TRANSPORTATION BARRIERS TO HEALTH CARE:

ASSESSING THE TEXAS MEDICAID PROGRAM

A Dissertation

by

STEPHEN BOYCE BORDERS

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2006

Major Subject: Urban and Regional Science

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Approved by:

Co-Chairs of Advisory Committee,	Don Sweeney
	Craig Blakely
Committee Members,	Sherry Bame
	Dennis Perkinson
Head of Department,	Forster Ndubisi

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ABSTRACT

Transportation Barriers to Health Care:

Assessing the Texas Medicaid Program. (May 2006)

Stephen Boyce Borders, B.A.., University of North Carolina;

M.S.H.P., Southwest Texas State University

Co-Chairs of Advisory Committee: Dr. Don Sweeney
Dr. Craig Blakely

Transportation is frequently cited as a barrier to health care, but rarely have researchers analyzed the problems in depth. The purpose of this study was to assess the role transportation plays in the utilization of preventive health care services among Medicaid recipients ages 0 – 20 in Texas. This preventive care is known as Early Periodic Screening and Diagnostic Testing (EPSDT), a comprehensive prevention and treatment program for Medicaid eligible children.

Our computer assisted telephone interviewing based survey was administered to Medicaid recipients selected from a representative sample through a stratified sampling scheme. Binary logistic regression models were used to assess and predict factors associated with utilization of the Texas Medicaid Transportation Program (MTP) and utilization of EPSDT. We also used k-means cluster analysis to identify subgroups of Medicaid clients with particularly acute transportation barriers.

Of the 1,214 Medicaid recipients interviewed, the overall odds of a Medicaid recipient being a MTP non-user was 0.94. For clients with automobile access, the probability increases to 0.98. Clients who experienced difficulties paying for gasoline decreased the overall odds to

0.86. When examining utilization of EPSDT, the overall probability of being a low utilizer was 0.59. Two factors, Spanish-speaking patients (0.21) and clients with more than one child at home (0.54) decreased the overall odds of being a low utilizer, while those with difficulty paying for gasoline increased the odds of being a low utilizer to 0.63.

Increasing EPSDT utilization among the millions of Texas Medicaid recipients is an important policy objective. Because the Texas Medicaid population is large and diverse, no single approach to increasing utilization is likely to address all needs. The group concept provides a means to understand which Medicaid recipients do not access MTP services and those with low utilization rates. These groupings can be useful in targeting Medicaid clients with specific transportation difficulties. Instead of broad informational campaigns, policy makers should devise targeted strategies to promote the most appropriate types of assistance. In addition to expanding transportation options, policy makers should also examine the locations in which care is delivered, considering telemedicine, mobile health and school-based health clinics as options.

DEDICATION

To my grandfather Maury, my grandmother Ruth, my mother and father.

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First, grateful acknowledgement to my doctoral committee, Dr. Don Sweeney, Dr. Craig Blakely, Dr. Sherry Bame and Dr. Dennis Perkinson. Their expertise, encouragement, patience have been invaluable in the development of this research project. Also, my sincere gratitude to Dr. Jim Dyer of the Public Policy Research Institute who mentored me throughout my entire graduate experience while at Texas A&M and provided me not only the opportunity to conduct this research, but the direction to make it a reality.

I am also grateful to my wife Cindy, my family, friends and colleagues for all of their support and encouragement that have guided and sustained me these last few years. I am also grateful for the contributions of the many people who helped transform this vague idea of a study into reality.

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CHAPTER I

INTRODUCTION: TRANSPORTATION BARRIERS TO HEALTH CARE, ASSESSING THE TEXAS MEDICAID PROGRAM

Access to health care services is an extremely broad concept and encompasses a variety of issues. Access to health care services also reflects one of the two overarching Healthy People 2010 goals and is intertwined within a number of key policy questions (1). Yet simply having health insurance coverage does not guarantee access to services. Aspects of potential access, such as health insurance coverage, can only lead to actual utilization if there is sufficient provider capacity to meet demand. Without adequate provider availability, access to requisite health care services is impeded even if a means to pay for the delivery of services exists (2).

