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Primary Care-Related Emergency Department Use

Tiffany Wetz

University of the Incarnate Word, tiffawetz@gmail.com

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PRIMARY CARE-RELATED EMERGENCY DEPARTMENT USE

by

TIFFANY WETZ

A DISSERTATION

Presented to the Faculty of the University of the Incarnate Word
in partial fulfillment of the requirements
for the degree of

DOCTOR OF BUSINESS ADMINISTRATION

UNIVERSITY OF THE INCARNATE WORD

May 2018

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ACKNOWLEDGMENTS

When I stepped up to the starting line of my doctoral race, I knew I was participating in a marathon, one that would be full of extreme highs and lows. There were times when I questioned my own personal sanity as to why I wanted to finish the grueling race. There were days when I had nothing left to give but somehow managed to keep pressing forward. I certainly did not run this race alone. I was accompanied by a very special group of team members who made sacrifices with me along the way. I owe my sincerest appreciation to them because I never would have crossed the finish line without their unwavering support and encouragement.

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The love, support, encouragement, and sacrifices from my family and friends were instrumental to my success. My parents, Dr. Robert and Debbie Wetz, have always been my twin pillars in life who have supported my every endeavor. I want to thank my Dad for always

Acknowledgments—Continued

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Tiffany A. Wetz

DEDICATION

This dissertation is dedicated to the loving memory of my grandmother, Billie Jean Wetz. She instilled a love for learning in my heart and showed me the true meaning of patience and perseverance in the face of adversity. She was my biggest advocate for continuing education and always encouraged me to work diligently to accomplish that which my heart desired. Although she was not here with me in the flesh, she was with me both in spirit and heart, especially during the toughest times of this doctoral journey. I miss you dearly, Bramna.

PRIMARY CARE-RELATED EMERGENCY DEPARTMENT USE

Tiffany Wetz

University of the Incarnate Word, 2018

Primary care-related emergency department use has become a focal point in the United States considering health reform and changes made to the delivery model and reimbursement mechanisms. Emergency departments serve as critical access points within the United States delivery system because important medical resources are made available for all members within the community. However, a gap in the literature exists due to a lack of consensus regarding factors that influence emergency department use for primary care-related health needs. The purpose of this study was to understand the relationship between demographic, social, economic, geographic, and need factors that influenced use of the emergency department for primary care-related health needs.

This study was modeled after the Andersen behavioral model of health care utilization, and it also utilized the New York University ED Algorithm to estimate the rate of visits that were primary care-related. This study employed a retrospective confirmatory research design using secondary administrative data obtained from the Kentucky State Emergency Department Database from January 1, 2008 to December 31, 2015 ($N = 15,635,828$).

All factors (insurance status, insurance type, income, area of residence, gender, race, and age) within the multi-factor logistic model were significant, except Race White, Missing insurance, and self-pay insurance.

The multi-factor model and ED Algorithm appear to have validity as an indicator of access problems to primary health care services. Findings from this study provide evidence that both community and individual level factors are influential in driving use of the emergency department for primary care-related health needs.

TABLE OF CONTENTS

LIST OF TABLES	xii
LIST OF FIGURES	xiii
OVERVIEW OF THE STUDY	1
Context of Topic	1
Statement of the Problem.....	3
Purpose of the Study	4
Research Questions	4
Summary of Appropriate Methodology.....	5
Theoretical Framework	8
Significance of the Study	10
Limitations of the Study.....	14
LITERATURE REVIEW	16
Major Areas of Review	16
Health Reform—The Affordable Care Act.....	19
The History of Emergency Medicine.....	23
Emergency Department Utilization—Trends and Consequences.....	24
Frequent Users	24
Insurance Status	26
Race/ethnicity	30
Age.....	32

Table of Contents—Continued

Income.....	35
Overcrowding	38
Fragmentation	39
Effect of Primary Care Access on Emergency Department Utilization	41
Research Hypotheses	44
RESEARCH DESIGN	46
Overall Approach and Rationale.....	46
Research Strategy.....	47
Participants.....	47
Instrumentation	47
Data Description	48
Study Variables	50
Dependent Variable	50
Independent Variables	50
Protection of Human Subjects: Ethical Considerations	52
Data Analysis	53
FINDINGS	57
Purpose of the Study	57
Descriptive Statistics.....	57
Primary Care-Related Characteristics.....	59
Analysis Approach.....	66
Single Factor Model Results	68

Table of Contents—Continued

Primary Care-Related Emergency Department Use by Gender	68
Primary Care-Related Emergency Department Use by Race	68
Primary Care-Related Emergency Department Use by Age.....	69
Primary Care-Related Emergency Department Use by Insurance Status	69
Primary Care-Related Emergency Department Use by Insurance Type	70
Primary Care-Related Emergency Department Use by Median Household Income	71
Primary Care-Related Emergency Department Use by NCHS Patient Region.....	72
Primary Care-Related Emergency Department Use by ACA Enactment.....	73
Multi-Factor Model Results	74
Hypothesis Testing Results	75
DISCUSSION AND RECOMMENDATIONS.....	81
Introduction.....	81
Discussion	81
Interpretation of Findings	81
Predictive Model Results	86
Heat Map Results	89
Recommendations.....	91
REFERENCES	93

LIST OF TABLES

Table	Page
1. Study Variables—Individual and Community Characteristics	52
2. Sample Population Characteristics.	60
3. Single Factor Results: Primary Care-Related Emergency Department Use by Gender	60
4. Single Factor Results: Primary Care-Related Emergency Department Use by Race	69
5. Single Factor Results: Primary Care-Related Emergency Department Use by Age	70
6. Single Factor Results: Primary Care-Related Emergency Department Use by Insurance Status	70
7. Single Factor Results: Primary Care-Related Emergency Department Use by Insurance Type.....	71
8. Single Factor Results: Primary Care-Related Emergency Department Use by Median Household Income	72
9. Single Factor Results: Primary Care-Related Emergency Department Use by NCHS Patient Region.....	73
10. Single Factor Results: Primary Care-Related Emergency Department Use by ACA Enactment	73
11. Multi-Factor Model Results	76

LIST OF FIGURES

Figure	Page
1. New York University Emergency Department Algorithm	7
2. Andersen's Behavioral Model of Health Care Utilization.....	9
3. Primary Care-Related Emergency Department Use by Insurance Status.	61
4. Primary Care-Related Emergency Department Use by Race	62
5. Primary Care-Related Emergency Department Use by Insurance Type	62
6. Primary Care-Related Emergency Department Use by Age.....	63
7. Primary Care-Related Emergency Department Use by Gender	64
8. Primary Care-Related Emergency Department Use by Median Household Income.....	65
9. Primary Care-Related Emergency Department Use by NCHS Patient Region	66
10. Primary Care-Related Emergency Department Use by ACA.....	67
11. Decision Boundary set at 60% Predicted Probability of Primary Care-Related.....	87
12. Decision Boundary set at 62% Predicted Probability of Primary Care-Related.....	88
13. Heat Map 1 – Percentage of Primary Care-Related Emergency Department Visits	90
14. Heat Map 2 – Per Capita Income	91

Overview of the Study

Context of Topic

The United States is in the process of reforming its health care delivery system, which presents significant opportunities and challenges in transitioning to an integrated, value-based care delivery model that emphasizes population health management (Rittenhouse, Shortell, & Fisher, 2009). The transition to a value-based care delivery model that places population health measures at the forefront of its focus is a journey that requires proper infrastructure and cooperation between participants, which is necessary for decreasing the prevalence of misaligned incentives. This type of care delivery model focuses not only on the health outcomes of a group of individuals but also the distribution of those outcomes (Kindig & Stoddart, 2003). The shift to this model places an emphasis on preventive care rather than episodic care, which directs efforts to improve patient outcomes, increase health capital, decrease health care costs, close care gaps, and manage chronic disease (Dentler & Davidson, 2015). Another high priority area that is key to achieving health reform is decreasing unnecessary utilization of emergency departments for primary care-related visits (Enard & Ganelin, 2013). More efforts are being directed towards addressing the health disparities and inequalities of individuals who use the emergency department as a substitute for primary care, a behavior that points to the underlying cause of dysfunction within the existing delivery system regarding equitable and timely access to preventive care.

Emergency department utilization has risen over the past two decades with a 52% increase between 1992 and 2011. Annual visit rate increased from 35.7 visits per 100 persons in 1992 to 44.5 visits per 100 persons in 2011 (FastStats, 2014; McCaig, 1994). Despite the steady increase in emergency department utilization over the years, the actual number of emergency

departments is on the decline (Kellermann, 2006). This trend contributes to the supply and demand crisis at hand because there are more patients who need care with fewer resources available to provide that care. So, as health reform efforts are propelling the United States care delivery model to value-based payments from fee-for-service payments, there is an even greater need to decrease utilization among frequent emergency department users, especially for those who use it as a substitute for primary care. Many patients who seek care in the emergency department could be treated in a more appropriate venue that is less costly and promotes coordination of care, which further decreases health care costs and improves patient outcomes (Billings, Parikh, & Mijanovich, 2000).

Increased use in the emergency department presents policy makers, health care providers, administrators, insurance payers, and other stakeholders with unique challenges in developing an integrated delivery model that promotes sustainable care coordination initiatives, which is one of the primary aims of health reform in the United States (Katz, Carrier, Umscheid, & Pines, 2012; LaCalle & Rabin, 2010). Fragmented care leads to poor communication among providers who care for the same patient. Poor communication leads to increased costs, duplication of services, and a misaligned care plan that fails to meet the patient's specific medical needs (Katz et al., 2012). It is a common misconception that frequent emergency department users are uninsured (Hunt, Weber, Showstack, Colby, & Callaham, 2006; LaCalle & Rabin, 2010; Weber, Showstack, Hunt, Colby, & Callaham, 2005; Weber, Showstack, Hunt, Colby, Grimes, Bacchetti, & Callaham, 2008). Several studies have focused on insurance status as a predictor of frequent emergency department use, and it has been found that these frequent users defy the uninsured stereotype (Hunt et al., 2006). Another common misconception is that frequent emergency department users take advantage of the health system. The assumption is this patient

population does not utilize health services other than in the emergency medicine setting.

However, this patient population tends to visit both primary care and specialty providers on a more frequent basis due to chronic disease and comorbidities (Hunt et al., 2006). Chronic disease places a considerable burden on the United States health care system, the health care workforce, and communities as it accounts for nearly 86% of total health care spending, which is relevant to this research because the emergency department has become a usual source of care for a large percentage of the total population (Gerteis, Izrael, Deitz, LeRoy, Ricciardi, Miller, & Basu, 2014; McNamara, Witte, & Koning, 1993). Little is known about whether patients who are being served in a primary care setting are increasing their use of the emergency department because of lack of timely access to primary care. Primary care-related emergency department visits are not only an indicator of access problems but also an indicator of the availability of emergency care for the community. If properly executed, there are many health reform initiatives in place that could improve access to primary care and reduce dependence on emergency departments.

Statement of the Problem

As the research suggests, emergency medicine continues to be an inappropriately utilized service in the health care industry. The research has revealed a steady increase in emergency department use across the nation despite the decline in overall number of available emergency departments. There is a gap in the research due to a lack of consensus regarding the factors that influence the need to seek emergency department services for primary care-related reasons, a population that is considered at-risk given the high incidence of chronic disease and comorbidities. This patient demographic is ideal for a population health program given the influence that social determinants have on the overall health of a community. Social determinants of health have the power to affect health outcomes. Key social determinants that

contribute to health disparities include poverty, inequitable access to health care services, educational deficiencies, and cultural barriers. Successful population health management programs are uniquely designed to address these barriers to better meet the needs of the community it serves, thereby promoting wellness and health equity (Dentler & Davidson, 2015). Several studies have been conducted that examine health care utilization and access, but very few studies have focused on the effect of social determinants of health and geographic distribution in driving unnecessary utilization of emergency departments for primary care-related needs (Higgins, Wakefield, & Cloutier, 2005). Findings from existing research suggest that socioeconomic status as it relates to area of residence can impact health care utilization independent of individual socioeconomic position (Saha, Riner, & Liu, 2005). Thus, the examination of socioeconomic and geographic factors that contribute to emergency department utilization for primary care-related needs could help create an effective population health program for at-risk populations that decreases unnecessary utilization, promotes cost savings, and addresses unmet medical needs, which could reduce the prevalence of health inequities and disparities across the nation.

Purpose of the Study

The purpose of this study is to understand the relationship between demographic, social, economic, geographic, and need factors that influence use of the emergency department for primary care-related health needs.

Research Questions

The specific research questions for the study are as follows:

Question 1: Is there a difference in emergency department usage for primary care-related health needs based on insurance status?

Question 2: Is there a relationship between race and primary care-related emergency department visits?

Question 3: Is there a relationship between insurance type and primary care-related emergency department visits?

Question 4: Is there a relationship between age and primary care-related emergency department visits?

Question 5: Is there a relationship between gender and primary care-related emergency department visits?

Question 6: Is there a relationship between median household income and primary care-related emergency department visits?

Question 7: Is there a relationship between area of residence and primary care-related emergency department visits?

Question 8: Do the number of primary care-related emergency department visits differ post-ACA enactment?

Summary of Appropriate Methodology

Since the research questions require an in-depth assessment of the individual and community level factors that influence the utilization of emergency department services for primary care-related needs, a quantitative research design is deemed appropriate for this study. According to Creswell (2012), a quantitative research method is appropriate when the researcher seeks to define trends in the data, especially since this study seeks to establish the prevailing disposition of patients to utilize the emergency department for primary care-related needs.

Secondary administrative data will be analyzed from the Kentucky State Emergency Department Databases (SEDD), which are part of the Healthcare Cost and Utilization Project

(HCUP), sponsored by the Agency for Healthcare Research and Quality (AHRQ). The predictors of interest are insurance status, insurance type, median household income, area of residence, gender, race, and age. The study outcome measure is emergency department visits for primary care-related health needs.

This study is modeled after the Andersen (1995) behavioral model of health care utilization, and it will utilize the New York University Emergency Department Algorithm (ED Algorithm) to estimate the rate of visits that are primary care-related, which is illustrated in Figure 1. The ED Algorithm was developed by the NYU Center for Health and Public Service Research, which was supported by the Commonwealth Fund, the Robert Wood Johnson Foundation, and the United Hospital Fund of New York. The ED Algorithm was created to help classify emergency department utilization. The development team included a panel of emergency department and primary care providers and was based on a sample of approximately 6,000 full emergency department records. The ED Algorithm assigns probabilities on a percentage basis and classifies cases in to the following categories: non-emergent; emergent/primary care treatable; emergent – emergency department care needed – preventable/avoidable; and emergent – emergency department care needed. The ED Algorithm removes cases related to mental health problems, alcohol, substance abuse, and injury (Billings et al., 2000). This study will employ exploratory data analysis and logistic regression analysis to understand primary care-related emergency department visits as an indicator of access and its relation to other measures of medical underservice. Geographical information system (GIS) factors will be calculated, and exploratory data analysis will be performed for pattern recognition. The study population will consist of patients who presented to the emergency department for care in Kentucky between January 1, 2008 to December 31, 2015. A GIS mapping software will be used to graphically

depict the 15 service area regions that comprise Kentucky as set forth by the Kentucky Cabinet for Health and Family Services (Lile, 2017). Andersen's model will be used to understand the effect area of residence and area income have on emergency department utilization within each of the 15 regions that comprise Kentucky while controlling for personal characteristics. The relationship between predisposing, enabling, and need factors will be used to examine the overall influence on health care use. The predisposing factors chosen for this study include age, race, and gender. The enabling factors include area median household income, health insurance classification, and rural or urban area of residence. The need factors are the conditions that prompted the use of emergency department services. The application of Andersen's behavioral model of health care utilization to the examination of factors that contribute to higher levels of need for emergency department services may be useful in identifying barriers that restrain access to primary care services. Moreover, it might be a constructive way to better understand primary care availability in Kentucky.

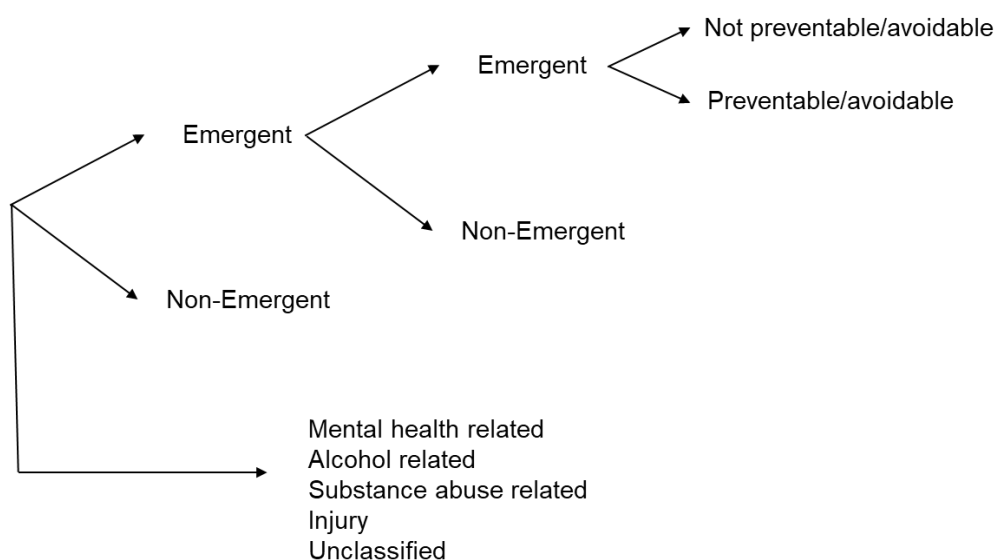


Figure 1. New York University emergency department algorithm.

Theoretical Framework

Andersen's (1995) behavioral model of health care utilization is used as the theoretical framework because it hypothesizes that predisposing, enabling, and need factors help determine why individuals seek health care services in addition to the types of health care services. Moreover, it is used because it provides the most comprehensive approach to examine the multilevel determinants that contribute to emergency department utilization in Kentucky.

The behavioral model of health care utilization is heavily employed by researchers who seek to identify factors that drive the utilization of health care services (Austin, Andersen, & Gelberg, 2008; Goldsmith, 2002; Lo & Fulda, 2008; Stein, Andersen, & Gelberg, 2007). The model was first developed in 1968, and it was designed to serve as a guide to help understand health care service seeking behavior (Andersen, 1968). The original model was developed on the idea that predisposing, enabling, and need factors determine why an individual seeks health care services, including the type of service. The model has evolved over time in response to the changes that have taken place in health care, including the factors that influence access to care (Andersen, 1995; Hughes & Wingard, 2008). The United States health care delivery model is experiencing a drastic makeover by implementing reform efforts that intend to improve payment mechanisms, establish care coordination initiatives, and improve disease prevention measures. This type of care delivery model shifts the focus of health care use and access research efforts from an individual perspective to a population perspective that incorporates the individual, the external environment, the health care system, and the manner through which each of these factors works in a collaborative fashion (Thorpe & Ogden, 2010). The model for this research study is illustrated in Figure 2.

