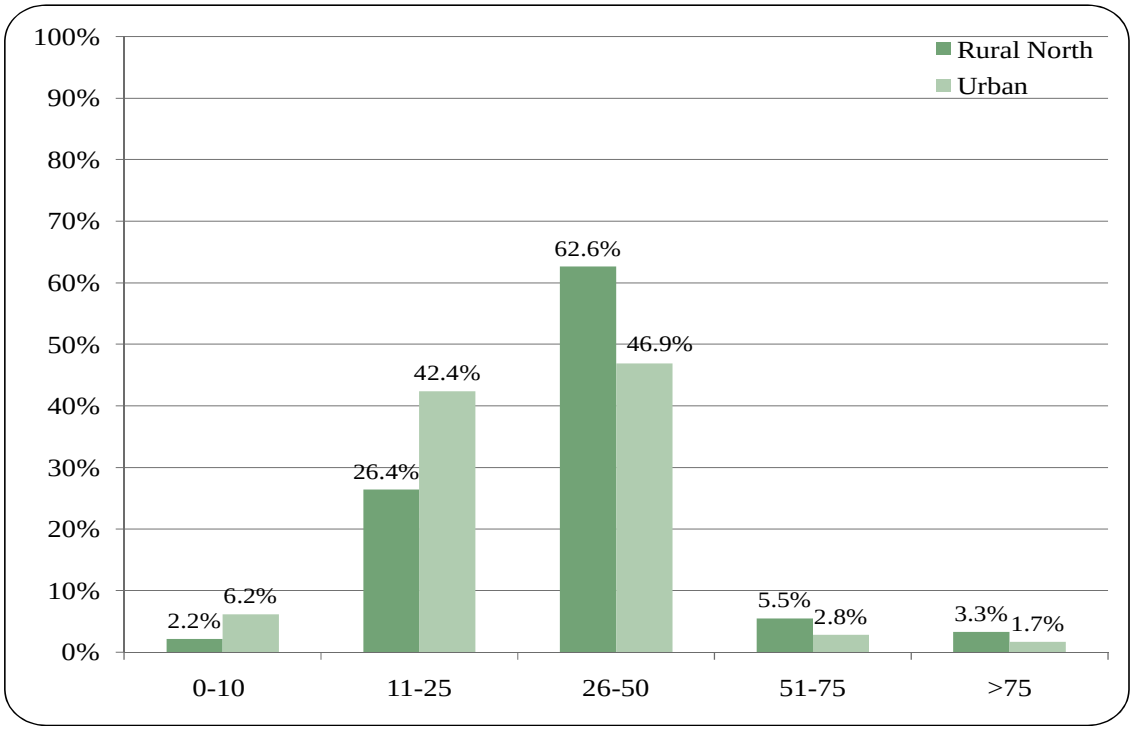

Figure 12. Patients seen per day (Rural North and Urban comparison) (U=6280.5, p=.001).

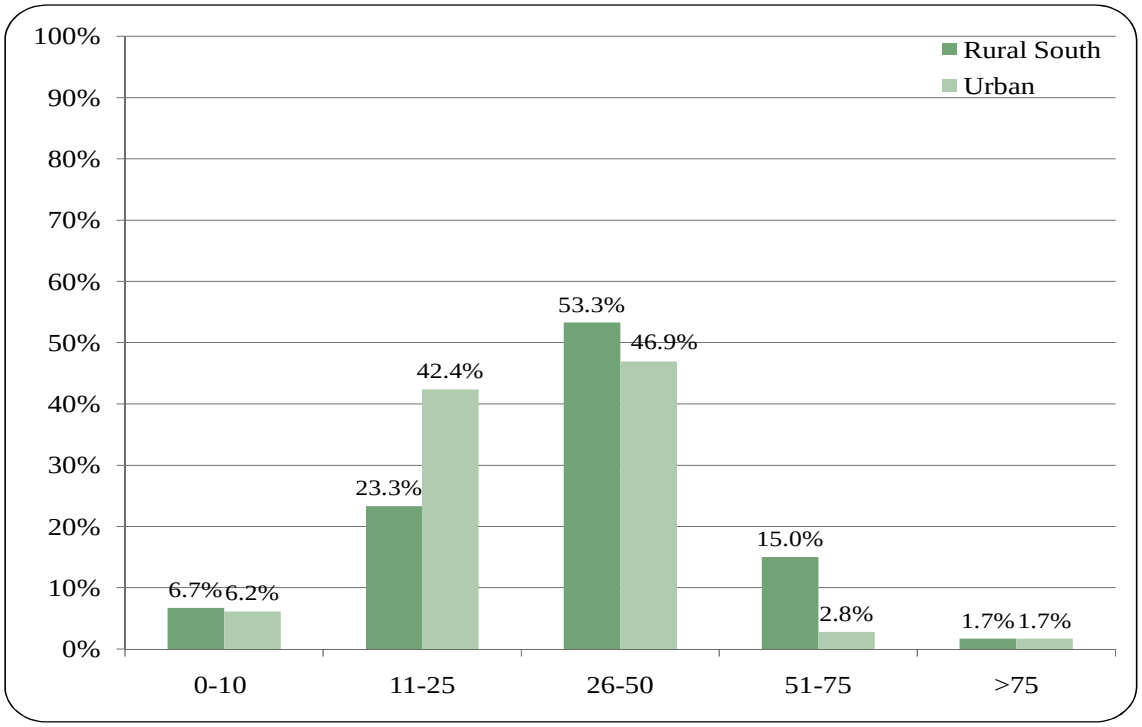

Figure 13. Patients seen per day (Rural South and Urban comparison) (U=4120.0, p=.004).

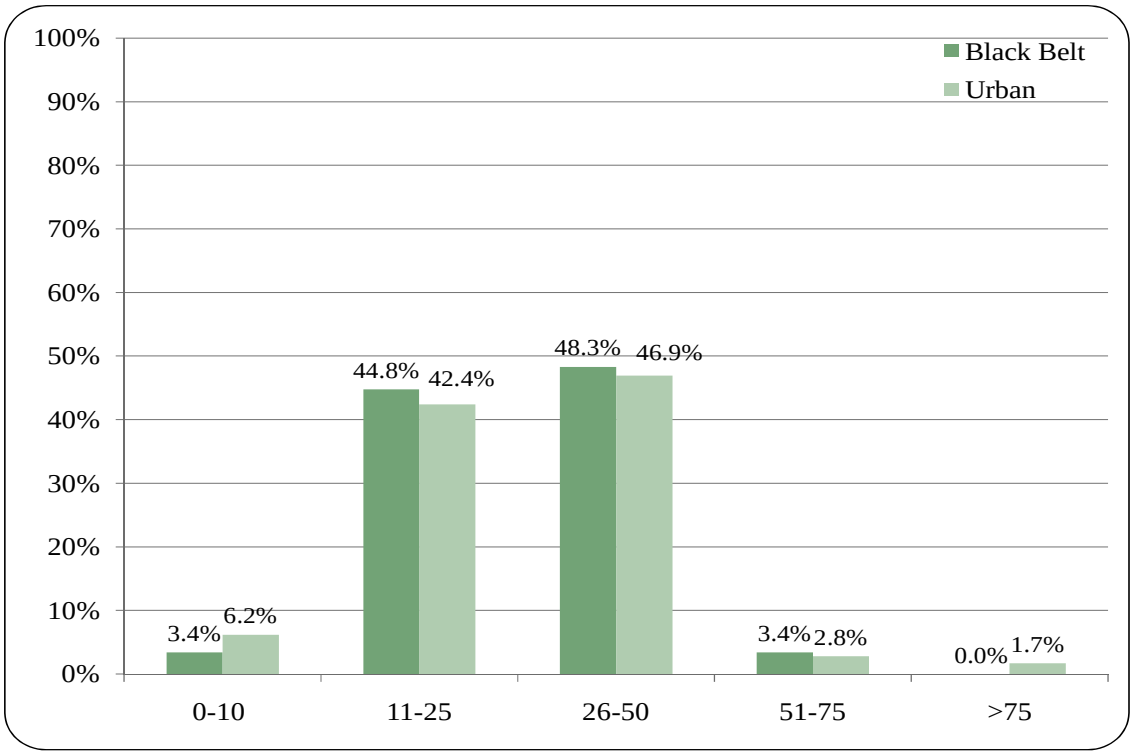

Figure 14. Patients seen per day (Black Belt and Urban comparison) (U=2540.5, p=.923).

