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WILLINGNESS-TO-PAY FOR ATTRIBUTES OF HEALTH CARE FACILITIES IN
RURAL KENTUCKY

THESIS

A thesis submitted in partial fulfillment of the requirements for the
degree of Master of Science in the College of Agriculture, Food and
Environment at the University of Kentucky

By

Emmanuel Owusu-Amankwah

Lexington, Kentucky

Director: Dr. Alison Davis, Professor of Agricultural Economics

Lexington, Kentucky

2018

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ABSTRACT OF THESIS

WILLINGNESS-TO-PAY FOR ATTRIBUTES OF HEALTH CARE FACILITIES IN RURAL KENTUCKY

Background: As rural hospitals in Kentucky face insolvency, stakeholders must assess the value of rural hospitals as well as alternatives such as rural clinics and private physician offices.

Objective: To identify the value of attributes of healthcare facilities based on Kentucky's rural residents' willingness-to-pay (WTP).

Methods: A survey instrument was created and distributed to ten counties in rural Kentucky. A conditional logit model was used to obtain baseline values and then a mixed logit model was used to address heterogeneity among consumers in estimating WTP. WTP values incorporated respondents' demographic characteristics and their health status from self-reported frequency of use of medical services and distance from these services.

Results: The results indicate that on average respondents were willing to pay \$69.90 each year for the attribute of a facility that treats patients whether they have health insurance or not, compared to a facility that only accepts patients with private health insurance. Uninsured residents were willing to pay \$81.15 for this attribute level.

Conclusion: The study suggests that uninsured residents value this attribute level of a facility that grants them access to care. Stakeholders may justify such welfare benefit amounts in support of the establishment or maintenance of such a facility.

KEYWORDS: Willingness to Pay, Mixed Logit, Choice Experiment, Rural Health, Rural Kentucky

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January 19th 2018

WILLINGNESS-TO-PAY FOR ATTRIBUTES OF HEALTH CARE FACILITIES IN
RURAL KENTUCKY

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Chapter 1: Introduction

1.1 Background

Over the last twenty years, the number of hospitals in rural America has decreased due to various kinds of financial pressure (Ricketts, 2000). In response to these financial constraints, some hospitals have shut down, and others have reduced the number of employees, hours, or closed certain departments (Ricketts, 2000). In rural Kentucky, there is a similar financial pressure facing hospitals due to reduced public and private funding (Davis, 2012). However, to meet healthcare needs of the population, there are alternatives to rural hospitals; such as, rural health centers and private physician offices. Communities must, therefore, decide how to allocate their scarce resources and funding to meet their healthcare needs. Hence, community and healthcare leaders would be able to better choose the optimal mix of healthcare provision if they knew how residents value the different attributes of various types of health care facilities.

Demand for healthcare differs from demand for other market goods because most consumers require some form of healthcare at some point in their lives without which they could lose their lives or suffer significant reduction in quality of life (Phelps, 2017). The need to use healthcare is more compelling service than other services which have different standards between rural and urban areas, such as education or transportation, because the outcome for using or not using healthcare services involves more than just economic wellbeing (Anderson et. al., 2015; Lenardson et. al., 2009; Skillman et. al, 2010). Healthcare provides significant benefits to consumers and the economy as a whole; for example, a healthier workforce leads to higher productivity of individuals and substantial marginal productivity to the economy. Healthcare services can however be expensive and

consumers have little choice but to use these services when they are essential and often costlier than if healthcare had been accessed earlier by the patient. Therefore, a large portion of tax revenue is spent on the health of a nation's residents (Phelps, 2017). These higher costs burden both the hospital and taxpayers who fund government programs like Medicaid and Medicare. As a result, hospitals are often undercompensated for care resulting in financial insolvency.

Healthcare spending in the United States grew by 5.8% in 2015 reaching \$3.2 trillion in 2015; approximately \$9,990 per person (Centers for Medicare and Medicaid Services, 2016). As a share of gross domestic product (GDP), spending on healthcare accounted for 17.8% in 2015 (Lorenzoni et al., 2014). It is estimated that it will be unsustainable for the United States economy to be spending beyond 20% of GDP (Centers for Medicare and Medicaid Services, 2016). In 1991, aggregate spending on medical care in the United States was about \$750 billion (Phelps, 1992). In 2011, only twenty years later, national health care spending reached \$2.7 trillion with a growth rate of 3.9% (Centers for Medicare and Medicaid Services, 2016). Per capita national healthcare spending was \$8045 in 2014 (CMS, 2016); in Kentucky, per capita spending on healthcare in 2014 from all payers was \$8004 (Kaiser Family Foundation, 2014). These expenditures are triple the organization for economic cooperation and development (OECD) average in 2015 of \$3,207, and double the expenditures in comparable income countries as Germany, Switzerland and Britain yet produce similar health outcomes (Lorenzoni et al., 2014). For these reasons, it is important to obtain realistic estimates when conducting valuation studies in the healthcare industry to be able to validate the need for such expenditures. This study seeks to examine the value of attributes of healthcare facilities and services to rural residents of Kentucky using a

willingness-to-pay as a method. The estimates of value can assist decision-makers, in both the private and public sector, to make optimal decisions in providing healthcare services to rural residents while balancing healthcare costs with benefits.

1.1.1 Description of Study Area

This section presents the typical facilities that rural residents utilize which are hospitals, rural clinics and private physician offices as well as their attributes. There are 125 hospitals in Kentucky of which 100 are community hospitals (Rural Health Information Hub, 2016). 69 of these community hospitals are located in rural areas and 29 of them are designated as Critical Access Hospitals (CAH) (Davis, 2012). The CAH designation program was created by the Medicare Rural Hospital Flexibility Program to enhance financial viability of rural hospitals by providing cost-based payments for care mostly through Medicaid and Medicare. To be eligible, a hospital must have applied for a critical access designation and must:

- i. be located in a rural area,
- ii. be at least 35 miles from another hospital or classified as a necessary provider,
- iii. have a maximum of 25 beds,
- iv. provide 24-hour emergency services and agree to have at least one physician on site or on-call with at least one registered nurse on-site 24 hours a day, and
- v. maintain at most an average of 96-hour length of stay for acute-care patients and have an agreement with an acute care hospital for patient referrals and transfers (Ona & Davis, 2011).

Clinics that receive federal funding to provide care to underserved areas across the United States can be designated as rural health clinics (RHC) or federally qualified health centers (FQHC). RHC is a clinic that is sited in a rural health care shortage area for which reason can receive further Medicare and Medicaid reimbursement to increase patient access to primary care services for underserved rural populations. To get further reimbursement, a RHC must offer primary care on an outpatient basis, basic laboratory services and be staffed at least half of the time by a mid-level practitioner such as a physician assistant, nurse practitioner or a certified nurse midwife (Rural Health Information Hub, 2016). The other type of facility that can provide clinical services and receive further Medicare and Medicaid reimbursement is a federally qualified health center (FQHC). A FQHC provides medical, dental, mental health and pharmacy services that are covered by Medicare, enhanced Medicaid reimbursements and are mandated to offer sliding fees based on patient income. RHCs are only designated for and sited in rural areas but FQHCs are a safety net in both rural and urban areas and may include a community health center and other programs for public housing, Native Americans, migrants, or home transient people (Rural Health Information Hub, 2016).

The third type of facility whose attributes are considered in this study are private practices. In Kentucky, private physicians make up more than half of practicing physicians and are often found in rural areas (Davis, 2013). Nurse practitioners or physician assistants may also staff private practices which are open during typical working hours, utilize little diagnostic technology and offer no emergency services but can provide primary health care. This is especially in anticipation of increased need for primary care providers due to the implementation of the Affordable Care Act. Hence, the private practice facility in this

study may have either a physician, physician assistant or nurse practitioner as the sole provider available to see patients.

Another term that needs a definition due to its prevalence across rural Kentucky is health profession shortage areas (HPSA). A HPSA is a shortage of health professionals designated for three years by the Secretary of the Department of Health and Human Services within the Health Resources Services Administration's Office of Shortage Designation criteria in the following areas – an urban or rural area, a population or a public or nonprofit private medical facility (Department of Health and Human Services, 2014). There are also several Medically Underserved Areas (MUA) or Medically Underserved Population (MUP) designations in Kentucky. A MUA refers to groups of census tracts with a high population-to-provider ratio that reflects a shortage. A MUP refers to groups of people who have economic, linguistic or cultural barriers to receiving health care by residing in a given locality or geographic area (Rural Health Information Center, 2016).

A federal MUA/MUP designation can help an area qualify for state, local and federal funding programs which are meant to increase health services to such marginalized populations through Critical Access Hospitals, (CAH), Federally Qualified Health Centers (FQHC), Rural Health Clinics (RHC), and J-1 visa waivers for foreign skilled labor (US Dept. Health and Human Services, 2014).

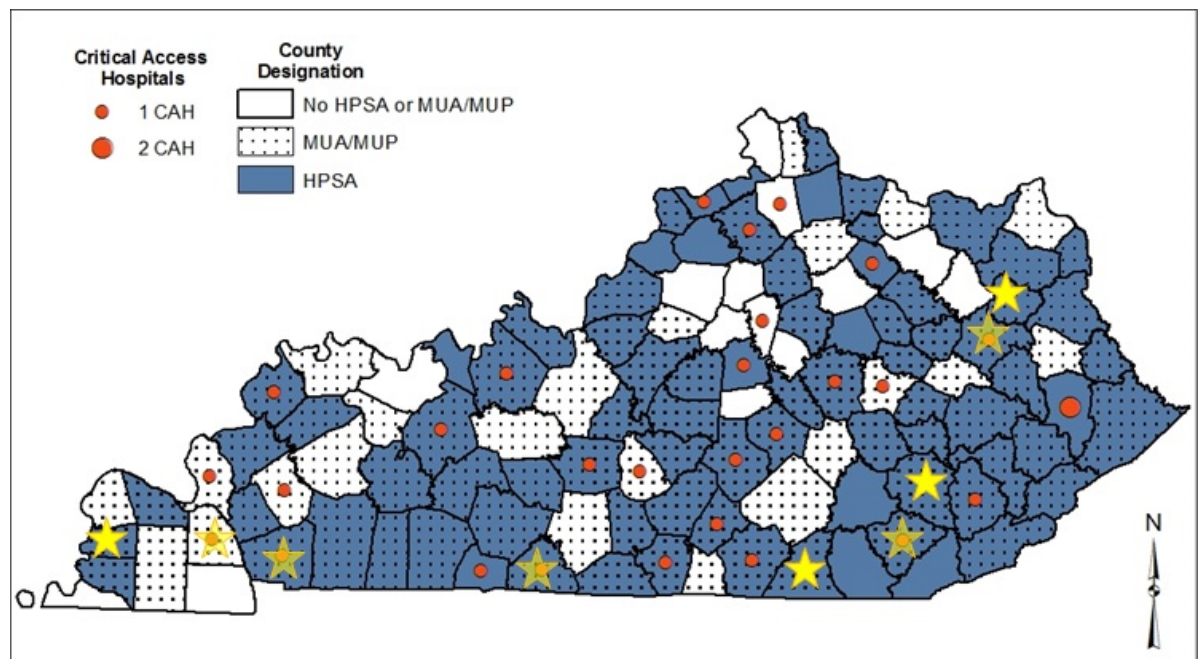
Each state has a slightly different definition for “necessary provider”. In Kentucky, the definition of a necessary provider is a hospital that must meet at least one of the following criteria:

- i. Located in a county where the percentage of the population with income less than 200 percent of poverty is greater than the state average;
- ii. Located in a county that has an unemployment rate higher than the state average unemployment rate;
- iii. Located in a county with a greater number of people age sixty-four (64) or older than the state average;
- iv. Treat on average a higher than average percentage of Medicare patients; and
- v. Treat on average a higher than average percentage of Medicaid patients (Rural Health Information Center, 2016).

In 2008, there were 30 CAHs in Kentucky and they were the necessary providers in their vicinity for the surrounding populations. In all these areas, the CAH was the only hospital in the county, except for Floyd County, which had three hospitals, of which two were designated licensed CAHs (Ona and Davis, 2011). Currently, there are only 29 CAHs in Kentucky over a state population of 4.4 million and across the country there are 1,326 certified Critical Access Hospitals as of June 30, 2014 for a population of 311 million (Rural Health Information Hub, 2016).

Figure 1 below shows the MUA/P and HPSA designations across Kentucky, and all CAHs. The yellow stars indicate the 10 counties that the surveys were sent to which were largely in Eastern, Southern and Western Kentucky. These rural areas have relative poverty, high levels of prescription drug abuse and other illicit drug use, a depressed economy, poor educational attainment and poor health outcomes with a high medical burden of lung cancer, diabetes and cardiovascular disease diagnoses (Schoenberg, et al. 2008).

The study was focused on the region shown in the figure below in 10 counties in various regions of Kentucky depicted in figure 1, giving a distribution of areas with and without CAH, MUA/P and HPSA designations to obtain a sample of respondents' willingness-to-pay values that would be a representative sample and reflective of the rural population of Kentucky. The 10 counties, in alphabetical order are Allen, Carlisle, Clay, Elliott, Estill, Leslie, Marshall, McCreary, Morgan, and Trigg.



Source: Map generated by Tom Sikora of CEDIK in ArcGIS software using 2013 data from Health Resources and Services Administration, 2013

Figure 1-1 HPSA, MUA/MUP and CAH designations in Kentucky

1.2 Purpose of the Study

Due to reduced public funding for hospitals from Medicare and Medicaid reimbursement rates, and insufficient payments from uninsured or underinsured patients largely using public insurance in rural areas, many rural hospitals cannot afford to operate and are in danger of being shut down (Ricketts, 2000). In response to this situation, the

Kentucky Hospitals Association in contracted with the Community and Economic Development Initiative of Kentucky (CEDIK) at the University of Kentucky, to complete a study to determine how much residents in rural Kentucky value attributes of services and facilities based on their socioeconomic and health status and needs. The findings of this study can help with planning healthcare facility provision at the hospital, local, state and federal levels. Knowing residents' value for various attributes of healthcare facilities, decision-makers can justify expenditures and additional funding needed to bridge deficits in revenue to these facilities to support rural health care provision.

1.3 Importance of the study

This study is important because it highlights the value of the services hospitals provide which, in their absence, other facilities likely could not offer such as an emergency departments and 24-hour, 7 day a week care. Therefore, the study was conducted to identify the value of specific attributes associated with healthcare facilities to Kentucky's rural residents based on their willingness-to-pay for specific attributes of a healthcare facility.

1.4 Research questions and objectives

This study addresses three main questions. First, which types of healthcare facilities are most valuable in rural parts of Kentucky? Second, what aspect or attribute of these healthcare facilities are most valuable? Third, compared to the average consumer, what is the difference in value for these attributes for individuals or households when considering different individual or household characteristics and needs? In consideration of these questions, the dual objectives of this thesis are:

Objective 1: To quantify consumers' willingness-to-pay for certain amenities of health care facilities.

Objective 2: To observe heterogeneity between individuals and determine the impact of the demographic and other non-facility specific factors on consumers' willingness-to-pay for given attributes of health care facilities.

1.5 Hypotheses

Rosenstock (1966) and Andersen (1995) discuss determinants of health behavior and utilization of healthcare services, such as health status and demographic characteristics. Considering household health needs, insurance coverage and financial constraints of rural residents. This study assesses these hypotheses for residents' willingness to pay for attributes healthcare facilities;

1. Uninsured residents will be willing to pay for a facility which treats patients with no health insurance compared to a facility that only accepts residents with private health insurance.
2. Households with children will be willing to pay for a facility that is open 24 hours a day, 7 days a week compared to a facility open from 9am to 7pm, 5 days a week; and also willing to pay for a facility to have an emergency department compared to a facility without an emergency department.
3. Higher income households (\$100,000 and above) will be willing to pay for a facility with full diagnostic services versus a facility with only X-ray services.

4. Individuals in poorer health, characterized as one who has used emergency care in the past 2 years, will be willing to pay for a facility with an emergency department compared to a facility without an ED
5. Households that live farther away from emergency care will be willing to pay for a facility with an ED compared to a facility without an ED.
6. Households who prefer their provider to accept individuals without health insurance will be willing to pay for a facility that accepts all patients (whether they have health insurance coverage or not), compared to a facility that only accepts patients with private insurance.

1.6 Thesis structure

Chapter 1 of this thesis provides an overview of the financial pressures faced by hospitals in rural Kentucky and the need to quantify the value and benefit of attributes of healthcare facilities to rural residents in the face of increasing costs. Chapter 2 reviews the literature on willingness-to-pay theory and demographic factors that affect access to healthcare. Chapter 3 presents the theoretical framework and empirical model used in this paper. Chapter 4 describes region of study and the research methodology used; Chapter 5 describes the survey instrument, data collection and a description of the data. The results and discussion of the healthcare facility choice experiment are presented in Chapter 6, and Chapter 7 presents the conclusions, implications, limitations and recommendations of this paper.

Chapter 2: Literature Review

2.1 Rural healthcare provision

There are several reasons why the provision of healthcare is difficult and costly in rural areas. Three such reasons for the relative higher cost are: 1) reduced public expenditure, 2) fewer consumers and practitioners, and 3) reduced health insurance coverage. For these reasons, valuation studies are warranted to establish value and justify the higher cost of providing care in rural as compared to urban areas.