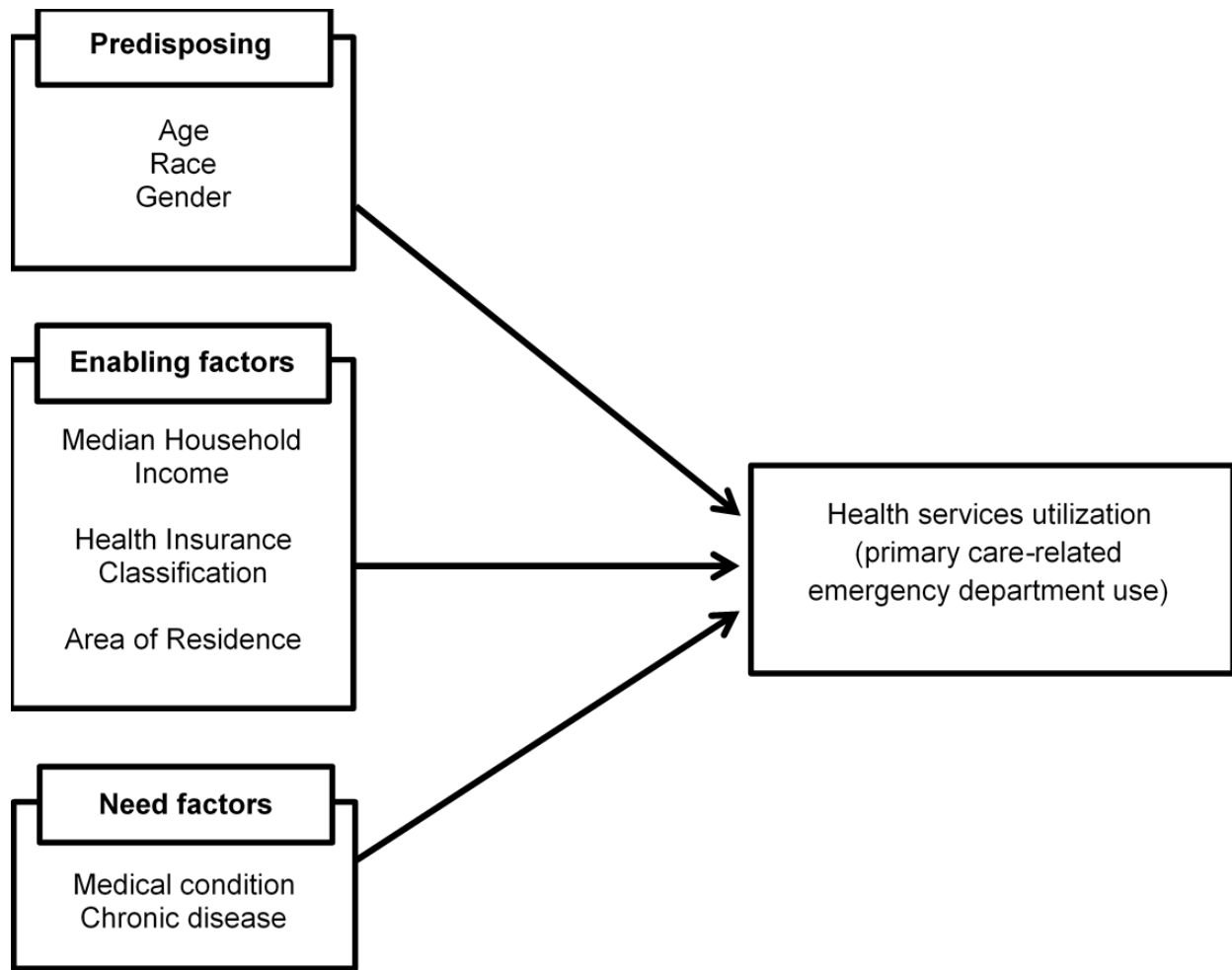


Figure 2. Andersen's behavioral model of health care utilization.

The lack of adequate and timely access to health care services has been associated with unmanaged chronic disease symptoms that result in the unnecessary utilization of emergency department services due to the delay in obtaining timely primary care (Hansagi, Olsson, Sjöberg, Tomson, & Göransson, 2001; Hudon, Sanche, & Haggerty, 2016; Miller et al., 2013; Rask, Williams, McNagny, Parker, & Baker, 1998). It has also been shown that individuals of lower socioeconomic status exhibit a higher likelihood of frequent emergency department utilization, which further complicates care coordination efforts (O'Brien et al., 1997). Therefore, the need for utilizing emergency department services is a function of poor disease management, an

immediate need for a higher level of care, and disparities that intensify the adverse health outcome. Thus, the literature yields reinforcing evidence to the idea that predisposing, enabling, and need factors influence the need for utilizing emergency department services for primary care-related needs.

Significance of the Study

The Emergency Medical Treatment and Labor Act (EMTALA) of 1986 changed the face of emergency medicine in the United States because it required emergency department providers to perform medical screening exams on all emergency department users (Hoot & Aronsky, 2008). Nearly 30 years later, the emergency department is an overcrowded, improperly utilized department that has reached its limit; it no longer serves as the safety net for the community (Institute of Medicine, 2006). The emergency department was neither built to serve as an extension nor as a substitute for primary care services, an unintended consequence resulting from the enactment of EMTALA. More recently, this phenomenon has been amplified due to health reform, more specifically the health insurance exchange. There has been an increase in the total number of insured lives, which increased the demand for health services (Rosenbaum, 2011). Unfortunately, changes made to address the supply shortage were not enough to offset the increased demand. In other words, the provision of health insurance is meaningless if additional providers and access points are not a part of the solution. As health care continues to transform, it is both relevant and pertinent to focus on emergency department utilization to help address supply deficiencies within the primary care workforce. This will likely help decrease primary care-related emergency department visits, which will preserve the emergency department as a safety net within the health care industry. Moreover, it will likely promote the utilization of

primary health care services, which aids care coordination efforts and promotes preventive medicine, primary tenets of a value-based care delivery model.

The inappropriate utilization of emergency department services is a widespread phenomenon, one that health systems and administrators across the nation continue to face. Despite varied research, emergency department providers and administrators have not been able to develop practical systems that both identify and address the needs of frequent emergency department users (Hunt et al., 2006). This patient population requires extensive resources, especially if the patient presents with a chronic disease, a factor that further complicates the emergency department visit. Recent evidence demonstrates that it results in increased wait times, overcrowding, unfavorable outcomes, fragmentation, and undue burden on emergency department resources (Murphy & Neven, 2014). The consequences associated with this phenomenon not only impact emergency department resources but also the patient. If this trend persists, the downstream effect of continued overcrowding by frequent users will result in fragmented care, which starkly opposes the aims underlying health reform and the shift to a value-based care delivery model (Weber et al., 2008).

The shift to a value-based care delivery model has been prompted by rising health care costs that have not translated into higher quality care and more favorable patient outcomes. In 2015, total health care spending in the United States rose to \$3.2 trillion, which equates to \$9,990 per person and 17.8% of the share of gross domestic product (Martin, Hartman, Washington, Catlin, & National Health Expenditure Accounts Team, 2016). The current financial trajectory is unsustainable, which is why health reform focuses not only on decreasing the total cost of care but also on improving the quality of care delivered. The traditional reimbursement methodology of fee-for-service contracts is gradually being replaced by value-based contracts. Value-based

contracts reimburse providers based on quality care rather than on quantitative measures such as visit volume, which is also referred to as utilization (UnitedHealthcare, 2012). Value-based contracts have financial stipulations built in to penalize inappropriate utilization of health services such as emergency department visits for primary care-related needs. The focus on utilization management and cost containment links back to the primary aim of health reform, which is to improve patient outcomes through better quality care at a lower cost. Thus, this research could be beneficial to health reform efforts by providing actionable insights that aid the development of initiatives that support the performance of value-based contracts. This is vital for health care providers to remain financially viable as reimbursement methodologies shift to a pay-for-performance model. There are several key focus areas within the health care delivery continuum that present opportunities for redesign and radical transformation, but an area of high interest is emergency department utilization given the high costs and consequences associated with receiving care in this setting.

The increase in emergency department visits in the United States has primarily been attributed to more vulnerable patients that are either uninsured or exhibit a lower socioeconomic status and reside in urban settings (Weber et al., 2005). The focus has shifted because recent literature shows that this patient population has insurance coverage, accesses a usual source of care, and suffers from poor health due to chronic disease and comorbidities (LaSalle & Rabin, 2010). Thus, it is important for research to be directed towards use of the emergency department for primary care-related health needs given the implications it bears for health reform and the shift to a value-based care delivery model. There is an obvious dysfunction within the system given the fact that insured patients are seeking care in the emergency department for primary care-related reasons, which is indicative of unmet medical need. This phenomenon is a major

public health concern, especially as the United States health delivery model shifts from reactive to preventive medicine. In addressing this problem, research cannot merely identify the characteristics of frequent emergency department users. It is equally as important to understand the availability and accessibility of preventive health services to address the dysfunction.

The increase in emergency department utilization could be due to a shortage of primary care physicians or other specialty providers (Pathman, Konrad, Dann, & Koch, 2004). The overall lack of primary care physicians or overall accessibility to the appropriate venue of care might be an indicator of emergency department use (LaCalle & Rabin, 2010). If this patient population does not have access to the appropriate provider, it is likely that there are little to no individual resources available to manage chronic conditions, which are a heavy cost burden to the health system. This further increases the frequency of emergency department visits given unmet medical needs are still present (Murphy & Neven, 2014). Thus, research should focus on access to primary care and developing solutions to address deficiencies within the system, which is critical for health reform to be successful, especially as the chronic disease prevalence in the United States continues to grow at an alarming rate.

The findings from this research will be beneficial to policy makers, health care providers, administrators, insurance companies, and other stakeholders by providing a better understanding of the individual and community level factors that influence emergency department utilization for primary care-related needs. This knowledge will aid the risk stratification process, which is necessary for developing effective care plans that address the unique needs of a given population. It will also provide insights regarding geographical disparities associated with access to primary care health services, which will help inform the facilities planning and capital budgeting processes. Evidence-based initiatives are more effective at addressing the health

needs of at-risk populations, which will help reduce emergency department utilization, improve disease management to reduce mortality and morbidity, and reduce health inequities and disparities. Overall, the culmination of these findings will help inform the decision-making process regarding the design of value-based contracts to support the financial performance of providers in a value-based delivery system.

Limitations of the Study

This study has several constraints that should be noted. First, this study uses secondary data from emergency department visits in Kentucky from January 1, 2008 to December 31, 2015. This data does not allow for the exploration of general availability of health care services, which is why future research should employ a mixed method study to address this limitation. Second, on October 1, 2015, the United States transitioned from using International Classification of Disease—Clinical Modification, Ninth Revision (ICD-9-CM) to the International Classification of Disease—Clinical Modification, Tenth Revision (ICD-10-CM) code sets for reporting medical diagnoses, which means the 2015 data set includes nine months of data with ICD-9-CM codes and three months of data with ICD-10-CM codes. This may not accurately depict utilization trends over the 2015 calendar year. Third, the ED Algorithm cannot categorize injury-related, mental health-related, and alcohol or substance abuse-related emergency department visits. Visits that result in an inpatient admission are also excluded from the probability assignment. Fourth, the results may need to be aggregated to represent larger geographical areas, especially in the rural areas because there may only be one hospital in a zip code. Reporting by zip code would indirectly disclose the identity of individual hospitals/institutions in the rural areas, which is a direct violation of the HCUP Data Use Agreement. This limitation might decrease the overall effectiveness of developing interventions that intend to address existing health disparities and

inequities. Lastly, the findings from this study may not be generalizable to other regions of the United States based on the unique demographics and socioeconomic factors inherent to Kentucky residents.

Literature Review

Major Areas of Review

Emergency departments serve as critical access points within the United States delivery system because important medical resources are made available for all members within the community (Hsia, Kellerman, & Shen, 2011). Unfortunately, emergency departments across the United States are ill-equipped to handle the increasing patient volumes year after year, especially since the number of available emergency departments is declining. Moreover, emergency departments continue to be used for visits that could be handled in a much more cost effective and efficient location like a primary care center (Glick & Thompson, 1997). In 2006, the *Institute of Medicine* issued a report about the United States emergency medicine delivery model. The briefing highlighted key issues regarding the increasing dysfunction present in the emergency medicine delivery model in the United States (Institute of Medicine, 2006). The trend of overburdened emergency departments exemplifies a growing dilemma that endangers one of the most critical access points within the delivery system that should be utilized for more appropriate, emergent cases.

The concept of misuse and overcrowding is an issue that gained traction in the early 90s and continues to create substantial problems for emergency departments across the nation (Richardson, Asplin, & Lowe, 2002). Thus, frequent emergency department users are becoming a large focal point for administrators, medical providers, and policymakers (Hunt et al., 2006). Although frequent users do abuse the system, recent findings suggest that this patient population has legitimate medical needs that require extensive resources, which helps explain perpetual use (Doupe et al., 2012; Hunt et al., 2006). The emergency department is considered the safety net in the healthcare industry, one that fills the gap for vulnerable populations (Doran et al., 2013).

Unfortunately, the safety net is bursting at the seams due to the increasing frequency of inappropriate emergency department visits (Sun et al., 2013). High-frequency emergency department consumers account for a considerable number of overall visits. The resources necessary to provide adequate care for this patient population places undue strain on a compromised structure that cannot bear the load (Murphy & Neven, 2014). Thus, the consequences associated with inappropriate use of the emergency department leads to increased overcrowding and lack of care coordination for at-risk populations, which increases the need to develop effective initiatives that route patients to the appropriate care venue that are more cost effective and efficient.

Research regarding inappropriate use of the emergency department, associated costs, and the characteristics of frequent users dates to the early 90s, more specifically after the enactment of EMTALA in 1986. At that time, the emergency department was preserved as a true safety net, so inappropriate utilization and escalating costs were not at the forefront of thought leaders and policy makers agendas. As population rates continued to increase, health care consumer behavior patterns began to change, which was influential in contributing to the crisis that continues to plague the United States health care delivery system. As this phenomenon has become the center of ever-increasing scrutiny, original perceptions regarding emergency department overuse have persisted. Early impressions supported the idea that care received in the emergency department accounts for a large percentage of total medical cost. This mentality was fueled by increasing levels of non-urgent visits that resulted in steep charge per visit rates. A study conducted by Tyrance, Himmelstein, and Woolhandler (1996) found that costs associated with medical care received in the emergency department were 1.9% of national health expenditures in 1987, a year after the enactment of EMTALA. This study also found that both insured and uninsured patients

utilized similar amounts of emergency medicine services, a finding that is key to dispelling the notion that uninsured patients comprise the majority of emergency department visits.

Nearly 30 years later, the emergency department continues to be a key area for cost reduction efforts. Health care expenditures in the United States are currently growing at a rate of \$100 billion per year (Galarraga & Pines, 2016). While estimates vary based on the given data source, emergency department health care costs account for 2% to 10% of total health care expenditures. A study conducted by Galarraga and Pines (2016) found that care received in the emergency department resulted in \$328.1 billion in payments in 2010, which comprised 12.5% of total health care expenditures. The authors focused on total cost, potentially avoidable costs, and proportional costs, which is important to understand as the United States shifts to a value-based care delivery model. Health reform does not intend to eliminate expenditures. It is simply a means for providing better quality care that results in decreased costs and improved patient outcomes. Care received in the emergency department does not promote these aims, especially if the visit is not for a true emergent medical condition. There are several barriers associated with this kind of shift, especially since the number of emergency department visits in the United States have increased from 88.5 million in 1991 to 129.5 million in 2011 with costs ranging anywhere from \$47 to \$240 billion based on the 2% to 10% total cost benchmark (Ondler, Hegde, & Carlson, 2014). Nearly 20% of adults in the United States visit the emergency department each year, which does not necessarily have a significant impact on total health expenditures. Utilization becomes problematic when patients are classified as frequent users, which means there are four or more visits per year. One study found that frequent users had a charge rate that was 10 times those of nonfrequent users given the total number of visits made by frequent users (Ondler et al., 2014). Moreover, frequent users typically have higher rates of

chronic disease, higher severity scores, and higher rates of mortality (Solberg et al., 2016). Given the complex nature of this patient demographic, reform efforts must incorporate initiatives that promote health behavior change, which will in turn promote efficient use of emergency department services, thereby preserving it as a safety net within the health system. Thus, the focus on inappropriate emergency department utilization is no longer unidirectional because health reform intends to improve access to primary care, promote care coordination efforts, and reduce avoidable utilization, which all contributes to lowering total cost of care through the delivery of quality care and improved patient outcomes.

Health Reform—The Affordable Care Act

The United States health care delivery system is undergoing massive change, which started in the first decade of the 21st century when the *Institute of Medicine* issued two reports that focused on quality improvement and patient safety (Grennan, 2013). These reports ignited radical change across the health care delivery system, more specifically within hospitals. Hospitals have been the focus of ever-increasing scrutiny regarding several initiatives, including decreasing hospital readmissions, maintaining comprehensive quality performance programs, and engaging physician leaders to champion improvement efforts (Grennan, 2013). Despite varied efforts, health care in the United States continues to be highly fragmented, which has serious implications on people who suffer from chronic disease and comorbid conditions (Naylor, Aiken, Kurtzman, Olds, & Hirschman, 2011). This demographic of patients incurs considerable health care costs, which is why the Affordable Care Act (ACA) of 2010 primarily focuses on payment reform, prevention, universal insurance coverage, primary health care access, and the overall value and quality of care delivered (Rosenbaum, 2011). Thus, the focus

has shifted from care delivery improvement efforts in the hospital-based setting to the outpatient setting given the inherent cost savings.

The ACA became law on March 23, 2010 with full implementation occurring on January 1, 2014. Health care in the United States is historically reactive because the system treats symptoms of disease instead of focusing on measures of true prevention. There are multiple layers of dysfunction within the delivery system design that contributes to its inability to provide equitable access to health care services despite socioeconomic, geographical, ethnic, and racial disparities (Pugno, Kellerman, McGaha, & Kahn, 2009). One of the focus areas within the ACA is the overall quality and coordination of health services to contain costs and improve health outcomes (Rittenhouse et al., 2009). This type of movement starts with building a robust primary care infrastructure, one of the key components underlying the ACA and transition to a value-based care delivery model (Goroll & Schoenbaum, 2012). The United States health care crisis has been mounting for quite some time, and it has reached its breaking point. The existing delivery model is no longer sustainable because the fee-for-service payment mechanism compensates providers based on volume rather than outcomes that promote better health and well-being through the delivery of high quality, low cost medical care (Goroll & Schoenbaum, 2012). Thus, the shift to value from volume is supported by accountable care organizations and the patient-centered medical home, two components vital for delivery system reform (Rittenhouse et al., 2009).

The shift to preventive health services does not come without substantial barriers, especially considering the limited access to primary health care services (Koh & Sebelius, 2010). Primary care is fundamental to the success and performance of accountable care organizations in promoting change across the care delivery continuum (Goroll & Schoenbaum, 2012). The

accountable care organization model is designed to align incentives and promote accountability among providers with an emphasis on practice care patterns. The patient-centered medical home model is designed to build an extensive primary care infrastructure that supports the delivery of high quality, low cost coordinated care (Rittenhouse et al., 2009). The two models are built to work in concert with one another, so cooperation between the two approaches is vital to effect lasting change in delivery reform efforts. However, the success of health care reform as set forth by the ACA requires a robust primary care workforce. The current workforce supply is not enough to meet demand, an issue that will grow progressively worse considering the 80 million Americans who will enter retirement over the next 20 years (Schwartz, 2012). As the demand for primary care health services continues to rise and the workforce supply falls, the prevalence of unnecessary utilization of health care services will increase, which has an exponential effect on total health system spending (David, Gunnarsson, Saynisch, Chawla, & Nigam, 2015).