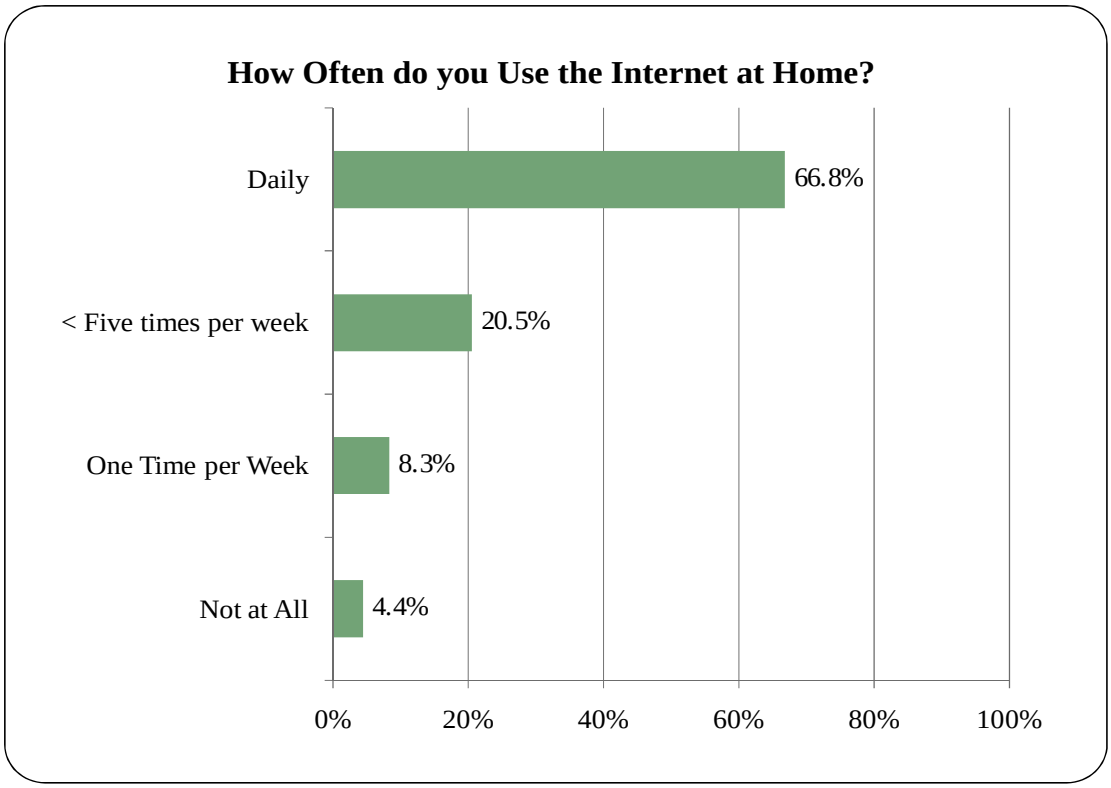

Figure 15. Computer use at home.

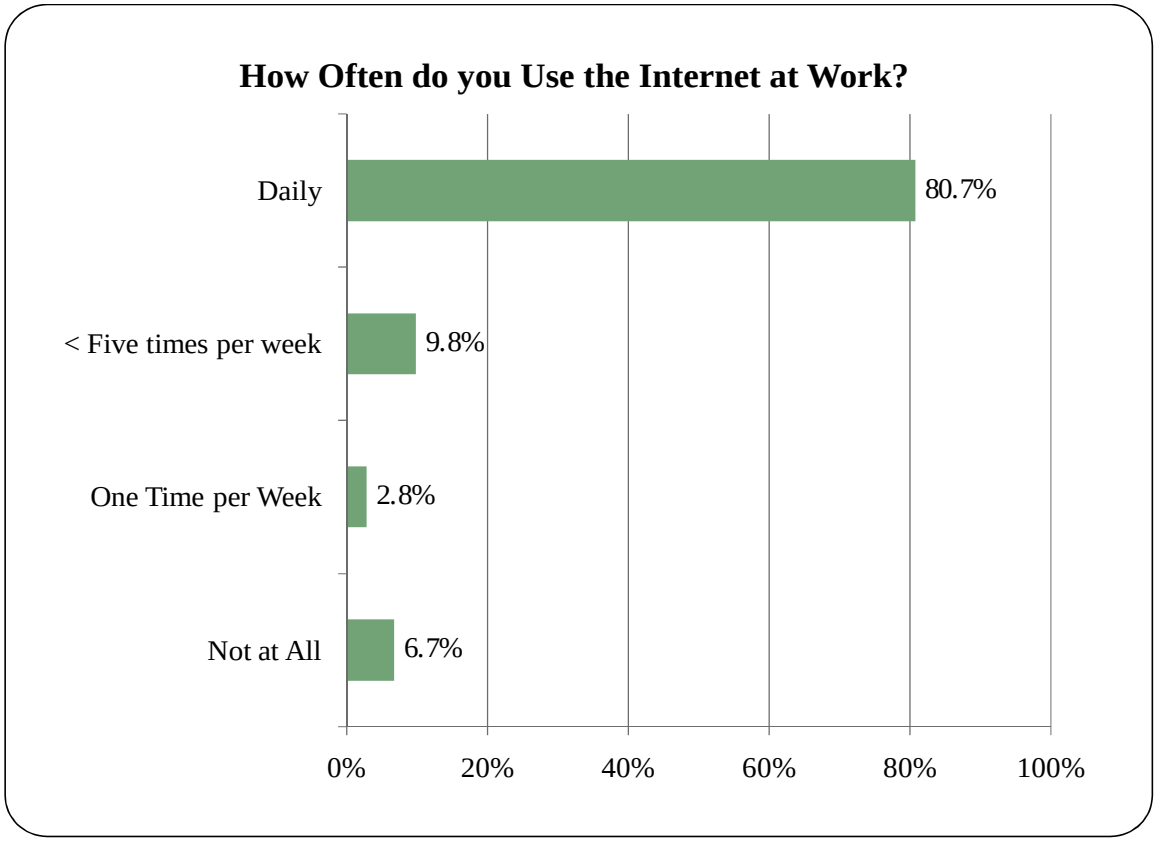

Figure 16. Computer use at work.

Approximately half (50.7%) of the physicians surveyed reported that they do not currently use EMR in their practice. While 49.3% report using some form of EMR in their practice, only 40.0% use it as their primary means of collecting patient health information. The remaining survey respondents reported that handwriting (41.7%) and dictation (18.1%) were their primary methods of documenting patient records.

Of the 365 respondents, 180 (49.3%) physicians who reported using EMR in their practices were asked to identify all clinical tasks they completed using their EMR system. Table 15 lists the clinical tasks in the order of most used by the surveyed physicians. The majority of the physicians reported using their EMR systems to view lab (87.2%) and medical reports (85.6%), record progress notes (71.7%), and order prescriptions (70.0%). Fifty to sixty-five percent of the respondents reported using the EMR for billing, scheduling, viewing hospital records, signing progress notes, ordering lab tests, and inter-office messaging. Less than half of the physician respondents (21.1% to 48.3%) reported using the EMR system for providing patient education, patient referrals, writing sick leave/school excuses, running data reports for individuals and groups, and providing physician education.