1) Reduced public expenditure

In rural areas, healthcare access is even more of an acute issue than in urban areas because of severely limited public and private funding (Douthit et. al, 2015). Public funding is allocated on a per capita basis, so with fewer residents, rural areas have smaller expenditure allocations. As a result, there are reduced expenditures on facilities and their services in rural areas compared to urban areas, which leads to increased out-of-pocket expenditures for patients for similar services obtained locally or in traveling to well-equipped facilities or to specialty services (Lee et. al, 2014; Archana et. al; 2014). To make up for the comparative shortfall in public spending, rural residents have to compensate with increased out-of-pocket payments compared to urban residents. In 2003, median total health care expenditures for the rural population were \$434, which is slightly higher than that for the urban population at \$418. Rural residents pay a larger proportion of their health care costs out of pocket, about 29%, compared to urban residents who pay about 23% of their healthcare expenditures out of pocket (Health Policy Institute, 2014). Almost a decade later in 2011, reported spending on health care is \$3,426 for rural households compared to

\$3,303 for urban households. Rural households tend to spend more on medications and urban households tend to spend more on emergency care but total expenditures were not significantly different. Rural households spent a slightly larger portion of their household total expenditures, though not statistically significant, on health care compared to other expenses and reported spending up to 32% more on prescription and nonprescription drugs, including vitamins, than urban households (Lee et al., 2014)

2) Fewer consumers and practitioners

There are fewer consumers of healthcare amenities, fewer support sites, fewer specialists and related professionals, and a less professionally competitive atmosphere in rural areas compared to urban areas. These factors make providers less eager to situate their businesses in rural areas, as there may not be a suitable density of patients for that establishment to be profitable. Approximately 20 to 25 percent of the United States population, or up to 65 million, resides in rural areas (Health Policy Institute, 2014). Of approximately 65 million rural residents in 2010, about 5 million lived in healthcare professional shortage areas (HPSA) (O'Toole, 2011). An HPSA is defined as a county with less than 33 primary care physicians for every 100,000 residents. In rural areas, the patient-to-primary care physician ratio is an average of 39.8 physicians per 100,000 people, compared to 53.3 physicians per 100,000 in urban areas (Hing and Hsiao, 2012). In fact, less than 11 percent of physicians in the U.S. practice in rural areas (Health Policy Institute, 2014). From the practitioners' perspective, compared to urban areas, there are fewer opportunities to specialize in a challenging field, earn a lucrative salary, enjoy a variety of recreational events or access prestigious schools for their children in rural areas. There are also fewer opportunities to pursue ambitions, or become highly esteemed and recognized

by one's peers in rural areas; yet recognition, prestige and ambition rank highly among many providers' goals (Robinson and Guidry, 2001; Wellever, 2004).

3) Reduced health insurance coverage

In rural areas, consumers of healthcare rely heavily on public insurance such as Medicaid and Medicare (Douthit, 2015). In some instances, patients will have no insurance coverage and will have to pay out of pocket for services. In other instances, after provision of the needed care, lower income individuals may not be able to afford to pay or be willing to pay the entire costs for their care. Thus, hospitals do not receive appropriate compensation for their services. Financing for rural health care facilities is even more limited (Zimmerman, 2004) than funding for urban counterparts due to reasons such as insufficient critical mass of consumers, prevalence of particular health needs (Wallace, 2004; Robinson, 2004), and unfavorable population-to-service ratio or population-to-practitioner ratio (Robinson, 2004). Furthermore, with large disparities in health insurance coverage between rural and urban localities, ability to pay for health care is further constrained in rural areas, as residents seldom purchase the limited and expensive private health insurance policies when limited healthcare services are available in their region (Hummer 2004).

Health insurance in the United States is largely tied to employment or groups where the insured persons can be pooled to reduce costs. Individuals in rural areas are less likely than their urban counterparts to have access to coverage through a job; 51% of the rural population had employer-sponsored insurance in 2013, compared to 57% of the urban population (Newkirk and Damico, 2014). The Patient Protection and Affordable Care Act (ACA) passed in 2010 was intended to reduce the number uninsured individuals and

possibly reduce the cost of health insurance to individuals as costs are higher when insurance risk pools are smaller (Douthit et al, 2015). Before the ACA was implemented, the rural population was covered more by Medicaid (21%) or other public insurance (4%) than the urban population (16% Medicaid, 3% other public insurance) (State Health Access Data Assistance Center, 2013). There were similar rates of insurance coverage between rural and urban areas before the ACA because Medicaid covered those left out of employer-sponsored insurance in rural areas (Newkirk and Damico, 2014).

The ACA employed Medicaid expansion for individuals with incomes up to 138% of the federal poverty level; and tax credits for moderate income families (100% to 400% of federal poverty level) to obtain insurance in the health insurance marketplaces. Among the rural uninsured population, 75% fall into the income range for these provisions for coverage (State Health Access Data Assistance Center, 2013). Twenty-four states in 2013 chose not to expand Medicaid as this was optional for states; in these states, many low income and uninsured individuals face a coverage gap in which their incomes put them above Medicaid eligibility levels but below eligibility levels for tax credits so they will not receive assistance and may not be able to afford health insurance. (Newkirk and Damico, 2014). Two-thirds of the rural uninsured individuals in America live in states that are currently not participating in Medicaid expansion, hence about 15% of these rural uninsured (more than 1 million individuals) will fall into the coverage gap compared to 9% of the uninsured in urban areas (State Health Access Data Assistance Center, 2013). In Kentucky, half of the 640,000 uninsured individuals will have access to health insurance due to Medicaid expansion yet about 206,000 individuals still fall in the coverage gap (Cabinet for Health and Family Services, 2013). Medicaid expansion in Kentucky favors

hospitals as \$287.5 million over fiscal years 2014 to 2021 for indigent care was cut by ACA (Cabinet for Health and Family Services, 2013).

Douthit et al. (2015) review the literature published before and after ACA was implemented and report that significant differences in health care access between rural and urban areas still exist. Patients are still reluctant to seek care in rural areas due to cultural and financial constraints. They state that this reluctance and poorer access is explained by a shortage of trained physicians and services, nonexistent public transportation, and poor internet services. Even with the implementation of ACA, rural residents had poorer health and rural areas still have difficulty in attracting and retaining physicians, and maintaining health services up to the level of urban areas.

2.1.1 Rural resident willingness-to-pay for healthcare services

Healthcare facilities and services are limited in rural areas across the world; in rural Kentucky, the reality is no different. Rural Eastern and Western Kentucky have limited access to health care facilities (Davis, 2012; also see figure 1) and high rates of uninsured individuals can be found in Eastern and South-Central Kentucky (Davis, 2009). Presently, no studies have examined residents' willingness to pay for healthcare services, facilities or practitioners in Kentucky's rural counties other than the initial findings this study published in 2015 (Allen, et al., 2015). Furthermore, because hospitals in rural areas are in danger of shutting down due to financial constraints, this study may provide information on the value of residents of rural Kentucky to keep them open. Findings from this study may not only help public authorities know more about the healthcare preferences of their rural constituents and residents, but can further provide justification to aid in securing additional

necessary funding for the communities' health care needs in a landscape where healthcare spending is already at maximal levels.

The literature indicates that participants are willing to pay for health insurance schemes to increase their access to improved healthcare facilities based on their socio-demographics. The studies show willingness to pay in general for these facilities but do not break down what aspects of the facilities that respondents most value or are most willing to pay for. This study contributes to the literature on rural health care facilities in the United States by focusing on the consumer's perspective. It breaks down healthcare facilities into its attributes and estimates the attributes participants are willing to pay for and how much they are willing to pay for each of these. Other studies on this subject tend focus on the effects on a rural economy of a hospital closing down (Holmes et al., 2006), or on the impact of a hospital based health sector on the rural economy (Davis, 2013).

Allen et al. (2015), a previous paper published from this study, elicits rural consumers' willingness to pay for attributes of healthcare facilities in Kentucky. The authors use a conditional logit model to determine the willingness to pay value of health care facilities. However, the conditional logit model does not account for differences between different customers but assumes customers are homogenous or the same in their preferences or choices so does not account for heterogeneity between consumers. As a further contribution, using the same data set used in Allen et al. (2015), this paper will use the mixed logit model to account for heterogeneity between customers as an extension of the previously published work.

2.2 Theory for Consumer Willingness-To-Pay

Markets do not exist for non-market goods and services such as clean air and water, health and environmental amenities and, hence, their economic value, which is deciphered from how much people would be willing to pay for them, is not revealed in market prices (Alpizar et al. 2003, Johnston et al. 2015, Champ et al. 2003). According to Champ et al. (2003), observable market interactions are often used to decipher the marginal value of non-market goods. A requirement for the above means of valuation is that there be an identifiable link between the non-market good and some subset or attribute of the market good. Cases where individuals' values for certain nonmarket goods have no identifiable or estimable link to market goods are referred to as existence use. Consumers may value and hence be willing to pay for goods for its potential use or merely for its existence and believe in its inherent value hence a person's health has existence use and innate value (Haab & McConnell, 2002). A controversy with existence use values is that it cannot be monetized or inferred from market demand and supply data because its consumption for the most part does not generate observable behavior (Vincent et al., 1995). This is because a market does not exist for "health" so one cannot observe the value of health to individuals. The value of a state of health can be inferred from market-based transactions conducted to maintain, improve or recover a state of health. The use of healthcare services and facilities to maintain, improve or recover one's health provides a market-based means to assess individuals' willingness to pay for attributes of healthcare and hence access to healthcare.

2.2.1 Methods of WTP estimation

Two main methods have been developed to measure the economic value of non-market goods; namely, revealed preferences and stated preferences methods (Alpizar et al. 2003; Champ et al. 2003). Revealed preferences uses data from actions consumers have actually carried out in the past to determine their value, but stated preferences devise and use hypothetical scenarios which are administered through surveys to derive value to consumers (Alpizar et al. 2003). According to Champ et al. (2003) inferences from revealed actions are the preferred means of establishing value but since revealed preference methods cannot be used with existence use goods, stated preference methods such as contingent valuation using direct surveys and other attribute-based methods using indirect surveys are the viable alternatives for measuring existence use values.

Contingent valuation method in healthcare is an increasingly popular method used to elicit consumer's monetary valuations of health program benefits or health states (Diener, 1998). It is a hypothetical, survey-based method using direct questions. However, this method is subject various biases and errors on the validity and reliability of the results. Bayoumi (2004) discusses contingent valuation as a method in the field of health economics of eliciting individuals' valuations of health programs. He advises that bias can be limited by careful participants selection, the ways questions are posed, the ways individuals interpret probabilities and value gained compared to losses and the way in which missing or extreme responses are interpreted. He claims that contingent valuation studies should measure the potential influence of biases, the validity of the tests used to measure quality of life and the reliability and responsiveness of responses in order to help improve the future measurement of contingent valuation for applications.

Klose (1999), on the other hand, suggests that further research is needed before contingent valuation is used in health care decision making due to inherent biases in the elicitation methods typically used. Different elicitation methods make comparisons difficult across studies. He describes starting point bias where the first bid affects valuation significantly. Range bias sets in when the range of bids of payment cards affect valuation. Direct questions are found to be problematic. These are similar to the aforementioned biases in the way participants are selected, the ways questions are posed and the way participants are allowed to evaluate gains and losses.

When using a stated preference method, direct and indirect methods can be used (Adamowicz et al., 1994; Breidert et al., 2006). Direct consumer surveys, also referred to as contingent valuation, directly ask consumers their willingness-to-pay (Portney, 1994). Indirect methods used to infer willingness-to-pay include choice experiments (Morey et al., 2002), contingent rating (Álvarez-Farizo, 2001), contingent ranking (Merino-Castello, 2003) and pair-wise testing (Cameron et al. 2002).

Choice experiments, which this study uses, present scenarios and offers alternatives of bundles of attributes that have prices attached to correspond to those bundles in attributes. The respondent can then pick 'A', 'B' or neither option. Contingent ranking offers different scenarios and asks respondents to rank each of the options in a scenario on a given scale. Different options of attributes with varying availability are offered and respondents can rank the options in order of preference usually in descending order from most preferred to least preferred (Merino-Castello, 2003). Pair-wise comparisons are like choice experiments in how the scenarios are presented and the way respondents can choose

between the various options but a further step is that respondents must show how strongly they prefer their choice to the other options (Alpizar et al. 2003).

Choice experiments involve putting together a set of attributes, making hypothetical profiles offering different attribute level of these attributes with monetary value assigned to the profiles and then asking individuals to pick between two hypothetical scenarios so that an individual's utility can be derived for the attribute levels relative to a baseline attribute level (Breidert et al. 2006). The difference between modelling from choice experiments and contingent valuation with direct surveys is that choice experiments derives willingness-to-pay from sets of rankings of options presented to respondents, which the respondents select between without needing to assign monetary values (Pearce et al., 2002). This is easier for respondents as they do not need to assign direct monetary values whereas in contingent valuation or direct surveys, respondents directly assign their willingness-to-pay in monetary values to their stated choices (Pearce et al., 2002).

The stated preference method with a choice experiment using product attributes can lead to the willingness-to-pay values desired with some benefits over other methods described here (Carson, 2000). For example, stated preference options are less costly to implement than revealed preferences, as one consumer responds to several scenarios in one survey and grants multiple data observations in one encounter (Adamowicz et al. 1994). Secondly, stated preference methods are the best option for this study and allow the researcher to have more control of the parameters the respondent is exposed to. A limitation of stated preference methods is that they deviate from real life situations and may become too simplistic or unrealistic for the respondent; this is because the researcher restricts the attributes and attribute levels included in order to reduce the cognitive burden on the

respondent. The other major limitation is the effect of hypothetical bias where it is difficult to ascertain that the consumer would make those same decisions in real life situations that they make in the hypothetical scenarios compared to revealed preference methods where the consumers have already made their decisions in the past and one can therefore study their actual preferences (Bridges, 2002)

With a stated preference method such as discrete choice analysis, one can break down health care facilities into bundles of attributes for healthcare facilities (Forbis, 1981). When a healthcare facility, for example, is decomposed into its attributes, an individual is in a sense paying for the individual attributes they care for that make up that facility. The more of these desirable attributes one stands to benefit from, the higher the price premium that one is willing to pay for the sum total of the attributes making up the facility.

2.2.2 Factors affecting consumer WTP

It is observed in the literature that consumers' willingness-to-pay for goods in healthcare can be distilled into:

- i) The attributes of the healthcare facility (Champ et al., 2003),
- ii) The demographic characteristics of the consumers (Martin-Fernandez et al., 2010)
- iii) The health status of consumers (Asselin, 2005) and
- iv) The current access consumers have to care (Baji et al., 2012).

i) Healthcare facility attributes:

Consumer products can often be broken down into a mixture of their desirable attributes that consumers are willing to pay for (Champ et al, 2003). Many studies report WTP for

health facility attributes; one such attribute is the availability and level of diagnostic capabilities. Lin et al. (2013), uses a meta-analysis to discuss WTP studies for diagnostics technologies. The authors find 66 articles from the years 1985 to 2011 half of which looked at WTP for diagnostics in oncology and the remainder in infectious disease, gynecological care, laboratory tests including genetic testing and other imaging studies. The study indicates that patients are willing to pay up to \$100 for basic diagnostic screenings and up to \$500 for specialized diagnostics in endocrinology, neurology and oncology variety of diagnostic information as an attribute of a medical facility and such technology has been growing rapidly in recent years.

Another attribute of a facility that patients are willing to pay for, is access to a physician. Martin-Fernandez (2010) documents with payment cards and an ordered probit model that patients are willing to pay for access to a physician through physician visits in 4 urban and 2 rural health centers with upper and lower ends of the range in socioeconomic characteristics in Madrid, Spain.

Some services which involve seeing a specialist can be costly to utilize and prohibitive if one does not have health insurance. Such an attribute we consider in this study is oncology treatment as a form of specialty treatment in rural Kentucky. Lang, (2010) discusses how much a patient with lung cancer would be willing to pay out of pocket for cancer treatment through their WTP for a hypothetical new drug using a double-ended dichotomous choice model.

ii) Demographic characteristics:

The demographic characteristics of consumers such as age, income, gender, educational attainment and place of residence, just to mention a few, highly affect what those consumers purchase and how much they are willing to pay for them (Ahmad et al. 2010). Martin-Fernandez et al. (2010) documents that demographic characteristics such as age, income, education and area of resident affect WTP for access to a physician. Lin (2013) and Lang (2010) both emphasize how much demographic characteristics affect patient willingness to pay for types of diagnostic services and oncology services, respectively. Asselin (2005), describes the demographics of respondents that affect their WTP decisions for healthier nutritional intake. Aizuddin et al. (2012) reviewed published and unpublished works from 1990 to 2011 on willingness-to-pay and factors that influence WTP for healthcare services. Findings from many of the studies reviewed showed that factors such as age, education, income, dependency ratio, household size, perception, healthcare services quality, and locality – whether rural or urban and ability to pay could significantly influence willingness to pay values.

iii) Health status:

Consumers who are healthier on average will typically be less willing to pay for healthcare whereas those who are less healthy will be more willing to pay for better dietary and treatment options for their disease states. Bellhouse et al. (2010), for example depicts how consumers who are more concerned about high cholesterol were willing to pay a premium for reduced cholesterol pork as well as buy more of such a product indicating that health status affects a person's willingness-to-pay for a product. The authors controlled the results for income by including a measure for socioeconomic standing and recognized that

only a small proportion of the increase in purchases came from high end respondents living in a high-income region and from those who were prepared to pay a premium in price for low cholesterol pork. Ahmad et al. (2010) and Gil. et al. (2001) describe how respondents are willing to pay for organic food because of their perception that it has a positive effect on their health. Asselin (2005) also expounds on consumer characteristics that affect their willingness to pay such as their health status and their health behavior. Martin-Fernandez et al. (2010) documents that patients with poorer health states and hence greater need for care are willing to pay for access to primary healthcare services. This study will consider residents who have used emergency services in the prior 2 years to be have a poorer health status compared to those who are not because of the event that caused them to need emergency services and the aftermath of using emergency services.

iv) Current access to healthcare:

Access to healthcare can be vague and difficult to define especially for different segments of the population. However, the more access a consumer has to current care, the less they are generally willing to pay for better access to care, whereas the less current access an individual has, the more they will be willing to pay when all other factors are held constant and available income is considered (Banerjee et al. 2004). Distance from care is one way of measuring access to care and the longer the distance from care especially in rural areas, the more likely a resident is willing to pay for access to a healthcare service (Aizuddin, 2012). Consumers will often pay to increase their access to healthcare, sometimes through health insurance programs (Donfouet et al. 2011). Baji et al. (2012), show through regression analysis that in Hungary, access to health care, based on attributes such as waiting and travel time or distance from facility, although important, was less

important than the skills and reputation of the physician and the attitude of the personnel and the level of technology which were other factors considered in access to care. Such patients were willing to travel longer distances to access a more experienced or reputable practitioner.