An area that possesses great potential to reduce unnecessary utilization of health care services in addition to total health care costs is emergency medicine. A trip to the emergency department can cost up to 5 times the amount that would be charged for the same service provided in a primary care setting. For example, the average cost of treating the common cold is \$560 in the emergency department versus \$121 in an outpatient, primary care setting (Machlin, 2003). It is evident that this medical specialty could benefit from expanded access to primary health care services given it has increasingly been used for inappropriate and unnecessary reasons, more specifically for primary care-related visits. If the current trend of unnecessary, inappropriate utilization continues, the consequences are multi-faceted because it raises insurance rates, co-payments, and deductibles for health care consumers. Thus, the emergency room should be utilized only in the event of traumas, natural disasters, and emergent health

conditions such as a myocardial infarction or severe burns to decrease wasteful health care spending.

The United States health care system has been in a constant state of flux, and efforts to restructure it have required considerable time and resources, which have been marked by success and failure. There are necessary changes that need to take place for health care in the United States to be both affordable and equitable, which is a sizeable undertaking given the associated complexities. The ACA launched the United States health care delivery system into a new era of accountability. Although it has experienced success in certain areas, considerable work remains if the United States wishes to attain the equity and affordability measures. The recent election of President Donald Trump brought about the promise of changes to the ACA that would promote these aims. President Trump has taken on a sizeable and difficult task, especially considering the differences of opinion that starkly divide the Republican and Democratic parties. Original efforts to repeal and replace the ACA were not successful, so the Trump Administration is trying to amend certain provisions through the Better Care Reconciliation Act (BCRA).

The major changes found in the BCRA include the following:

1. The individual mandate penalty fee is waived, but there is a penalty if individuals fail to maintain continuous health coverage.
2. The employer mandate is eliminated.
3. Pre-existing conditions are still protected with the exception that states may have the discretion to redefine essential health benefits.
4. Insurers who carry major medical policies can apply for a waiver to define essential health benefits.

5. Cost assistance in the form of tax credits is available to individuals who earn up to 350% of the federal poverty level.
6. The dependent coverage provision remains unchanged.
7. States may have the ability to apply for waivers that allow insurers to reinstate annual and lifetime payout limits.
8. The maximum allowable contribution to a health savings account is increased to the out-of-pocket maximum in addition to monies received from spouses.
9. Insurers can charge older enrollees 5 times the premium amount that is charged to younger enrollees.
10. Medicaid expansion will end by 2024, but per-capita caps or block grants will be available as alternatives (Trumpcare.com, 2017).

Health care reform is difficult to attain because it involves several stakeholders who have differing goals and objectives. As the Trump Administration attempts to further efforts that were set in motion by the ACA, it is important to continue focusing on the innovation of broken processes that perpetuate higher costs within the health care delivery system. The prevalence of misaligned incentives between providers and payers only serves to promote inefficiencies and waste within the system, which is why future efforts need to focus on redrawing processes that promote equity and affordability.

The History of Emergency Medicine

Emergency medicine did not emerge as a specialty until the early 1960s in response to the need for a more robust quality of care within the health system. Emergency departments were originally comprised of providers who were ill-suited to provide emergency medicine services to a population that presented to the emergency department with a broad spectrum of health needs

(Danzl & Munger, 2000). Changes related to insurance and covered events made it conducive for patients to seek care in the emergency department setting because primary care office visits were no longer covered, but hospital visits were covered (American College of Emergency Physicians, 1999a). As volumes continued to increase in the emergency department, it became more evident that providers in this setting were ill-equipped to provide a comprehensive level of care, especially as it related to trauma cases. In response to this issue, the National Research Council issued a report entitled *Accidental Death and Disability: The Neglected Disease of Modern Medicine*, which led to the development of legislation that established eligibility standards for personnel providing emergency medicine services (Danzl & Munger, 2000). This led to the eventual development of emergency medicine fellowships that provide enhanced training to better equip the clinicians to provide a comprehensive level of quality medical care services in the emergency medicine setting (American College of Emergency Physicians, 1999a).

Emergency Department Utilization—Trends and Consequences

Frequent users. Frequent emergency department users are a focal point in health services use research because it has been shown that this population intensifies the overcrowding issue, increases wait times, increases the incidence of ambulance diversions, and increases total cost of care (Hunt et al., 2006; Ly & McCaig, 2002; Rising et al., 2015). It is a common misconception that frequent emergency department users are uninsured because financial resource barriers limit access both to emergency and preventive medical care (Weber et al., 2008). Current utilization trends show that frequent emergency department users have insurance coverage, utilize a healthcare provider on a normal basis, are of poor socioeconomic status, and suffer from bad health due to chronic disease and comorbidities (Byrne et al., 2003; Doupe et al., 2012; Hansagi et al., 2001; Hunt et al., 2006; LaCalle & Rabin, 2010; Weber et al., 2005; Weber

et al., 2008). The resources necessary to confront and effectively care for the unique needs of this population pose considerable barriers, and the emergency department is not designed to provide care to this patient population (Begley, Vojvodic, Seo, & Burau, 2006; Chambers et al., 2013). The provision of emergency medical services within any given community needs to be utilized in the event of acute illness, trauma, and disaster response.

The original belief that the uninsured population contributes a disproportionate share to total emergency department visits is no longer valid, which suggests that this factor has a minimal impact on emergency department use or the overcrowding effect (Doupe et al., 2012). This change in basic assumptions led researchers to determine that this patient population heavily utilizes other health services to meet their needs (Hansagi et al., 2001). A national study that evaluated emergency department use based on health insurance type and self-perceived acuity or access issues found that access issues influenced behavior rather than actual medical acuity (Capp, Rooks, Wiler, Zane, & Ginde, 2014). In other words, patients did not seek care in the emergency department because of actual medical need; patients sought care because a usual source of care was either unavailable or non-existent. Thus, the emergency department serves as the means through which unmet medical need is satisfied, especially given the inherent access issues to alternate sites of care that can increase care coordination and decrease total health care costs (Murphy & Neven, 2014). The ability to satisfy the medical needs of this population in the emergency department is not a long-term solution. Future efforts should focus on ways to make the appropriate care setting (i.e., a primary care physician or specialist) more readily available for this patient population (Weber et al., 2005). The continual increase in emergency department visits is more likely attributable to the timely accessibility of other health services as well as structural dysfunction in the delivery model (Weber et al., 2008). A qualitative study that

focused on patient perception as a driver of continual emergency department use found that both fear and uncertainty regarding one's medical condition was the primary contributing factor, even among patients who had a primary care physician (Rising et al., 2015). This type of health-seeking behavior is symptomatic of a failing delivery system, one that places undue strain on the emergency department and is a function of multiple social factors related to area poverty, violence, the indigent population, and increased use of the emergency department for medically unnecessary reasons.

Insurance status. Emergency department utilization and health insurance status have been extensively researched, especially considering recent health reform efforts. It is a widely held belief that the uninsured population is responsible for the nationwide increase in emergency department visits despite mounting evidence that proves otherwise. One study found that emergency department visits increased to 108 million from 2000 to 2001, which was a 16% increase from 1996 to 1997. Privately insured beneficiaries accounted for 24% of the increase while 10% of the increase was attributed to the uninsured population (Cunningham & May, 2003). A similar study focused on the relationship between insurance status and emergency department visits (Weber et al., 2008). The authors found that the percentage of emergency department visits by the uninsured population remained stable over a 10-year period. Moreover, the study showed that disproportionate increases in utilization were attributed to individuals with family incomes greater than 400% of the federal poverty level and individuals who identified as having a usual source of care. This finding supports the claim that both insured and uninsured individuals utilize the emergency department for inappropriate reasons that are better addressed in outpatient settings that are not as costly and fragmented as the emergency department.

Practitioners have tried to implement managed care programs to decrease inappropriate emergency department utilization, which has experienced varied success among low income populations that are either insured or receiving Medicaid benefits. One study implemented a managed care program at an urban, academic medical center, and the authors found that the program did not have a significant impact on emergency department utilization patterns for the uninsured population (Kwack et al., 2004). The program sought to decrease emergency department utilization by providing greater access to primary care services. The patients enrolled in the program were older, had higher rates of chronic disease, had less social support, and had an increased prevalence of psychosocial problems. These patient characteristics reinforce the importance of considering socioeconomic factors that influence the health care decision making process, especially regarding the development of policy and programs that intend to alter health behavior. However, a study conducted by Selby, Fireman, and Swain (1996) found that members of a managed care plan who were required to pay a small co-payment for emergency department services resulted in a 15% utilization reduction. The concept of cost sharing has been heavily implemented to promote the appropriate utilization of health services. Unfortunately, it has also resulted in the reduction of appropriate forms of care such as preventive health and screening services (Birnbaum, Gallagher, Utkewicz, Gennis, & Carter, 1994). A Massachusetts-based study focused on members of a high deductible insurance plan who utilized the emergency department for non-emergent conditions. The authors found that these members utilized the emergency department less than those who did not have a high deductible (Wharam et al., 2007). While the intent is to decrease inappropriate emergency department utilization, the use of high deductible insurance plans to alter health behavior could bear unintended consequences. In

electing to defer care because of a high deductible insurance plan, it could potentially deter preventive health behavior, which could culminate into a very costly crisis.

Given the sheer number of uninsured people in the United States and the overarching notion that the uninsured contribute a disproportionate increase in utilization rates, Carlson, Menegazzi, and Callaway (2013) used the 2006 to 2009 National Hospital Ambulatory Medical Care Survey to analyze emergency department visits by the uninsured. The authors found that the uninsured population accounted for roughly 16.6% of total emergency department visits, which is commensurate to the total percentage of uninsured patients in the United States. The uninsured patients also had different demographics compared to the insured patients. The uninsured patients were primarily male, young adults, Black/African American, and presented to the emergency department with lower acuity complaints. Although it is becoming more evident that the uninsured population does not contribute a disproportionate share to total emergency department use rates, this study underlines the importance of improving access to primary care providers or a usual source of care to those who are limited due to socioeconomic factors.

Conversely, an occurrence where emergency department utilization rates decrease is when individuals age out of an insurance plan. This issue has gained a lot of traction since the enactment of the ACA, which includes a provision that allows dependents to remain on their parents' insurance plan. The concept of aging out pertains to young adults who are no longer eligible to enroll on their parents' insurance plan, which results in a change of insurance status. One study found that aging out resulted not only in decreased emergency department utilization rates but also increased utilization rates for care received at public hospitals, which are typically classified as the safety net within any given community (Anderson, Dobkin, & Gross, 2012). While this outcome is favorable in terms of emergency department utilization rates, the

downstream effect becomes problematic. In other words, the uninsured are also likely to defer preventive care, which could result in greater health care costs based on the health condition. It could also exacerbate the overcrowding issue and disproportionate share of uninsured patients who seek health care from public hospitals and community health providers. Another issue that falls under this continuum of research is health insurance status change. A recent study used the 2004 to 2009 National Health Interview Survey to analyze emergency department use among newly insured, continuously insured, and uninsured adults. The authors found that both newly insured and newly uninsured adults had greater emergency department utilization rates (Ginde, Lowe, & Wiler, 2012). While the ACA intends to improve patient access to primary care services to reduce inappropriate emergency department utilization, this study renders alarming results. The provision of insurance to those who were previously uninsured led to increased utilization because care had been deferred. Thus, the continual provision of insurance is necessary for improving health outcomes, which also means the provision of timely access to outpatient health services is necessary, especially considering change in insurance status resulted in greater emergency department use.

Finally, an important factor to consider when determining reasons why individuals inappropriately utilize the emergency department is perception, more specifically the sense of urgency surrounding the decision to seek care in the emergency department. The widely held belief that convenience fuels the decision-making process certainly holds merit; however, it is not the sole driver of use. Patient perception is a very subjective measure, one that requires an in-depth understanding before initiatives will experience success in effectively redirecting individuals to appropriate care sites. A study conducted by the Center for Studying Health System Change found that patients who sought care in the emergency department did so out of

genuine concern (Carrier & Boukus, 2013). In other words, this subset of patients sought care in the emergency department because they believed their condition was a true medical emergency. These patients also reported reasons for emergency department use because of untimely access to a primary care provider or specialist. Ultimately, this further reinforces the need to develop policy and program initiatives that address inappropriate emergency department utilization through a multifaceted approach that accounts for barriers that extend beyond insurance status.

Race/ethnicity. A topic that plays an important role in health disparities research is the influence that race and ethnicity have upon health services use. There is widespread research regarding determinants of emergency department use, including the importance of race and ethnicity. However, given the complex nature of health services use, it has not been extensively researched as a sole determinant of emergency department use. Baker, Stevens, and Brook (1996) conducted a cross-sectional survey in a public emergency department over a 3-month period, which was comprised of patients who presented to the emergency department with non-emergent medical conditions. After adjusting for age, insurance status, usual source of care, and barriers to health care, race/ethnicity was not a significant factor of emergency department use. This finding was important because it further reinforces the line of thought regarding emergency department use and the complexity associated with the decision to seek care in the emergency department. There are several factors that influence the overall decision-making process, which is why researchers cannot view it from a singular perspective. Emergency department use and the relationship it has with race/ethnicity is a culmination of factors that is more readily explained by differences in health status, access, socioeconomic status, and demographics. Given the inherent barriers that prohibit timely access to care, these patients typically utilize the emergency department for non-emergent health needs because it is likely the only viable option

within the community. There is empirical evidence to support the claim that race/ethnicity is a predictor of emergency department use when socioeconomic status serves as a confounding factor. A study was conducted at an urban, academic hospital where researchers surveyed adult patients who presented to the emergency department for routine care (Hong, Baumann, & Boudreaux, 2007). The authors found that both Black and Hispanic patients were roughly twice as likely to utilize the emergency department for routine health needs. However, race/ethnicity was not a significant predictor of emergency department use after controlling for income, employment status, insurance status, and education level. This study also found that routine emergency department use was associated with patients who were uninsured, unemployed, 18 – 54 years old, not highly educated (less than high school), and had an annual personal income less than or equal to \$20,000. Based on these findings, effective initiatives that seek to reduce inappropriate emergency department use must account for the effect that socioeconomic status has on actual health services use. The Multicenter Airway Research Collaboration conducted a study from 1996 to 1998 that experienced similar results. The study sought to understand the relationship between race/ethnicity and adults presenting to the emergency department for an acute asthma attack to determine if differences in use were attributable to socioeconomic status (Boudreaux, Emond, Clark, & Camargo, 2003). The authors found that hospitalization and emergency department utilization rates were greater among both Black and Hispanic patients. This same demographic of patients was also twice as likely to be hospitalized for an acute asthma episode after accounting for several confounding variables. This study highlights the importance of incorporating socioeconomic, demographic, and race-related variables when developing interventions designed to reduce inappropriate emergency department utilization, thereby reducing any potential race-based health disparities.

Age. Frequent emergency department use is a heavily researched topic, even more so after the enactment of the ACA. One study conducted a systematic review of the literature to provide an evidence-based forecast regarding the future practice of emergency medicine because of the ACA (Medford-Davis, Eswaran, Shah, & Dark, 2015). The research focused on visit volume, patient acuity, and reimbursement and how each variable would be influenced by a change in patient behavior. The authors made predictions based on research that was conducted post-ACA enactment: (a) there will be a difference in patient behavior between Medicaid and privately insured beneficiaries; (b) the emergency department visit rate will increase for new Medicaid enrollees given higher acuity levels; (c) the Marketplace enrollees will initially avoid the emergency department due to high deductible health plans, which have high out-of-pocket costs; and (d) reimbursement levels will increase since both Medicaid and private insurance plans reimburse more than self-pay. The authors found that early trends in emergency department utilization post-ACA enactment demonstrated increases in total emergency department volume, decreases in indigent care for Medicaid expansion states, and increases in patient acuity levels among both Medicaid and Marketplace patients. There is an important caveat associated with this research. The forecast, despite being evidence-based, should not be generalized across all populations given differences in patient demographics, prevalence of chronic illness, acuity levels, insurance status, and numerous other barriers to care. While the ACA intended to provide greater access to primary and preventive care services via the insurance coverage provision, thereby reducing utilization of high cost services, it increased the emergency department visit rate, which has placed even greater strain on emergency departments nationwide. A study conducted in Illinois found evidence to support this claim. The average monthly emergency department visit volume by adults aged 16 to 64 years increased by 14,080

visits (Dresden et al., 2017). The increase was most consistent among patients aged 55 to 64 years with much of the increase from Medicaid beneficiaries. This increase was accompanied by a sharp decrease in total visits by uninsured patients. While the nationwide emergency department visit volume increased, the researchers believe the significant increase in Illinois is due to state specific characteristics. Illinois has large urban, suburban, and rural populations with large variations both in income and baseline insurance coverage. It is important for policy makers to account for state specific characteristics during the initiative development process. These findings underscore the significance of developing a multilevel model that helps explain behavior as a function of the barriers that dilute the effectiveness of health reform initiatives that intend to increase access to primary care, improve care coordination, and decrease total health care costs.

The ACA sought to increase insurance coverage for young adults through the dependent coverage provision, which allows parents to cover their children as dependents until age 26 years. Young adults are less likely to have health insurance coverage compared with any other age group (DeNavas-Walt, Proctor, & Smith, 2010). Based on this statistic, researchers sought to understand how health insurance status affects emergency department use by young adults. A group of researchers used the Nationwide Emergency Department Sample database to understand this relationship post-ACA enactment. The authors found that there was a quarterly emergency department visit rate decrease of 1.6 per 1,000 population, which was attributable to a decrease in visits related to treat-and-release, weekday, non-urgent, and primary care treatable conditions (Antwi, Moriya, Simon, & Sommers, 2015). Based on these findings, the dependent coverage provision was effective in promoting a positive behavior change regarding appropriate use of medical services. Hernandez-Boussard, Morrison, Goldstein, and Hsia (2016) also found

similar findings through their study. The study used archival data from 2009 to 2011 for emergency department visits in California, Florida, and New York to understand emergency department utilization both pre-ACA and post-ACA. The authors found that there was a slight decrease of 0.5% emergency department visits per 1,000 population, which was attributable to specific medical needs that are better met in alternate care sites like a primary care setting.

Another patient demographic that is at-risk for inappropriate emergency department utilization is Medicare beneficiaries. A recent study that used claims-based data from fee-for-service Medicare encounters found evidence to support the claim that Medicare beneficiaries are almost twice as likely to utilize the emergency department compared with privately insured individuals (Colligan, Pines, Colantuoni, Howell, & Wolff, 2016). The authors also found that frequent emergency department users were women, black, less than 65 years, Medicaid eligible, disabled, and had a high prevalence of chronic disease. The presence of socioeconomic, demographic, clinical, and health system level factors are important to consider when developing interventions and reform initiatives that aim to decrease frequent emergency department use. A Canadian-based study found evidence to support the idea that the propensity to utilize the emergency department by older adults is not only a function of unmet medical need but also a combination of factors that decrease access to primary care (Gruneir, Silver, & Rochon, 2011). This study utilized a modified version of Andersen's health behavior model, which was originally developed to study access disparities that are magnified when need (medical diagnosis) factors are not the primary driver of health services use. The researchers conducted a systematic review of the literature and found that older adults who frequently utilize the emergency department have higher prevalence of chronic conditions, comorbidities, and functional impairments, all of which contribute to unmet medical need. Although there is

extensive research regarding emergency department utilization, it is evident that crucial gaps prohibit the development of policies and initiatives that effectively address the crisis at hand.