The level of EMR use was determined using the EMR User Categories: Non User, Basic User, Moderate User, and Complete User. Physicians were categorized based on their identified clinical tasks they completed using their EMR system. The number of tasks each physician completes using EMR was given a point value of 1 and then each physician was given a total point value of 0-16. The physicians were then placed in their appropriate User Category.

Table 16 shows that the majority (49%) of the survey respondents fall into the Non User category. The Basic User consisted of 13.9% of the survey population, Moderate User consisted

Table 15

Clinical Tasks by Physicians Using EMR (N=180)

Clinical Tasks	Frequency	P
View Lab Reports	157	87.2
View Medical Records	154	85.6
Record Progress Notes	129	71.7
Order Prescriptions	126	70.0
Billing	118	65.6
Scheduling	118	65.6
Sign Progress Notes	117	65.0
View Hospital Records	115	63.9
Order Lab Tests	113	62.8
Inter-Office messaging	96	53.3
Provide Patient Education	87	48.3
Patient Referrals	82	45.6
Sick Leave / School Excuses	80	44.4
Data Reports for Individuals	63	35.0
Data Reports for Groups	57	31.7
Provide Physician Education	38	21.1

Table 16

User Category Frequencies

User Categories	Frequency	P
Non-User	181	49.9
Basic User	50	13.9
Moderate User	73	20.1
Complete User	59	16.3

of 20.1% of the population, and Complete User category held the remaining 16.3% of the survey respondents.

Physician Attitudes and Beliefs

Table 17 shows the responses to the attitude and belief questions. Each answer was categorized by Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree. When asked about issues of treatment errors (Questions a, b, and e), the physicians' respondents strongly agree to agree that EMR could reduce or eliminate medical (69.7%), medication (79.7%), and interpretation errors (92.0%). The Family Medicine physician respondents strongly agree to agree that EMR can improve quality of care (60.2%); however, approximately 35% were neutral in their thoughts that EMR could reduce overall treatment costs when compared to those who strongly agree and agree (36.5%).

Almost three in four (72.2%) physician respondents strongly agree to agree that EMR can improve physicians' ability to monitor patients' care. Given the large patient to physician daily visit ratios noted, 25-60 patients per day, this benefit could become necessary justification for adoption.

The majority of the Family Medicine physician respondents were in agreement with the benefits and barriers of using and implementing an EMR system. Barrier identification questions noted that 68.2% of the surveyed physicians strongly agree to agree that EMR systems were too expensive, while 45.1% felt they required too much time to install, and 46.5% strongly agree to agree they took too much time to learn. However, only 32.4% felt the EMR system took too much time and effort to use after it was installed as opposed to 38% who felt it was worth the time and effort. It appears economics of adoption remains a much greater barrier to

Table 17

Response to Survey Attitude Questions in Percentages

Question	SA	A	N	D	SD
a. EMR can reduce medical errors.	25.1	44.6	20.9	7.1	2.3
b. EMR can reduce medication errors.	29.7	50	15.0	3.7	1.7
c. EMR can improve quality of care.	21.6	38.6	29.3	8.0	2.6
d. EMR can reduce overall treatment costs.	12.9	23.6	37.6	19.0	6.9
e. EMR can eliminate errors that result in misinterpretation of handwritten notes	51.4	40.6	5.7	1.7	0.6
f. EMR can save time in writing medical notes	17.3	24.4	24.1	23.5	10.8
g. EMR can eliminate the problem of missing medical information	17.4	38.6	26.3	14.3	3.4
h. EMR can improve physicians ability to monitor patients medical care	24.1	48.1	20.9	4.9	2.0
i. EMR systems are too expensive	32.7	35.5	22.3	8.5	1.1
j. EMR systems require too much time to install	16.1	28.9	36.0	17.3	1.1
k. EMR systems require too much time to learn	15.8	30.7	30.7	19.3	3.4
l. EMR systems can provide many uses for my office	22.6	52.3	18.6	6.0	0.6
m. EMR systems take too much time and effort to use	8.0	24.4	29.5	29.8	8.2
n. Some of my colleagues have benefited from EMR use	14.4	52.6	27.3	4.6	1.1
o. I would like to see how EMR could benefit my work	15.1	34.1	41.5	7.1	2.1
p. I would take a CME course on EMR	16.2	35.3	28.9	14.7	4.9
q. My computer skills are excellent	15.7	35.3	29.3	16.2	3.4
r. I have no plans to adopt an EMR system until required by regulation or policy	11.1	16.0	22.7	23.0	27.1
s. I do not feel comfortable trying new technology	1.7	6.9	15.8	39.3	6.4

Note. SA=Strongly Agree; A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree.

implementation than the resource of physician time to learn the EMR as only 55% strongly agree to agree that EMR systems would require too much time to install.

The benefits of EMR were evaluated and found that 72.2% of the physicians strongly agreed to agreed that EMR can improve their ability to monitor their patients' medical care, can eliminate the problem of missing medical information (56%), and can provide many uses for their office (74.9%). However, the physicians were split on their opinions regarding the actual use of the EMR system. When asked if EMR can save time writing medical notes, 41.5% strongly agree to agree, while 34.3% disagree to strongly disagree, and 24.1% were neutral. It appears that the surveyed physicians appreciate the benefits that the EMR systems afford but often find it difficult to maneuver the actual system.

Physician self-efficacy was evaluated and was found that the majority of physicians (41.5%) were neutral about seeing how EMR could benefit their work; however, over half (51.5%) strongly agreed or agreed that they would like to take a CME course on EMR systems. Along the lines of personal skills, 51% of surveyed physicians felt their computer skills were excellent and 75.7% felt comfortable trying new technology. Sixty-seven percent strongly agree to agree that their peers have benefited from EMR use.

With respect to perceived threat (susceptibility and severity), it appears that the Alabama Family Medicine physician's biggest advantage to EMR adoption is its ability to reduce handwritten note errors (question e, 92% SA/A). Somewhat contradictory to this belief is that only 41.7% of Alabama Family Medicine physicians strongly agree to agree that EMR implementation will save time in writing notes.

Another example of perceived threat is in the area of Alabama Family Medicine physician's view of regulatory mandate by governmental regulation or policy. Only 27.1%

strongly agree to agree that threat of regulation or policy would affect their plans to adopt an EMR system. Clearly this does not represent a significant cue to action.

Inferential Statisics

Before beginning the more sophisticated analysis, it was necessary to determine the reliability of the survey instrument. Cronbach's Alpha, a measure of internal consistency, was used to estimate reliability. The overall Cronbach's Alpha was .743. Measures of reliability for individual scales are presented with their associated analysis.

Evaluation of Specific Aims

Specific Aim #1

The four specific aims that were set forth for this study were examined and the results reported in the following section.

1. *Determine the level of electronic medical record use, if any that is currently used in Family Medicine practices in rural and urban areas of Alabama.*

A difference was found between rural and urban EMR use among Alabama Family Medicine physicians ($\chi^2 = 4.73$, $df = 1$, $p = .03$). Realizing that there is a difference between the rural and urban groups, further analysis was sought to determine difference within the rural and urban areas (see Table 18). Again, Rural North, Rural South, and Black Belt regions were individually compared to the Urban group. No difference ($\chi^2 = 0.72$, $df = 1$, $p = .789$) was found

Table 18

EMR Use and Alabama Regions

Variable:	Rural North		Rural South		Black Belt	
EMR Use	χ^2	*p*	χ^2	*p*	χ^2	*P*
Rural South	.132	.717				
Black Belt	5.927	.015*	4.191	.041*		
Urban	.072	.789	.405	.524	7.622	.006**

Note. * $p<.05$, ** $p<.01$, $df=1$.

between Rural North and Rural South (χ^2 = .405, *df* = 1, p =.524) when compared to Urban EMR use; however, a significant difference (χ^2 = .7.62, *df* = 1, *p* =.006) was found between the Black Belt and Urban regions. When comparing the EMR use in the Rural North to EMR use in the Black Belt, a significant (χ^2 = .5.927, *df* = 1, *p* =.015) difference was found.