Medicaid coverage has the *potential* to provide access to a broad range of personal health services. Because access to care includes both the potential and actual entry of the population into the health care delivery system, access can be a difficult concept to define and, thus to measure. While there are many dimensions to measuring access to care, one of the most basic and common measures is accomplished by examining the actual delivery or utilization of health care services. Utilization is often examined in terms of patterns or rates of use of a single service or type of service. Physician visits and inpatient hospital stays are the primary and most widely used components of utilization measurement in the United

This dissertation follows the style of the *American Journal of Public Health*.

States (3). Thus, disparities in utilization often point to problems or barriers to access of care. Barriers to access of health care and the disparities in utilization manifest themselves in areas such as cultural, language and transportation issues. For many poor Americans, such as those receiving Medicaid benefits, simply being unable to get health care transportation in a timely, affordable, and reliable way is an enormous barrier to receiving health care services, particularly in Texas.

The Texas Medicaid program provides transportation assistance to clients who have no other means of transportation to and from their medical appointments. In many circles, this type of transportation is known as non-emergency medical transportation (NEMT). In Texas, some estimates have indicated that nearly 90 percent of Medicaid recipients receiving welfare benefits do not own a private automobile (4). With such a large percentage of Texas Medicaid recipients without access to a private automobile and the Texas Medicaid program providing services for fewer than seven percent of them, there is a huge proportion of Texas Medicaid recipients the program does not serve (5). In Texas, public transportation is far from ideal even in the state's major metropolitan areas such as Dallas-Fort Worth, Houston, San Antonio and Austin. Public transportation in other urban areas is quite poor and practically non-existent in many rural areas of the state.

How then are we to understand the role of transportation in access to health care among Medicaid recipients in Texas? Given the importance and complexity of this issue, the paucity of research in the area of NEMT nationwide is surprising. Many health care officials cite transportation as a barrier to care, but rarely go further analyzing the problem in depth, exploring the contextual stimuli that lead to transportation barriers or the impact these barriers have on primary care utilization, health status, etc. Thus, several major questions have

been insufficiently explored: First, what are the motivations for individuals to access NEMT services? For example, do both monetary and/or opportunity costs associated with transportation limit individual desire to access medical services? Do factors such as having other small children at home or having to carry another child compound the transportation problem? Do long commuting times or distances discourage individuals from seeking care? Second, do the means to travel to medical appointments exist? What access to transportation do low income recipients have? How do transportation barriers impact the utilization of health care services? This study seeks to answer these questions as they relate to utilization of preventive health care services among Medicaid recipients ages 0 – 20 in Texas by exploring the factors related to transportation that both support and impede access to preventive health care services.

Conceptual Framework

In a larger sense, access is an intricate and multifaceted issue and goes beyond simply defining access to health care. Because the tenet of potential access to care is satisfied by the virtue that the study population has access to health care coverage via the Texas Medicaid program, an appropriate measure of their ability to access care is through the use of health care services. Simply put, utilization as an access measure can accurately capture deficiencies in access to care. Thus, the key to measuring access is in the actual utilization of health care services. Physician visits and inpatient hospital stays are the most widely recognized and frequently used components of utilization measurement in the United States. Variations on measuring utilization of health care services also include common measurements such as the number of physician or provider visits an individual had in the past year which reflects intensity of use (3). More precise measures of utilization can include use of preventive

services. Preventive care often includes such things as immunizations for children, diagnostic and screening tests and prenatal care, all of which are an important part of the Early Periodic Screening Diagnostic and Treatment Program (EPSDT), also known in Texas as the Texas Health Steps or THSteps program. The extent to which certain populations fall short of "normal" utilization patterns can constitute a proxy measure for inadequate access to health care services.

Planning Theory and Access

The work and theories of F. Stuart Chapin (6), a pioneer of city and regional planning, may make critical additional contributions to a practical conceptualization of access to health care services. Chapin sought to describe and explain the living patterns, what he described as the human activity within a city, through the realm of behavioral and environmental dynamics. These behavioral and environmental dynamics work in tandem to influence activity both positively and negatively. For example, satisfaction or dissatisfaction (behavioral) with various modes of transportation choices (environmental) create incentives or disincentives that mediate choices for humans engaging in movement within and around cities.