Income. Emergency department utilization and income are frequently studied together, especially when it pertains to health inequities and disparities research. The emergency department has frequently been labeled as the only care option for the uninsured and underinsured, a demographic of patients who are poor and medically underserved given inadequate access to community-based providers. While the emergency department is considered a safety-net within any given community, there is a subset of critical safety-net emergency departments that provides roughly 40% of total emergency department visits to the Medicaid and uninsured patient populations (Burt & Arispe, 2004). Previous research shows that individuals with private insurance account for most of the emergency department visit rate increases, but recent studies suggest otherwise (Garcia, Bernstein, & Bush, 2007). One study analyzed emergency department visit data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) from 1997 to 2007 and found that emergency department visit rates increased from 352.8 to 390.5 per 1,000 population. Medicaid beneficiaries accounted for most of the visit rate increase, which went from 693.9 to 947.2 visits per 1,000 population (Tang, Stein, Hsia, Maselli, & Gonzales, 2010). The increase nearly doubled the population growth during that same period, which is alarming and points to a dysfunctional system that is not able to provide timely access to health services in the appropriate setting. The emergency department intends to treat emergent medical conditions, so it is neither equipped nor designed to provide primary care and preventive health services. After the enactment of EMTALA, the inappropriate utilization of the emergency department quickly became a national health priority. One study used data from the 1987 National Medical Expenditure Survey to estimate the cost of treating non-urgent cases in the

emergency department by low-income patients (Thompson & Glick, 1999). The authors found that the cost per visit rate was approximately 3 times higher than if care had been received in the appropriate outpatient setting. Nearly 30 years later, this issue has only gotten worse, and the emergency department continues to serve as one of the only sources of care for the medically underserved population.

There were controversial changes made to Medicaid and the State Children's Health Insurance Program (SCHIP) during the Bush Administration in the early 2000s. Substantial cuts were made to both programs, which caused concern about the effect it would have on safety net providers. The potential increase in uncompensated care would likely result in increased utilization. A study that used data from the 2000-2001 and 2003 Community Tracking Study Household survey found that Medicaid/SCHIP costs resulted in cost savings only because access was decreased, a response to reduced eligibility and enrollment (Cunningham, 2006). The author also found that enrollees who lost Medicaid/SCHIP coverage had multiple chronic conditions and were in fair or poor health. Given inherent barriers that limit access to appropriate care sites such as a community health center that could provide primary care and preventive health services, enrollees who lost coverage were forced to receive care in the emergency department for non-urgent medical needs. While the cuts shifted costs away from the Medicaid/SCHIP program, it redirected costs to safety net providers via the form of uncompensated care. The focus ought to be on changing patient behavior by improving access to primary care services, which in turn lowers total health care costs, improves quality of care, and promotes better patient outcomes.

Some states have implemented cost sharing for non-emergent visits to reduce inappropriate utilization of the emergency department by low income individuals. Cost sharing

intends to promote the efficient use of medical services, especially those that are high cost (Ku & Wachino, 2005). A recent study used data from the 2001 to 2006 Medical Expenditure Panel Survey (MEPS) to examine the effect of co-payments on emergency department use by low income Medicaid beneficiaries (Mortensen, 2010). While cost sharing has demonstrated varied success in reducing emergency department utilization, this study found that the co-payment policy for non-emergent visits did not decrease emergency department use by Medicaid beneficiaries. The results of this study further highlight existing inadequacies within the health system that prohibit access to alternate care sites for low income individuals. If a co-payment does not deter Medicaid beneficiaries from utilizing the emergency department for non-emergent medical needs, policy makers should focus on strategies that improve access to a usual source of care in an outpatient setting. A recent study that used the 2011 National Health Interview Survey found evidence to support this claim (Capp et al., 2014). The researchers split the responses into one of two categories: emergency department use was either a function of acuity (medical condition) or access. They found that emergency department seeking behavior was driven more by access issues rather than acuity issues. In other words, self-perceived acuity is a very subjective measure, so if a patient's knowledge regarding the definition of a true medical emergency deviates from the clinical standard, the emergency department is the best option for care, especially given the inherent access issues that prohibit patients from receiving timely care in an outpatient setting. These findings help surface education related issues, which might be an indicator of use among low income individuals. Ultimately, in the wake of health reform that places a priority on patient-centric care, it is important to consider the patient's perspective when developing initiatives that decrease inappropriate utilization of the emergency department.

Overcrowding. The total number of emergency departments declined by 381 between 1995 and 2005 while visits rose by 20% over the same period (Moskop, Sklar, Geiderman, Schears, & Bookman, 2009). It is evident that the demand for emergency medicine services is far greater than the available resources, an issue riddled with ineffective solutions (Sun et al., 2013). Thus, overcrowding is a key issue that ails emergency departments across the nation. The American College of Emergency Physicians defined overcrowding as an encounter through which need for emergency medical services outweighs available resources in the emergency department (Committee on Pediatric Emergency Medicine, 2004). However, there is lack of consensus regarding a standard definition of overcrowding, which is why the concept has adopted several definitions including excessive wait times, treatment time delays, transfer delays from the emergency department to an inpatient bed, number of available emergency department beds versus number of patients, and prevalence of ambulance diversions (Gordon, Billings, Asplin, & Rhodes, 2001). Emergency department overcrowding is indicative of steadily growing demand being greater than total available resources. It is also a function of several inefficiencies in the healthcare delivery model, one that leads to undesirable patient outcomes such as excessive levels of mortality and lengths of stay (Sun et al., 2013). The quality of patient care suffers due to a diminished ability to evaluate and treat patients with a clear line of thought. Moreover, it is becoming increasingly more difficult for providers to deliver patient-centric care due to environmental distractions associated with overcrowding (Moskop et al., 2009). Patient care in the emergency department then becomes a matter of efficient throughput with little to no effort placed on care coordination post-discharge from the facility.

Emergency department overcrowding is a function of three interdependent factors according to the conceptual model proposed by a multi-disciplinarian team of researchers

(Asplin et al., 2003). The model studies the overcrowding phenomenon from a holistic lens rather than an isolated one. Thus, three major concepts work together to escalate emergency department overcrowding, which include input, throughput, and output. The input factor incorporates mechanisms that increase emergency department service demand (Asplin et al., 2003). The emergency department provides care for truly emergent cases, but it largely provides care for non-emergent cases because of narrow primary care access points. Thus, the demand for timely access to primary care services or other appropriate care venues is much greater than the available supply (O'Malley, 2013). This patient population then seeks to satisfy the gap in primary medical care by utilizing the emergency department as an alternative. The throughput factor incorporates mechanisms that influence efficient and effective patient flow. If an emergency department lacks standard internal processes that mitigate bottlenecks in the patient flow process (i.e., triage, diagnostic, and treatment protocols), it amplifies overcrowding. The output factor incorporates mechanisms that serve as bottlenecks in the patient flow process, such as the boarding of patients. This is a function of the hospital not having any available inpatient beds, so the patient occupies the emergency department until an inpatient bed becomes available. This parallels to higher instances of ambulance diversion because the emergency department staff is unable to maintain the patient load and is improperly equipped to assess new patients (Asplin et al., 2003).

Fragmentation. Increased emergency department use leads to greater levels of fragmentation due to an overall lack of care coordination (Katz et al., 2012). The emergency medicine delivery model has shifted over the past 65 years because primary care physicians and internists originally comprised the field—it was not a designated specialty (Institute of Medicine, 2006). Although emergency medicine has evolved into a highly technical specialty, the actual

delivery of medicine in the emergency department results in costly, fragmented care with poorer patient outcomes (Medford-Davis et al., 2015). Care coordination enables providers to engage in a fully informed clinical decision-making process because the patient's complete history is available (Katz et al., 2012). When a patient seeks medical care in the emergency department for a medical condition that is better managed by a primary care provider, the emergency medicine provider is practicing medicine at a slight disadvantage. The consequence of this behavior is multiplied when it is a patient who presents to the emergency department for symptoms related to an underlying chronic disease or comorbidity. Emergency medicine providers are trained to treat symptoms of disease, and it is an unfair expectation for this group of specialists to manage complex chronic diseases in an environment that was created to address acute episodes of illness. In addition to the heavy burden of chronic disease on care delivery and medical decision making, there is an inherent conflict of interest regarding reimbursement between emergency medicine providers and patients who seek care in the emergency department. The current reimbursement model does not incentivize emergency medicine providers to engage in care coordination initiatives; it reimburses providers solely based on utilization. Thus, higher utilization rates equate to higher levels of reimbursement based on total patient volume. Fortunately, in the wake of health reform, the ACA is moving the reimbursement model to one that aligns both provider and facility compensation with care coordination initiatives, which provides incentives that reward quality efforts that promote better patient outcomes (Smulowitz, Honigman, & Landon, 2013).

Fragmentation is not exclusive to the emergency department—it is prevalent throughout the entire healthcare system. Fragmentation leads to poor communication, increased costs, duplication of services, and a misaligned care plan that fails to meet specific medical needs (Katz

et al., 2012). The emergency department is a model location for implementing care coordination initiatives through strategic partnerships with primary care providers since several high-frequency users have a designated usual source of care (O'Malley, 2013). Early studies propose this vulnerable population as misaligned within the system, but recent studies demonstrate the opposite (Doupe et al., 2012). This population has a usual source of care but seeks to augment care in the emergency department because fundamental medical needs are left unsatisfied (O'Malley, 2013). A well-developed care coordination plan could help decrease excessive emergency department use, reduce health care costs, promote chronic disease management and prevention efforts, improve access to more appropriate care venues like primary care clinics or chronic care clinics, improve patient outcomes, and alter patient perceptions and behaviors by improving their trust in the system to meet their medical needs (Rising et al., 2015).

Effect of Primary Care Access on Emergency Department Utilization

The United States primary care workforce shortage continues to grow, a crisis that bears serious implications and grave consequences for health systems, physicians, payers, and health care consumers if left unaddressed. According to the Agency for Healthcare Research and Quality (AHRQ), there were 208,807 physicians providing primary care services out of 624,434 total practicing physicians in the United States (AHRQ, 2011). In this same period, there were 956 million visits made to office-based physicians, of which primary care comprised 51.3% of the total. As a result, there are approximately 65 million people living in Primary Care Health Professional Shortage Areas (PCHPSA), an official term designated by the Health Resources and Services Administration (HRSA). PCHPSAs are areas with ratios of population to primary care physician greater than 2000:1 (Rieselbach, Crouse, & Frohna, 2010). It is obvious that the current supply fails to meet existing demand, which does not even account for individuals who

lack a usual source of care (USOC). A factor that heavily contributes to the primary care workforce supply shortage is the sizeable income gap between primary care physicians and specialists. This prompts many medical graduates to avoid a career in primary care given the burden of student loans upon entering the workforce (Bodenheimer & Pham, 2010). According to the 2017 Medscape Physician Compensation Report, the average salary of a primary care physician was \$217,000 versus \$316,000 for specialty providers (Grisham, 2017). This salary is not a very attractive number considering the average amount of student loan debt carried by a medical school graduate is \$166,750 (American Medical Association, 2014). Students who graduate with higher levels of debt are not incentivized to pursue a career in primary care, a specialty that pays the least and demands more time during patient care. So as the health delivery system moves toward a value-based, integrated model, a much greater emphasis needs to be placed on the importance of building a sustainable primary care workforce because it serves as the catalyst for achieving reform.

Health reform as set forth by the ACA intends to promote the appropriate utilization of health care services. A key focus area not only in health reform but also in the existing literature is emergency department utilization for primary care-related reasons. The existing research shows that patients who have a USOC experience lower mortality rates, receive regular preventive care, and incur less inpatient hospitalizations and emergency department visits, factors that help reduce total health care costs (Bodenheimer & Pham, 2010). Although the benefits associated with having a USOC have been realized, the reality of the situation remains. There are considerable barriers that prohibit timely access to primary care services, which heavily influences use of emergency department services for primary care-related needs.

The barriers inherent to primary care extend beyond basic measures of access. A patient who has a USOC but is unable to obtain timely access will seek other avenues of care, especially if the medical condition is perceived to be either emergent or life-threatening. A study that examined barriers to primary care found that patients who went to the emergency department instead of going to a USOC did so because of the following barriers: (1) “couldn’t get through on a phone”; (2) “couldn’t get an appointment; (3) “waiting too long in doctor’s office”; (4) “not open when you could go”; and (5) “no transportation” (Rust et al., 2008). Thus, primary care access cannot be measured solely based on whether it exists; measures should focus on the overall effectiveness and ability to meet patient’s medical needs in a timely fashion. Otherwise, these barriers will reinforce behaviors that increase the prevalence of inappropriate utilization of the emergency department. A qualitative study that focused on the decision-making processes of patients who utilize the emergency department for non-urgent, primary care-related needs found that perception of medical need and basic knowledge of health service options influenced use of the emergency department (Shaw et al., 2013). This further exemplifies the importance of addressing both actual and perceived barriers to primary care services to promote appropriate utilization of health care services, more specifically the emergency department.

The costs and resulting inefficiencies associated with inappropriate utilization of the emergency department for conditions that are both preventable and treatable in a primary care setting emphasizes the need to build a comprehensive health system, one that promotes quality access to care, increases care coordination, and reduces health disparities, especially for patients with chronic health conditions. Chronic disease is the leading cause of death and disability in the United States with nearly 50% of all adults having at least one chronic health condition (Ward, 2014). In 2010, 7 of the top 10 causes of death were due to chronic diseases with heart disease

and cancer contributing to nearly 48% of all deaths (Centers for Disease Control and Prevention, 2013). Other serious chronic conditions that are among the most costly and preventable illnesses include obesity, arthritis, and diabetes. In 2010, the cost attributable to providing care for this at-risk patient population was 86% of total health care spending (Gerteis et al., 2014). The number of Americans who have a chronic disease is expected to grow to 157 million by 2020, which places undue stress on an already compromised delivery system and weary workforce (Bodenheimer, Chen, & Bennett, 2009). The United States chronic disease dilemma places increased burden on health care providers, especially in the emergency department because the current delivery system encourages patients to seek care in this setting, regardless the level of medical appropriateness. The emergency department no longer serves as the critical lynchpin in the community that provides medical services in the event of critical traumas, disasters, and other related emergencies. It now functions as an inefficient, inappropriately utilized arm of medicine that further adds to the chronic disease dilemma by nullifying care coordination efforts, increasing the degree of fragmentation, and exponentially increasing the total cost of care. Ultimately, primary care providers are better suited to address and manage patients with chronic health conditions given the intimate knowledge base regarding a patient's complete medical history, which can result in less unmet medical need and a decrease in total health care costs (O'Malley, 2013).

Research Hypotheses

Based on the literature review, the following hypotheses are presented:

H_1 : Insured patients will be more likely to use the emergency department for primary care-related health needs than uninsured patients.

H₂: Minority race patients will be more likely to use the emergency department for primary care-related health needs than non-minority race patients.

H₃: Primary care-related emergency department use will vary based on insurance type.

H₄: Primary care-related emergency department use will be negatively related to patient age.

H₅: Men will be more likely to use the emergency department for primary care-related health needs than women.

H₆: Primary care-related emergency department use will be negatively related to median household income.

H₇: Patients who live in a rural area will be more likely to use the emergency department for primary care-related health needs than patients who live in an urban area.

H₈: There will be a difference in primary care-related emergency department use post-ACA enactment.

Research Design

Overall Approach and Rationale

The purpose of this study was to understand the relationship between demographic, social, economic, geographic, and need factors that influence use of the emergency department for primary care-related health needs. This study employed a few statistical techniques to understand primary care-related emergency department visits as an indicator of access and its relation to other measures of medical underservice, which included exploratory data analysis and logistic regression analysis. The ED Algorithm was used to estimate the rate of visits that were primary-care related. This study analyzed the distribution of primary care-related visits and the characteristics of patients with visits. It also developed maps to show differences across the state of Kentucky in the rates of total emergency department visits that were primary care-related. The use of the ED Algorithm assumed that the pattern of primary care-related emergency department visits (identified by the ED Algorithm) reflected differences in access to primary care. This research sought to inform the decision-making process of policy makers and health care administrators regarding ways to improve access to comprehensive quality health care services. The study used a logistic regression method to test the hypotheses regarding factors that influence primary care-related visits in Kentucky. The Chi-Square test of independence was used to determine significance among relationships. This retrospective study used a quantitative approach that sought to define trends in the data by examining de-identified emergency department medical records for adults with primary care-related visits. A quantitative approach is most appropriate when the research problem focuses on trends in the field (Creswell, 2012).

Research Strategy

A quantitative methodology involving the use of archival data formed the basis for data collection. The quantitative research strategy was deemed appropriate because the study sought to establish associations and define trends between emergency department use, primary care access, and other measures of medical underservice (Creswell, 2012). Thus, the use of quantitative data from a state administrative database will help “produce results to assess the frequency and magnitude of trends” (Creswell, 2012, p. 535).

Participants. Data was analyzed from the State Emergency Department Databases (SEDD), which are part of the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality (AHRQ). The SEDD are a powerful set of databases that reflect all patient visits in the emergency department that did not result in an inpatient admission (HCUP Databases, 2010). Data was analyzed on all diagnoses for all patients who presented to the emergency department from January 1, 2008 to December 31, 2015 from hospitals within the 15 service area regions of Kentucky as set forth by the Kentucky Cabinet for Health and Family Services. The study population consisted of patients who presented to the emergency department for medical care. A primary discharge diagnosis was determined from the International Classification of Disease—Clinical Modification, Ninth Revision (ICD-9-CM) and the International Classification of Disease—Clinical Modification, Tenth Revision (ICD-10-CM).

Instrumentation. The conceptual framework for this study was based on the theoretical behavior model of health care utilization developed by Andersen (Andersen, 1995). This model places emphasis on both contextual and individual determinants that can limit access to medical care. Moreover, perceived need is considered influential in driving the decision to seek health

services (Andersen, 1995). Ultimately, this model was used to examine the relationship between the individual's health and the factors that influence health outcomes, more specifically access to care. The New York University ED Algorithm was used to estimate the rate of visits that were primary care-related to better understand differences in access to primary care.

Data description. Secondary administrative data was analyzed from the State Emergency Department Databases (SEDD), which are part of the Healthcare Cost and Utilization Project (HCUP). Emergency department records are processed by the Agency for Healthcare Research and Quality (AHRQ), the entity that sponsors the HCUP initiative. Datasets purchased from HCUP are limited to use for research, analysis, and statistical reporting. The SEDD provides comprehensive information regarding emergency department usage, although it excludes patients seen in the emergency department who were admitted to the hospital instead of being discharged home. The SEDD is comprised of data provided by both state government and private data organizations. The state government entities provide information on nearly all acute care hospitals; the private data institutions are limited to member hospitals. The hospitals have been classified as either community or non-community. Community hospitals are defined as all non-federal, short-term facilities that provide either general or specialty medical services. Non-community hospitals are defined as (a) federal, (b) long-term, (c) behavioral health, or (d) substance abuse treatment facilities (HCUP Databases, 2010).