The next step in this analysis was to determine if there was a difference between the level of EMR use among rural and urban Alabama Family Medicine physicians.

After the User Categories were determined (see Table 19) they were then compared to the rural regions (Rural North, Rural South, Black Belt, and Urban). Each region, Rural North, Rural South, and Black Belt, was compared to the Urban region. No significant difference was found between Rural North (χ^2 = .443, *df* = 3, *p* =.931) and Urban EMR use. No significant difference was found between Rural South (χ^2 = 3.968, *df* = 3, *p* =.265) EMR use when compared to Urban EMR use. However, a significant difference (χ^2 = 9.042, *df* = 3, *p* =.029) was found between the Black Belt and Urban Family Medicine physicians.

Initial analysis showed a difference with respect to level of EMR use among rural and urban Alabama Family Medicine physicians. When rurality was further defined, the difference was solely attributed to the Black Belt region and was consistently statistically significant with respect to difference within all regional counterparts. With regard to the level of EMR use within the Alabama regions, the Black Belt was the only region that showed a statistically significant difference when compared to the Urban region.

Table 19

User Categories and Alabama Regions

Variable:	Rural North		Rural South		Black Belt	
User Categories	χ^2	*p*	χ^2	*p*	χ^2	*p*
Rural South	3.308	.346				
Black Belt	7.528	.057	6.065	.108		
Urban	.443	.931	3.968	.265	9.042	.029*

Note. $^{*}p<.05$. *df=3.*

Specific Aim #2

2. *Based on the Diffusion of Innovations theory, determine the individual characteristics of early adopter compared to late adopters in regard to electronic medical record adoption in rural and urban areas of Alabama.*

Individual characteristics are defined as gender, age, race, years of licensure, travel for CME, and travel for vacation/business. Early and late adopters were characterized based on use or non use of EMR. If physicians are currently using EMR in their practice they are considered early adopters. If physicians are not currently using EMR then they are considered late adopters.

Gender (χ^2 = 2.284, df = 1, p =.131), race (χ^2 = .772, df = 2, p =.680), travel for CME (χ^2 = 4.093, df =2, p =.129), and vacations (χ^2 = 3.700, df =4, p =.448) were not different between early and late adopters (see Tables 20 and 21). However, age (χ^2 = 8.359, df = 3, p =.039) and years of licensure (χ^2 = 13.147, df = 3, p =.004) were significant in regard to EMR use.

Age and years are continuous variables; therefore, a determination of whether these variables were normally distributed was completed before selecting the appropriate analyses. These two variables were examined for normality using tests for skewness and kurtosis (see Table 22). Neither of these variables was found to be normally distributed, therefore nonparametric forms of analyses were employed.

Early adopters ($\bar{x}$ *=48.32, SD=9.96;* $\bar{x}$ *=18.33, SD=10.58*) were significantly younger and had been in practice for a shorter time period than late adopters ($\bar{x}$ *=52.89, SD=12.02;* $\bar{x}$ *=22.44, SD=13.03* respectively) (see Table 23).

Table 20

Individual Characteristics and EMR Use (Categorical Data)

Variable	Value		
	χ^2	*df*	*p*
Gender	2.284	1	.131
Race	.772	2	.680
Travel for CME	4.093	2	.129
Travel for Vacation / Business	3.700	1	.448

Note. $^{*}p<.05$.

Table 21

Individual Characteristics and EMR Use (Continuous Data)

Variable	Value	
	U	*p*
Age	12740.5	.001**
Years of Practice	13304.5	.004**

*Note. **p<.01.*

Table 22

Skewness and Kurtosis

Variable	Skewness		Kurtosis	
	Statistic	*SE*	*Statistic*	*SE*
Age	.401	.129	-.314	.256
Practice Size	3.835	.130	17.120	.259
Years of Practice	.549	.129	-.286	.257

Table 23

Adopters and Age and Years of Practice

Variable	Early Adopters		Late Adopters	
	M	*SD*	*M*	*SD*
Age	48.32	9.96	52.89	12.02
Years of Practice	18.33	10.58	22.4	13.3

Next, an analysis was completed to compare early and late adopters of EMR within their rural and urban distinction. The level of significance was then determined for the individual characteristics of age and years of practice in regard to the Alabama regions (Rural North, Rural South, Black Belt, and Urban) of the Family Medicine physicians (see Table 24).

Figure 17 shows the comparisons for age and Alabama regions. The Black Belt region showed a difference in age when compared to Rural North and Urban areas. This indicates that the Black Belt region of Alabama has an older Family Medicine physician population ($\bar{x}$ *=56.17, SD=12.228)* when compared to the Urban Family Medicine physician population ($\bar{x}$ *=50.33, SD=10.865*).

Figure 18 shows the comparisons for years of practice and Alabama regions. The Black Belt region showed a difference in years of practice when compared to Rural North, Rural South, and Urban areas. This indicates that physicians in the Black Belt region ($\bar{x}$ *=27.13, SD=12.065)* of Alabama have been in practice longer than other regions of Alabama.

Next, we sought to determine if the individual characteristics were predictive and the relative strength of those predictions. Each individual characteristic variable was entered into a logistic regression model to predict early and late adopters. The model was found to be predictive (χ^2 = 21.476, df = 11 p =.029). Unfortunately, although significant, this model only explains 6% of the variance. Age was the only variable found to be predictive (Beta=.056, p=.043).

Analysis was attempted to determine if this model was different for those in urban or rural locales but neither model was found to be predictive.

Table 24

Age and Years of Practice Comparison

Variable: Rural- Urban	Comparator	*N*	*M*	*p*
Age	Rural North	92	49.41	.039*
	Rural South	61	50.38	
	Black Belt	30	56.17	
	Urban	177	50.33	
	Total	360	50.59	
Years of Practice	Rural North	91	18.26	.004**
	Rural South	60	19.87	
	Black Belt	30	27.13	
	Urban	177	20.50	
	Total	358	20.38	

Note. * p<.05. ** p<.01.