With a contingent valuation method, Donfouet et al. (2011) show that 58.1% of rural households in rural Cameroun would pay higher than the average \$2.15 for the second bid, indicating that the rural poor aim to increase their access to healthcare and are willing to pay for it. This point matters greatly for rural populations where access to care is typically limited and incomes are typically lower compared to the national average (Banerjee et al. 2004). The uninsured often have less access to healthcare and this reduced access is correlated with cultural barriers (predominantly for immigrant and ethnic minority groups), income levels, and educational attainment and health outcomes (Becker, 2001). Although causation is often difficult to establish, education, income and health outcomes are related and thus a lower socioeconomic status reduces WTP as well as health outcomes and longer distances from medical facilities increase patients' WTP for access to primary medical care (Martin-Fernandez et al., 2010).

This study will examine the impact of some of these demographic factors – children in the household, distance from care, age, income, lack of health insurance coverage, and health status on willingness to pay for attributes of healthcare facilities and services in rural Kentucky.

Chapter 3: Theoretical Framework and Empirical Model

3.1 Random Utility Model

As mentioned in Chapter 2, the good or service that an individual consumes can be broken down into various attributes. Those attributes are what the individual pays for when he/she purchases that good or service. In other words, the benefit that an individual obtains from a good or service can be derived from the intrinsic attributes of the good or service and not solely from the whole good itself (Lancaster, 1966). This is Lancaster's theory of consumer demand, from which he depicts the utility that an individual derives with the Random Utility Model. The Random Utility Model is a mathematical relationship used to represent the indirect utility an individual obtains when that individual (represented by the letter i) chooses an alternative (represented by the letter j) in a choice set labelled as the t -th choice set which has attribute levels labelled as X_{ijt} as follows (McFadden 1974):

$$U_{ijt} = X_{ijt}\beta + \varepsilon_{jt} \quad \text{Equation (1)}$$

The individual will choose alternative j only if the utility he/she obtains from alternative j is higher than the utility derived from other available alternatives. In equation (1), β is a vector whose parameters are unknown but are estimated by this procedure. This is an additive linear function with a deterministic portion, $X_{ijt}\beta$, and a random term, ε_{jt} , that reflects the randomness of the error terms and so is described as stochastic. The assumption that this error term follows an *iid* extreme value type I distribution so that maximizing utility results in a conditional logit model from the choice probability of person i making the choice to pick alternative j in the t -th choice.

The choice probability in the form of the conditional logit model is;

$$P_{ijt} = \frac{\exp(X_{ijt}\beta)}{\sum_{k=1}^J \exp(X_{ikt}\beta)} \quad \text{Equation (2)}$$

The Maximum likelihood estimation of the conditional logit model results in estimators that are asymptotically efficient and normally-distributed when conducted under very general conditions (McFadden, 1974).

In addition to the attributes of the clinical facilities, respondents' demographic characteristics are also useful in determining the utility associated with given attributes and facilities. The contribution to the value or willingness-to-pay from respondents' unique characteristics can be differentiated from the contribution to due to attributes of the given facilities. Therefore, for further analysis, one can also create interaction terms between the demographic variables and attribute variables, and these interaction terms can be included within vector X_h (Colombo et al., 2007). With the inclusion of interaction variables, the conditional logit model cannot avoid the restrictive substitution pattern imposed by the IIA property inherent in the conditional logit model.

This is one of the two ways in which the conditional logit model is limited; 1) It cannot represent variation in tastes that are random, and 2) It is subject to restrictive substitution patterns of the Independence of Irrelevant Alternatives (IIA) assumption (Train, 2003). The IIA assumption is that the probability of the individual choosing between any pair of alternatives is independent of the probability of choosing between other alternatives or attributes in a choice set. In other words, choosing between the alternatives is a mutually-exclusive exercise and making a choice in one set of alternatives does not affect the choice made in another set of alternatives.

Some models that may be used to relax the IIA assumption are the mixed logit, latent class model, nested logit, multinomial probit, and heteroskedastic extreme value models. This study uses the mixed logit model, also known as the random parameters logit (RPL), random coefficients logit, or error components logit to deal with heterogeneity. The study opted to use the mixed logit over the latent class model (LCM), which could also have been useful but the mixed logit is more flexible than the LCM and can induce almost any behavioral assumption when speaking of preference distribution. However, the LCM benefits from its semi-parametric structure which does not require any assumption about the distribution of parameters which the RPL does (Sagebiel, 2011).

The mixed logit model is preferred (Carlsson et al., 2007; Hu et al., 2005) and can manage the unobserved heterogeneity that is often an issue with choice experiments. The basic mixed logit model and the mixed logit model with interactions can manage heterogeneity though a fixed price coefficient is necessary because a random price coefficient leads to unrealistic welfare measures (Train, 2003). This then also resolves the taste variations across individuals, as well as the restrictive IIA substitution or forecasting patterns that the conditional logit does not avoid.

A further word on heterogeneity may be warranted here. Economic agents are not identical in their reasoning or actions but for the sake of simplicity in modeling behavior or choices, individuals are assumed to be identical. Heterogeneity becomes problematic when there are relevant variables that are not observed in the data but are correlated with the observed variables. Heterogeneity can occur from demographic factors that cause respondents to make different choices from each other based on unique individual or

household characteristics, which necessitates their need for different levels of health care and access to available facilities.

The mixed logit model acknowledges and accounts for the fact that individuals are heterogeneous. The mixed logit generalizes the standard logit by letting the coefficient associated with each variable vary across consumers (Revelt and Train, 1998). In other words, it lets unobserved factors follow any distribution. When individual unobserved heterogeneity is controlled for, the reported characteristics collected in the survey data will not have an excessive effect on the choices that respondents make. We hypothesize that respondents' individual and household choices are not just due to unobserved heterogeneity. When unobservable variables are controlled for by using mixed logit, then the observed variables remaining are believed to be sufficient in the choice process for respondents. The variation in unobserved respondent-related parameters induces correlation over the alternatives in the random portion of utility so that general patterns of correlation over alternatives can be generated through appropriate specification of variables and parameters with appropriate choice of explanatory variables and distributions for the random parameters (i.e. normal or lognormal distributions). It therefore allows for efficient estimation when the same customers make repeated choices, as in this study (Revelt and Train, 1998; Louviere et al., 2000). Ben-Akiva et al. (1993), Ben-Akiva and Bolduc (1996), Bhat (1996), and Brownstone and Train (1996) use similar mixed logit specifications but do not have repeated choices by each individual respondent. In all its uses except Ben-Akiva et al. (1993) and Train et al (1987), the integration of the logit formula is done by simulation as is done in this paper.

In the mixed logit, the parameters to be estimated are assumed to be random variables and can take on different values for the different sampled respondents. This specification weighs the relative importance of the alternatives within a choice set unevenly and hence can avoid the restrictive substitution pattern suggested by the IIA property that the conditional logit model is subject to. For the IIA assumption to be relaxed, the mixed logit assumes that the coefficients β that are estimated are random and can vary from individual to individual. Assume that the distribution of the random parameters β , can be specified as $\beta \sim H(\theta, v)$, where $H(*)$ is a probability distribution function. The general function $H(*)$ can represent individual distribution functions for each random parameter represented by β , or can be a joint function for some of or all of the random parameters signified by β . The parameters θ and v , represent the mean and variance of the distribution or other necessary parameters consequent upon specific types of distribution represented by $H(*)$. Instead of the parameter β being estimated, θ and v , (mean and variance of the distribution) are the parameters that are estimated. Based on how $H(*)$ is specified, these parameters may or may not be independent. Using the mixed logit basis, the choice probability of the individual i selecting the alternative j from a t -th choice set is represented by the expression below in terms of the logistic distribution and its specification is the mixed logit model with the choice probability below (Train 2003);

$$P_{ijt} = \int \frac{\exp(X_{ijt}\beta)}{\sum_{k=1}^J \exp(X_{ikt}\beta)} h(\beta) d\beta \quad \text{Equation (3)}$$

The $h(\beta)$, as seen in equation 3 above, is the joint density function for the random parameters β . The nonrandom coefficients are estimated together with their means and standard deviations.

Furthermore, the utility function can be broken down into two components, an observation component and an error term for both conditional and mixed logit models to get:

$$U_{ijt} = C_{ijt} (P_{ijt}, \mathbf{X}_{ijt}) + e_{ijt} \quad \text{Equation (4)}$$

$$\text{Where, } C_{ijt} = \alpha_i P_{ijt} + \beta \mathbf{X}_{ijt} \quad \text{Equation (5)}$$

The component that can be observed in equation 5 above has two parts – one is the Price (P_{ijt}) and the other is the coefficient of Price, α , which has a fixed component. The reason that the coefficient of price is fixed is to prevent a situation where there are unrealistic positive welfare effects associated with the price because it has been found that a random price coefficient leads to such unrealistic welfare measures (Train, 2003). The \mathbf{X}_{ijt} component is a vector of the healthcare facility attributes offered in the choice experiment to respondents that are shown in Table 4.1 and as some of the categorical variables in the tables in chapter 6. The choice probability then becomes;

$$\text{For the Conditional Logit, } P_{ijt} = \frac{\exp(\alpha_i P_{ijt} + \beta \mathbf{X}_{ijt})}{\sum_{k=1}^J \exp(\alpha_i P_{ikt} + \beta_i \mathbf{X}_{ikt})} \quad \text{Equation (6)}$$

For the Mixed Logit;

$$P_{ijt} = \int \frac{\exp(\alpha_i P_{ijt} + \beta \mathbf{X}_{ijt})}{\sum_{k=1}^J \exp(\alpha_i P_{ikt} + \beta_i \mathbf{X}_{ikt})} h(\beta) d(\beta), \text{ where } \beta \sim \text{Normal}(\mu, \nu)$$

Equation (7)

As a rule, the models should be run with repetitions or halton draws of at least the square root of the number of observation. Therefore with 8604 observations used for the

simulations, the square root of which is 93, 120 halton draws were sufficient as used in this study (Revelt and Train, 1998). The statistical package Stata was used to run these models.

The marginal value for an attribute j is calculated as the negative of the coefficient of the attribute divided by the coefficient of the price coefficient.

$$\text{Marginal Value} = WTP_j = - \frac{\beta_j + \beta_D * D}{\beta_\alpha + \beta_D * D} \quad \text{Equation (8)}$$

The marginal value is the estimated willingness to pay for the attribute j .

Where β_j is the coefficient of the attribute and β_α is the coefficient of price. $\beta_D * D$ is the coefficient of the attribute with its interaction as D is a vector of the demographic variables used in interaction terms. β_D is the vector of corresponding coefficients in the models.

3.2 Empirical model

3.2.1 Model and Specification

In the choice experiment used in this study, respondents are presented with four scenarios. The respondents have two options of healthcare facilities in each of the four scenarios and they can pick either an option “A” or “B” with the corresponding prices or decline both facilities and select the “neither” option. The “neither” option corresponds to the status quo and is known as the baseline option for which there is no associated cost. Their choice of “A” or “B” when presented with each hypothetical facility is the dependent variable and the explanatory variables are the levels of the attributes as well as the demographic characteristics of the respondents. The base option of each facility attribute

was omitted from the explanatory variables specified and the alternatives of each attribute were specified so their coefficients could be obtained relative to the base level.

Since the data records the limited choices that respondents may make based on various attributes in alternative health facilities, the analysis involves a Limited Dependent Variable (LDV) which is a dependent variable whose values are constrained to a few values such as zeros and ones. Respondents in this study either choose or do not choose a given facility that makes “the respondent’s choice”, take on two possible values, zero or one. Our LDV is a binary dependent variable as it can take on only two possible values (Wooldridge, 1999). The logit model is one model that is used when working with limited dependent variables. The form of the conditional logit model used in this study is the Alternatives Specific Conditional Logit, which allows one to specify the alternative options for the attributes in the specification of the model. Based on respondents’ choices, the utility of goods comprised of the included attributes can be obtained.

From equation’s 6 and 7, to determine the probability of the respondent i , making a utility maximizing choice of an alternative j , in a choice set t , one can plug in the attribute variables X_{ijt} to obtain the coefficients of the attributes’ alternatives specified.

The alternatives of the attributes are specified as $X_{ijt} =$ [Open 24 hours; open 9-5, 7 days a week] [Physician immediately available; Physician, Nurse Practitioner; or Physician Assistant available by appointment only] [X-rays and diagnostic labs only; full diagnostics services available] [Emergency Care] [Dialysis; Physical Therapy; Cancer care] [all insurance types and sliding scale payment based on income accepted; Medicaid/Medicare and Private Insurance accepted,] $_{ijt}$,

The marginal value is the estimated willingness to pay for the attribute j .

$$\text{Marginal Value} = WTP_j = - \frac{\beta_j}{\alpha} \quad \text{Equation (9)}$$

Where j = [Open 24 hours; open 9-5, 7 days a week] [Physician immediately available; Physician, Nurse Practitioner; or Physician Assistant available by appointment only] [X-rays and diagnostic labs only; full diagnostics services available] [Emergency Care] [Dialysis; Physical Therapy; Cancer care] [all insurance types and sliding scale payment based on income accepted; Medicaid/Medicare and Private Insurance accepted] ij . The numerator is the coefficient estimate of j , (β_j) and the denominator is the coefficient of price, α .

Furthermore, WTP from interactions with demographic variables are performed in both the conditional logit and mixed logit using the mean values of the attributes and in that case the willingness to pay becomes;

$$\text{Marginal Value} = WTP_j = - \frac{\beta_j + g}{\alpha} \quad \text{Equation (10)}$$

Where the numerator is the sum of the coefficient of the attribute level with the coefficient of its interaction, and the denominator is the estimated mean values of the coefficient of price (α_{price}). g stands for the interactions performed between the attributes and the variables. For example, g = [open 24 hours*children, emergencycare*children, Allinsurance_Uninsured, etc].

Chapter 4: Survey Design and Choice Experiment

4.1 Survey Design

4.1.1 Survey instrument

This survey instrument used in this study comprised a 10-page paper questionnaire with five parts described below:

Part I: Respondents are asked about their health behavior and use of preventive health care, emergency health care and several specialty services such as radiology, oncology, pulmonology, urology orthopedics and pediatrics over the past two years. Respondents are asked to report their individual responses as well as enter responses for their household members.

Part II: Respondents are asked about their access to a primary care doctor and, if they have one, how far they drive to see this practitioner. Respondents are then asked if they are aware of or use a rural health center or federally qualified health center. The survey then asks about their recent experiences at nearby hospitals within the last 12 months.

Part III: The choice experiment is included to determine respondents' willingness to pay values.

Part IV: Respondents are asked to rank and describe their use of certain services, the distances from those services and whether they would have to leave their county to use some of those services. Finally, the respondent is asked how important it is to the respondent that their doctor accept their insurance.

Part V: Respondents provide demographic information that could affect their willingness to pay such as age, income, marital status, type of health insurance, ages and number of children and whether respondents care for elderly parents who may or may not

live with them. A space is provided to allow respondents to leave any comments on the survey they wish to provide.

4.1.2 Data collection

The survey was distributed through the mail to minimize costs versus phone survey, to allow the respondent to see the choice experiment and allow enough time for participants to fully consider their responses. Internet usage is much lower in rural areas, hence the investigators expected to receive a higher response rate through the mail. There was the option to complete the survey online, however only 11 surveys were completed online. The choice experiment was displayed in a tabular form for ease in differentiating between the options. The questionnaire used closed-ended instead of open-ended questions to avoid confusion and to make data entry more straightforward and consistent. Most questions could be answered with a “yes” or “no” or a check mark to select one out of several options allowing for easier coding and analysis. The questionnaire was available in the same format both in hard copy and online with an online survey company known as Survey Monkey. An appropriate coding system was utilized to translate the survey responses into numerical values for data analysis.