This database is helpful to researchers and policymakers in investigating access to health care issues, identifying state-specific trends in emergency department utilization, access, charges, and outcomes. It also provides a way to compare different regions within the state that exhibit the highest risk for primary care-related emergency department use. This study adopted the 15 service area regions as defined by the Kentucky Cabinet for Health and Family Services to

remain within the scope of the HCUP Data Use Agreement. The Data Use Agreement prohibits both direct and indirect identification of participating institutions in any disseminated materials (HCUP Databases, 2010). Since there may be only one hospital in a zip code within rural areas in Kentucky, this study aggregated results to larger geographic areas (i.e., 15 service area regions) for final reports and maps.

The database is very robust because each record contains information on all listed diagnoses, all listed procedures, patient demographics, payment source, total charges, hospital identifiers to permit linkage to inpatient hospital databases, and hospital county identifiers that permit linkage to Area Resource Files. The predictors of interest for this study were insurance status, insurance type, median household income, area of residence, gender, race, and age, which were all available through the SEDD. Moreover, the Chronic Condition Indicator database made available by the HCUP was used to categorize the ICD-9-CM and ICD-10-CM diagnosis codes into one of two categories: chronic or not chronic. This classification system allows researchers to readily determine if a diagnosis is a chronic condition, which is a key focus area of health reform given the associated costs and poor patient outcomes. The tool groups all diagnoses into body systems so that users can create indicators listing which specific body systems are affected by a chronic condition listed on the record.

The HCUP quality control process does not significantly alter the original record but ensures the data values validity, internal consistency, and overall consistency with established norms is maintained, which makes the data useful (HCUP Quality Control Procedures, 2008). The quality control procedures are automated and intend to assess the validity of data values for each discharge record to ensure accuracy. The quality control process also included a provision for numeric data, which verified that the numeric data was numeric. The range of numbers was

compared against values documented by the data source, compared against standard norms, and compared against the maximum allowed for the data element (HCUP Quality Control Procedures, 2008). Finally, the statistics for each record were reviewed by an independent contractor for each year and data source, and internal consistency was established by comparing values of related data elements (HCUP Quality Control Procedures, 2008).

Study Variables

Dependent variable. The dependent variable for the study was emergency department visits for primary care-related health needs. It is a categorical variable because each emergency department discharge record was classified as either being primary care-related or non-primary care-related based on the ED Algorithm probability assignment. The existing literature has shown that there are multiple factors that influence use of the emergency department for primary care-related health needs, including race, socioeconomic status, and area of residence. The etiology of primary care-related emergency department use is based on several complex interactions, and it is not solely driven by underlying medical conditions. There is a need to understand how emergency department use for primary care-related health needs is driven by both individual and community level factors.

Independent variables. The independent variables for the study included the following: insurance status, insurance type, median household income, area of residence, gender, race, and age. Reference groups were determined for the categorical variables. Reference variables are typically determined by the largest sample size, but the coding scheme is ultimately determined by preference in reporting information (Hardey & Bryman, 2009). The reference variables for this study were based on the lowest odds given the final reporting structure. The variables chosen to exhibit individual level factors were insurance status, insurance type, race, gender, and age.

Insurance status was classified as either insurance or no insurance. The reference group for insurance status was insurance. Insurance type was classified as Medicare, Medicaid, Commercial, Self-pay, No Charge (Charity), and Other (Workers' Compensation, CHAMPUS, CHAMPVA, VA, and Black Lung). The reference group for insurance type was Commercial. Race was classified as White, Black, Hispanic, Asian or Pacific Islander, Native American, and Other. The reference group for race was Asian or Pacific Islander. Gender was classified as female or male. The reference group for gender was male. Age was calculated from the date of birth and the admission date in the HCUP state databases. The age value ranged from 0 to 124 years. The variables chosen to exhibit community level factors were median household income and area of residence. Median household income was classified into one of four quartiles based on the Claritas ZIP Code-demographic data with the following ranges: 1st quartile: 0 – 25th percentile (1 – 41,999); 2nd quartile: 26th – 50th percentile (median: 42,000 – 51,999); 3rd quartile: 51st – 75th percentile (52,000 – 67,999); and 4th quartile: 76th – 100th percentile (68,000+). The reference group for median household income was the fourth quartile. Area of residence was classified by the 2013 National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties because it is heavily used to examine health differences based on urban or rural residence to understand disparity, access, and use-related issues. NCHS classifies counties into one of six levels. These levels include four metropolitan (large central metro, large fringe metro, medium metro, and small metro) and two nonmetropolitan (micropolitan and noncore) schemes. The reference group for area of residence was large central metro areas. A description of each variable is provided in Table 1.

Table 1.

Study Variables – Individual and Community Characteristics

Study Variables			
Variable	Measure	Code	Reference Group
Dependent variable	Primary care-related emergency department visit	Primary care-related diagnosis = 1 Non-primary care-related diagnosis = 0	
Individual characteristic	Insurance status	No insurance = 1 Insurance = 0	Insurance
Individual characteristic	Insurance type	Medicare Medicaid Commercial Self-pay No Charge (Charity) Other (Workers' Compensation, CHAMPUS, CHAMPVA, VA, and Black Lung)	Commercial
Community characteristic	Median household income	Quartile 1 Quartile 2 Quartile 3 Quartile 4	Quartile 4
Community characteristic	Area of residence	Large central metro Large fringe metro Medium metro Small metro Micropolitan Noncore	Large central metro
Individual characteristic	Gender	Male = 1 Female = 0	Female
Individual characteristic	Race	White Black Hispanic Asian or Pacific Islander	Asian or Pacific Islander
Individual characteristic	Age	0-124 years	

Protection of Human Subjects: Ethical Considerations

Typically, prior to any research study being implemented, approval is obtained from the University of the Incarnate Word Institutional Review Board. Because this research involves the use of a database, consent is only required to access the database information. Nevertheless, an IRB application will be submitted for approval by the UIW IRB. In accordance with human

subjects research and the *Health Insurance and Portability Accountability Act* (HIPPA) requirements, complete anonymity of the database contents will be maintained by safeguarding the data in a password protected laptop to which no one other than the researcher has access. Individually identifiable information will not appear in any data because this was previously removed by the rendering entity (HCUP) prior to receipt of the datasets. Individual institutions that provide public use data to HCUP cannot be identified from the data that is analyzed because results will reflect trends based on service region rather than at the individual zip code level. If this study is published, only group data will be used.

Data Analysis

The data was uploaded into predictive analytics software (Tableau and R) to perform descriptive statistics, probability assignment, and exploratory data analysis for pattern recognition. This study adopted the 2013 National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties to examine health differences to understand disparity, access, and use related issues. Studies that focus on geographic variations among small areas can more readily identify health care utilization trends that yield valuable information in understanding the needs that exist within these health service areas (Briggs, Rohrer, Ludke, Hilsenrath, & Phillips, 1995). GIS was used to create maps that illustrated the fifteen service area regions of Kentucky.

Several types of analysis were conducted to (a) understand the characteristics of the population being studied, to (b) identify relationships among the factors analyzed regarding the population, and to (c) complete hypothesis testing. Exploratory data analysis was conducted to understand the characteristics of the population being studied to produce statistical summarizations. This included utilization of descriptive summary matrices and data visualization

techniques to identify interactions among the variables within the dataset and provide insight into possible predictors of primary care-related emergency department use. Descriptive summary matrices were used to establish baseline data completeness and to determine whether data imputation was necessary to conduct further analysis. The ED Algorithm was used for probability assignment of each emergency department discharge record and whether the visit was identified as being primary care-related. Finally, the specific hypotheses for this study that tried to predict primary care-related emergency department use patterns as well as to understand the contributing factors are presented as follows with corresponding data analysis techniques:

H₁: Insured patients will be more likely to use the emergency department for primary care-related health needs than uninsured patients. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and insurance status was the independent variable. The Chi-Square test of independence was used to determine if there was a significant relationship.

H₂: Minority race patients will be more likely to use the emergency department for primary care-related health needs than non-minority race patients. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and race was the independent variable. The Chi-Square test of independence was used to determine if there was a significant relationship.

H₃: Primary care-related emergency department use will vary based on insurance type. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and insurance type was the independent variable. The Chi-Square test of independence was used to determine if there was a significant relationship.

H₄: Primary care-related emergency department use will be negatively related to patient age. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and age was the independent variable. The Chi-Square test of independence was used to determine if there was a significant relationship.

H₅: Men will be more likely to use the emergency department for primary care-related health needs than women. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and gender was the independent variable. The Chi-Square test of independence was used to determine if there was a significant relationship.

H₆: Primary care-related emergency department use will be negatively related to median household income. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and median household income was the independent variable. The Chi-Square test of independence was used to determine if there was a significant relationship.

H₇: Patients who live in a rural area will be more likely to use the emergency department for primary care-related health needs than patients who live in an urban area. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and area of residence was the independent variable. The Chi-Square test of independence was used to determine if there was a significant relationship.

H₈: There will be a difference in primary care-related emergency department use post-ACA enactment. This hypothesis was tested using logistic regression analysis where primary care-related emergency department use was the dependent variable and ACA enactment was the

independent variable. The Chi-Square test of independence was used to determine if there is a significant relationship.

Findings

Purpose of the Study

The purpose of this study was to understand the relationship between demographic, social, economic, geographic, and need factors that influence use of the emergency department for primary care-related health needs. The predictor variables and outcome measure were examined using single factor, multi factor, and logistic regression approaches. This chapter provides the results of these analyses.

This study employed a retrospective confirmatory research design using secondary administrative data obtained from the Kentucky State Emergency Department Database. Data was analyzed on all diagnoses for all patients who presented to the emergency department from January 1, 2008 to December 31, 2015 from hospitals within the 15 service area regions of Kentucky as set forth by the Kentucky Cabinet for Health and Family Services. The predictors of interest were insurance status, insurance type, median household income, area of residence, gender, race, and age. The study outcome measure was emergency department visits for primary care-related health needs. This study was modeled after the Andersen behavioral model of health care utilization, and it also utilized the ED Algorithm to estimate the rate of visits that were primary care-related. This study utilized a logistic regression approach to determine the statistical significance of the independent factors when predicting the probability of an emergency department encounter being flagged as primary care-related.

Descriptive Statistics

In Kentucky, 15,635,828 emergency department discharges occurred from 2008 to 2015 for those who sought care in the emergency department. Of these discharges, 7,054,893 were found to be primary care-related based on the ED Algorithm probability assignment. Non-

primary care-related emergency department discharges accounted for 8,580,935 of the total. The average median age was 43 years old, and the average mean age was 45.5 years old. Median household income was classified into one of four quartiles with the following ranges: 1st quartile: 0 – 25th percentile; 2nd quartile: 26th – 50th percentile (median); 3rd quartile: 51st – 75th percentile; and 4th quartile: 76th – 100th percentile. The corresponding percentages for the sample population were as follows: 15.11% fell within the 1st quartile; 32.52% fell within the 2nd quartile; 25.87% fell within the 3rd quartile; and 24.40% fell within the 4th quartile.

Insurance type was classified into the following categories: Commercial, Medicaid, Medicare, Missing, No Charge (Charity), Other (Workers' Compensation, CHAMPUS, CHAMPVA, VA, and Black Lung), and Self-pay. The corresponding percentages for the sample population were as follows: 25.50% had Commercial insurance; 33.23% had Medicaid; 17.31% had Medicare; 2.67% received Charity care; 4.47% had Other; and 16.61% were Self-pay. This study adopted the 2013 NCHS Urban-Rural Classification Scheme for Counties, which classifies counties into one of six levels. These levels include four metropolitan (large central metro, large fringe metro, medium metro, and small metro) and two nonmetropolitan (micropolitan and noncore) schemes. The majority of emergency department visits related to this study were incurred by patients who resided in urban scheme counties (72.09%) when compared to rural scheme counties (27.75%).

The corresponding percentages for the NCHS patient regions were as follows: large central metro areas of ≥ 1 million population (14.44%); large fringe metro areas of ≥ 1 million population (13.07%); medium metro areas of 250,000-999,999 population (14.96%); small metro areas of 50,000-249,999 population (8.98%); micropolitan areas of 10,000-49,999 population (20.63%); and noncore areas (27.75%). White patients accounted for a disproportionate share of the total percentage of emergency department visits when compared to any other race. The

corresponding race percentages for the sample population were as follows: Asian or Pacific Islander (0.34%); Black (10.04%); Hispanic (2.38%); Native American (0.18%); Other (3.38%); and White (83.61%). The majority of emergency department visits were incurred by females (55.86%) in comparison to males (44.07%). Emergency department visits by patients with insurance represented 76.04% of total emergency department visits made in Kentucky from 2008 to 2015. Finally, comparing pre-ACA and post-ACA emergency department visit trends revealed that 68.67% of total emergency department visits were made post-ACA compared to 31.33% pre-ACA. A summary of the sample population characteristics is presented in Table 2.

Primary Care-Related Characteristics

This study tried to identify interactions among the variables (insurance status, insurance type, median household income, area of residence, gender, race, and age) within the dataset to provide insight into possible predictors of primary care-related emergency department use. This study found that both insured and non-insured patients sought care in the emergency department more for non-primary care-related health needs (55.16% and 53.88%) as evidenced by Figure 3. Patients without insurance sought care more for primary care-related health needs (46.12%).

The proportion of primary care-related emergency department use by race was predominantly for non-primary care-related health needs except for Blacks (50.50%) who utilized the emergency department more for primary care-related health needs. Native Americans (41.58%) were least likely to use the emergency department for primary care-related health needs out of all the race categories. Hispanics (47.87%) had the second highest probability for primary care-related emergency department use. Figure 4 summarizes these findings.

Figure 5 illustrates the rate of primary care-related emergency department visits by insurance type. This study found that patients with Other insurance used the emergency

Table 2

Sample Population Characteristics

<i>N</i>	15,635,828	
<i>Primary Use / Non-Primary Use</i>	Primary Care-Related	7,054,893
	Non-Primary Care-Related	8,580,935
<i>Age</i>	Min	1
	Max	108
	Median	43
	Mean	46
	NA's	10,924
<i>Median Household Income</i>	1st Quartile	2,362,067
	2nd Quartile	5,085,413
	3rd Quartile	4,045,483
	4th Quartile	3,815,861
	Missing	105,802
	Unknown	221,202
<i>Insurance Type</i>	Commercial	3,987,004
	Medicaid	5,196,129
	Medicare	2,707,131
	Missing	30,965
	No Charge	417,813
	Other	699,112
	Self-Pay	2,597,674
<i>NCHS Patient Regions</i>	Central Counties of metro areas of >= 1 Million Population	2,258,550
	Fringe counties of metro areas of >1 million population	2,044,298
	Counties in metro areas of 250,000-999,999 population	2,338,592
	Counties in metro areas of 50,000-249,999 population	1,404,708
	Micropolitan counties	3,226,309
	Not metropolitan or micropolitan counties	4,338,795
	Missing	24,576
<i>Race</i>	Asian or Pacific Islander	53,753
	Black	1,570,144
	Hispanic	372,422
	Native American	28,069
	Other	529,227
	White	13,073,005
	Missing	9,208
<i>Gender</i>	Male	6,890,129
	Female	8,733,590
	Unknown	2,485
	Missing	9,624
<i>Insurance Status</i>	Has Insurance	11,890,264
	No Insurance	3,714,599
	Missing	30,965
<i>ACA</i>	Pre	4,898,789
	Post	10,737,039

department for primary care-related health needs (31.95%) less than any other insurance type.

Conversely, both Self-Pay and Medicaid beneficiaries used the emergency department for primary care-related health needs approximately half the time (49.71 % and 49.23%).

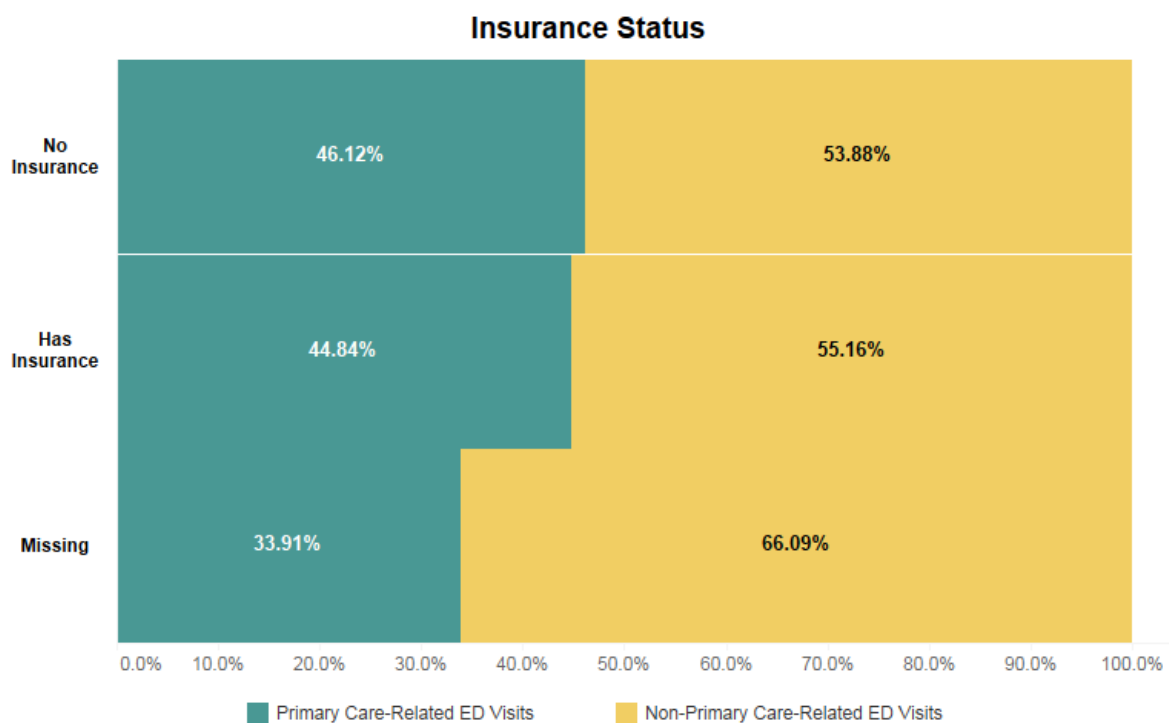


Figure 3. Primary care-related emergency department use by insurance status.