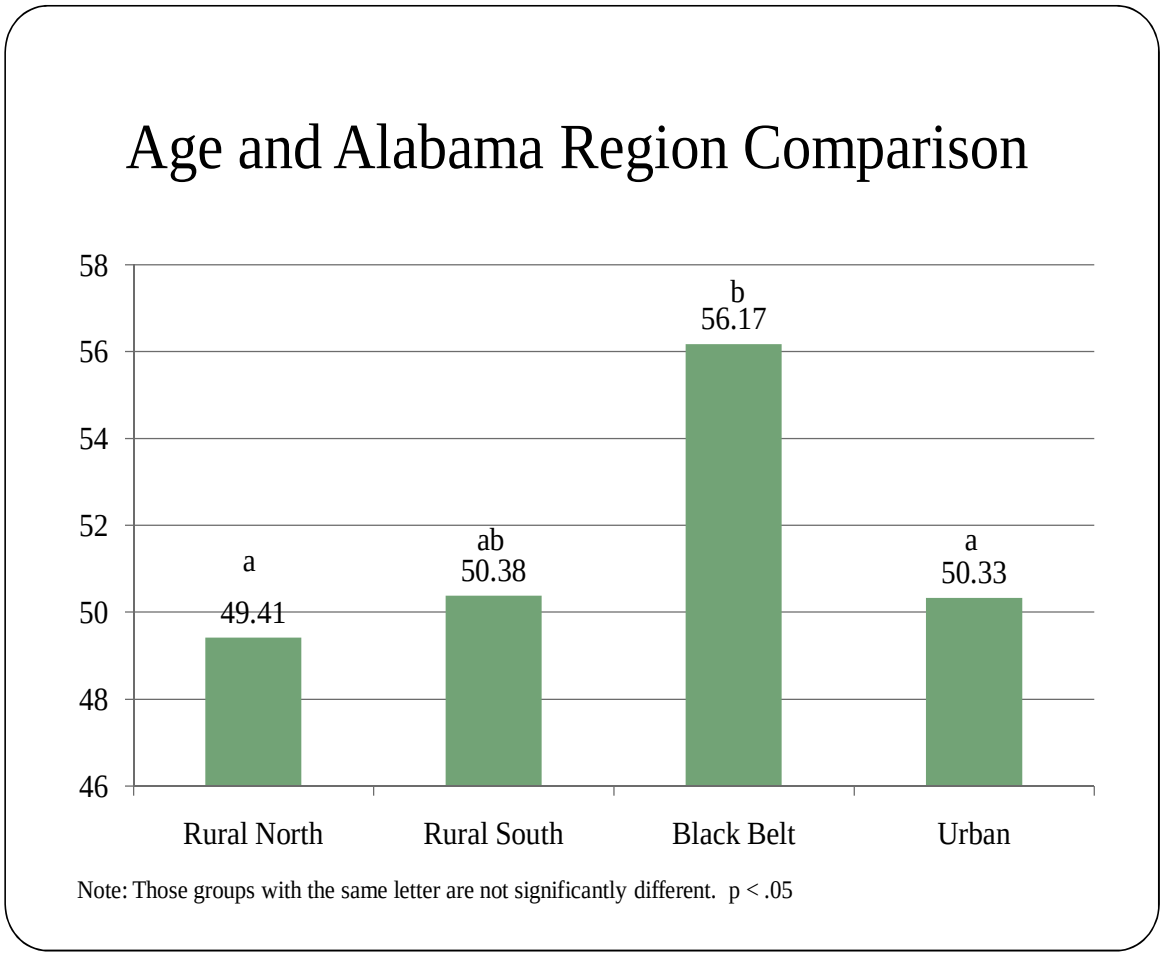

Figure 17. Age and Alabama region comparison.

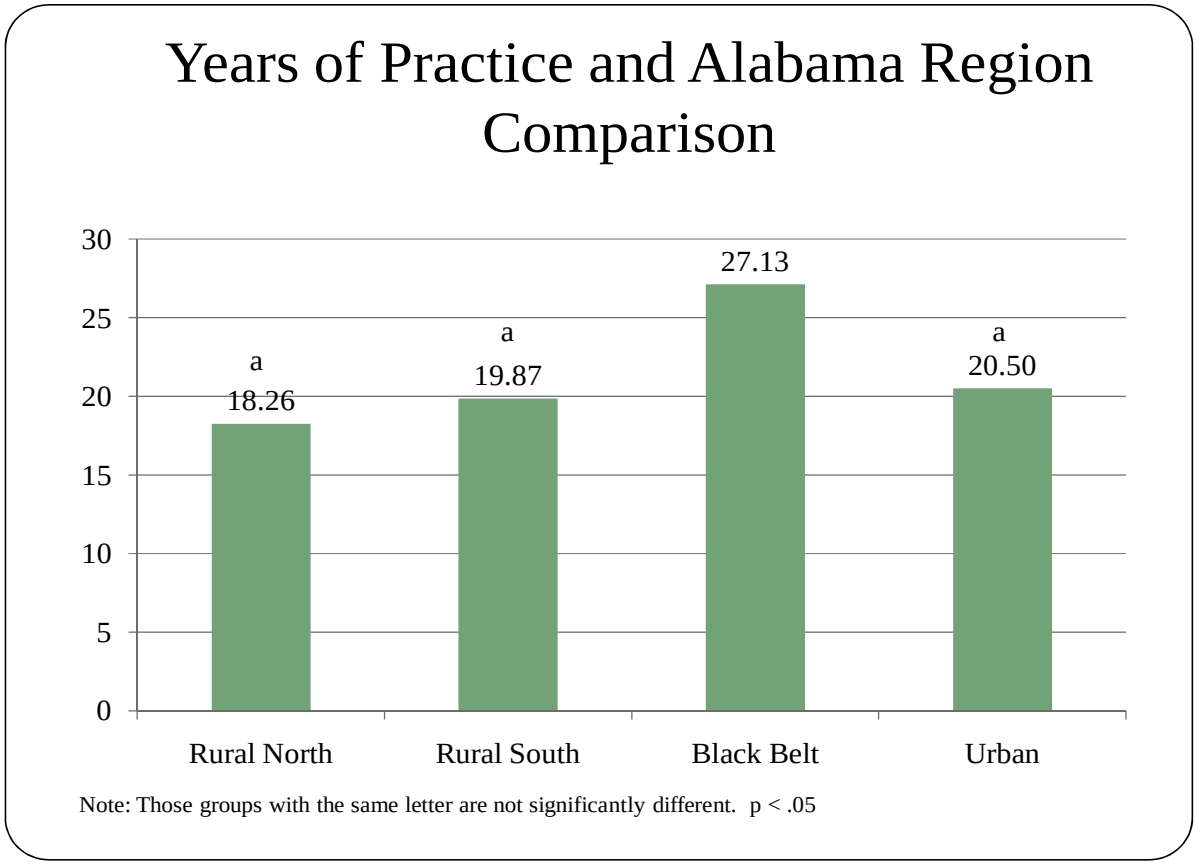

Figure 18. Years of practice and Alabama region comparison.

Specific Aim #3

3. *Based on the Diffusion of Innovations theory, determine the organizational characteristics of early adopters compared to late adopters of EMR by Family Medicine physicians in Alabama.*

External organizational characteristics are defined by the variables, patients seen per day, practice size, and rural/urban distinction.

There was no difference between early and late adopters with regard to number of patients seen per day ($\chi^2 = 6.07$, df = 4, p =.194).

However, early adopters did have more physicians *($\bar{x}$ =4.5, SD=7.8)*in their practice than did late adopters *($\bar{x}$ =2.9, SD=5.8)*(U=13216.5, p=.009). Additionally, a larger percentage of urban Family Medicine physicians were early adopters (54.9%) compared to their rural counterparts (43.2%) ($\chi^2 = 4.733$, df = 1, p =.03).

When evaluating practice size in the Alabama Regions (see Table 25), the mean practice size was 2.81physicians per practice for the Rural North (U=6349.5, p=.004), 2.35 physicians per practice in the Rural South (U=3834.0, p=.006), and 2.0 physicians per practice in the Black Belt (U=1898.0, p=.023).

S*pecific Aim #4*

4. *Based on the Health Belief model, determine the perceived threat, benefits, and barriers of Alabama Family Medicine physicians regarding EMR.*

This specific aim corresponded to the question #5 and contains 19 statements that were answered with Strongly Agree, Agree, Neutral, Disagree, or Strongly Disagree.

The reliability for this portion of the survey was estimated using Cronbach's Alpha and was found to be .764.

Table 25

Alabama Region Practice Size

Variable: Practice Size	*N*	*M*	*SD*	*U*	*p*
Rural North	*91*	2.81	5.323	6349.5	.004**
Rural South	57	2.35	5.476	3834.0	.006**
Black Belt	29	2.00	3.262	1898.0	.023*
Urban	177	3.68	8.268		

Note. * p<.05. ** p<.01.

A factor analysis of these variables was completed in order to confirm the supposition that certain variables made up factors for perceived threats, perceived benefits, and perceived barriers as was delineated previously in Chapter 3 (see Table 5). Only those factors with Eigen values greater than 1.0 were considered. In fact, only three factors were found to be significant: perceived threat, perceived barriers, and self-efficacy. The remaining constructs, perceived benefits, and cues to action were not significant and thus removed from the analysis.

In determining which variables were to be used in each of the factors, each variable had to have a factor loading greater than .5 and that did not load higher on a subsequent factor. Table 26 presents the factors and the factor loadings. These items then became the basis for sub-scales for each of the aforementioned concepts.

Again, in an effort to enhance validity of these scales, a reliability analysis was undertaken for each of the sub-scales. As Table 27 demonstrates, the estimate of reliability using Cronbach's Alpha was found to be in the acceptable range.