Two focus groups were held to refine and edit the survey to ensure participants were interpreting the survey as predicted and to make sure all questions were reasonable and understandable. Based on the feedback from the focus groups, the survey was finalized and prepared for mailing. Based on the criteria provided to match the population of interest – single family residences in the 10 counties in rural Kentucky, a sample of households reflective of rural population of Kentucky was obtained from a firm which provided recipient addresses. Since non-probability sampling is applicable when studies do not need

to form generalizations from the sample to the general population, the study opted for probability sampling where every unit in the sample frame has a known non-zero probability of being chosen for the sample as this then allows for extrapolations to the broader population from the survey sample. Finally, to get a highly powered study and also to reduce type II error, the study aimed for a large sample of 4000 survey recipients.

4.2. Sample description

The surveys were sent out in the summer of 2012 to the addresses of 3900 households in ten rural counties in Eastern and Western Kentucky. From the 3900 surveys sent out, 188 were undelivered due to failed addresses and were not replaced due to funding limitations. Each mailing included a letter inviting recipients to complete and return the survey by mail or complete the survey instrument online. To improve the response rate, mailings included an unmarked prepaid return envelope and households who returned a completed were entered into a raffle to win prizes. Also, a postcard was sent as a reminder to all addresses a few weeks after the initial mailing. A second round of 2,000 surveys was sent to the four counties with the lowest response rates. The study did not track which of the residents responded to the surveys in part to help maintain confidentiality and assure participants of their anonymity but it did track the county from which the survey was returned.

Zip codes were the only identifying information requested. Three individuals entered the survey data into Microsoft excel sheets following a coding system to give a consistent transcription of survey responses. The collected data were analyzed using STATA, an econometric and statistical software program to run both the conditional logit and mixed logit models.

Descriptive statistics are reported in Chapter 5. The choice of facility that respondents made from the given scenarios and respondent rankings of specialty care needs and preference for provider insurance requirements are also presented in the appendix. Further statistical analyses such as cross-tabulations on interesting pairs of variables from the responses presented in the appendix.

4.3 Choice experiment

The attributes and attribute levels for the choice experiment were selected based on key differences between hospitals, clinics and private practices. Typically, rural hospitals are open 24 hours a day, 7 days a week but clinics and private practices are typically open during business hours. Clinics may have a wide range of diagnostic equipment and may more easily accept Medicare and Medicaid insurance unlike private practices. In accordance with Lancaster's new theory of consumer demand described in chapter 3, the goods and services being offered to respondents are not the Critical Access Hospitals, Rural Health clinics or private practitioner offices directly but rather the attributes that make up these facilities that we are hypothetically offering. As recommended by Louviere et al. (2000), input from guided focus groups was appropriated to select realistic attributes to consumers such as the annual fee. Table 4.1 summarizes the attributes and attribute levels included in the model.

Table 4-1 Table of attributes and attribute levels used in Choice experiment

Attribute	Attribute levels offered				
Hours Open	24 hours	9-7/ 5 days a week	9-5/ 7 days a week		
Providers on Staff	Physician immediately available	Only Nurse Practitioner or Physician Assistant	Physician, NP or PA by appointment only		
Services	X-rays only	Full diagnostic services (x-rays, labs, CAT scans, MRI)	X-ray and Diagnostic lab Services only		
Emergency Care	Yes	No			
Specialized Care	Physical Therapy	Cancer Care	Dialysis	None	
Accepted Insurance	Medicaid/Medicare, Sliding Scale Fee based on income, and private insurance	Medicaid/Medicare and private insurance	Private Insurance only		
Mandatory annual household	\$40	\$60	\$80	\$100	\$120

The price attribute was the mandatory fee that each household would have to pay each year for that facility, if that facility were in operation. This is stated within the column showing the facilities attributes in Table 4-1. The attribute “hours open” is offered to respondents in three different forms – either with the facility open from 9am to 5pm, 7 days a week; 9am to 7pm, 5 days a week, or with the facility open 24 hours a day seven days a week.

The attribute “Providers on staff” is offered in three different modes with the option “Physician immediately available”, Only Nurse Practitioner or Physician Assistant available” or “Physician, Nurse Practitioner or Physician Assistant seen by appointment only” available in the scenarios. This is important because some patients only want to see a physician and are willing to pay for it whereas others are more accepting of seeing a nurse

practitioner and having more time to talk about concerns and having to pay less for medical attention from a health care provider.

The services attribute offers respondents either “Full Diagnostic services involving X-rays, laboratory work, CAT scans and an MRI” or “only X-rays and diagnostic laboratory services” or “X-rays only”. The Emergency Care attribute provides respondents with the option of either having emergency care or not. The Specialized Care attribute offers Dialysis, Cancer Care, Physical Therapy or No specialized care at all, in the four scenarios.

Health insurance that is accepted at these facilities are in three forms which are offered to respondents as the options, “Private Insurance only”, “Medicaid/Medicare and private insurance” and “Medicaid/Medicare, private insurance and Sliding Scale payments based on patient’s income”. Finally, a mandatory annual household fee ranging from \$40 to \$120 is asked of respondents for each facility they pick in the four scenarios with payments of \$40, \$60, \$80, \$100 and \$120 for the selection of attributes they made. The prices used are selected to be as realistic as possible and to allow the conjoint analysis to be performed within bounds that can be computed (Louviere, Hensher and Swait, 2000).

In this study, respondents were presented with two hypothetical healthcare facilities, facilities A and B in each choice set along with a third option of “neither facility A nor B”. Each choice set had a mix of seven attributes including “price” and there were four different choice sets. Respondents could pick any of these three options in each choice set. The respondents were told that apart from the differences in the attributes, the two

facilities in each choice set were identical. One such choice set or scenario is shown on figure 4-1 below as an example.


	Facility A (following features offered)	Facility B (following features offered)	
Hours Open	24 hours a day/7days	9-7/5 days	
Providers on Staff	Physician, Nurse Practitioner, or Physician Assistant seen by appointment only	Only Nurse Practitioner or Physician Assistant available	
Services	x-rays and diagnostic laboratory services only	x-rays only	
Emergency Care	Yes	No	I do not prefer either facility (please check below)
Specialized Care	None	None	
Accepted Insurance	Private insurance only	Private insurance only	
Mandatory fee every household will pay per year	\$100	\$80	
I would prefer to have facility: (choose one only)	<input type="checkbox"/>	<input type="checkbox"/>	 <input type="checkbox"/>

Figure 4-1: A Choice scenario

Each respondent had 4 choice sets to consider in their survey. There were three different versions of the surveys sent out which offered the option levels of attributes in different ways in the choice experiments (CEs) and this was accounted for in the analysis involving the choice experiment. The 3 versions of the survey were created because 3

different groups of 4 choice sets giving a total of 12 facility profiles were available for the choice experiment. The way these final profiles were obtained was that several different facility profiles were created from the two or three levels of each of the eight attributes including price which from full factorial design gives a maximum possible number of combinations. Using a D-optimal fractional factorial design, the 12 final unique profiles used in the medical facilities in the choice experiment were then obtained. Limiting the number of choice sets, attributes and attribute levels is necessary so as not to overwhelm respondents with the mental demands of the experiment.

In summary, respondents were provided information on a series of four choice experiments with three choices in each experiment. The choices are between two facilities with a mix of attributes as well as a third option to pick neither facility. The choice experiments were designed with plausible attributes so respondents could imagine themselves actually choosing between such facilities in real life. The experiments were also designed such that no experiment had a dominant alternative or dominant option that most respondents would gravitate to as an obvious choice. In other words, no facility had an undue advantage because none had substantially more desirable options than others between the attributes offered.

Chapter 5: Variable and Response Descriptions

5.1 Description of Survey Data

This section describes and summarizes the key healthcare variables and demographic characteristics used in the study. A total of 789 surveys from the 3712 surveys sent out were returned which represented a 21.26 percent response rate. However, 786 surveys were completely filled out and usable for descriptive analysis. Table 5-1 below, shows percentages of respondents' use of preventive healthcare use, emergency room services, specialty services and health care providers. About 66% of respondents (519 respondents), indicated that they had used preventive care within the last two years while 46% reported that a member of their household had used preventive care. Altogether, 60% of respondents accessed primary care services for the care of another illness or health concern and 47% reported that their household members also did. Of those that reported using x-ray or diagnostic services, 57% were respondents and 40% household members of respondents. Additionally, 29% reported using the emergency room for the care of emergency issues (26% was indicated for household members) and 20% of respondents used the emergency room for care of non-emergency issues (19% for household members of respondents).

Of specialty services, 22% had used cardiology (15% for their household members), 23% of respondents and 10% of their household members had used obstetrics/gynecology, 32% had used radiology (21% of household members of respondents) and 10% of respondents (and 8% of their household members) had used neurology services. Also 6% of respondents, 4% of their household members had used

psychiatric services, 7% respondents, 4% of their households had used oncology services, 11% of respondents and 8% of the household members of respondents had used urology services, 13% of respondents and 10% of household members of respondents had utilized orthopedics. To round off specialty services, 10% respondents, 8% household members had used pulmonology and 13% of respondents' household members had seen a pediatrician.

Of the responders (89.5%) who responded in the affirmative to having a regular care physician, 59% indicated that their primary care physician was located in their county. Of those whose primary care physicians are not located in their county, 288 (41%) respondents reported having to drive an average of 29.6 miles to visit their physician. It is worth noting that in every instance, the individual filling out the survey had higher frequency of use of healthcare services than their household members.

Table 5-1: Use of health care services

Health care Services	Unit	Mean
Healthcare History		
Use of these services over past two years		
Preventive care, respondent	Yes=1, No=0	0.662
Preventive care, member of household	Yes=1, No=0	0.458
Care of other illness respondent	Yes=1, No=0	0.602
Care of other illness, household member	Yes=1, No=0	0.467
X-ray/Diagnostic Services, respondent	Yes=1, No=0	0.566
X-ray/Diagnostic Services, household member	Yes=1, No=0	0.399
Emergency Room Services		
Care of emergency issues, respondent	Yes=1, No=0	0.292
Care of emergency issues, household member	Yes=1, No=0	0.263
Were ER issues life threatening?	Yes=1, No=0	0.143
Care of non-emergency services, respondent	Yes=1, No=0	0.202
Care of non-emergency services, household	Yes=1, No=0	0.185
Specialty Care Services		
Cardiology, respondent	Yes=1, No=0	0.218
Cardiology, household member	Yes=1, No=0	0.145
Obstetrics/Gynecology, respondent	Yes=1, No=0	0.232
Obstetrics/Gynecology, household member	Yes=1, No=0	0.103
Radiology, respondent	Yes=1, No=0	0.324
Radiology, household member	Yes=1, No=0	0.213
Neurology, respondent	Yes=1, No=0	0.102
Neurology, household member	Yes=1, No=0	0.084
Psychiatry, respondent	Yes=1, No=0	0.056
Psychiatry, household member	Yes=1, No=0	0.043
Oncology, respondent	Yes=1, No=0	0.071
Oncology, household member	Yes=1, No=0	0.041
Urology, respondent	Yes=1, No=0	0.110
Urology, household member	Yes=1, No=0	0.088
Orthopedics, respondent	Yes=1, No=0	0.128
Orthopedics, household member	Yes=1, No=0	0.098
Pulmonology, respondent	Yes=1, No=0	0.101
Pulmonology, household member	Yes=1, No=0	0.078
Pediatrics	Yes=1, No=0	0.130
Healthcare Providers		
Do you have a regular primary care physician?	Yes=1, No=0	0.895
If affirmative, is physician based in your county?	Yes=1, No=0	0.590
If your primary care physician is not based in your county, how far do you drive to visit him/her?	Miles	29.646

Of those who had used a hospital in the last two years, almost every respondent highly rated their hospitals with a 4 or 5, on a 5-point scale, indicating a satisfactory or very satisfactory quality of experience. Most respondents selected physician referral (56%) and “friends and family experiences” (54%) and “word of mouth” (35%) for the information sources used when deciding which hospital to use (Table 5-2).

Table 5-2: Sources of Information for Choosing Hospital for Care

Sources of Information	Mean
Physician referral	0.566
Friends and family experiences	0.541
Word of mouth	0.346
County events (e.g. Fairs)	0.042
Internet	0.041
Newspaper	0.033
Radio/TV	0.022
Direct mail	0.019
Billboards	0.011
Facebook	0.008
Twitter/social media	0.004

In table 5-3, 51% of respondents indicated that they believed their community had a federally qualified health center or rural health clinic - the survey took great pains to emphasize that this was not the health department, as most people casually associate rural health clinics with the local health department. To a follow-up question, 28% of the respondents indicated that they had used the federally qualified health center/rural health clinic in their community in the last two years.

Table 5-3: Communities with Qualified Health Center or Rural Health Clinic

Availability/Use of Health Care Facility	Mean
Availability of Federally Qualified Health Center/Rural Health Clinic)	
Yes	0.51
No	0.49
Use of Federally Qualified Health Center/Rural Health Clinic in your community	
Yes	0.28
No	0.72

Table 5-4 summarizes the demographic characteristics and income distribution of the study respondents. The sample had an average age of 55 years with 34% reporting as male and more than half (66%) reporting as female. About 68% of the respondents were married or living with a significant other, while about 35% of the respondents had children. There was an average of 1.86 children (approximately 2 children) per household. Children of respondents had an average age of 13 years. Of those who reported caring for the elderly (17%), 31% indicated that their elderly relatives lived with them full-time.

Household combined income in the sample was distributed in a similar manner to that of the actual population. 24% of respondents' households earned less than \$15,000; 18% earned between \$15,000 and \$25,000 and these are considered low income earners. 13% of respondents earned between \$25,000 and \$35,000. 12% are middle income households earning between \$35,000 and \$50,000. 16% earned between \$50,000 and \$75,000 and upper middle-class earners make up 7% of respondents earning \$75,000 to \$99,000 and 5% earned over \$100,000.

Table 5-4: Descriptive Statistics of Demographic Characteristics

Variables	Mean	Stand. Dev.	Min	Max
Age (years)	55.15	16.02	23.0	93.00
Male	0.34	0.47	0.00	1.00
Married	0.68	0.47	0.00	1.00
Children under 18 years old	0.35	0.48	0.00	1.00
Number of Children	1.86	1.24	1.00	15.00
Children's ages	13.05	9.50	0.20	66.00
Care for elderly (over 65 years)	0.17	0.38	0.00	1.00
Elderly live in respondent's home	0.31	0.46	0.00	1.00
Income Distribution				
Income under 15k	0.24	0.43	0.00	1.00
Low Income: 15-25k	0.18	0.38	0.00	1.00
Income 25-35k	0.13	0.33	0.00	1.00
Middle Income: 35-50k	0.12	0.32	0.00	1.00
Income 50-75k	0.16	0.37	0.00	1.00
Upper Middle Income: 75-99k	0.07	0.25	0.00	1.00
Income over 100k	0.05	0.22	0.00	1.00

Figure 5-1 shows the distribution and types of insurance coverage of the respondents. 33% of the respondents had Medicare coverage in 2012. The second largest group of respondents with health insurance were those who had private employer-sponsored health insurance (30%). 16% had Medicaid, 15% had employer-sponsored public insurance, 15% had a combination of private insurance and Medicare, while 13% of the respondents remaining uninsured in 2012. A summary of some comments penned by respondents indicated that they often could not afford health insurance with their incomes and in the slow recovery of the economy after the 2008 financial crisis. Many in their households and communities were unable to find jobs and unable to afford healthcare. Some also did acknowledge long emergency room wait times that had resulted from many being unable to utilize healthcare otherwise.

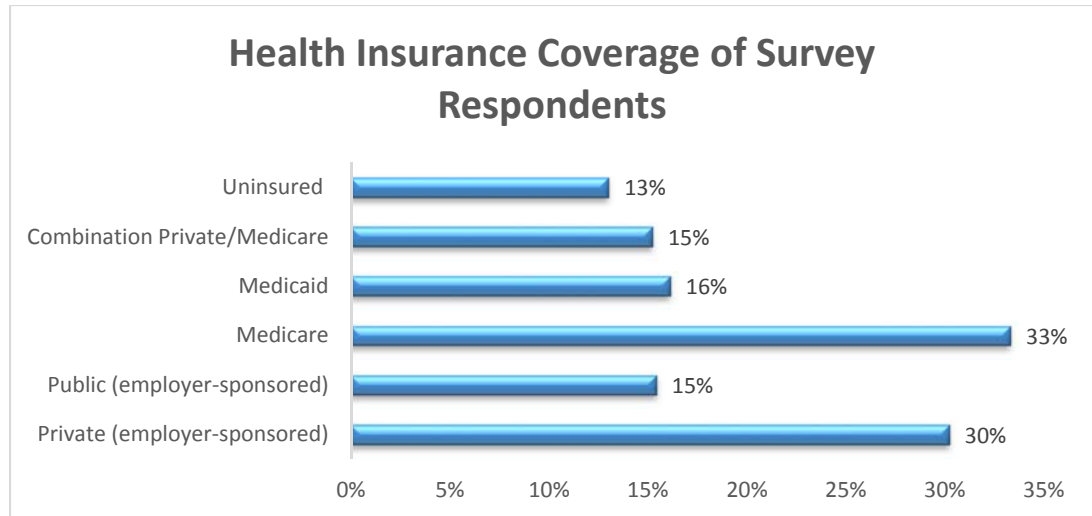


Figure 5-1 : Bar graph of distribution of types of insurance coverage

On average, respondents had to drive 23 minutes to routine care services, 47 minutes to specialized care services, 32 minutes to urgent care services, 30 minutes to emergency health care services and 33 minutes to diagnostic services. 5% of respondents had to leave their state to visit the nearest service as their communities did not have a local hospital. For these respondents, it would take 44 minutes on average to drive to access regular services that are usually provided by a local hospital (see appendix).