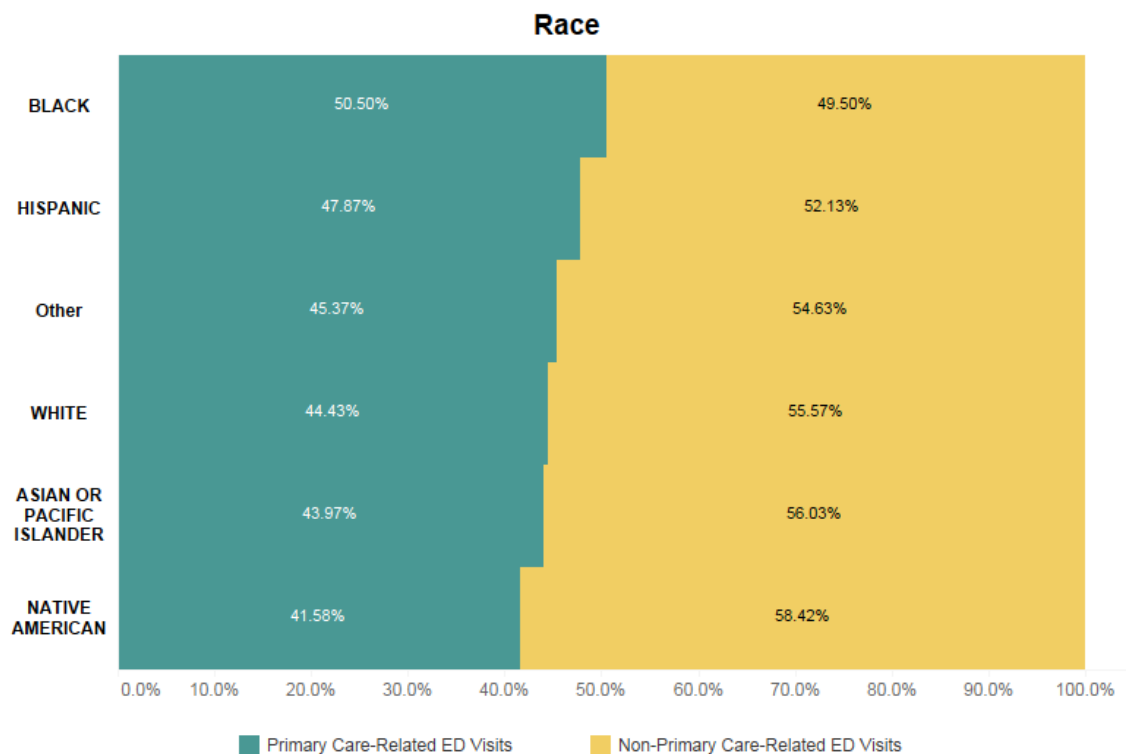


Figure 4. Primary care-related emergency department use by race.

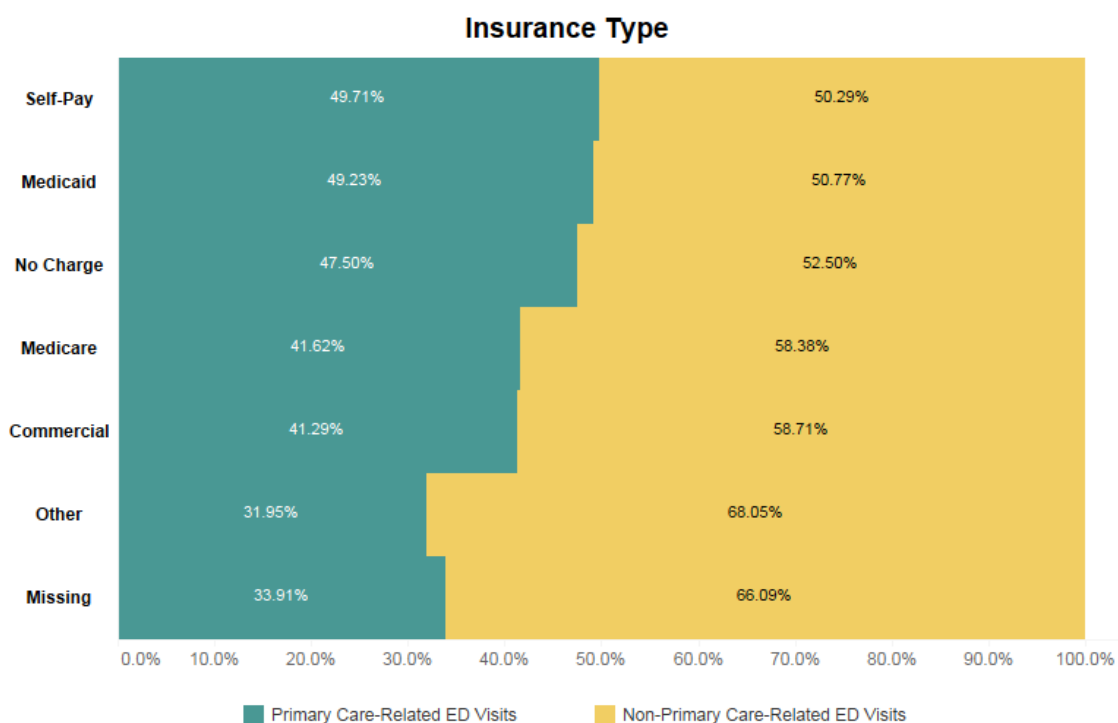


Figure 5. Primary care-related emergency department use by insurance type.

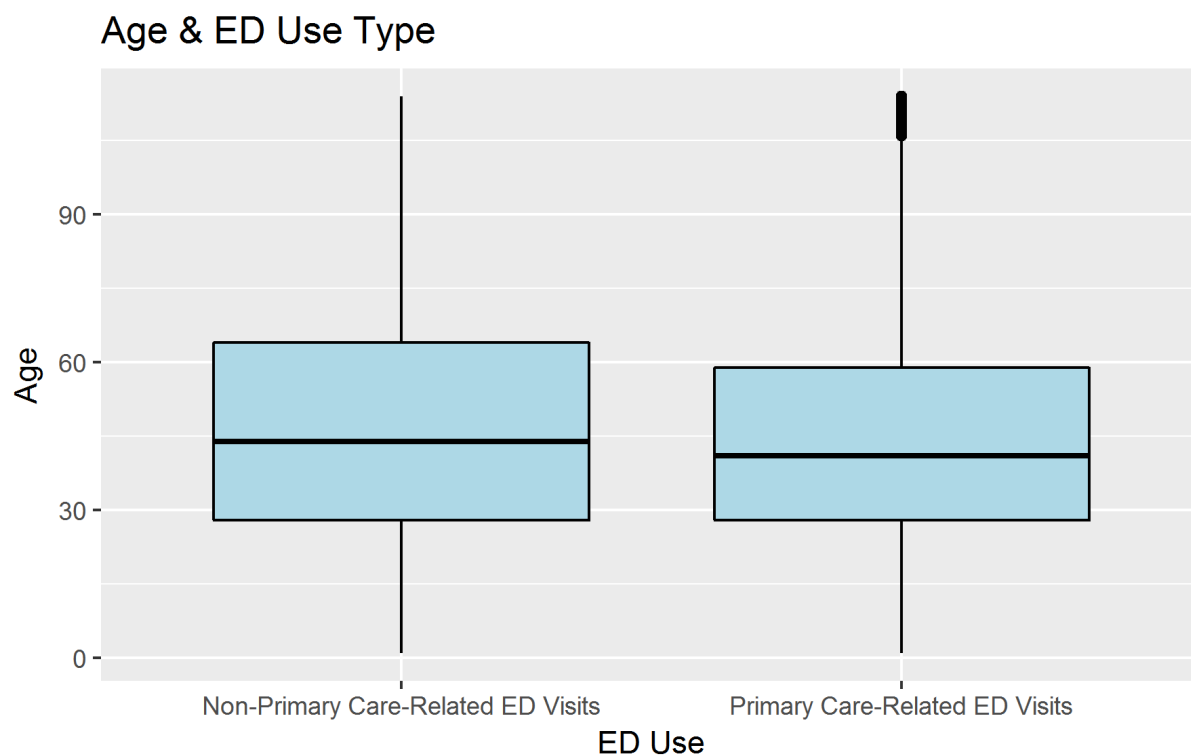


Figure 6. Primary care-related emergency department use by age.

The median age for non-primary care-related emergency department visits was 44 years old, which was slightly higher than those who used the emergency department for primary care-related health needs (41 years old). Thus, there was a pattern that people who are younger tend to use the emergency department more for primary care-related health needs. The full spectrum of primary care-related emergency department use by age is shown in Figure 6, which is a box plot.

Females (47.93%) sought care in the emergency department for primary care-related health needs more often than men (41.62%). Men sought care in the emergency department for non-primary care-related health needs nearly two-thirds of the time. Figure 7 highlights the rate of primary care-related emergency department use by gender.

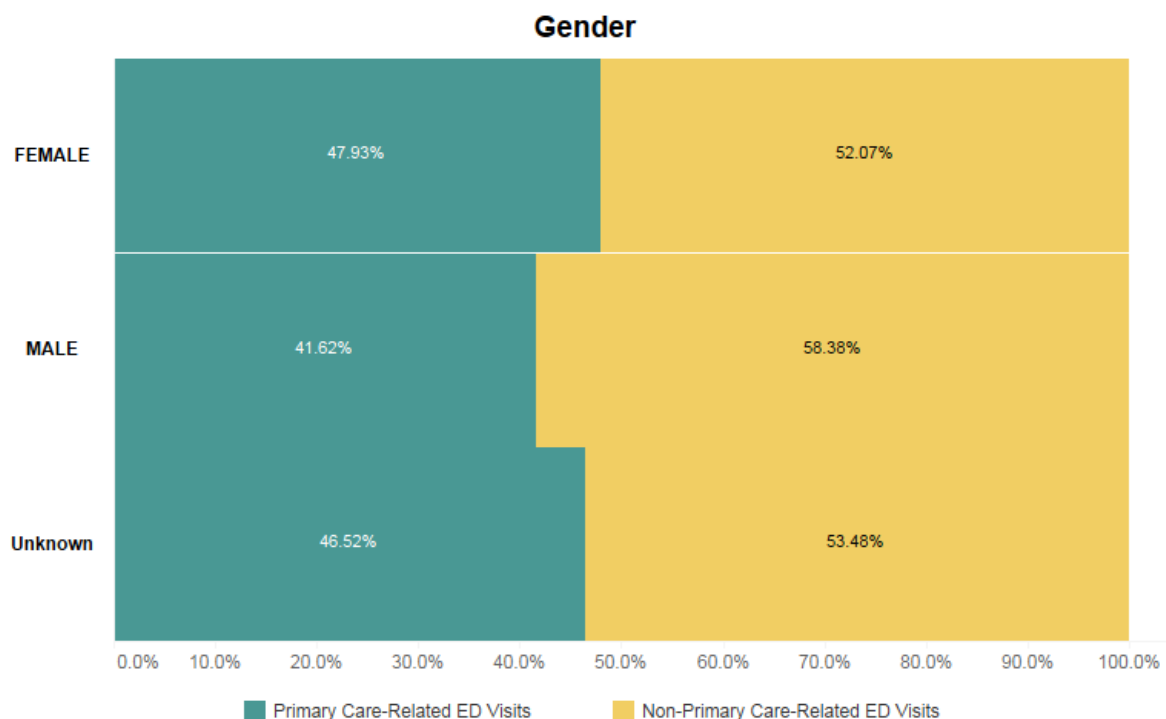


Figure 7. Primary care-related emergency department use by gender.

Figure 8 shows the rate of primary care-related emergency department visits by income quartile. The 1st quartile (lowest income) had the highest rate (46.20%) of primary care-related emergency department visits. The rate decreased as income increased with each quartile. Thus, patients with a higher median household income used the emergency department more for non-primary care-related health needs. Only 42.32% of the population in the 4th quartile sought emergency department services for primary care-related health needs.

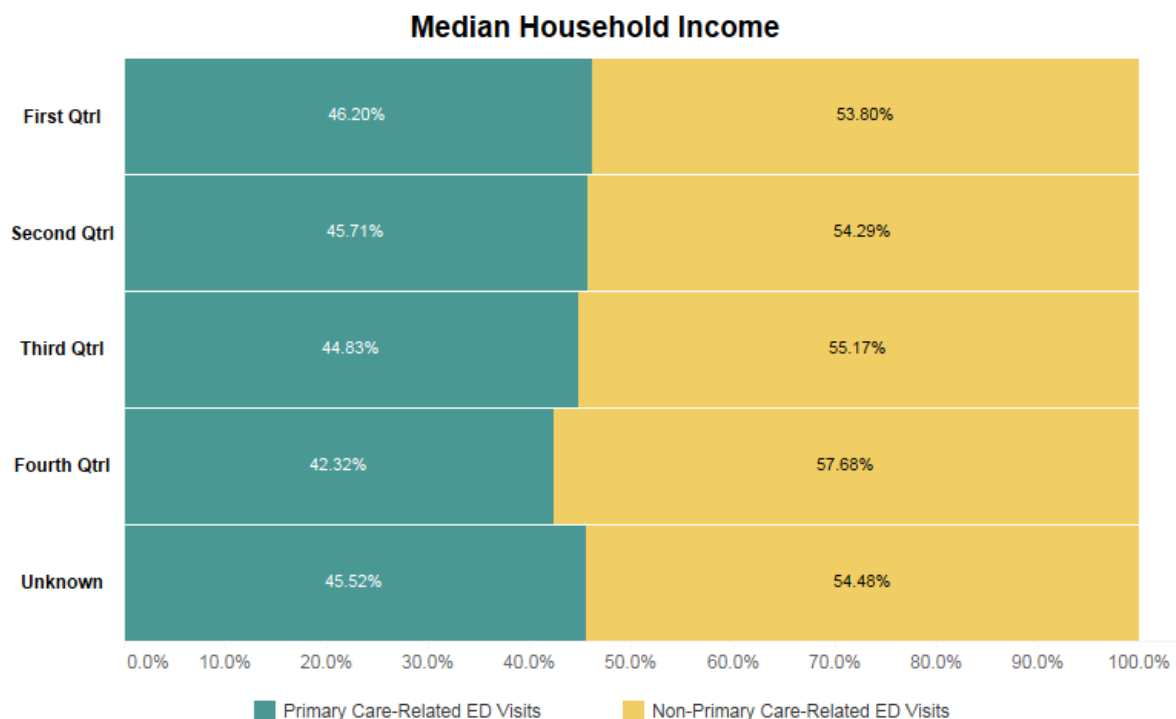


Figure 8. Primary care-related emergency department use by median household income.

Primary care-related emergency department use varied by NCHS patient region, which is shown in Figure 9. The two largest county schemes (large metro and fringe metro) both exhibited lower primary care-related emergency department use rates of 43.93% and 43.68% respectively. The county scheme that had the highest primary care-related emergency department rate was counties in metro areas of 250,000-999,999 population (47.12%). The county schemes designated as rural (micropolitan and noncore) had the next highest primary care-related emergency department visit rates of 45.29% and 45.14% respectively.

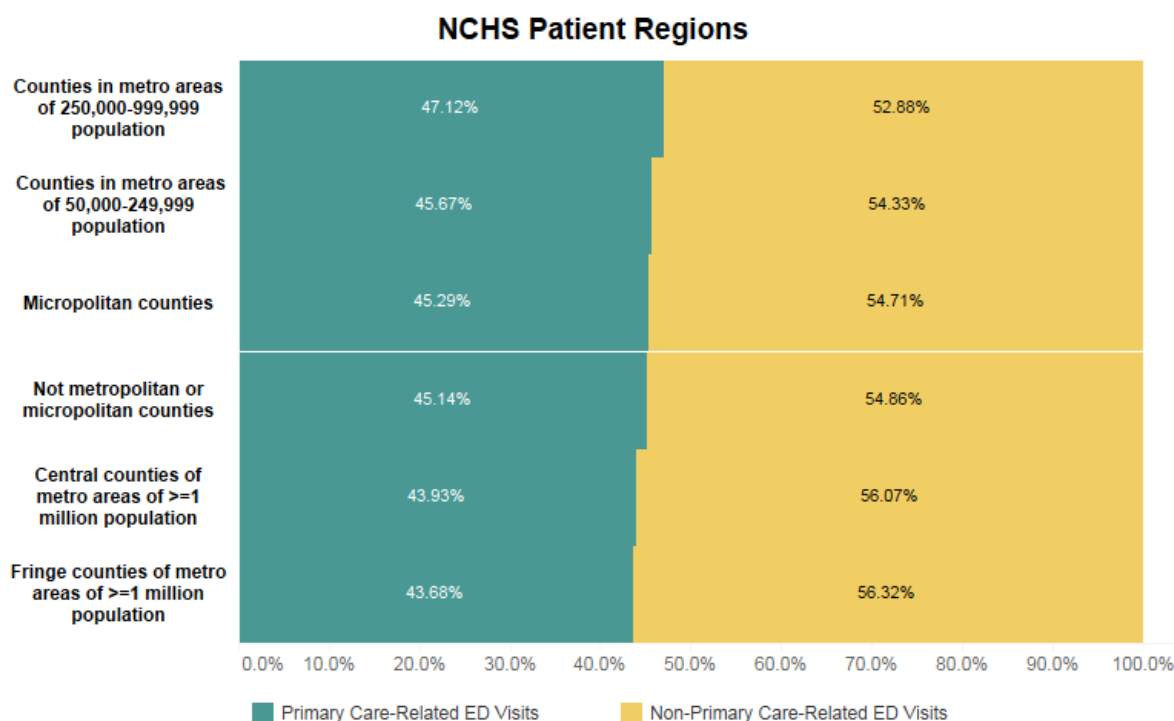


Figure 9. Primary care-related emergency department use by NCHS patient region.

Figure 10 shows the rate of use both pre-ACA and post-ACA. There was a slight decrease in the rate of primary care-related emergency department visits post-ACA (44.80%).

Analysis Approach

A logistic regression approach was used to determine the statistical significance of the independent factors when predicting the probability of an emergency department encounter being flagged as primary care-related. For example, it sought to understand if there was a statistically significant difference between the values of gender in predicting the likelihood that the patient would utilize the emergency department for primary care-related health needs.

The first set of analysis took a single factor approach in determining the statistical significance of each independent factor regarding the type of emergency department use (primary care-related and non-primary care-related). The study was modeled against the

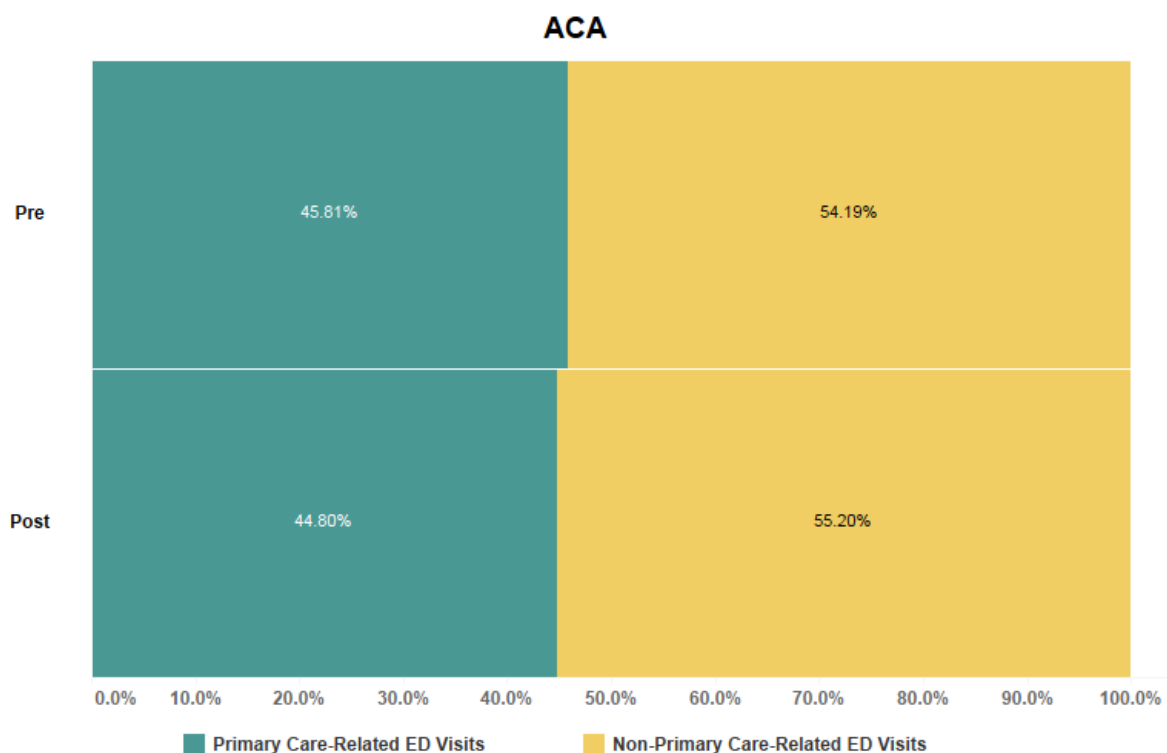


Figure 10. Primary care-related emergency department use by ACA.

probability that a person would inappropriately utilize the emergency department in a primary care-related manner through a logistic regression. From there, the output coefficients were first converted to an odds ratio and then converted to a probability, which provided interpretability and insights regarding patterns in the data. This first single factor approach did not control for the other factors within the data. For example, when modeling gender as the independent variable, this approach did not control for other factors in the data like insurance type, patient region, race, etc.