Chapin posits that there are number of ways to examine such activity patterns from macro to micro analysis. Once we begin to understand individual behavior (micro), such as how and why people of different race, gender, socioeconomic strata behave, we can begin to understand the collective or aggregate patterns (macro) of the human activity. He calls this the "whole cloth" view which provides policy makers with the ability to understand these activity patterns as a whole. Once policy makers understand how these individual behaviors

sum to the collective "whole cloth", they can make policy to address such issues. However, in nearly every instance, there are tradeoffs involved to reach those decisions.

The nature of this study permits an examination at the micro level to focus on the personal transportation behaviors and experiences that ultimately impact EPSDT utilization. Using Chapin's theories, if we can clearly understand these patterns of movement and utilization through examining individual behaviors, we can then aggregate these individual activities into activity patterns of the entire population and make better policy to address deficiencies in what Chapin describes as "human activity patterns." This will come in understanding how and why persons of different demographic characteristics, such as ethnicity, income, and family size access preventive care services for their children.

Chapin calls the process of access an "activity," and defines the term as "classifiable acts or behavior of persons or households that…permit us to study the living patterns or life ways of socially cohesive segments of metropolitan area society" (6 p.21). Chapin posits that there are two underlying components that must be present for the activity, or access to occur; 1) motivation to take part in the activity and 2) the opportunity to engage in the activity.

Motivation is an important component in seeking preventive health care services and this is what makes this study unique. Most studies to date have focused on transportation examined the subject in relation to acute or chronic care access, not necessarily preventive care access to health. For example, patients are typically motivated by pain, injury or other uncomfortable circumstances to seek care. With preventive care, such as that offered through the EPSDT program, these basic motivators are typically absent. Preventive care is thus a higher order motivation. Maslow developed a hierarchy of needs that are primarily based in two groupings: deficiency and growth needs. Within each of the two groupings, lower level

needs must be met before moving to higher level needs (7). For example, deficiency needs could be classified as those relating to pain or injury and growth needs are those related to prevention. As individuals are able to satisfy their most basic needs of security, they can begin to think about and address higher level needs such as prevention.

Thus, there is a choice component included within this study and although we know little about the overall motivations of Medicaid patients seeking preventive health care services, it is an important component to the overall model. However, what we can begin to understand about these motivations is how they are shaped through positive and negative experiences (impendence factors) related to transportation and access, those of which we explore in this study. In its simplest form, Chapin developed a model to explain activity based in the following sequence: motivation-choice-action (see Figure 1). He notes that although this model is seemingly simplistic, developing such a model is enormously complex because it requires to work across discipline lines and require extensive data collection.