More than half of the respondents (58%) ranked cancer treatment as very important. The majority of respondents, 59%, thought access to cardiac rehabilitation was very important. Similarly, 56% found diabetes treatment to be imperative by assigning it a very important score. Dialysis services were ranked very important by 50% of sample, while physical therapy was thought to be very important by 54% of our sample (see appendix).

When seeking immediate medical care, 86% of the sample believed that it was very important that their provider accept their health insurance; Medicaid or Medicare. Additionally, 66% of the sampled population elected that when seeking immediate medical

care, it was very important that their provider accepts individuals who do not have health insurance or those who self-pay, 14 % thought it somewhat important, 4% found it somewhat unimportant and 6% of the respondents considered it not important at all (see appendix).

Table 5-6 compares the actual population of the 10 counties surveyed to the respondents’ demographic characteristics. The sample population is compared to actual population in terms of gender, income, age and health insurance used. 66% of the respondents were female whereas 51% of the actual population were male. The respondents’ average household income is \$38,205 whereas the actual population’s income is \$32,205. The respondents were older with an average age of 56 years whereas the population’s average age is 48 years old. Among those who responded to the survey 13% were uninsured whereas in the population 23% were uninsured in 2012. Finally, 16% of the respondents were on Medicaid compared to 26% in the surveyed region who were on Medicaid.

Table 5-6: Comparison of sample and actual populations

Demographic Variable	Sample Mean	Standard Deviation	10 County Average
Percent male	34%	47%	51%
Household income	\$38,205	\$30,762	\$32,514
Age (years)	56	15	48
Percent uninsured	13%	34%	23%
Percent on Medicaid	16%	36%	26%

Source: Allen et al., 2015, (n = 769)

From the comparisons in Table 5-6, the survey respondents were older, made up of more females than the gender proportion living in that area and had more income. There were also fewer respondents who had no health insurance (13%) than those uninsured in

the region. Finally, fewer of the respondents are on Medicaid (16%) than the actual rural population's proportion on Medicaid (26%). This comparison shows that the sample is representative of the population being studied thus the results of the study can be generalized to the population in the 10 rural counties specifically and may also be applicable to other similar rural populations.

5.2 Health Status Index

To be able to incorporate a measure for how healthy or ill respondents are or how much healthcare they utilize, a health status index was created from respondents' utilization of health services over the last 2 years. This index of patient 'health service utilization' was generated by aggregating responses of the services utilized and distance to services by the respondents. This illustrates respondent' access to key health care facilities; particularly how frequently the respondent uses the facilities and how far they have to drive to get to the facility. The variables from this index used in the analyses in chapter 6 are shown in table 5-7 below. The full index is shown in the appendix.

The variables for primary care, care for other illness and x-ray/diagnostic services were combined into one new variable for preventive health so if a respondent or their household member had used one or more of these services that would be indicated with the numbers zero for no or 1 for yes. The more of these services the respondent and their household used, the higher their number reported for the categorical variables. Specialty services was designated a combined variable of all the specialty services listed in the survey. These specialty services were cardiology, obstetrics/gynecology, radiology, neurology, psychiatry, oncology, urology, orthopedics, pulmonology and pediatrics. The ranking of distances to the various services listed below were also combined into one new

composite variable showing distance to services. The distance to emergency care variable was not combined with other variables but was kept as a standalone variable. The respondents' ranking of importance to access to different healthcare facilities was also combined into a new variable showing from their responses, how important those healthcare facilities are to that household.

These variables were generated depicting whether they used emergency and specialty services in the previous 2 years and how far they are from emergency and certain specialty services in their locality. These variables help assess whether individuals who utilize more healthcare services would be willing to pay for such attributes. The use of emergency care variable was a dummy variable, but the distance from emergency care was a categorical variable to capture the average distance respondents lived from various healthcare services. The ranking of importance of certain aspects of access to care was a categorical variable ranked on a scale of 1 to 4. Lower numbers on the scale show less use of healthcare so may indicate healthier respondents and higher numbers show more use of care and may portray less healthy respondents.

Table 5-7: Health Services Utilization

Variable	Type	Description
Emergency Room (ERcare), Dummy variable	Used no emergency service = 0, Used emergency department=1.	Whether in the last 2 years, respondent or household member has used Emergency Room services
Distance to Emergency Room Services (Diercare), Categorical variable	0-15 minutes = 1, 15-30 minutes = 2, 30-60 minutes = 3, over 60 minutes = 4	Distance to Emergency Room care services

Chapter 6: Results

The results of the choice experiment to determine the value rural residents place on various healthcare attributes are presented here. Two models are used for estimation; the alternative specific conditional logit model is used to provide a basis of comparison for the mixed logit model. The alternatives specific conditional logit and the mixed logit allow the specification of the attribute levels and the mixed logit model is used to address inherent heterogeneity.

6.1. Comparing Alternative Specific Conditional Logit with Mixed Logit

The results for the conditional logit and the mixed logit are shown below in Tables 6.1. In the mixed logit results the estimated standard deviations of the coefficients of attribute levels twenty-four hour service, physician immediately available and emergency are significant at the 1% level; 9am to 5pm, 7 days a week is significant at the 5% level and dialysis is significant at the 10% level which indicates that heterogeneity is present with these attribute levels. This implies that the mean coefficients reported vary across the respondents in the sample. The conditional logit model on the other hand does not report standard deviations on the coefficients, as it assumes heterogeneity to be non-existent.

As expected, the study finds the price coefficient to be negative in both models consistent with economic theory that as the price of a good increases the quantity demanded of that normal good decreases. In the second column of Table 6.1 where the conditional logit results are presented, almost all the significant variables are significant at the 1% level

except for one variable (whether a facility is open from 9am to 5pm, seven days a week) which is significant at the 5% significance level.

Table 6-1: Comparing Alternatives Specific Conditional Logit to Mixed Logit

VARIABLES	Conditional Logit	Mixed Logit Model	
	Coefficient	Coefficient	Standard Deviation
Open 24 hours, 7 days/week	0.760*** (0.116)	0.536*** (0.097)	1.714*** (0.154)
Open 9am-5pm, 7 days/week	0.302** (0.128)	0.205** (0.087)	0.351** (0.160)
Physician, NP, PA seen by appointment only	0.407*** (0.090)	-0.013 (0.084)	0.193 (0.151)
MD immediately available	0.543*** (0.090)	0.361*** (0.099)	0.936*** (0.185)
X-rays, diagnostic labs only	0.639*** (0.084)	0.543*** (0.091)	0.173 (0.130)
Full Diagnostic services (x-rays, labs, CATscans, MRI)	0.978*** (0.093)	0.970*** (0.085)	-0.110 (0.110)
Emergency care	0.477*** (0.074)	0.363*** (0.080)	-0.358*** (0.109)
Physical Therapy	-0.075 (0.108)	-0.550*** (0.101)	-0.113 (0.108)
Dialysis	-0.162 (0.117)	-0.770*** (0.107)	0.184* (0.107)
Cancer care	0.187 (0.125)	-0.299*** (0.101)	0.131 (0.090)
Medicaid/Medicare, Income-based Sliding Scale fee and private insurance accepted	1.134*** (0.095)	1.316*** (0.105)	0.127 (0.095)
Medicaid/Medicare and private insurance accepted	0.582*** (0.103)	0.547*** (0.117)	-0.044 (0.105)
Price	-0.011*** (0.001)	-0.019*** (0.001)	
Observations	8,604	8,604	8,604
Constant for Alternative B	0.004 (0.124)	- -	- -
Constant for Alternative C	1.386*** (0.190)	- -	- -

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

The mixed logit results are presented in the last two columns of table 6-1. Most the variables for the mixed logit specification are statistically significant at the 1% significance level except hours of 9 – 5pm, seven days a week which is significant at the 5% significance level just like in the conditional. Seeing medical practitioners by appointment only is not significant at all, unlike in the alternatives specific conditional logit where it was significant at the 1% significance level.

6.2 WTP for Conditional Logit and Mixed Logit

Since Willingness-to-pay is a marginal value as shown in the equation below, it can be calculated as the negative of the ratio between the coefficient of an attribute and the coefficient of price. From the coefficients of the various attributes and the coefficient of ‘price’ from the results table above, one can calculate respondents’ willingness to pay for included attributes using the following formula;

$$\text{Willingness to pay} = - \frac{\text{Attribute's Coefficient}}{\text{Price Coefficient}}$$

The marginal effects of the facility attributes are displayed in Table 6.2 and 6.3. For the logit model specification, the price coefficient is fixed while allowing the other coefficients to vary (Revelt and Train, 1998). The willingness to pay for each attribute is therefore distributed in the same way as the attribute’s randomly varying coefficient as the willingness to pay value is the ratio of the attribute coefficient to the price coefficient. This makes interpreting the model more convenient. In addition, the non-price coefficients are specified to be independently and normally distributed. Variables that are found to be significant have corresponding WTPs that are also significant as WTP is obtained simply from the attribute coefficient divided by the price coefficient.

6.2.1 Willingness to Pay for Attribute Levels Using Mixed Logit

The WTP values are discussed here focusing on the mixed logit coefficients in table 6-3 since its results are controlled for heterogeneity, however the WTP values are presented in tables 6-2 and 6-3 below from both the conditional and mixed logits. The WTP estimates are largely consistent in sign and magnitude and significant at the 1% level in both the mixed logit and the conditional logit although the conditional logit's estimates are generally larger than the mixed logit's WTP estimates. The WTP values are reported relative to the value of the designated baseline option for each attribute.

The baseline option for the hours open attribute is 9am to 7pm, 5 days a week; the baseline option for "providers" is only a mid-level practitioner i.e. only nurse practitioner or only a physician assistant available. The baseline option for diagnostic services offered is x-rays only, and the basic option of providing emergency services is that this facility does not have an emergency department so does not offer emergency services. For specialized care, the baseline option is no specialized care offered; and for insurance accepted, the base option is that private insurance only is accepted.

The baseline facility is the facility that respondents accept by default if they select the 'neither' option. This facility looks like a private practice that is operated or staffed by either a nurse practitioner or a physician assistant which is open from 9am to 7pm, 5 days a week. This baseline facility accepts only private insurance and for diagnostics services has an x-ray machine only. The facility does not have an emergency department or offer any form of specialized care. The upper and lower limits of the WTP estimates show the 2.5% and 97.5% quantiles and hence the range for each WTP value.

For the attribute “hours the facility is open”, compared to the baseline of 9am to 7pm, 5 days a week, respondents are willing to pay \$28.50 for twenty-four-hour service; and \$10.90 for hours open of 9am to 5pm, 7 days a week. The willingness-to-pay for twenty-four hour service is significant at the 1% level, and 9am to 5pm, 7 days a week is significant at the 5% level in both models. Respondents value a facility that is open 24 hours a day the most, followed by a facility open from 9am to 5pm, 7 days a week. Both of these attribute levels are preferable to the baseline facility open from 9am to 7pm, 5 days a week, implying respondents value these options for the convenience of weekend service and service throughout the night.

For emergency care, \$19.30 is the WTP value which signals respondents’ relatively high valuation of an emergency department compared non-emergency care. This amount is significant at the 1% level. This attribute is necessary for accidents and illnesses where urgent or emergent care is needed. However, emergency departments are seen here to be valued less (at \$19.30) than 24-hour service (at \$28.50). This is expected because although it is essential to have emergent care for crisis situations, consumers prefer preventative care or early interventions obtained from seeing a provider before the illness escalates. For example, patients would prefer to get assessed by a clinician and receive a prescription for pneumonia than to have to go to the emergency room when they are more ill with the same disease. However, respondents still like to have the emergency department for unavoidable incidents such as automobile or construction accidents, accidental ingestions and poisonings with children or rapidly escalating illnesses such as an asthma attack, a heart failure exacerbation or a chronic obstructive pulmonary disease exacerbation.

On average respondents are willing to pay \$19.20 to see a physician who is immediately available without an appointment needed compared to the baseline of being able to see only a mid-level practitioner such as a nurse practitioner or a physician assistant; but have negative WTP (-\$0.70) to see all these providers by appointment only whether physicians or mid-level practitioners. The WTP for physicians immediately available is significant at the 1% level in both models however, the WTP for needing an appointment is not significant in the mixed logit model though it is significant at the 1% level in the conditional logit. This speaks to respondents' value for convenience and timeliness as an aspect of access to healthcare. Patients who have urgent health needs may not want to wait several days until their appointment date arrives hence will pay a significant amount to be able to see a provider without needing to make an appointment.

Compared to the baseline option of having only X-ray services available for diagnostics, respondents are willing to pay \$28.80 for X-ray and other diagnostic labs only; and \$51.60 for full diagnostic procedures. Patients want the flexibility, accuracy and specificity provided by other diagnostic radiology such as CAT (computer aided tomography) scans and MRI's (Magnetic Resonance imaging). Although these are costlier to utilize, practitioners may need them to diagnose early and accurately tumors, cardiac or other soft tissue abnormalities for precision and during immediate, interventional and surgical treatment.

Physical therapy is valued at -\$29.20, dialysis -\$40.90, cancer-care -\$15.90 compared to the no specialty services. These attribute levels are not significant in the conditional logit but are all significant at the 1% level in the mixed logit model. These options compared to the baseline option of no specialty care, elicit smaller or negative

amounts as these specialty services do not have a large demand or supply prices due to the highly specific nature of the specialties and the lower occurrence of such ailments in rural areas. Patients tend to travel to urban areas for such specialty services where they would see more experienced personnel and perhaps receive better quality service do to larger volumes of such services being provided, resulting in less need for and lower utilization rates of those specialty services in rural areas.

Respondents are willing to pay \$29.10 for a facility which only accepts those with public insurance or private insurance coverage; this option was significant at the 1% level with both models. This is preferable to a baseline facility that only accepts patients with private insurance. This is because many patients in these rural areas have Medicare and Medicaid. 16% of the respondents had Medicaid and 26% of the actual population of the 10- county area where this study was conducted had Medicaid in 2012. 33% of the respondents had Medicare only. 15% of the respondents had some supplemental private health insurance in addition to their Medicare coverage. Another 15% of respondents had public employer-sponsored insurance. All these respondents would not be able to use the baseline facility but would be able to use this facility which accepts public health insurance in addition to private health insurance. Only 30% of the respondents who had private employer-sponsored insurance could use the baseline facility because it requires private health insurance. A quarter of the population utilizing Medicaid and 48% utilizing Medicare could not access the baseline facility and hence the respondents are willing to pay \$29.10 annually on behalf of their household for this option of being able to use public insurance.

Respondents had a willingness-to-pay of \$69.90 for a facility that treats everyone regardless of whether they have health insurance or not, over the base option of private insurance only accepted. This is the most valued attribute level in study according to the respondents. This facility would cover the 13% of the respondents in rural Kentucky who were uninsured as well as the 23% of the actual study population who were uninsured in 2012. This attribute level was significant at the 1% level for both models.

Table 6-2: Willingness to pay with Alternative Specific Conditional Logit

Variable	Willingness-to-Pay (\$)	Statistically significant?
Open 24 hours a day, all week	68.43	Yes
Open 9am-5pm, 7 days a week	27.19	Yes
Any Practitioner by appointment only	36.67	Yes
Physician immediately available	48.93	Yes
X-rays and diagnostic labs only	57.52	Yes
Full Diagnostic services	88.03	Yes
Emergency care	42.94	Yes
Physical Therapy	-6.78	No
Dialysis	-14.59	No
Cancer care	16.84	No
All patients accepted	102.09	Yes
Public/private insurance accepted	52.40	Yes

Table 6-3: Willingness-To-Pay Values from Mixed Logit

Variable	WTP (\$)	Lower limit/\$	Upper limit/\$
Open 24 hours a day, all week	28.50	18.00	39.00
Open 9am-5pm, 7 days a week	10.90	2.20	19.60
All 3 Practitioners by appointment only	-0.70	-9.50	8.10
MD immediately available	19.20	8.80	29.60
X-rays and diagnostic labs only	28.80	19.60	38.10
Full Diagnostic services	51.60	42.10	61.00
Emergency care	19.30	11.70	26.90
Physical Therapy	-29.20	-40.80	-17.60
Dialysis	-40.90	-53.80	-28.10
Cancer care	-15.90	-26.80	-5.00
All patients accepted	69.90	58.40	81.40
Public/private insurance accepted	29.10	17.30	40.80

The upper and lower limits here were generated by the 'WTP' command in Stata.

6.3 Including Interaction Variables to Deal with Heterogeneity

To account for the fact that respondents are all different and have different characteristics that come into play when they make decisions, some of their demographic characteristics are incorporated into the results. This indicates the difference it makes when respondents' demographic characteristics and an index of their health status, compiled from their self-reported utilization of medical services and distances from these services, are incorporated into the base models.

For the marginal effects of the conditional logit model with interactions, only the signs but not the magnitudes of the coefficients from the conditional logit will be interpreted. The WTP obtained from the interaction terms are therefore only to be observed for their signs. The WTP from the interaction term is added to the WTP from the original standalone variable related to that interaction variable. When looking at the interactions of the variables with respondents' demographic variables, the study identifies significant findings (Table 6-4). Not all the tested interactions were found to be statistically significant although they may be clinically significant; even such statistical insignificance may be useful information.