The second set of analysis took a multi-factor approach, which solved for the issue above. The multi-factor approach allowed for the determination of statistical significance and provided interpretability within the data and controlled for other factors (i.e., Males have a 51% probability of inappropriately utilizing the emergency department while controlling for race,

patient region, etc.). Overall, this method provided a more robust approach to this analysis as well as interpretability.

Single Factor Model Results

Primary care-related emergency department use by gender. Each gender factor was statistically significant when utilizing a two-tailed chi-squared test (binomial distribution), which means there was a difference between each factor and the probability that each factor utilized the emergency department for primary care-related health needs. A female patient was 1.29 times more likely to use the emergency department for primary care-related health needs than a male patient. Female patients had a 56.36% probability of utilizing the emergency department for primary care-related health needs, which is shown in Table 3.

Table 3

Single Factor Results: Primary Care-Related Emergency Department Use by Gender

<i>Gender</i>						
Variable Value	Coefficients	std. err	p-value	chi-squared test	Odds	Probability
Intercept	-0.338	0.001	<.000		0.713	41.62%
NA	-3.820	0.001	<.000		0.022	2.15%
Female	0.256	0.002	<.000		1.291	56.36%
Unknown	0.199	0.012	0.000		1.220	54.96%

Primary Care-Related Emergency Department Use by Race. Each race factor was statistically significant when utilizing a two-tailed chi-squared test. A Black patient was 1.29 times more likely to use the emergency department for primary care-related health needs than an Asian or Pacific Islander patient. A Hispanic patient was 1.17 times more likely to use the emergency department for primary care-related health needs than an Asian or Pacific Islander patient. Thus, Black patients had a 56.52% probability of utilizing the emergency department for

primary care-related health needs, and Hispanic patients had a 53.92% probability, which is shown in Table 4.

Table 4

Single Factor Results: Primary Care-Related Emergency Department Use by Race

<i>Race</i>					
Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability
Intercept	-0.242	0.009	<.000	0.785	43.97%
Black	0.262	0.088	<.000	1.300	56.52%
Hispanic	0.157	0.009	<.000	1.170	53.92%
Native American	-0.098	0.015	0.000	0.907	47.56%
Other	0.057	0.009	0.000	1.058	51.42%
White	0.018	0.009	0.033	1.018	50.45%

Primary care-related emergency department use by age. Age was statistically significant when utilizing a two-tailed chi-squared test (binomial distribution), which means there was a difference between each unit change and the probability that each patient will utilize the emergency department for primary care-related health needs. Since age is a continuous variable, the interpretation of its effect on the probability was slightly changed. A one-unit (in this case, a standard deviation of 24.1) change in age resulted in a 42.61% reduction in the probability that a patient utilized the emergency department for primary care-related health needs. Thus, as age increased, the probability that patients utilized the emergency department for primary care-related health needs decreased, which is shown in Table 5.

Primary care-related emergency department use by insurance status. Each Insurance Status factor was statistically significant when utilizing a two-tailed chi-squared test. Patients with no insurance were 1.05 times more likely to use the emergency department for primary care-related health needs than patients with insurance. Patients with no insurance had a

51.30% probability of utilizing the emergency department for primary care-related health needs. Patients missing their insurance information (within an electronic medical record or claim) only had a 38.69% probability of utilizing the emergency department in a primary care-related manner. The fact that the insurance type information was missing offers predictive value, which may be indicative of a variable not captured in the data. The results for insurance status are shown in Table 6.

Table 5

Single Factor Results: Primary Care-Related Emergency Department Use by Age

<i>Age</i>					
Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability
Intercept	0.000	0.001	<.000	1.00	49.99%
Age	-0.004	0.001	<.000	0.996	49.89%

Table 6

Single Factor Results: Primary Care-Related Emergency Department Use by Insurance Status

<i>Insurance Status</i>					
Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability
Intercept	-0.207	0.001	<.000	0.813	44.84%
Missing	-0.460	0.120	<.000	0.631	38.69%
No Insurance	0.052	0.001	<.000	1.053	51.30%

Primary care-related emergency department use by insurance type. Each Insurance Type factor was statistically significant when utilizing a two-tailed chi-squared test. Patients with Medicaid were 1.37 times more likely to use the emergency department for primary care-related health needs than patients with Commercial insurance. No charge (charity) patients were 1.29 times more likely to use the emergency department for primary care-related health needs than patients with Commercial insurance. Self-pay patients were 1.41 times more likely to use the

emergency department for primary care-related health needs than patients with Commercial insurance. Self-pay patients had a 58.43% probability of utilizing the emergency department for primary care-related health needs. Medicaid and no charge patients had high probabilities as well with 57.96% and 56.26% respectively. Medicare patients only had a 50.33% probability of utilizing the emergency department for primary care-related health needs, which aligns with the study's finding on age. As patients got older and were more likely to have Medicare insurance, the propensity to utilize the emergency department for primary care-related health needs decreased. Table 7 summarizes these findings.

Table 7

Single Factor Results: Primary Care-Related Emergency Department Use by Insurance Type

<i>Insurance Type</i>					
Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability
Intercept	-0.352	0.001	<.000	0.703	41.29%
Medicaid	0.321	0.001	<.000	1.379	57.96%
Medicare	0.013	0.002	<.000	1.013	50.33%
Missing	-0.316	0.012	<.000	0.729	42.17%
No Charge	0.252	0.003	<.000	1.286	56.26%
Other	-0.404	0.003	<.000	0.668	40.04%
Self-Pay	0.340	0.002	<.000	1.406	58.43%

Primary care-related emergency department use by median household income.

Table 8 shows the results for median household income. Each Median Household Income factor was statistically significant when utilizing a two-tailed chi-squared test. Patients living in an area that was in the 1st quartile (lowest income area) were 1.17 times more likely to use the emergency department for primary care-related health needs than patients living in the 4th quartile (highest income area). Patients in the 1st and 2nd quartile median household income areas had probabilities of 53.93% and 53.44% to utilize the emergency department for primary

care-related health needs. The lower the median household income, the more likely a patient was to utilize the emergency department for primary care-related health needs.

Table 8

Single Factor Results: Primary Care-Related Emergency Department Use by Median Household Income

<i>Income</i> Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability
Intercept	-0.310	0.001	<.000	0.734	42.32%
First Quartile	0.158	0.002	<.000	1.171	53.93%
Second Quartile	0.138	0.002	<.000	1.148	53.44%
Third Quartile	0.102	0.002	<.000	1.108	52.55%
Missing	0.011	0.006	0.087	1.011	50.27%
Unknown	0.130	0.004	<.000	1.139	53.25%

Primary care-related emergency department use by NCHS patient region. Each NCHS Patient Region factor was statistically significant when utilizing a two-tailed chi-squared test. Patients living in counties in metro areas of 250,000-999,999 population were 1.13 times more likely to use the emergency department for primary care-related health needs than patients living in central counties of metro areas greater than one million population. Patients in any region not in central counties or fringe counties all had elevated probabilities of utilizing the emergency department for primary care-related health needs. The probabilities for each region are listed in Table 9.

Table 9

Single Factor Results: Primary Care-Related Emergency Department Use by NCHS Patient Region.

<i>NCHS Patient Regions</i>					
Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability (%)
Intercept	-0.244	0.001	<.000	0.784	43.93
Fringe counties of metro areas of >1 million population	-0.010	0.002	0.000	0.990	49.75
Counties in metro areas of 250,000-999,999 population	0.129	0.002	<.000	1.137	53.22
Counties in metro areas of 50,000-249,999 population	0.070	0.002	<.000	1.073	51.75
Micropolitan counties	0.055	0.002	<.000	1.056	51.37
Not metropolitan or micropolitan counties	0.049	0.002	<.000	1.050	51.22

Primary care-related emergency department use by ACA enactment. Each ACA (pre/post) factor was statistically significant when utilizing a two-tailed chi-squared test. Patients who utilized the emergency department prior to the launch of ACA were 1.04 times more likely to use the emergency department for primary care-related health needs than someone post-ACA. The enactment of the ACA influenced the type of emergency department use in Kentucky for all populations, and the results are shown in Table 10.

Table 10

Single Factor Results: Primary Care-Related Emergency Department Use by ACA Enactment

<i>ACA</i>					
Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability
Intercept	-0.209	0.001	<.000	0.812	44.81%
Pre-ACA	0.041	0.001	<.000	1.041	51.02%

Multi-Factor Model Results

All factors within the multi-factor logistic model were significant, except Race White, Missing insurance, and self-pay insurance (model could not converge on the two insurance types), which means there was a difference between each factor and the probability that each factor utilized the emergency department for primary care-related health needs.

When controlling for difference in insurance status, race, gender, age, income, and NCHS patient region, patients with Medicaid were 1.29 times more likely to utilize the emergency department for primary care-related health needs than commercial patients. Patients with Other insurance only had a 32.80% probability of utilizing the emergency department for primary care-related health needs. When controlling for all other factors, patients without insurance were 1.37 times more likely to utilize the emergency department for primary care-related health needs than patients with insurance. Female patients were nearly two-thirds more likely to utilize the emergency department for primary care-related health needs than men. Black patients were 1.24 times more likely to use the emergency department for primary care-related health needs than Asian or Pacific Islander patients. Both White and Native American patients had the lowest probabilities of 49.86% and 48.18% respectively. A one-unit change in age resulted in a 30.33% reduction in the probability that a patient utilized the emergency department for primary care-related health needs. Thus, as age increased, the probability that patients utilized the emergency department for primary care-related health needs decreased, which was consistent with the single factor analysis findings. Patients living in an area that was in the 1st quartile (lowest income area) were 1.11 times more likely to use the emergency department for primary care-related health needs than patients living in the 4th quartile (highest income area). Consistent with the single factor analysis results, patients in the 1st and 2nd quartile median household income areas

had probabilities of 52.63% and 52.30% to utilize the emergency department for primary care-related health needs. Finally, patients living in counties in metro areas of 250,000-999,999 population were 1.16 times more likely to utilize the emergency department for primary care-related health needs than patients living in central counties of metro areas greater than one million population, which exhibited a 53.88% probability. A summary of these findings are listed in Table 11.

Hypothesis Testing Results

The multiple logistic regression model included all variables that were statistically significant during bivariate analysis ($p \leq .05$) except for Race White, Missing insurance, and Self-pay insurance because the model could not converge on the two insurance types. A multiple logistic regression model is deemed appropriate when several variables have the potential to predict the outcome because this model can adjust for potential confounding variables during the analysis (Katz, 2006). Each specific hypothesis and corresponding results are listed below:

H_1 : Insured patients will be more likely to use the emergency department for primary care-related health needs than uninsured patients.

Hypothesis 1 explored if there was a difference in emergency department usage for primary care-related health needs based on insurance status. Insurance status was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs. Uninsured patients were more likely to use the emergency department for primary care-related health needs compared to insured patients after controlling for insurance type, median household income, area of residence, gender, race, and age. Thus, Hypothesis 1 was not supported by the data.

Table 11

Multi-Factor Model Results

<i>Multi-Factor Model</i>					
Variable Value	Coefficients	std. err	p-value chi-squared test	Odds	Probability
Intercept	-0.860	0.103	<.000	0.423	29.73%
Insurance_statusmissing	0.239	0.014	<.000	1.270	55.96%
insurance_statusno insurance	0.316	0.002	<.000	1.371	57.83%
RACEBLACK	0.219	0.009	<.000	1.244	55.44%
RACEHISPANIC	0.095	0.009	<.000	1.100	52.37%
RACENATIVE AMERICAN	-0.073	0.015	0.000	0.930	48.18%
RACEOTHER	0.072	0.009	0.000	1.075	51.80%
RACEWHITE	-0.006	0.009	0.510	0.994	49.86%
Insurance_Medicaid	0.260	0.001	<.000	1.297	56.46%
Insurance_Medicare	0.090	0.002	<.000	1.094	52.25%
Insurance_Missing			NA		0.00%
Insurance_No charge	-0.061	0.004	<.000	0.941	48.48%
Insurance_Other	-0.717	0.003	<.000	0.488	32.80%
Insurance_Self Pay			NA		0.00%
SexMALE	0.341	0.103	0.001	1.406	58.43%
SexFemale	0.596	0.103	0.000	1.814	64.47%
SexUnknown	0.571	0.110	0.000	1.770	63.90%
AGE	-0.003	0.000	<.000	0.997	49.92%
MedHouseIncome_First Q	0.105	0.002	<.000	1.111	52.63%
MedHouseIncome_Second Q	0.092	0.002	<.000	1.097	52.30%
MedHouseIncome_Third Q	0.060	0.002	<.000	1.062	51.50%
MedHouseIncome_Missing	0.150	0.007	<.000	1.161	53.73%
MedHouseIncome_Unknown	0.103	0.005	<.000	1.109	52.58%
Fringe counties of metro areas of >1 million population	0.070	0.002	<.000	1.072	51.74%
Counties in metro areas of 250,000-999,999 population	0.155	0.002	<.000	1.168	53.87%
Counties in metro areas of 50,000-249,999 population	0.097	0.003	<.000	1.101	52.41%
Micropolitan counties	0.074	0.002	<.000	1.077	51.84%
Not metropolitan or micropolitan counties	0.074	0.002	<.000	1.077	51.86%

Hypothesis Testing Results

The multiple logistic regression model included all variables that were statistically significant during bivariate analysis ($p \leq .05$) except for Race White, Missing insurance, and Self-pay insurance because the model could not converge on the two insurance types. A multiple logistic regression model is deemed appropriate when several variables have the potential to predict the outcome because this model can adjust for potential confounding variables during the analysis (Katz, 2006). Each specific hypothesis and corresponding results are listed below:

H₁: Insured patients will be more likely to use the emergency department for primary care-related health needs than uninsured patients.

Hypothesis 1 explored if there was a difference in emergency department usage for primary care-related health needs based on insurance status. Insurance status was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs. Uninsured patients were more likely to use the emergency department for primary care-related health needs compared to insured patients after controlling for insurance type, median household income, area of residence, gender, race, and age. Thus, Hypothesis 1 was not supported by the data.

H₂: Minority race patients will be more likely to use the emergency department for primary care-related health needs than non-minority race patients.

Hypothesis 2 pertained to primary care-related emergency department use by race. Race was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs except for White patients ($p = .51$). Black patients were more likely to use the emergency department for primary care-related health needs compared to Asian or

Pacific Islander patients after controlling for insurance status, insurance type, median household income, area of residence, gender, and age. Thus, Hypothesis 2 was supported by the data.

H₃: Primary care-related emergency department use will vary based on insurance type.

Hypothesis 3 focused on primary care-related emergency department use by insurance type. Overall, insurance type was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs except for Missing and Self-pay patients ($p = \text{NA}$). The model failed to converge on the two insurance types, which means there was a difference between each factor and the probability that each factor utilized the emergency department for primary care-related health needs. Medicaid patients were more likely to use the emergency department use for primary care-related health needs compared to Commercial patients after controlling for insurance status, median household income, area of residence, gender, race, and age. The remaining insurance types (Medicare and Other) were also statistically significant predictors of use with varying probabilities. Thus, Hypothesis 3 was supported by the data.

H₄: Primary care-related emergency department use will be negatively related to patient age.

Hypothesis 4 investigated the relationship between age and primary care-related emergency department use. Age was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs. A one-unit change in age resulted in a 30.33% reduction in the probability that a patient utilized the emergency department for primary care-related health needs. On average, as patients aged, the probability to use the emergency department for primary care-related health needs decreased. Thus, Hypothesis 4 was supported by the data.

H₅: Men will be more likely to use the emergency department for primary care-related health needs than women.

Hypothesis 5 examined the relationship between gender and primary care-related emergency department use. Gender was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs. Females were more likely to use the emergency department for primary care-related health needs compared to males after controlling for insurance status, insurance type, median household income, area of residence, race, and age. Thus, Hypothesis 5 was not supported by the data.

H₆: Primary care-related emergency department use will be negatively related to median household income.

Hypothesis 6 analyzed the relationship between median household income and primary care-related emergency department use. Median household income was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs. First quartile patients (lowest income area) were more likely to use the emergency department for primary care-related health needs compared to fourth quartile patients after controlling for insurance status, insurance type, area of residence, gender, race, and age. As the income increased, emergency department use for primary care-related health needs decreased. Thus, Hypothesis 6 was supported by the data.

H₇: Patients who live in a rural area will be more likely to use the emergency department for primary care-related health needs than patients who live in an urban area.

Hypothesis 7 evaluated the relationship between area of residence and primary care-related emergency department use. Area of residence was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs. Patients living

in counties in metro areas of 250,000-999,999 population were more likely to use the emergency department for primary care-related health needs compared to patients living in central counties of metro areas greater than one million population (both urban areas) after controlling for insurance status, insurance type, median household income, gender, race, and age. Thus, Hypothesis 7 was not supported by the data.

H₈: There will be a difference in primary care-related emergency department use post-ACA enactment.

Hypothesis 8 assessed if there was a difference in emergency department use for primary care-related health needs post-ACA enactment. The ACA enactment was statistically significant in predicting the likelihood of emergency department use for primary care-related health needs. Patients pre-ACA enactment were more likely to use the emergency department for primary care-related health needs compared to patients post-ACA. Thus, Hypothesis 8 was supported by the data.

Discussion and Recommendations

Introduction

The purpose of this study was to understand the relationship between demographic, social, economic, geographic, and need factors that influenced use of the emergency department for primary care-related health needs. The study was guided by eight research questions that addressed these factors, which were considered relevant based on current and on-going health reform initiatives. The health care delivery model in the United States has changed and will continue to change. The focus has shifted from a reactive model that treats symptoms of disease where providers are reimbursed based on utilization to a proactive model that focuses on preventive health services where providers are reimbursed based on quality measures and patient health outcomes. Primary care-related emergency department use was identified as a key area of health reform that could provide insights for addressing barriers to care.

Discussion

Interpretation of findings. Insurance status, insurance type, median household income, age, gender, race, and area of residence were significant predictors of primary care-related emergency department use based on the findings of this study. Patients who lacked insurance exhibited higher rates of primary care-related emergency department use. The findings demonstrated a relationship between low income individuals and lack of insurance coverage, which resulted in higher rates of primary care-related emergency department use due to limited access points. Both Self-pay and Medicaid beneficiaries were more likely to use the emergency department for primary care-related health needs, which coincided with the finding for primary care-related emergency department use by income. Lower socioeconomic individuals had the highest rate of primary care-related emergency department use. This patient demographic

typically receives Medicaid benefits, a federal health insurance designed for individuals who require financial assistance. Thus, there was a relationship between individuals with lower income levels who either lacked insurance or had Medicaid and primary care-related emergency department use due to barriers that prohibited access to primary care health services.