Early adopters were significantly different from late adopters with regard to scores on each of the three sub-scales: perceived threat (U=10952.5, p=.001), perceived barriers (U=11586.5, p=.001), and perceived self-efficacy (U=10573.5, p=.001). Late adopters were found to have high scores on perceived threat, higher scores on barriers, and lower levels of self-efficacy than early adopters.

Table 26

Analysis of Survey Question #5

Question	Threat (Factor 1)	Barriers (Factor 2)	Self-Efficacy (Factor 3)
Question a	*.814*		
Question b	.752		
Question c	.817		
Question d	.781		
Question e	.626		
Question f	.704		
Question g	*.685*		
Question h	.750		
Question i		.538	
Question j		.562	
Question k		.664	
Question o			.740
Question p			.754

Table 27

Health Belief Model and EMR Use

Variable: EMR Use	EMR Use	*N*	*U*	*p*	Skewness	Kurtosis	Cronbach Alpha
Perceived Threat	Yes	158	10952.5	.001**	Skewed	Normal	.905
	No	177					
Barriers	Yes	171	11586.5	.001**	Normal	Normal	.812
	No	176					
Self-Efficacy	Yes	167	10573.5	.001**	Normal	Normal	.712
	No	169					

Note. **p<.01.

Summary

In conclusion, this study set out to evaluate the adoption and implementation of electronic medical records (EMR) by rural and urban Alabama Family Medicine physicians. This analysis further addressed individual and organizational variables that could lead to physician EMR adoption. With the constructs of the Health Belief Model and Diffusion of Innovations Theory serving as the basis for analysis, significant differences emerged with respect to EMR use among physicians based on age, years in practice, patients seen per day, practice size, and with respect to elements of perceived threat, barriers to adoption, and the self-efficacy. Throughout the review and analysis there emerged differences between Family Medicine physicians from urban Alabama settings and their counterparts from rural practices.

CHAPTER 5

DISCUSSION

The purpose of this chapter was to discuss the findings of this investigation of EMR use among Alabama Family Medicine physicians. The chapter is divided into four sections: Summary of findings, Implications, Limitations, Future research and Conclusion.

Summary of Findings

The purpose of this study was to evaluate the current level of EMR use among Alabama Family Medicine physicians as well as their perceptions, attitudes, and beliefs about EMR. The main variables of interests were age, gender, race, practice size, years of practice, and practice location (urban/rural) in regard to EMR use. The physician's perception of the EMR threat, barriers, and self-efficacy were also evaluated. The Diffusion of Innovations Theory and Health Belief Model were used to guide the study and develop the survey questions. The Diffusion of Innovations Theory was used to understand the dynamic interactions between the Family Medicine physician's individual and medical practice characteristics. The Health Belief model was used to assess the physician's perceptions toward adoption of EMR.

Survey Responses

The survey had 365 respondents which constitutes a 30% response rate which is in line with physician responses to surveys. Olson, Schneiderman, and Armstrong (1993) identified that achieving a high response rate with any survey can be quite a challenge; however, physicians'

rate of response (18%-54%) (Asch et al., 1997; Delnevo, Abatemarco, & Steinberg, 2004; Menachemi & Brooks, 2006) are typically lower than the general population (68%) (Asch et al., 1997). It must be noted that in the higher response rate studies there was monetary incentives for completion. This study offered as an incentive, a no-cost admission to the 2009 Rural Health conference which includes conference meals and potential for 12 CMEs. It is unclear if this incentive had a bearing on their decision to complete the survey.

Pre-notification cards were sent to the physicians prior to the surveys being distributed in order to increase response rates. It is unclear if this process increased the response rate. However, previous studies that used pre-notification letters or cards found that they increased their response rate by 7.7% - 28.5% above response rates when not using such letters (Essex, Welsch, Fletcher, & Crew, 2004; Fox, Crask, & Kim, 1988; Yammarino, Skinner, & Childers, 1991; Yu & Cooper, 1983).

In order to counter the anticipated low response rate by physicians, this study used web-based surveys in combination with paper surveys. Schleyer & Forrest (2000) suggested in their research to use both methods in order to increase response rate. One hundred fifty-seven of the mailed surveys (43%) were returned via fax and 208 (57%) emailed surveys were returned via the electronic Vovici system. Significantly more surveys were returned via email (34%) than mail (27%) (χ^2 =5.86; p<.05). Of the physician responders, 38.3% have their practice in rural Alabama, while 61.7% of the physician responders have their practice in urban Alabama.

EMR Use

The study found that half (50.7%) of the physicians surveyed do not currently use EMR in their practices which leaves 49.3% that have implemented EMR. The number of Alabama Family Medicine physicians using EMR is quite an increase from the Family Medicine physician

national average of 13% (DesRoches et al., 2008). However, even though a large number of physicians have implemented EMR in their practices, only 16.3% report using them to their fullest capacity which is higher than the national average of 4% (Hsiao et al., 2008). Des Roches et al. (2008) defined a basic user and a physician who views patient demographics, problem lists, clinical notes, writes orders for prescriptions, and views laboratory reports. A complete user views patient demographics, views problem lists, writes clinical notes, writes medical history and follow-up, orders prescriptions, orders tests, send prescription and test orders electronically, views laboratory and imaging results, as well as being warned of drug interactions or contraindications, and reminded of guideline-based interventions. It appears that many physicians are using their EMR systems to view patient records and document health progress notes but few are using the EMR system to track individual health indicators or for patient/physician education which was no different than the research findings of Desroches et al. (2008). This opens the door for health educators to provide education to physicians or their staff regarding the multiple uses of the EMR system.

Physician Characteristics

This study showed that there are multi-faceted reasons that Family Medicine physicians have not or will not adopt an EMR system. These reasons can be categorized into three sections: Individual Characteristics, Organizational Characteristics, and Physician perception.

The individual characteristics analyzed in this study were age, gender, race, years of practice, travel for CME, and travel for vacation/business. Of the six variables, age and years of practice were the only two variables that showed a difference in regard to EMR use. The Black Belt region showed to be different from Rural North, Rural South, and Urban areas in regard to physician age and length of practice. However, on further analysis age was the only variable that

was deemed predictive to EMR use. This indicates that physicians in the Black Belt region of Alabama are older, have been in practice longer, and are more likely to not use EMR in their practices. This actually contradicts Roger's Diffusion of Innovations Theory where only personality, not age, is found to be a predictor of technology adoption. However, this study is not the first to find that age is a factor. Moore's (1993) research of EMR users characterized them as recent medical graduates which suggest they were younger in age.

The organizational characteristics analyzed in this study were practice size and patients seen per day. Both variables showed a difference in regard to EMR use among the rural and urban Alabama Family Medicine physician. However, when the rural/urban distinctions were further categorized into Alabama Regions, only practice size was found to be different. In Roger's Diffusion of Innovations theory, geography plays a critical role in determining whether or not an innovation will be adopted by a social system. As noted earlier, the Alabama Black Belt region is clearly a different region than the rest of Alabama; therefore, this study supports Roger's theory. However, Desroches et al. (2008) found that physicians who serve a higher proportion of minority, uninsured, or Medicaid patients were likely to have EMR which contradicts the representation of the Alabama Black Belt citizen. Further in Desroche's (2008) research it was found that larger physician groups (50+ physicians) were three times more likely to have EMR than those in very small practices (3 physicians or less), which supports the findings of this investigation.

In regard to practice size the Black Belt region showed a significant difference when compared to their Urban counterpart. The Black Belt region has more physicians in solo or very small practices than the Urban region who have more multi-physician practices. The number of patients seen per day, by those in the Black Belt region, was not significantly different when

compared to their Urban counterpart. This indicates that the Black Belt physicians have smaller practices; however, as individuals, they are seeing about the same number of patients per day as individuals in the Urban multi-physician practices. Therefore, this reveals that practices located in the Black Belt region are required to handle large patient loads without the assistance of additional physicians or EMR. This supports Marshall's (1989) research that purported to be that Family Medicine physicians tend to spend more time on patient care, thus having less time to learn about IT innovations. This study shows that Alabama Black Belt Family Medicine physicians tend to be in a solo or small practice and see as many patients at their Urban counterparts.