The interactions in the conditional model displayed in table 6-4 are from the hypotheses in chapter 2 and the corresponding willingness-to-pay values are shown in table 6-5. The significant interactions, whose signs but not magnitudes will be presented, are as follows. An uninsured respondent is willing to pay for a facility that accepts any patient regardless of whether they have health insurance or not relative to a facility that only accepts patients with private health insurance. A respondent with private health insurance coverage is willing to pay a facility with full diagnostic services and residents with incomes

greater than \$100,000 a year are willing to pay for full diagnostics services relative to a facility with X-ray capability only. With increasing age, respondents are willing to pay for dialysis services and with increasing age respondents are willing to pay for cancer services compared to a facility with no specialty services in rural Kentucky.

Table 6-4: Conditional Logit with interactions

VARIABLES	Coefficient (Standard Deviation)
Open 24 hours a day, 7 days a week	0.793*** (0.127)
Open 9am-5pm, 7 days a week	0.361*** (0.134)
MD, NP, or PA seen by appointment only	0.431*** (0.093)
Physician immediately available	0.505*** (0.099)
X-rays and diagnostic laboratory services only	0.682*** (0.087)
Full Diagnostic services (x-rays, lab work, CATscans, MRI)	0.971*** (0.104)
Emergency care	0.442*** (0.087)
Physical Therapy (Specialized Care)	-0.076 (0.112)
Dialysis as a form of specialized care	0.508* (0.289)
Cancer care as an offering of Specialized Care	0.747*** (0.267)
Medicaid/Medicare, Sliding Scale based on patients' income and private insurance are all accepted	1.048*** (0.105)
Medicaid/Medicare and private insurance accepted	0.541*** (0.111)
Price	-0.012*** (0.001)
Private insurance interacted with full diagnostics services	0.216* (0.116)
Full diagnostics interacted with respondents with income of 50k-75k	-0.042 (0.153)

Table 6-4 (continued)

24-hour service interacted with respondents with children	0.083 (0.110)
Emergency care attribute interacted with respondent with children	0.100 (0.112)
Dialysis interacted with age	-0.012** (0.005)
Oncology specialty services interacted with age	-0.010** (0.004)
Facility that accepts all patients interacted with uninsured patients	0.752*** (0.173)
Facility that accepts patients with public or private insurance interacted with patients with Medicare and private insurance	0.273 (0.194)
Facility having a Physician immediately available interacted with respondents who have income of 50k to 75k	0.010 (0.184)
Facility which accepts all patients interacted with patients with income less than \$15,000	0.035 (0.131)
Constant (alternative 2)	0.045 (0.129)
Constant (alternative 3)	1.442*** (0.197)
Observations	8,160

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Legend for variables is below in table 6.9.

Table 6-5: Sign of WTP with Conditional Logit and Interaction Variables

Attribute	WTP/\$	Is WTP Significant ?
Twentyfour , open 24 hours a day, 7 days a week	66.00	Yes
Ninetofive , open 9am-5pm, 7 days a week	31.14	Yes
Allappt , Physician, Nurse Practitioner or Physician Assistant seen by appointment only	37.05	Yes
Phys , Physician immediately available	43.61	Yes
Xraydiag , x-rays and diagnostic laboratory services only	58.55	Yes
Fulldiag , Full Diagnostic services (x-rays, lab work, CATscans, MRI)	80.31	Yes
Emergency , Emergency care	37.25	Yes
Therapy , Physical Therapy (Specialized Care)	-6.53	No

Table 6-5 (continued)		
Dialysis , Dialysis as a form of specialized care	43.86	Yes
Cancer , Cancer care as an offering of Specialized Care	65.23	Yes
Allinsurance , Medicaid/Medicare, Sliding Scale based on patient's income and private insurance are all accepted	90.68	Yes
Pubpriv , Medicaid/Medicare and private insurance	46.45	Yes
Value with interactions		
Fulldiag_privat , value a respondent with private insurance has for full diagnostics versus their value for X-rays only	98.67	Yes
Fulldiag_Inc5075k , Full diagnostics interacted with respondents with income of 50k-75k	77.50	No
Emergency_kids , value a respondent with children has for emergency care versus their value for no emergency care	45.17	No
Dialysis_age , Dialysis interacted with respondents' age	-41.33	Yes
Cancer_age , Cancer care interacted with respondents' age	-61.42	Yes
Allinsurance_uninsured , Facility accepting all insurance types and out of pocket payers on a sliding scale interacted with uninsured respondents	150.10	Yes
Pubpriv_combo , Facility accepting only Medicare, Medicaid and Private insurance interacted with respondents who have a combination of Private insurance and Medicare	67.80	No
Phys_inc5075k , Facility having a Physician immediately available interacted with respondents' income of 50k to 75k	42.92	No
Allinsurance_inc15k , Facility accepts all insurance types and uninsured interacted with respondents' income < \$15,000 a year	90.25	No
Fulldiag_inc100k , Facility offers full diagnostic services interacted with respondents' income over \$100,000 annually	142.67	Yes
Fulldiag_combo , Facility with full diagnostics interacted with respondents with combination of private insurance and Medicare	87.75	No
Phys_combo , Physician immediately available interacted with respondents with combination of private insurance and Medicare	34.83	No

6.3.1 Mixed Logit model with interactions

Some of the interaction variables with the mixed logit model include the demographic characteristics and health status of respondents from the index in section 5.2. The most valuable attribute, a facility which accepts all patients regardless of whether they have health insurance [All insurance] was interacted with patients' ranking of how

important it is to them that their provider accept all patients [No insurance], and also interacted with patients who had no insurance[Uninsured]. An interaction between the attribute of having an emergency department and whether respondents or members of their household have used an emergency department was performed. An interaction between the attribute of having an emergency department the distance respondents travelled to an emergency department was performed.

Table 6-7: Mixed Logit with Health Index and Demographic Data

VARIABLES	Mean	Standard Deviation
Price	-0.033*** (0.003)	
Open 24 hours a day, 7 days a week	0.929*** (0.215)	2.281*** (0.254)
Open 9am-5pm, 7 days a week	0.378** (0.162)	1.319*** (0.245)
MD, NP or PA seen by appointment only	-0.139 (0.185)	2.209*** (0.306)
Physician immediately available	0.555*** (0.180)	-1.036*** (0.363)
X-rays and diagnostic laboratory services only	0.639*** (0.167)	0.804*** (0.269)
Full Diagnostic services (x-rays, labs, CATscans, MRI)	1.805*** (0.191)	1.146*** (0.339)
Emergency care	-0.190 (0.405)	2.080*** (0.282)
Physical Therapy (Specialized Care)	-0.865*** (0.201)	1.151*** (0.312)
Dialysis as a form of specialized care	-1.170*** (0.208)	1.356*** (0.325)
Cancer care as an offering of Specialized Care	0.404 (0.528)	-0.565 (0.347)
Medicaid/Medicare, Sliding Scale based on patients' income and private insurance are all accepted	1.207*** (0.355)	1.498*** (0.320)
Medicaid/Medicare and private insurance accepted	0.992*** (0.202)	-1.240*** (0.333)

Table 6-7 (continued)

Emergency_ercare, Facility with emergency department interacted with Respondent use of ER last 2 years	-0.027 (0.203)	1.475*** (0.266)
Emergency_diercare, ER and respondents' distance to ER	0.312** (0.150)	0.268** (0.136)
Allinsurance_noins, All insurance/uninsured accepted interacted with ranking of respondents indicating importance to them that their provider accept uninsured	0.234** (0.103)	0.574*** (0.111)
Twentyfour_kids, A facility that is open 24 hours interacted with respondents with children	0.412 (0.316)	-0.736 (0.507)
Emergency_kids, ER interact with respondents with kids	0.346 (0.321)	-0.439 (0.454)
Emergency_uninsured, ER interacted with uninsured	-0.070 (0.461)	-0.748 (0.535)
Cancer_age, Cancer services interacted with age	-0.009 (0.009)	0.001 (0.007)
Allinsurance_uninsured, All insurance/uninsured accepted interacted with uninsured respondents	1.479** (0.610)	3.617*** (0.880)
Observations	8,184	8,184

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.3.2 Estimation of the Willingness-to-pay with interactions

In the mixed logit model which includes respondents' health history from the health index and demographic variables, there are three significant interaction variables (Table 6-7).

Table 6-8: WTP from Mixed Logit with Health History and Demographic Data

Variable	Description	WTP	Lower Limit	Upper Limit
Twentyfour	24 hours a day, 7 days a week	28.08	15.37	40.79
Ninetofive	9am-5pm, 7 days a week	11.43	2.23	20.62
Allappt	Practitioner by appointment only	-4.19	-15.25	6.86
Phys	MD immediately available	16.76	6.25	27.27
Xraydiag	X-rays and diagnostic lab services only	19.30	9.67	28.93
Fulldiag	Full Diagnostic services	54.54	43.98	65.11
Emergency	Emergency care	-5.75	-29.80	18.29
Therapy	Physical Therapy	-26.14	-38.77	-13.51
Cancer	Cancer care	12.21	-18.96	43.38
Allinsurance	All patients accepted	36.48	15.59	57.37
Pubpriv	Public/private insurance accepted	29.99	18.58	41.41
Emergency_ercare	ER interacted with respondent using ER in last 2 years	-0.82	-12.86	11.23
Emergency_diercare	ER interacted with their distance from ER	9.42	0.59	18.25
Allinsurance_noins	Facility that accepts all patients interacted with respondents' ranking importance for facility to accept all patients	7.06	0.96	13.15
Twentyfour_kids	24-hour facility interacted with respondents with children	12.45	-6.13	31.03
Emergency_kids	ER interact with respondents with kids	10.46	-8.54	29.47
Emergency_uninsured	ER interact with uninsured respondents	-2.10	-29.41	25.21
Cancer_age	Cancer service interacted with age	-0.28	-0.81	0.25
Allinsurance_uninsured	All insurance types accepted interacted with uninsured respondents	44.68	7.82	81.54

The WTP values are presented below in Table 6-8. These results in Table 6-8 are consistent with the hypotheses that the respondents are willing to pay for the attributes they find valuable based on their particular individual demographic characteristics. First, distance from emergency care interacted with a facility that has an emergency department is significant at the 5% level. As respondents' self-reported distance or driving time from emergency care increased by one unit (1 unit is a 15 minute drive; e.g. from a 15- minute drive to a 30-minute drive), they were willing to pay \$3.67 for emergency department services. This is consistent with the hypothesis that respondents' WTP would increase with increasing distance from emergency care.

Second, 'No insurance', a measure of how important respondents find it that the provider accepts individuals who do not have insurance or who self-pay when seeking immediate medical care being, being interacted with a facility that accepts all patients regardless of whether they have public or private or no insurance is significant at the 1% level. Respondents' ranking the importance of their provider accepting everyone regardless of their insurance coverage compared to seeing only accepting patients with private insurance was valued at \$43.52. This indicates how much respondents value access to care and fits the hypothesis that as the respondents value their provider seeing all patients they will be willing to pay for that attribute of access to care.

Third, a facility that accepts all patients regardless of health insurance type or lack coverage interacted with uninsured persons is significant at the 5% level. In line with the hypothesis, the study finds that uninsured respondents are willing to pay \$81.15 for the above facility compared to a facility that only accepts patient with private health insurance.

There are four findings that are interesting but not statistically significant. First, respondents with children had a willingness-to-pay total of \$40.52 whereas the average respondent was willing to pay \$28.08 for a facility that operated 24 hours compared to a facility open from 9am to 7pm, 5 days a week. Second, respondents with children had a WTP of \$4.71 for emergency services; but the average respondent had a negative WTP for emergency services when interactions were included. These findings are clinically significant although they may appear to be statistically insignificant. This is because households with children, knowing how especially prone children are to illness and accidents, would want medical care to be available around the clock either in an emergency department or in a 24-hour facility. These respondents would want a facility they could take their children to for more comprehensive medical care and not only emergency services. They appear to prefer a facility open 24 hours to an ED although they value both. Although these findings are consistent with the hypotheses, they are not statistically significant.

Third, as age increased, respondents WTP for cancer care had a negative sign and respondents with no insurance had a negative sign for emergency services. These findings seemed counter-intuitive that with increasing age they would not want to pay for a facility to include cancer care or with no insurance a person would not want to pay for a facility to include an attribute of emergency services. It appears that rural residents would prefer to travel to urban medical centers or academic health centers for more advanced care from more experienced practitioner than to have a facility in their rural locality providing oncology services. Also, it may be that uninsured respondents have had many experiences with emergency departments being their predominant source of care and do not wish to

pay for them either due to poor experiences or because they can always have such care from an emergency department so do not see the need to pay for it themselves, but can use it as a public good.

Chapter 7: Discussions and Conclusions

7.1 Main findings

The results from this study showed that respondents value attributes of healthcare facilities presented to them. Access to healthcare in America is largely predicated on having health insurance, being able to see a provider when needed, and having diagnostic medical technologies available in a community. Thus, respondents value a facility that treats everyone regardless of whether they have health insurance or not, compared to one which only treats patients with private insurance, at \$69.90. The study also found that respondents are willing to pay \$19.20 to see a physician who is immediately available compared to only being able to see a mid-level practitioner. However, they are not willing to pay for the attribute level which requires them to make an appointment first before they can see their providers, whether the provider is a physician or mid-level practitioners compared to only being able to see a mid-level practitioner. This would imply that respondents prefer being able to see a practitioner quickly without having to make and wait for an appointment whether a full physician or mid-level practitioner.

The third main finding related to patients' access healthcare is medical technology such as diagnostic information for detecting and staging cancer, obstetric or genetic abnormalities, and infectious diseases. Respondents are willing to pay \$28.80 for X-ray and diagnostic labs only compared to only X-rays; and are willing to pay \$51.60 for full diagnostic services when compared to only X-rays. Full diagnostics services is the second most valuable attribute level after a facility which treats all patients even if they do not have health insurance coverage. In a developed country where technology drives many sectors of the economy, technology drives healthcare provision to a large extent and makes

up a significant portion of the costs of healthcare in America. The study suggests the high value respondents hold for expensive medical technology which is a significant cost driver with healthcare spending. This valuation can help administrators in rural facilities justify the need for more and improved medical technology to improve the services in the local emergency departments and the satisfaction of their residents.

Incorporating respondent characteristics with the facility attributes provided some relevant results. Respondents are willing to pay \$19.30 on average for an emergency department to be offered in a facility in their vicinity compared to having no emergency department. However, those who had used an emergency department in the last 2 years were not willing to pay for an emergency department. Several respondents indicated in the comments section that they were not satisfied with the services they received in the emergency departments in their rural or community hospitals. They indicated that they would prefer to travel a longer distance to a large academic medical center for more experienced practitioners, more advanced medical technology with more sensitivity in detection and faster more efficient service delivery. Long wait and service times in smaller, rural hospitals in which the facilities have a limited number of diagnostic machines, a larger ratio of patients to providers, and inefficient processing and triage of patients were also a dissatisfaction to respondents. The respondents prefer an ED visit at a larger facility that would take less the time than at their rural facility. The patient may need transferred to or have to later visit another facility to get the higher level of care they need that could not be provided by their rural emergency department. There are also more limited hours of operation in the day of personnel such as specialists, pharmacy staff and medical technicians needed to support the operation of rural emergency departments. These reasons

explain why to rural residents who have experience with their local emergency department not being willing to pay for an emergency department to be sited in their community.

The second respondent characteristic of distance from emergency department services showed that an increase in drive time by 15 minutes from an emergency department made respondents WTP \$3.67. When adjusted for, the respondents' self-reported distance from emergency care positively increased their WTP for emergency department services by \$3.67 by every 15 minutes additional drive away from an emergency care facility. This implies that respondents who lived farther away from an ED were willing to pay more to have an ED nearby as their distance increased from such care.

Considering the dissatisfaction of residents who have used an ED recently and the value of residents who live far from an ED, a group of rural communities near each other can pool their resources to support the provision of an emergency department accessible these communities. Instead of each community having a smaller emergency department which may send home specialized personnel after a typical workday, they could consolidate their resources to have a larger ED accessible to each other them within a reasonable driving distance that is open 24 hours and having specialists such as cardiologists on call or on staff 24 hours while retaining smaller urgent care facilities from which patients could be transferred to this larger consolidated facility.

Oncology service is valued at -\$15.90 compared to not having oncology service; though this value is not significant, interacting age with oncology services showed that with every additional year respondents were still not willing-to-pay for cancer (WTP - \$0.28). This implies that rural residents even when increasing in age and becoming increasingly limited by transportation options would still prefer care at established hospital

systems or academic health centers in urban cities than in rural regions where more experience, technological advancement and larger numbers of procedures tend to result in improved outcomes for patients.

Uninsured respondents had a willingness-to-pay value for an emergency department of -\$7.85 compared a facility without an emergency department whereas the average respondent had a WTP of \$19.30. It implies that uninsured respondents do not value an emergency department. However uninsured respondents were willing to pay \$81.16, an extra \$11.26 over the \$69.90 that the average respondent was willing to pay for a facility that accepted and treated anyone regardless of whether they had insurance or not compared to a facility that only accepts patients with private insurance. This may be a beneficial attribute of a healthcare facility for the uninsured. The results suggest that uninsured respondents prefer preventive health care to emergency health care. They would prefer a facility which resembles a health department or federally qualified health center that provides preventive, comprehensive and primary health care for chronic issues rather than accessing emergency treatment for acute interventions. Preventive health care is more desirable for patients, practitioners, society and the health system than emergency care as many problems such as heart attacks or strokes dealt with in an emergency setting cost a significant amount in time, resources, health personnel and money compared with treating a patient's high blood pressure at a primary care visit hence preventing such complications such as heart attacks and strokes in the future.