Middle age patients demonstrated a greater likelihood of emergency department use for primary care-related health needs, which was consistent with the sample population average median age for the state of Kentucky. Female patients used the emergency department more frequently for primary care-related health needs than male patients. Existing literature demonstrated that females were consistently designated as the health care decision makers, which was consistent with the findings from this study. Females were more proactive in obtaining primary health care services even though it was obtained in the emergency department. Moreover, Black and Hispanic patients used the emergency department more frequently for primary care-related health needs than non-minority patients. The relationship between primary care-related emergency department use and race indicated that a disproportionate share of visits resulted from Minority individuals of poor socioeconomic status who were either unable to obtain insurance or had limited benefits through a federal program. Primary health care access points were further constrained because an increasing proportion of providers no longer accepted Medicaid patients due to poor reimbursement. This patient demographic lacked many options for primary health care services other than the emergency department.

Patients residing in counties in metro areas of 250,000-999,999 population exhibited higher primary care-related emergency department use rates, which was classified as an urban area. Although Kentucky was more rural in terms of geography, the relationship between primary care-related emergency department use and individuals residing in urban counties with

ample population was consistent with the fact that Kentucky had approximately five metro areas with higher population rates when compared to the population rates in rural areas. This resulted in increased use due to limited access to primary care health services and other preventive health care resources due to barriers such as transportation and primary care health professional shortages within the metro and urban communities.

Primary care-related emergency department use based on insurance status, insurance type, and income differed in important ways. Uninsured patients were at higher risk of utilizing the emergency department for primary care-related health needs. This finding is not consistent with the current body of research that demonstrated a higher risk among the insured population. However, given the time frame of the data and the demographics unique to Kentucky, this finding was consistent with the notion that the uninsured have a greater likelihood of using the emergency department for primary care-related health needs. In this study, uninsured patients were roughly 1.4 times more likely to use the emergency department for primary care-related health needs than insured patients. This finding seems to be related to the fact Kentucky ranks fourth out of the top 10 states with the highest poverty rate. Approximately 18.5% of Kentuckians live below the poverty line. Thus, individuals who fall into this demographic likely do not have the resources to purchase health insurance and access primary care health services in the appropriate setting. Consistent with the Kentucky poverty rate, this study found that patients with Medicaid exhibited higher risk of primary care-related emergency department use when compared to any other insurance type. Nearly 22% of the total population in Kentucky were covered by Medicaid, which aligns with the finding that Medicaid patients were approximately 1.3 times more likely to use the emergency department for primary care-related health needs. Kentucky ranks 45th in overall health status in the United States, and approximately 23% of the

population lives in a primary care health professional shortage area, which limits access to vital preventive health services that could improve overall health status. The findings for primary care-related emergency department use by income are like the findings for insurance status and insurance type. In this study, patients who had the lowest income level (1st Quartile) exhibited greater risk of primary care-related emergency department use. Of the 4.4 million people who live in Kentucky, nearly 40% are considered low income, which is an income level less than 200% of the federal poverty level. Thus, insurance status, insurance type, and income level were significant predictors of emergency department use for primary care-related health needs in Kentucky.

Primary care-related emergency department use by age, gender, and race also differed in meaningful ways. Age was found to be a significant predictor of primary care-related emergency department use. Older patients had a lower risk of utilizing the emergency department for primary care-related health needs. The average median age of individuals who engaged in primary care-related emergency department use was 41 years old, which was relatively in line with the median age of 38.8 for the state of Kentucky. Gender was also a significant predictor of use. However, this study deviated from the expectation that men would be more likely to use the emergency department for primary care-related health needs. Women were 1.8 times more likely to use the emergency department for primary care-related health needs. As a standard, women are more likely to visit a doctor for health needs, so given the unique access barriers inherent to Kentucky, the emergency department might have been the only viable care option. Men tend to defer care, which could explain the lower level of risk in comparison to females. This finding was interesting because even though the male to female population ratio was approximately 50/50, the emergency department use rate for both primary care-related and non-primary care-

related health was approximately 56% for women versus 44% for men. Finally, the race demographic in Kentucky was predominantly White (88.0%). Despite this overwhelming percentage, Black patients were found to be at higher risk for primary care-related emergency department use. Black patients represented 8.3% of the total population. It is important to note that the reference group for this variable was Asian or Pacific Islander, which represented 0.1% of the Kentucky population. In addition, Hispanic patients exhibited greater risk for primary care-related emergency department use even though the population rate was 3.5% of the total population. Thus, Black and Hispanic patients were more likely to use the emergency department for primary care-related health needs despite having low population rates. This finding supported the literature and hints at greater health disparities and inequities among minority race patients due to a general lack of available health care resources, especially when accounting for income and other socioeconomic factors.

Area of residence was a significant predictor of primary care-related emergency department use. The urban counties in metro areas of 250,000-999,999 population exhibited greater risk of primary care-related emergency department use. Although this finding did not support the research hypothesis regarding the increased likelihood of primary care-related emergency department use by patients living in rural areas, there were important factors to note. Approximately half (49%) of Kentuckians lived in rural areas, which far surpassed the national average of 19%. While patients living in urban areas had an odds ratio of 1.2, patients living in rural areas (noncore) had an odds ratio of 1.1 respectively. The odds ratio for both urban and rural primary care-related emergency department use were not overwhelmingly different, which could be attributable to the underestimation of the prevalence of patients who were unable to access primary health care services in general. When patients defer much needed preventive

care, it can result in chronic disease, development of comorbidities, and increased mortality risk, which does not support the focus of health reform in the United States. The shift to a value-based care delivery model is accompanied by difficult barriers because it requires a multi-disciplinarian change in behavior as the focus shifts to improving care quality and bettering patient health outcomes, which carries the potential to reduce the total percentage of the at-risk population that is responsible for increasing the total cost care.

Predictive Model Results. The enactment of the ACA prompted a paradigm shift within the United States health care delivery model. Health reform has incurred substantial changes, but a large focus was placed on population health, which is defined as the health outcomes of a group of individuals, including the distribution of such outcomes within the group. Predictive modeling is a tool that practitioners can use to support a successful population health approach to care delivery. It is the application of mathematical models to predict an outcome. For example, predictive modeling can be used to identify the potential cost associated with managing a specific patient population like individuals with uncontrolled diabetes. Predictive modeling can be used to stratify at-risk patients to develop targeted interventions that generate an acceptable return on investment. For this study, a predictive model was built to identify future utilization of emergency department resources based on past patterns of use with the ultimate intent of developing interventions that address unmet medical needs.

A logistic model was built from this data and tested for accuracy to determine both the feasibility and significance of being able to produce accurate predictions regarding emergency department use type solely based on socioeconomic factors. The data was split at random into a training/test set. The training set was used to build the model, and the test set was used to expose the model to data that had never been run through the model (test dataset) to assess performance.

Figure 11 is a confusion matrix, which was used to measure the performance of the model on the test dataset to determine how the model would likely perform in the real world. Since this study utilized a logistic regression approach, the output after some conversion for this model performance was a probability of a patient utilizing the emergency department in a primary care-related manner. The decision boundary can be adjusted to reflect at what probability does the model determine that a patient will be likely to use the emergency department in a primary care related manner to hone in on the best performance level.

		Predicted	
		Non Primary Use	Primary Use
Actual	Non Primary Use	1516189	4186436
	Primary Use	875597	3821910

Accuracy	51.33%
Misclassification Rate	48.67%
Recall	81.36%
Precision	47.72%

Figure 11. Decision boundary set at 60% predicted probability of primary care-related.

The model in Figure 11 used a decision boundary at 60% probability, which means that probabilities greater than 60% are flagged as predicting a patient will use the emergency department for primary care-related health needs. Accuracy measures how often the model is correct, but it is important to note that this is not always the main focal point of a predictive model because the focus may be more geared towards capturing positive hits instead of overall accuracy. The Misclassification Rate measures how often the model is wrong. Recall measures when the outcome is *yes* and how often the researcher predicts *yes*. Precision measures when the researcher predicts *yes* and how often the real outcome is *yes*. In the above listed model, the

accuracy was slightly above 50%, which was better than chance. More importantly, the high recall rate means that this model can detect when the outcome is truly yes, which means it is primary care-related. There is a similar trade off with the precision metric. Figure 12 shows the model results with the decision boundary adjusted to 62% probability.

		Predicted	
		Non Primary Use	Primary Use
Actual	Non Primary Use	4192930	1509695
	Primary Use	3040449	1657058

Accuracy	56.25%
Misclassification Rate	43.75%
Recall	35.28%
Precision	52.33%

Figure 12. Decision boundary set at 62% predicted probability of primary care-related.

The 2% probability increase resulted in an increase in overall accuracy, but it lowered the recall. However, it raised the precision of the model in this decision boundary. Overall, each of these outcomes demonstrated that while the model was not great in overall performance, it did offer the ability to determine the outcome better than chance. More specifically, the model can generate a good recall and precision rate with the correct boundary. By simply using socioeconomic factors, the model can predict how a patient will utilize the emergency department better than a guess. Thus, the purpose of the model is to assess if one can accurately predict the type of emergency department use a patient will have based on the captured factors, which demonstrates overall significance. This also provides a model that can be used to input data to predict the likelihood of inappropriate use based on the factors captured around the

patient (i.e., a white male, with commercial insurance, living in an area with a median household income in the 2nd quartile has a 42% probability of inappropriate use).

Heat Map Results. The phenomenon of unmet health needs across the country continues to be a focal point for policy makers, administrators, and health care practitioners. There is limited capacity to provide primary care and preventive health care services, which results in an increase in primary care-related emergency department use. Moreover, the demand for non-urgent health care services has risen since the enactment of the ACA, which creates a charge for leaders within communities to address local needs for primary care based on geographical inequities and disparities. In 1997, the Institute of Medicine formed a committee to draft a set of indicators that monitored community health improvement efforts. This initiative was supported by the U.S. Department of Health and Human Services and the Robert Wood Johnson Foundation. The committee produced a tool (GIS) that has proved useful to local policy makers that has helped provide actionable insights despite the rapidly shifting health care landscape. This tool provides insights that allow leaders to determine current health status of the population with the intent to establish goals that aim to improve health outcomes and address health disparities. GIS, which are also referred to as heat maps, is extensively used in health services use research because it is a beneficial supplement to tabulated population statistics in determining where to invest health resources. GIS was used to create heat maps that illustrate primary care-related emergency department use to highlight primary care health disparities in Kentucky.

Figure 13 shows primary care-related emergency department use as a proportion of overall use by zip to show differences in use between urban and rural areas. It also exhibited overall primary care-related emergency department use for the 2008-2015 period. As evidenced

by Heat Map 1, the rural areas of Kentucky had higher primary care-related emergency department use rates than the urban areas.

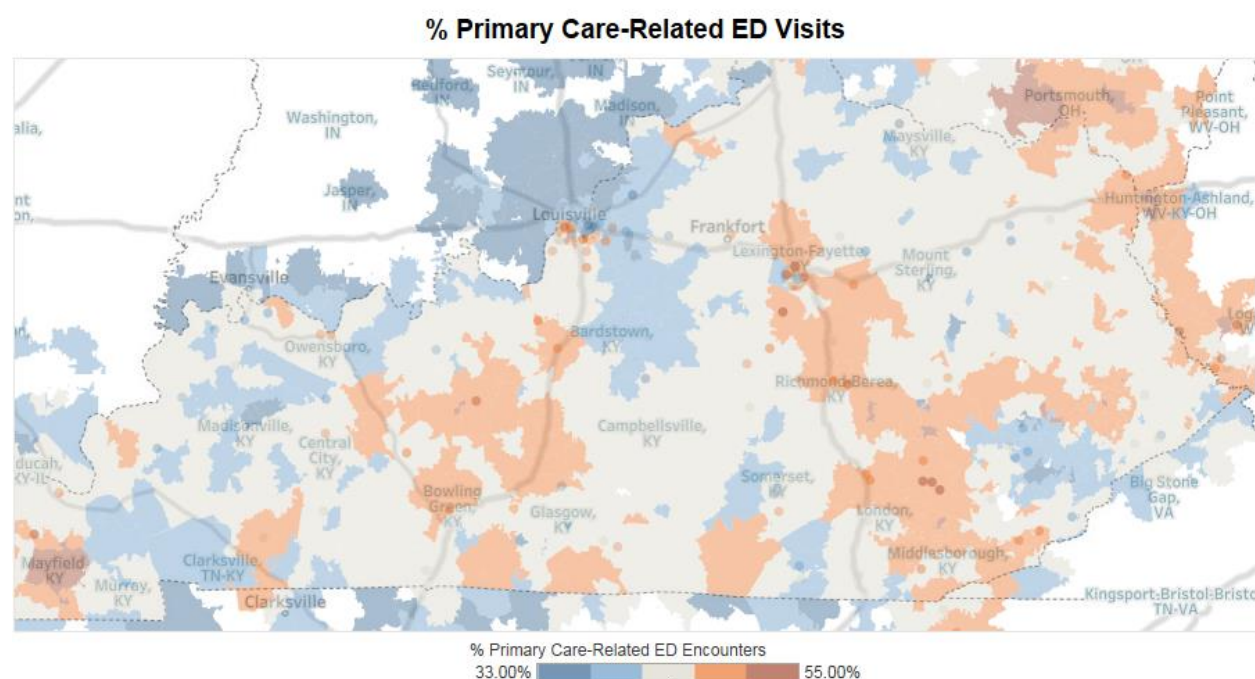


Figure 13. Heat Map 1 – Percentage of primary care-related emergency department visits.

Figure 14 shows primary care-related emergency department use as a proportion of overall use by median household income to show differences in use between lower and higher income areas. It also illustrated 2018 per capita as a proxy for that same period. When Heat Map 2 was compared against Heat Map 1, it demonstrated that higher rates of primary care-related emergency department use were accompanied by lower per capita income rates. The following rural regions in Kentucky had higher percentage of primary care-related emergency departments encounters and lower per capita income rates in comparison to urban areas with higher per capita income rates: Clarksville (East); Bowling Green (North); Lexington-Fayette (Central); Richmond-Berea; London; and Middlesborough.

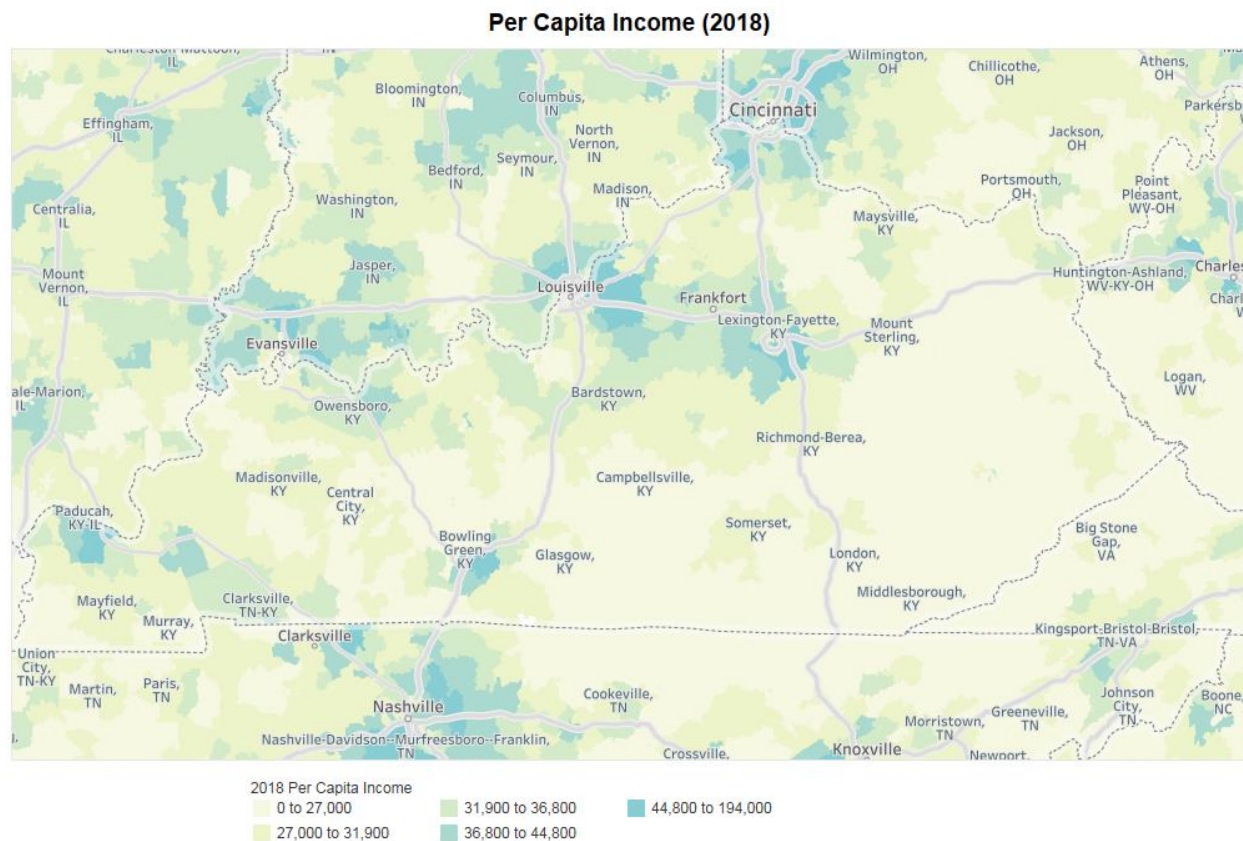


Figure 14. Heat map 2 – per capita income.

These findings seem to be related to severe primary health care professional shortages and other socioeconomic barriers in these areas. Unfortunately, the heat maps for this study were presented at a macro level view based on the HCUP Data Use Agreement, which prohibited reporting by zip code to protect the identity of individual hospitals/institutions in the rural areas. However, the heat maps produced by this study provided useful information through the geographic representation of health disparities and inequities across the state of Kentucky.

Recommendations

Based on this study, the regression model and ED Algorithm appear to have validity as an indicator of access problems to primary health care services. This study provides evidence that both community and individual level factors are influential in driving use of the emergency

department for primary care-related health needs. The findings of this study highlighted a key knowledge gap that requires further research.

Rural areas had less emergency department use for primary care-related health needs, which might suggest general health care availability and access issues in more isolated, rural areas. Ultimately, less primary care-related emergency department use in rural areas does not mean that the need is less than the need found in urban areas. Lower primary care-related emergency department use rates might suggest that patients residing in rural areas have uncontrolled health conditions with comorbidities from a lack of preventive care. A detailed examination of both outpatient and inpatient use in these rural areas would help provide a better understanding regarding access and availability issues. Moreover, low income, rural areas tend to be more at risk for a lack of preventive health care resources, including fewer physicians per capita. A future study could link the Kentucky State Inpatient Database with the Kentucky State Emergency Department Database to identify patients who were admitted to the hospital due to a complication of an underlying chronic condition. A more comprehensive understanding of primary care-related emergency department use in rural areas requires further study to inform public health planning and direct primary care interventions to the most at-risk populations. This study provided support for future studies regarding the use of a multilevel approach that helps researchers and practitioners better understand how both individual and community level factors influence health outcomes and the utilization of primary health care services.

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