The perception characteristics analyzed in this study were perceived threat, barriers, and self-efficacy. All three variables were highly significant in regard to the physician's beliefs about EMR implementation and use. The physicians were in agreement that EMR could provide additional safeguards by reducing medical errors, especially in the areas of interpreting handwritten notes and prescriptions, while improving the overall care of the patient. The economics of implementing an EMR system proves to be a prominent barrier while the time to learn and install the system is noted as a critical issue as well. Self-efficacy proved to be the only variable that was common between the rural and urban physicians. This falls in line with Suther and Goodson's (2004) research which found the strongest predictors of adoption of an innovation is the physician's perception of its complexity. In both the Diffusion of Innovations Theory and the Health Belief Model, a level of perception is assessed. In Roger's Diffusion of Innovations Theory, personality characteristics can be generalized to include attitude toward adoption; however, the Health Belief model is where true self-efficacy is addressed.

Implications

The collection and analysis of the data allowed for (a) the exploration of the current level of EMR use among Alabama Family Medicine physicians, (b) the identification of individual characteristics of early and late adopters, (c) the identification of organizational characteristics of early and late adopters, and (d) the identification of perceived threat, benefits, and barriers to the implementation of EMR within the Family Medicine practice. As a result, this study contributes to the understanding of the impact and utilization of EMR within the Alabama Family Medicine practice. After completing the analysis several points of interest emerged:

1. Family Medicine physicians who practice in the Black Belt region of Alabama are very different than other Family Medicine physicians who practice in the other Alabama Regions. These physicians tend to be older, practice alone, and do not use EMR systems. These differences alone do not translate into a lack of ability to implement EMR; however, when coupled with a lack of self-efficacy this leads to low adoption and use rates. It is imperative that health educators take into consideration that self-efficacy is a prominent issue among rural Family Medicine physicians. Therefore, health educators should tailor their health messages to affect the physician's self-efficacy, such as hands-on training for the entire medical staff, while providing continued EMR support and guidance.
2. EMR use among the Alabama Family medicine physicians is generally seen as a positive move toward improved patient care and the reduction of medical errors. This attitude toward EMR use is encouraging as it shows that the benefits of EMR use outweigh the overall barriers.

3. EMR use among Alabama Family Medicine physicians is higher than expected and considerably higher than the national EMR use. However, the majority of the physicians are not using their EMR system to its fullest capacity. This provides an opportunity for health educators to implement EMR education programs that will assist the Family Medicine physician in their continued use of EMR as well as meeting CME (continuing medical education) requirements.
4. The benefits and barriers of EMR implementation and use of the Alabama Family Medicine physicians are consistent with physicians across the board. Identified barriers include EMR system cost and too much time and effort to install and learn. Identified benefits include increased safety due to lack of medication and translation errors, improved quality of care, and improvement of the overall monitoring of the patient. It is imperative that health educators take into consideration the benefits and barriers of EMR adoption prior to implementing any physician education program around EMR use.
5. The constructs of the Health Belief Model and Diffusion of Innovations Theory prove to be fitting theories when assessing the Alabama Family Medicine physician's perceptions regarding the use and adoption of EMR systems. Health educators should continue to use research tested theories when developing their health research and health education/health promotion programs.

Limitations

Several factors may influence the results of this research study. First, the study sample was comprised of rural and urban Family Medicine Physicians who practice in Alabama; no other physician specialty was used. Therefore, the data collected may not be generalizable to

other physician specialties across the state or across the nation. However, rural physicians will not have the diversity of specialty seen in urban areas. Second, history could be a threat to the validity of this study. Second, during the data collection portion of this study the United States inaugurated a new president, Barak Obama. Currently, it appears that President Obama's timeline for EMR implementation will remain in line with this study and will remain a high priority among political and health care providers. Third, the research study used a survey instrument that measured one point in time in order to produce descriptive data. This descriptive data neither established causality nor predicted behavior change in regard to EMR adoption among Family Medicine physicians. No longitudinal inference as to the beliefs and attitudes of Family Medicine physicians beyond this period of measurement can be made.

Specific Aims

Specific Aim #1

1. *Determine the level of electronic medical record use, if any, that is currently used in Family Medicine practices in rural and urban areas of Alabama.*

This investigation found that approximately half of the Alabama Family Medicine physicians surveyed currently use an EMR system in their practice. This shows that Alabama Family Medicine physicians are well ahead of the national average for Family Medicine physician EMR use. Even though less than a quarter of the Alabama Family Medicine physicians use their EMR system to its fullest capacity, they are still ahead of their national Family Medicine counterparts which fall at 4%. Even though the Alabama Family Medicine physicians are ahead of the national average for EMR implementation, there are many changes that must take place before the goal of total EMR implementation by 2014.

Specific Aim #2

2. *Based on the Diffusion of Innovations Theory, determine the individual characteristics of early adopters compared to late adopters of EMR by Family Medicine physicians in Alabama.*

The individual characteristics of age and years of practice were the only two variables that were predictive of EMR use. Unfortunately, age and years of practice are two variables that cannot be changed. This investigation showed that younger physicians use EMR more often than older physicians, which is probably attributed to younger physicians receiving EMR training during medical school and their residency. While it is important to continue EMR training in medical school and residency, it is imperative that continued EMR use is encouraged after graduation and increased opportunities to gain CME credits for EMR training are offered. This investigation shows that continued emphasis needs to be place on training for the older physician who did not receive EMR training during medical school or their residency.

Specific Aim #3

3. *Based on the Diffusion of Innovations Theory, determine the organizational characteristics of early adopters compared to late adopters of EMR by Family Medicine physicians in Alabama.*

The external characteristics of practice size and patients seen per day were different between the early and late adopters. The combined review provides an interesting observation of practice size and patients seen per day. As noted previously, there was no significant difference between patients seen among Black Belt and Urban physicians. However, a significant difference did emerge between practice sizes and these physicians. This reveals strong evidence that smaller Black Belt practice physicians are as busy as their Urban counterpart and are required to

handle large patient loads with smaller practice sizes. This issue leads to a call-to-action for health education / health promotion programs, as well as medical schools to focus additional training and emphasis on rural health and guide their graduates to a career in rural health education and rural medicine.

Specific Aim #4

4. *Based on the Health Belief model, determine the perceived threat, barriers, and self-efficacy of Alabama Family Medicine physicians regarding adoption of the EMR.*

Alabama Family Medicine physicians are ahead of the national average for EMR implementation and use; however, there are many changes that must take place before the goal of total EMR implementation by 2014. Health educators must take into account that physician perception in regard to EMR use is a critical step in the adoption process. This investigation shows that self-efficacy is a critical component to motivating the Family Medicine physicians to consider EMR adoption.

Future Research

Further research is warranted in the area of EMR adoption among physicians. The first area for future research is to evaluate the type of patient the rural and urban doctors treat on a daily basis. Collecting information on insurance company coverage would yield data about the level of care the patient might receive. For example, if a patient is on Medicare they could need more long-term care for chronic conditions such as high blood pressure, high cholesterol, and heart disease. These types of health conditions are not reimbursed by Medicare at a high reimbursement rate; therefore, the physicians would need to see more patients to net a practice profit. Rural health research (ADPH, 2003; Bahensky, 2008) has shown that many of the Black Belt citizens fall into the category of having chronic conditions that need long-term monitoring.

The second area for future research is to continue evaluating the perceived threats, benefits, barriers, and self-efficacy of Alabama Family Medicine physicians in regard to EMR adoption and use. In specific aim #4, physician perception focused on the Alabama physician as a whole and did not delineate between rural and urban areas. Future research needs to be completed on the Alabama Family Medicine physician's perceptions of EMR use in regard to their practice location: Rural and Urban; Rural North, Rural South, Black Belt, and Urban. This could possibly bear out that perceptions differ depending on the region of practice.