This response reflects the value of the large number of uninsured persons in the population. 13% of the respondents in this study were uninsured and 23% of the residents of the 10-county region where this study was conducted were uninsured in 2012. The

significant willingness-to-pay values reflect how much uninsured residents value access to medical care. The impact of having health insurance and the policy implication of providing insurance therefore are to improve health and subsequently economic output of rural areas as productivity and economic output depend heavily on the health of the labor force. Andersen's (1995, 2005) theory of health behavior and care utilization corroborates the results of this study because based on their health status and health beliefs respondents are willing to pay for what they believe are valued determinants of health in the biomedical model of health some of which are the various attributes of healthcare seen here.

7.2 Policy implications

Since the majority of WTP studies conducted is to inform policy-making (Carson, 2000), for policy-makers the results of this study can be useful because they inform how funds can be allocated to healthcare attributes that residents are willing to pay for.

7.2.1 Implications for providers of healthcare facilities

The findings from this study show that residents in rural Kentucky value the stated attributes of healthcare. For hospital associations, private practitioners and public officials who are involved in providing medical care facilities, paying attention to the attributes consumers care about, how much they value them and the circumstances that affect their willingness-to-pay will inform where necessary funds should be allocated. This will enable facilities with the right services to be provided in the right locations for the right price to the right consumers.

Gafni (1991) suggests using the willingness-to-pay of residents as a way to measure the benefits accruing to the society to influence governmental decision making about

implementing health care programs. Decision makers such as governments and private health care service providers need to understand the users' willingness to pay values using various direct or indirect measurements to get the best possible gauge of the public's perception (Gafni, 1991). Thus, the motivation for this study is to help inform public and private providers of healthcare about consumers' perception and value of health care facilities in rural areas.

Alderman and Lavy (1996) explain that the effectiveness of government investments in healthcare depends on the public's response to price and quality, and whether these investments actually improve health outcomes. According to their findings, consumers, even those in low-income households, are willing to pay fees for better health care if those fees translate into improved access and reliability of health care facilities. They further explained that the availability of basic healthcare has a relatively greater impact on households with low incomes or low education or both than does the provision of more specialized services (Alderman and Lavy, 1996).

Inferring from this study, facility administrators in a region that is distant from a facility with an emergency department can sum up the value of the residents in their market and their distances from the nearest emergency facility and come up with the value of their locality for an emergency department. This administrator can justify the costs to provide such a facility by comparing the welfare benefit to his clients especially if public funds will be used to provide that emergency service. Facility managers may decide to provide diagnostics services care to an aging population with favorable health insurance that enables them to pay for such services to reduce the travel time to such services in urban areas. They may also elect to provide preventive health care services to uninsured or

indigent populations who require public health insurance such as Medicare or Medicaid and can justify such expenditures by showing that the benefits outweigh the costs. Finally, health administrators may provide several services to several different population with different health needs and justify public health spending necessary to meet the needs of their local populations based the valuation of the residents for the attributes of the services in their localities.

Market research is needed in each county to determine the needs of the population, their willingness-to-pay, their ability to pay, education level, stages in life of household residents (with young children or retirees) and type of insurance coverage. When prioritizing the communities' needs, public officials could use relevant resident willingness-to-pay values to inform their budgets. Public officials in adjoining counties can collaborate to review existing health services, and healthcare needs in their region and consider consolidation of publicly provided healthcare services. This could be done at the level of area development districts or even smaller regional groups.

7.2.2 Implications for rural residents

Because the rural healthcare system is supported by a mix of federal, state, and private entities, knowing the private benefit of services could help federal and state entities to focus their efforts on the amenities for which social benefits are greater private benefits. In a region impacted by diabetes, obesity, cancer, and drug addiction, treatment services for attribute levels valued by each community can be established by justifying the benefits to society compared to the costs to society with community health needs assessments. This is especially important in areas where a quarter of the population (23%) is uninsured and another quarter of the population (26%) uses Medicaid in the 10-county region where the

study is conducted. Uninsured persons may still get medical care in emergency departments and when they are unable to pay their medical bills, the hospitals have to write off the costs or pass on the cost of these services to paying customers whose out-of-pocket payments or insurance premiums get raised in response. It costs significantly more to use an emergency department for care and when these options, costs and outcomes are presented to the community members they may be willing to pay for all, including uninsured residents, to have access to preventative primary health care. This is cost minimizing for the whole community rather than using costlier emergency services for the same issues at the same time or in future when complications have set in requiring emergency services for transportation, hospitalization, or intensive care.

If, for example, each resident is willing to pay \$30 dollars annually for an attribute, based on the total number of residents, a facility with the needed attribute and value to those residents can be justified. These attributes could be added on to existing infrastructure provided by federal and state funding sources. For example, a physician assistant or nurse practitioner could be hired on a part-time basis to run an outpatient service in an office attached to a rural health clinic that attracts such funding designated for certain needs. As communities' health needs assessments dictate, residents' willingness-to-pay, and what services to provide can be addressed in a public forum by administrators to obtain resident input at each step of the decision-making process.

7.3 Limitations and further research

There are a few limitations in this study. First, it focused on one narrow aspect of access to health care and insurance issues in rural areas and what the population values or is willing to pay for in health care attributes. The study only examines basic attributes in areas

dealing with the burdens of shortages of health professionals, poor insurance coverage, comparatively lower incomes and lower public and private sector funds for healthcare amenities. Further research can assess attributes such technological advancement, experience, expertise, quality, efficiency and long-term outcomes of care delivery in rural areas with instruments that can quantify these attributes that are less tangible. Further research can consider attributes such as quality of service and outcomes of interventions on patient health which the centers for Medicare and Medicaid services now consider to provide star ratings for facilities and hence improved reimbursement rates.

This work can be further developed by expanding the choice situations and increasing the number and levels attributes offered respondents. The attributes, levels and prices utilized can be increased despite inherent limitations of balancing the increase in complexity of the experiment for respondents with trying to gain more reliability in results. Second, the survey did not include an option for respondents to report educational attainment. This may affect the results with demographic variables because education has a correlation with income and health status so its exclusion may result in omitted variable bias.

Zimmerman and McAdams (1999) looked at all 105 counties in Kansas to examine local funding for healthcare with more depth than could be observed with the United States Census data. They observe that there was substantial variation in spending between counties based on income level, population age and population density. They explain that in rural areas, incomes tend to be lower, age tends towards the elderly and poorer health, and population density is lower. These three items explained about 40 percent of the variation in spending between urban and rural counties showing the effect that income,

health status and distance from care can have on expenditures. Similarly, this study suggests that rural respondents' willingness-to-pay for services vary from the average respondent according to income, health insurance coverage, health status and distance from care. Hence public spending appears to mirror residents value for healthcare so that benefits of spending appear to match the costs as Alderman and Lavy (1996) suggests.

In summary, this study provides relevant information to stakeholders and policy makers about the rural residents in Kentucky value improvements in certain attributes of health care. The results show that demographic characteristics influence willingness-to-pay for healthcare. Decision-makers can decide the healthcare services that would most benefit their communities. Public providers of care or private hospital groups can consider the insurance reimbursement rates among the population of persons without insurance and the amount of indigent care that would have to be written off. The results of the study may also be applied to similar rural community across the United States of America which may have similar demographics as rural Kentucky.

Appendices

Appendix A – Survey

The Value of Healthcare Survey

I. Healthcare History

1. Over the past two years have you or members of your household utilized the following health care services? (Please check the ones that apply)

Primary Care

Preventive Care You Member of household

Care of other illness or health concern You Member of household

X-Ray/Diagnostic Services You Member of household

Emergency Room Services

Care of emergency issues You Member of household

If so, were these issues life threatening? YES NO

Care of non-emergency issues You Member of household

Specialty Care Services

Cardiology You Member of household

Obstetrics/Gynecology You Member of household

Radiology You Member of household

Neurology You Member of household

Psychiatry You Member of household

Oncology (cancer care) You Member of household

Urology You Member of household

Orthopedics You Member of household

Pulmonology (lung care) You Member of household

Pediatrics Children

2. Healthcare Providers

a. Do you have a regular primary care physician? YES NO

b. If you answered yes to 2a, is your primary care physician located in your county? YES NO

- c. If you answered no to question 2b, how far do you drive to visit your primary care physician? _____ miles
- d. If you or a member of your household have used a hospital in the past two years please list the name of the hospital and indicate if the visit was for emergency purposes. Please indicate the **quality of your experience on a scale of 1 to 5 where** 1 = very unsatisfactory, 2 = somewhat unsatisfactory, 3 = neutral 4 = somewhat satisfactory and 5 = very satisfactory.

Hospital Name	Emergency room visit?		Quality of Experience
	Yes	No	
_____	Yes	No	_____
_____	Yes	No	_____
_____	Yes	No	_____
_____	Yes	No	_____
_____	Yes	No	_____

- e. Do you use any of the following sources of information when making the decision about which hospital to use? (Check all that apply)

- | | |
|---|---|
| <input type="checkbox"/> Billboards | <input type="checkbox"/> Internet |
| <input type="checkbox"/> County events (fairs, wellness events) | <input type="checkbox"/> Newspaper |
| <input type="checkbox"/> Direct mail | <input type="checkbox"/> Physician referral |
| <input type="checkbox"/> Facebook | <input type="checkbox"/> Radio/TV |
| <input type="checkbox"/> Friends and family experiences | <input type="checkbox"/> Twitter/social media |
| | <input type="checkbox"/> Word of mouth |

- f. Do you believe your community has a Federally Qualified Health Center/Rural Health Clinic (this is not the Health Department)?

_____ YES _____ NO

- g. Have you used the Federally Qualified Health Center/Rural Health Clinic in your community in the last two years?

_____ YES _____ NO


In the following, you will be presented with a series of new medical facilities that may be built to serve your community. These facilities are grouped in four choice situations. Each choice situation presents two medical facilities. You are asked to indicate your preferred facility in each choice situation. You can also indicate that you do not prefer either. The two medical facilities in each choice situation are identical in all other characteristics except those described. In order to create or maintain the characteristics listed for these facilities, additional funding must be generated. The amount of household funding necessary to support each facility is provided with each choice. While making your choices, please keep in mind that:

- *Please choose ONLY ONE FACILITY in each situation*
- *FACILITIES in each situation are the ONLY ones available*
- *Do NOT compare facilities in different choice situations*

Choice Situation 1 of 4

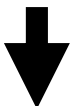
	Facility A (following features offered)	Facility B (following features offered)	
Hours Open	24 hours a day/7days	9-7/5 days	
Providers on Staff	Physician, Nurse Practitioner, or Physician Assistant seen by appointment only	Only Nurse Practitioner or Physician Assistant available	
Services	x-rays and diagnostic laboratory services only	x-rays only	
Emergency Care	Yes	No	I do not prefer either facility (please check below)
Specialized Care	None	None	
Accepted Insurance	Private insurance only	Private insurance only	

Mandatory fee every household will pay per year I would prefer to have facility: (choose one only)

\$100 <input type="checkbox"/>	\$80 <input type="checkbox"/>	 <input type="checkbox"/>
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- Please choose ONLY ONE FACILITY in each situation
- FACILITIES in each situation are the ONLY ones available
- Do NOT compare facilities in different choice situations

Choice Situation 2 of 4

	Facility A (following features offered)	Facility B (following features offered)	
Hours Open	9-5/ 7days	9-7/5 days	
Providers on Staff	Only Nurse Practitioner or Physician Assistant available	Physician, Nurse Practitioner, or Physician Assistant seen by appointment only	
Services	Full Diagnostic services (x-rays, lab work, CATscans, MRI)	x-rays only	
Emergency Care	Yes	No	
Specialized Care	Dialysis	Dialysis	
Accepted Insurance	Medicaid/Medicare, Sliding Scale based on patient's income, and private insurance	Medicaid/Medicare, Sliding Scale based on patient's income, and private insurance	
Mandatory fee every household will pay per year I would prefer to have facility: (choose one only)	\$100 <input type="checkbox"/>	\$40 <input type="checkbox"/>	I do not prefer either facility (please check below)  <input type="checkbox"/>


- Please choose ONLY ONE FACILITY in each situation
- FACILITIES in each situation are the ONLY ones available
- Do NOT compare facilities in different choice situations

Choice Situation 3 of 4

	Facility A (following features offered)	Facility B (following features offered)	
Hours Open	24 hours a day/7 days	9-5/ 7days	
Providers on Staff	Physician immediately available	Physician immediately available	
Services	Full Diagnostic services (x-rays, lab work, CATscans, MRI)	x-rays and diagnostic laboratory services only	
Emergency Care	Yes	Yes	
Specialized Care	Physical therapy	Cancer care	
Accepted Insurance	Medicaid/Medicare and private insurance	Medicaid/Medicare and private insurance	
Mandatory fee every household will pay per year	\$40	\$80	
I would prefer to have facility: (choose one only)	<input type="checkbox"/>	<input type="checkbox"/>	<p>I do not prefer either facility (please check below)</p> <p style="text-align: center;"></p> <input type="checkbox"/>

- Please choose ONLY ONE FACILITY in each situation
- FACILITIES in each situation are the ONLY ones available
- Do NOT compare facilities in different choice situations

Choice Situation 4 of 4

	Facility A (following features offered)	Facility B (following features offered)	
Hours Open	24 hours a day/7 days	9-7/5 days	
Providers on Staff	Physician, Nurse Practitioner, or Physician Assistant seen by appointment only	Only Nurse Practitioner or Physician Assistant available	
Services	x-rays only	x-rays and diagnostic laboratory services only	
Emergency Care	No	Yes	
Specialized Care	Cancer care	Physical therapy	
Accepted Insurance	Medicaid/Medicare and private insurance	Medicaid/Medicare, Sliding Scale based on patient's income, and private insurance	
Mandatory fee every household will pay per year	\$60	\$120	
I would prefer to have facility: (choose one only)	<input type="checkbox"/>	<input type="checkbox"/>	<p>I do not prefer either facility (please check below)</p> <p style="text-align: center;"></p> <input type="checkbox"/>

II. Follow up questions

3. How long do you have to travel to access the following services? (Please check the appropriate box)

Services	Driving Time				
	0 to 15 minutes	15 to 30 minutes	30 minutes to 1 hour	Longer than 1 hour	Don't know or not applicable
Routine care services (family doctor)					
Specialized care services (cancer care, dialysis, etc.)					
Urgent care services					
Emergency health care services (emergency room)					
Diagnostic services (x-ray, lab work, MRI, CATscan)					

4. How important is it that you have access to the following specialty services in your community? (Please check one for each specialty service)

	Not important at all	Somewhat unimportant	Somewhat important	Very important	Don't know or not applicable
Cancer treatment					
Cardiac rehab					
Diabetes treatment					
Kidney Dialysis Services					
Physical therapy					

5. When seeking immediate medical care how important is it that your provider accepts your health insurance, Medicaid, or Medicare? (Please circle one)

Not important at all Somewhat unimportant Somewhat Important

Very important NA

6. When seeking immediate medical care how important is it that your provider accepts individuals who do not have health insurance or those who self pay? (Please circle one)

Not important at all Somewhat unimportant Somewhat Important

Very important NA

7. If your community didn't have a local hospital, how long would it take you to drive to access regular services that are usually provided by your local hospital? (Please check one)

0-15 min 15-30 min 30 min - 1 hour More than 1 hour

8. Would you have to leave the state to visit the nearest services? YES NO

III. Demographic Information

9. What is your postal code? _____

10. What is your age? _____ Years

11. Are you? _____ Male _____ Female

12. Are you currently married or living with a significant other? YES NO

13. Are there children currently living in your household? YES NO

If yes, how many children? _____ Children

What are the ages of the children? _____

14. Do you currently care for elderly members (older than 65) of your family?

_____ YES _____ NO

If yes, do these individuals live with you full-time? _____ YES _____ NO

15. Do you participate in any of the following private or public insurance plans?

_____ Employer sponsored (Private)

_____ Employer sponsored (Public)

_____ Medicare

_____ Medicaid

_____ Combination Private/Medicare

_____ Uninsured

16. Please indicate your annual **household** income within the ranges below.

_____ Under \$15,000

_____ Between \$15,000 and \$24,999

_____ Between \$25,000 and \$34,999

_____ Between \$35,000 and \$49,999

_____ Between \$50,000 and \$74,999

_____ Between \$75,000 and \$99,999

_____ Over \$100,000

Please use space below to provide any comments you may have on this survey.

Appendix B. Table of responses from choice experiment

	Mean	Percentage of respondents who chose this facility %
Scenario 1 facility A	0.242	24.2
Scenario 1 facility B	0.376	37.6
Scenario 1, neither facility	0.352	35.2
Scenario 2 facility A	0.395	39.5
Scenario 2 facility B	0.227	22.7
Scenario 2, neither facility	0.328	32.8
Scenario 3 facility A	0.301	30.1
Scenario 3 facility B	0.379	37.9
Scenario 3, neither facility	0.276	27.6
Scenario 4 facility A	0.416	41.6
Scenario 4 facility B	0.144	14.4
Scenario 4, neither facility	0.386	38.6

Appendix C. Distances to the following services

	Mean	SD	Min	Max
Routine care services (family doctor)	23.022	17.469	7.500	75.000
Specialized care (cancer, dialysis)	47.403	18.634	7.500	90.0
Urgent care services	32.482	18.979	7.500	75.000
Emergency health care services (ER)	29.820	18.856	7.500	75.000
Diagnostic services (x-ray, lab work, MRI, CAT scan)	33.128	19.403	7.500	75.000
No local hospital	43.725	15.354	7.500	75.000
Would have to leave the state (%)	5.4	0.226	0.0	1.000

Appendix D. Rankings of importance of specialty care

1. If it were applied to you, how important is it that you have access to the following specialty services in your community?

Cancer	Frequency	Percent
Don't know or not applicable	119	15.18
Not important at all	36	4.59
Somewhat unimportant	28	3.57
Somewhat important	150	19.13
Very Important	451	57.53
Total	784	100

Cardiac Rehabilitation	Frequency	Percent
Don't know or not applicable	100	12.76
Not important at all	26	3.32
Somewhat unimportant	27	3.44
Somewhat important	169	21.56
Very Important	462	58.93

Diabetes	Frequency	Percent
Don't know or not applicable	111	14.16
Not important at all	33	4.21
Somewhat unimportant	35	4.46
Somewhat important	167	21.3
Very Important	437	55.74
45	1	0.13

Dialysis	Frequency	Percent
Don't know or not applicable	138	17.6
Not important at all	38	4.85
Somewhat unimportant	43	5.48
Somewhat important	169	21.56
Very Important	395	50.38

Physical Therapy	Frequency	Percent
Don't know or not applicable	97	12.37
Not important at all	24	3.06
Somewhat unimportant	32	4.08
Somewhat important	204	26.02
Very Important	426	54.34

2. When seeking immediate medical care how important is it that your provider accepts your health insurance, Medicaid or Medicare?

Respondent's Insurance	Frequency	Percent
Don't know or not applicable	75	9.57
Not important at all	6	0.77
Somewhat unimportant	3	0.38
Somewhat important	23	2.93
Very Important	677	86.35

3. When seeking immediate medical care how important is it that your provider accepts individuals who do not have health insurance or those who self pay?

No insurance	Frequency.	Percent
Don't know or not applicable	84	10.71
Not important at all	44	5.61
Somewhat unimportant	34	4.34
Somewhat important	107	13.65
Very Important	515	65.69

Appendix E – Additional tables

Table E-1: Description of Variables

Variable	Description
Healthcare History	
<u>Use of these services over past two years</u>	
Preventive care	Dummy variable, yes = 1
Care of other illness	Dummy variable, yes = 1
X-ray/Diagnostic Services	Dummy variable, yes = 1
Emergency Room Services	
Care of emergency issues	Dummy variable, yes = 1
Were ER issues life threatening?	Dummy variable, yes = 1
Care of non-emergency services	Dummy variable, yes = 1
Specialty Care Services	
Cardiology	Dummy variable, yes = 1
Obstetrics/Gynecology	Dummy variable, yes = 1
Radiology	Dummy variable, yes = 1
Neurology	Dummy variable, yes = 1
Psychiatry	Dummy variable, yes = 1
Oncology	Dummy variable, yes = 1
Urology	Dummy variable, yes = 1
Orthopedics	Dummy variable, yes = 1
Pulmonology	Dummy variable, yes = 1
Pediatrics	Dummy variable, yes = 1
Healthcare Providers	
^a Do you have a regular primary care physician?	Dummy variable, yes = 1
If affirmative, is physician based in your county?	Dummy variable, yes = 1
If your primary care physician is not located in your county, how far do you drive to visit your primary care physician?	Continuous variable, distance from Physician in miles

Table E-2: Importance of Services

Variable	Description
Cancer treatment	Respondents rank how important it is to them to have cancer treatment specialty services in their community on a scale of 1 to 5.
Cardiac rehab	Respondents rank how important it is to them to have cardiac rehabilitation specialty services in their community on a scale of 1 to 5.
Diabetes treatment	Respondents rank how important it is to them to have diabetes treatment specialty services in their community on a scale of 1 to 5.
Kidney Dialysis Services	Respondents rank how important it is to them to have dialysis specialty services in their community on a scale of 1 to 5.
Physical therapy	Respondents rank how important it is to them to have physical therapy specialty services in their community on a scale of 1 to 5.
How important is it that Provider accept your insurance, Medicare, or Medicaid	Respondents rank how important it is to them for their medical provider to accept their private health insurance, Medicare or Medicaid on a scale of 1 to 5.
For immediate care how important is it that provider accepts those with no insurance or those who self-pay	Respondents rank how important it is to them for their medical provider to accept those with no insurance or those who pay out of pocket for immediate care on a scale of 1 to 5.

Table E-3: Distance to Services

Variable	Description
Routine care services (family doctor)	Categorical variable; 0-15min=1, 15-30min=2, 30-60min=3, over 60min=4, don't know or NA=5
Specialized care services (cancer care, dialysis)	Categorical variable; 0-15min=1, 15-30min=2, 30-60min=3, over 60min=4, don't know or NA=5
Urgent care services	Categorical variable; 0-15min=1, 15-30min=2, 30-60min=3, over 60min=4, don't know or NA=5
Emergency health care services (emergency room)	Categorical variable; 0-15min=1, 15-30min=2, 30-60min=3, over 60min=4, don't know or NA=5
Diagnostic services (x-ray, lab work, MRI, CAT scan)	Categorical variable; 0-15min=1, 15-30min=2, 30-60min=3, over 60min=4, don't know or NA=5

Table E-4: Health Services Utilization

Variable	Description
Emergency Room (ERcare)	Dummy variable; In the last 2 years, respondent or household member used no Emergency Room services= 0, used Emergency Room service=1.
Specialty Care (Specicare)	Dummy variable; In the last 2 years, respondent or household member used no specialty care services=0, used 1 specialty care service=1.
Distance to Routine care/family doctor (Diprimcare)	Categorical variable; Distance to routine care services; 0-15 minutes=1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
Distance to X-ray/Diagnostic services (Dixrayserv)	Categorical variable; distance to X-ray/diagnostic care services; 0-15 minutes =1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
Distance to Emergency Room Services (Diercare)	Categorical variable; distance to Emergency Room care services; 0-15 minutes=1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
Distance to Specialty care services (Dispecicare)	Categorical variable; distance to specialty care services; 0-15 minutes =1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
If it were applied to you, how important is it that you have access to the following specialty services in your community	Ranking of importance of access to the following specialty services below
How important is access to cancer care (Cancer)	Respondents' ranking of importance of access to cancer care
How important is access to cardiac care (Cardiac)	Respondents' ranking of importance of access to cardiac care
How important is access to diabetes care (Diabetes)	Respondents' ranking of importance of access to diabetes care
How important is to you that your provider accept anyone regardless of their insurance coverage or if they are uninsured (Noins)	Respondents' ranking of importance of access regardless of insurance coverage "insurance" is index variable for how important provider accept your insurance, medicare or Medicaid. "Noins" is variable for ranking of importance of access regardless of insurance, used in index; and "uninsured" is demographic variable

Table E-5: Health Services Utilization

Variable	Description
Primary Care (Primcare)	Dummy variable; In the last two years, respondent or member of household used no primary care services= 0, used a primary care service=1.
X-ray/diagnostic services (Xrayserv)	Dummy variable; In the last two years, respondent or member of household used no X-ray/diagnostic services= 0, used X-ray/diagnostic service=1.
Emergency Room (ERcare)	Dummy variable; In the last 2 years, respondent or household member used no Emergency Room services= 0, used Emergency Room service=1.
Specialty Care (Specicare)	Dummy variable; In the last 2 years, respondent or household member used no specialty care services=0, used 1 specialty care service=1.
Distance to Routine care/family doctor (Diprimcare)	Categorical variable; Distance to routine care services; 0-15 minutes=1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
Distance to X-ray/Diagnostic services (Dixrayserv)	Categorical variable; distance to X-ray/diagnostic care services; 0-15 minutes =1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
Distance to Emergency Room Services (Diercare)	Categorical variable; distance to Emergency Room care services; 0-15 minutes=1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
Distance to Specialty care services (Dispecicare)	Categorical variable; distance to specialty care services; 0-15 minutes =1, 15-30 minutes=2, 30-60 minutes=3, over 60 minutes=4
If it were applied to you, how important is it that you have access to the following specialty services in your community	Ranking of importance of access to the following specialty services below
How important is access to cancer care (Cancer)	Respondents' ranking of importance of access to cancer care
How important is access to cardiac care (Cardiac)	Respondents' ranking of importance of access to cardiac care
How important is access to diabetes care (Diabetes)	Respondents' ranking of importance of access to diabetes care
How important is access to dialysis care (Dialysis)	Respondents' ranking of importance of access to dialysis care

How important is access to Physical Therapy (Ptherapy)	Respondents' ranking of importance of access to physical therapy
How important is it that your provider accepts your health insurance, Medicaid or Medicare when seeking immediate medical care (insurance)	Respondents answered with the legend above of the categorical variable ranking importance
How important is it that your provider accepts individuals who do not have health insurance, or who self-pay when seeking immediate medical care (noINS)	Respondents answered with the legend above of the categorical variable ranking importance

For the categorical variables ranking importance in this table – Legend; Not at all important=1, somewhat unimportant=2, somewhat important=3, very important=4, Don't know or not applicable=5.

Table E-6: Legend of mixed logit interactions with health status and demographics

Variable	Meaning of Variable
Emergency_ercare	Facility has emergency department interacted with index label "ercare" of whether Respondent or a member of their household had used the emergency room in the last 2 years
Emergency_diercare	Value for emergency department relative to no ER based on respondents' current distance to emergency department
Allinsurance_noins	All insurance types accepted interacted with health service utilization variable of respondents who indicated that the importance to them that their provider accept uninsured
Twentyfour_kids	A facility that is open 24 hours interacting with respondents with children
Emergency_kids	A facility that has an emergency department interacting with respondents with children
Emergency_uninsured	A facility with an emergency department interacting with respondents who indicated they were uninsured

Cancer_age	A facility that offers cancer services as specialty services interacted with age
Allinsurance_uninsured	All insurance types accepted interacted with respondents' response that they are uninsured
Fulldiag_privat	Value a respondent who has private health insurance will pay for Full Diagnostics relative to only X-rays
Emergency_kids	Value a respondent with children will has for emergency care relative to no emergency care

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Zimmerman, M. K., McAdams, R., & Halpert, B. P. (2004). Funding health services in the rural United States: Federal policies and local solutions. *Critical issues in rural health*, 211, 224.

Curriculum Vitae

EMMANUEL OWUSU-AMANKWAH

EDUCATION

University of Cincinnati, Cincinnati, OH Doctor of Pharmacy Degree: April 2017
University of Kentucky, Lexington, KY Candidate for Master's Degree: May 2018
Amherst College, Amherst, MA Bachelor of Arts Degree: May 2010
Major: Economics. Certificates: Financial Accounting; Culture, Health and Science

United World College of the American West, Montezuma, New Mexico
International Baccalaureate Diploma: May 2006

LICENSES

Ohio Pharmacist License # 03337692
Kentucky Pharmacist License # 019677

PUBLICATIONS

Allen, J.E., Davis, A., Hu, W., Owusu-Amankwah, E. (2015), Residents' Willingness-to-Pay for Attributes of Rural Health Care Facilities. *The Journal of Rural Health*, 31: 7–18.

Allen J.E. IV, Bowker, S.F., Stamper, C.E., Owusu-Amankwah, E., Davis, A. (2014), Resident Valuation of Kentucky's Extension Fine Arts Program. *Journal of Extension*, Volume 52, Number 2.

CURRENT RESEARCH

Master's Thesis research on, "Willingness-to-Pay for Attributes of Health Care Facilities in Rural Kentucky Considering Residents' Individual-Specific Characteristics"

RELEVANT WORK AND VOLUNTEER EXPERIENCE

Graduate Intern, Rite Aid Pharmacy, Cincinnati, OH January 2017 – January 2018

Volunteer, UC Open School Clinic, St. Vincent De Paul Food Bank, Cincinnati, OH
August 2012 – April 2017

Volunteer, Drop Inn Shelter, Cincinnati, OH August 2012 – April 2017

Pharmacy Intern, CVS Pharmacy, Cincinnati, OH October 2013 – January 2015

Teaching Assistant, University of Kentucky, Lexington, KY May 2012 – December 2013

Research Assistant, University of Kentucky, Lexington, KY Jan 2012 – December 2013

Volunteer, Food Not Bombs, Memphis, TN July 2010 – June 2011

Language Assistant, Five College Supervised Independent Language Program, UMASS, Amherst Sept 2009 – May 2010

Field Assistant, Intervention Forum, Adenta, Ghana June – August 2009

Laboratory Assistant, Amherst College, Amherst, MA August 2008

Assistant to Director of Clinical Services, Tapestry Health, Florence, MA
June – July 2008

Volunteer Tutor, Osu Children's Orphanage Home, Accra, Ghana 23rd
December 2007 - 26th January 2008

Student Assistant, Amherst College Archives and Special Collections, Amherst College
May 2007 – September 2007

Coordinator, African Scholars Program, Five Colleges, M.A
September 2007 – May 2010

IT Student Supervisor, Seeley Mudd Computer Center, Amherst College
September 2006 – May 2010

Volunteer Tutor, Achimota School, Accra, Ghana May – July 2006

OTHER WORK AND VOLUNTEER EXPERIENCE

Care Giver, Close to Home and Bluegrass Connection/ Independent Opportunities, Lexington, KY
Oct 2012 - Oct 2013

Safe Ride Driver and Student Security Monitor, Campus Police, Amherst College
September 2006 – May 2010

Lobby Attendant, Mead Art Museum, Amherst College September 2006 – May 2010

Volunteer, Columbus House Inc, New Haven, CT July 2005 – August 2005

Volunteer, Las Vegas Recycling Plant, NM. September 2005 – May 2006

Volunteer, Habitat for Humanity, Santa Fe, NM. September 2005 – May 2006

Fitness Room Attendant, Amherst, MA, and at Montezuma, NM.
September 2004 – May 2008

Digitizing Assistant, Amherst College Academic Technology Services, Amherst College
October 2006 - May 2007

Tour guide, United World College, Montezuma NM, September 2005 – May 2006

LEADERSHIP SKILLS

Team Co-Captain, Innovative Pharmacy Business Plan April 2016

Board Member, Christian Students at UC, University of Cincinnati, Cincinnati, Ohio
June 2015- April 2017

Board Member, Christians On Campus, University of Kentucky, Lexington, KY
January 2012 – May 2015

Treasurer, PIWC Christian group, Lexington, KY May 2012 - May 2013

Orientation Leader, Amherst College, Amherst, MA March 2007 – May 2010

Board Member, Future Leaders of Ghana Program, Amherst, MA
September 2007 – Present

Captain of Intramural Soccer and Basketball Teams, Amherst College, MA
September 2006 – May 2010

Entrepreneur, AfroCar; AfroWear Accra, Ghana. June 2006 – Present

AWARDS/HONORS

Awarded \$500 for Second place team in Innovative Pharmacy Business Plan Competition
April 2016

Awarded \$1000 Plough Scholarship, UC College of Pharmacy, OH August 2015

Awarded \$1500 Plough Scholarship, UC College of Pharmacy, OH June 2014

Awarded \$6000 Fellowship for Graduate Education, Amherst College, MA 04/2014

Awarded \$5900 Fellowship for Graduate Education, Amherst College, MA 04/2013

Awarded \$3900 Fellowship for Graduate Education, Amherst College, MA 04/2012

Awarded \$3000 Fellowship for Action, Amherst College, Amherst, MA 05/2009

Awarded \$3500 Fellowship Amherst College, Amherst, MA 05/2008

Awarded \$1200 Fellowship For Action Award, Amherst College, MA November 2007

Young Entrepreneur Award, National Foundation for Teaching Entrepreneurship, N.Y April 2006

First Runner up Team, New Mexico State's Science Knowledge Bowl/ Science Olympiad, Albuquerque, N.M Feb 2006

National champions in Science and Mathematics Quiz competition April 2004

United World College representative for Ghana April 2004

ORGANIZATIONS

Member, Student National Pharmaceutical Association (SNPhA), UC Chapter.
August 2013 – August 2017

Member, American College of Clinical Pharmacology (ACCP), UC Chapter.
August 2015- August 2017

Member, Student Societies of Health System Pharmacy, (SSHP), UC Chapter.
August 2015- August 2017

POSTER PRESENTATIONS

2016 Student Poster Presentation entitled, "PCOS, Obesity, Hypertension, Hyperlipidemia..., so managing weight". UC College of Pharmacy, Cincinnati, Ohio.

2014 Student Poster Presentation entitled, "Managing PCOS in a 52 year old Caucasian Female". UC College of Pharmacy, Cincinnati, Ohio.

2017 Student Poster Presentation entitled, "Willingness to pay for healthcare facility attributes in Rural Kentucky based on individual characteristics". UC College of Pharmacy, Cincinnati, Ohio.

SKILLS

Health: First Aid, CPR and AED certified

Computer: Used Stata and SAS for Master's Thesis data analysis. Provided campus IT support in college (2006-2010). Java Programming Certified (2003).

Languages: Twi (Ghana), English. Studied Spanish, Ewe (Ghana), German and French.