Conclusion

Electronic medical record implementation is an issue being discussed among physicians, patients, policy-makers, and political pundits—an issue that will not go away and must be addressed by all involved. While EMR has shown to increase quality of patient care and safety, it has evolved into an entity that carries a high monetary and manpower price tag—one that many rural Family Medicine physicians cannot afford. The charge of health educators will be to tailor their health messages to the Family Medicine physician in order to increase their understanding of the EMR system while promoting and improving their self-efficacy.

The EMR system is a tool that can assist the Family Medicine physician in providing quality care to their patients, a tool that can provide a foundation for future technology, such at tele-health, as well as tele-home health. However, in our zest as health educators to share our knowledge of a tool that can possibly impact the health of the entire community, we must remain mindful to preserve the integrity of the rural Family Medicine physician and their craft. While the health disparities of rural areas receive much research and attention, we must not fail to realize what so many rural physicians, such as Dr. J.K. Heid (1979, p. 827), so aptly stated, "The rural physician today is something of a breed apart. He thinks he owns the best of both worlds.

He lives and works in a rustic, often pastoral, setting. Still, with the ease of modern transportation, he finds that the cultural and recreational attractions of the city lie within his easy reach."

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL

Office for Research

Office of the Director of
Research Compliance

THE UNIVERSITY OF
ALABAMA
RESEARCH

December 3, 2008

Melanie Tucker, MA, CCRC
Institute for Rural Health Research
University Medical Center
Box 870326

Re: IRB # 08-OR-275 "Linking the Diffusion of Innovations Theory with the Health Belief Model to Describe EMR Use Among Family Medicine Physicians: A Rural and Urban Analysis"

Dear Ms. Tucker:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your protocol has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Should you need to submit any further correspondence regarding this proposal, please include the assigned IRB application number. Please provide copies of the IRB approved consent form to your participants.

Good luck with your research.

Sincerely,

Carpantato T. Myles, MSM, CIM
Director of Research Compliance & Research Compliance Officer
Office of Research Compliance
The University of Alabama

152 Rose Administration Building
Box 870104
Tuscaloosa, Alabama 35487-0104
(205) 348-5152
FAX (205) 348-8882

APPENDIX B

CONSENT LETTER

Rural Health Institute for
Clinical and Translational Science

December 8, 2008

THE UNIVERSITY OF
ALABAMA
FOUNDED 1831

Dear Physician,

The University of Alabama Rural Health Institute for Clinical and Translational Science and Ph.D. candidate, Melanie Tucker, are conducting a research study to evaluate the electronic medical records (EMR) use among rural and urban Family Medicine Physicians.

This survey will take approximately **five minutes** of your time and may be completed by simply marking your answers on the enclosed survey and faxing it to:

205-348-8885

Some important information about the survey:

- *Confidentiality:* Your responses will be strictly confidential. Only summary data will be provided in the final report.
- *How this information will be used:* Results of this survey will be used to evaluate the technological uses and needs of the rural and urban physician.
- *Incentive:* All individuals completing the survey will receive a **Certificate of Admission** to the **2009 Rural Health Conference** sponsored by the University of Alabama Rural Health Institute for Clinical and Translational Science. This certificate will cover the registration fee, meals provided by the conference and CME credits. (More information will follow.)

Your participation is completely voluntary. Your willingness or unwillingness to participate will not affect your relationship with The University of Alabama. If you have questions about the survey or the work of the Rural Health Institute for Clinical and Translational Science, please contact Melanie Tucker at 205-348-6151, or Tanta Myles, Compliance Officer in the University's Office for Sponsored Programs, at 205-348-5746.

On behalf of the University of Alabama Rural Health Institute for Clinical and Translational Science, thank you for taking the time to provide us with this important information.

Sincerely,

John C. Higginbotham, Ph.D., M.P.H.
Associate Dean for Research and Health Policy

Melanie Tucker, MA, CCRC
Ph.D. Candidate

The University of Alabama
School of Medicine
Tuscaloosa Campus

College of Community
Health Sciences

Mailing Address:
Box 870326
Tuscaloosa, Alabama 35487-0326

Shipping Address:
850 5th Avenue East
Tuscaloosa, Alabama 35401

(205) 348-0025
fax (205) 348-9417
www.rhi.ua.edu

APPENDIX C

SURVEY

EMR Use Among Rural and Urban Family Medicine Physicians

1) Please indicate your answer for each question.

	Not at all	One time per week	≤ Five times per week	Daily
How often do you use a computer at HOME?				
How often do you use a computer at WORK?				
How often do you use the internet at home or at work?				

2) When using the internet how do you spend your time? (Check top THREE)

_____ Reading emails
_____ Instant messaging
_____ Chat rooms
_____ Message boards
_____ Shopping
_____ Booking travel
_____ Banking
_____ Computer games
_____ Reading the news
_____ Researching medical information
_____ Looking up general information
_____ Watching movies/sporting events

3) What is your primary method for recording patient health information?

____Dictation ____ Handwriting ____EMR ____Other (please specify) _____

4) Please check all clinical tasks that you complete using EMR.

____ I Do Not Use EMR
____ View medical records
____ View lab reports
____ View hospital medical records
____ Patient referral
____ Billing
_____ Run data reports for patient groups
_____ Run data reports for individual patients
_____ Record patient progress notes
_____ Sign progress notes
_____ Order lab tests
_____ Write sick leave / school excuses
_____ Provide patient education
_____ Provide physician education
_____ Inter-office E-mail
_____ Scheduling
_____ Order prescriptions

5) Please indicate your answer for each question.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. EMR can reduce medical errors.					
b. EMR can reduce medication errors.					
c. EMR can improve quality of care.					
d. EMR can reduce overall treatment costs.					
e. EMR can eliminate errors that result from misinterpreting handwritten notes.					
f. EMR can save time in writing medical notes.					
g. EMR can eliminate the problem of missing medical information					
h. EMR can improve physician's ability to monitor patient's medical care.					
i. EMR systems are too expensive.					
j. EMR systems require too much time to install.					
k. EMR systems require too much time to learn.					
l. EMR systems can provide many uses for my office.					
m. EMR systems take too much time and effort to use.					
n. Some of my colleagues have benefited from EMR use.					
o. I would like to see how EMR could benefit my work.					
p. I would take a CME course on EMR use.					
q. My computer skills are excellent.					
r. I have no plans to adopt an EMR system until it is required by a regulation or policy change.					
s. I do not feel comfortable trying new technology.					

6) How many years have you been a licensed medical practitioner? _____

7) How many other physicians are in your practice? _____

8) How many patients do you see per day?
_____0-10 _____11-25 _____26-50 _____51-75 _____>75

9) How many times per year do you travel outside the state for CME or additional training?
_____0 _____1-3 _____4-7 _____8-10 _____>10

10) How many times per year do you travel outside the state for business or vacation?
_____0 _____1-3 _____4-7 _____8-10 _____>10

11) What is your gender? _____Female _____Male

12) What is your racial identification?
_____ African American _____White _____Hispanic _____Asian _____Other: please specify: _____

13) What is your age? _____

14) What is the Zip Code of your medical practice? _____

15) Please submit your name and email address so we may send you the Certificate of Attendance waiver to the 2009 Rural Health Conference.

Name: _____

Email: _____

On behalf of the University of Alabama Rural Health Institute for Clinical and Translational Science,
thank you for taking the time to provide us with this important information.

APPENDIX D

PRE-NOTIFICATION CARD

Coming Soon!!!!!

Family Medicine Physician Survey

The University of Alabama
Rural Health Institute for Clinical and Translational Science
is conducting a survey to evaluate your level of EMR use.
Look for the survey in your e-mail next week.

THE UNIVERSITY OF
ALABAMA
RURAL HEALTH RESEARCH