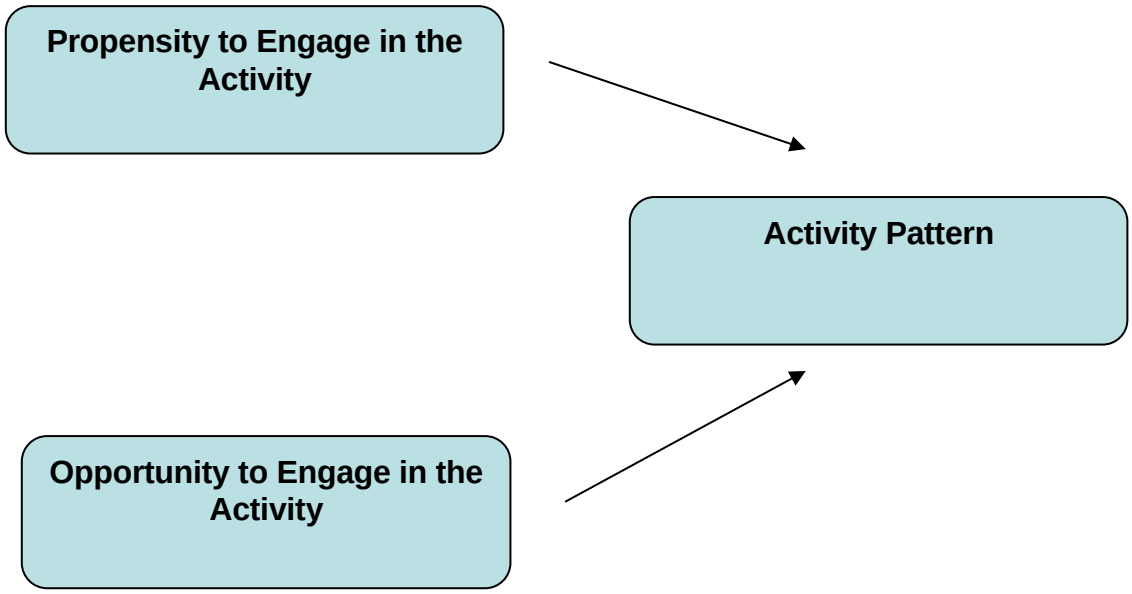

Figure 1: General Model for Explaining Activity Patterns

Source: Chapin, F.S. (1974). Human Activity Patterns in the City: Things People Do in Time and Space. New York, John Wiley and Sons, Inc. (6).

One component of Chapin's activity model is based on the propensity or motivation to engage in the activity. Motivation includes the ability to engage in the activity, such as the quality of the activity and the time context, such as opportunity costs and the ease or difficulty in engaging in the activity. Motivational factors for those seeking health services might also include a sense of understanding, some awareness of the need for services, the severity of conditions, and the preventive impact of some forms of early care. Chapin's model is

derived from motivation as being the desires or wants of the individual to engage in the activity.

The second component and that which is of critical importance to low-income persons, is the opportunity to engage in the activity. Chapin laments that most planning studies have focused almost exclusively on the demand side of the access equation, largely ignoring supply side considerations. Supply side considerations are simply the opportunities that humans have to partake in an activity. Human activity is thus contingent on both factors, demand and supply. Individuals of meager means, such as those on Medicaid and eligible for ESPDT services may have limited opportunities to engage in these activity patterns and thus, supply considerations are of critical importance to this study. Individuals with constrained choices to health care services may be impeded in accessing preventive care services, such as EPSDT.

Using Chapin's model, access to transportation and subsequently the utilization of health care services can be studied through a similar approach. Talia McCray employed a similar model in her study of prenatal care services in the Ubombo Magisterial District of South Africa. In her study, McCray used Chapin's model of activity patterns to understand how environment, culture and travel patterns affect utilization of prenatal health care services(8). It is from her earlier application of Chapin's model of human activity patterns which serves as the primary foundations for this study.

When measuring access to NEMT services, specifically those provided to Texas Medicaid recipients by the Medical Transportation Program (MTP) of Texas, we must consider both opportunity and individual factors (see Figure 2). Opportunity factors include such things as the availability of transportation, the mode of transportation available, and

distance to the health care facility or health care provider. Not only do the means of transit need to exist, but also the ability to schedule an appointment at a time when it is feasible to attend, such as the provider having routine or weekend hours. This is an especially important access issue because of recent welfare reforms that place an emphasis on work and personal responsibility, making it more difficult for parents to take their children for routine medical and dental appointments during regular business hours (9). Motivating factors are equally important, such as Medicaid recipient knowledge of MTP or attitudes about providers and experiences with the program.

While there are many factors that impact access to care, it would be impractical as well as nearly impossible to include all of them in a single study. For example, one of the most important factors in access would be the confirmation of the actual delivery of care via a paid claim for a health services provided. Given the evolution of Medicaid in Texas from a fee-for-service model to that of a managed care model, paid claims for many preventive services such as EPSDT or THSteps exams no longer exist. The capitated arrangement between the Medicaid managed care organizations and the individual providers means that most providers in Texas receive a set fee for providing such services as EPSDT exams. Thus, the paper trail of a paid claim documenting the delivery of the health care service and thus, the most widely accepted proxy for access, no longer exists in the state.

This study will explore the impacts of the variables listed in Figure 2 as they relate to access to transportation for the utilization of non-emergency care within the Texas Medicaid program for Medicaid recipients ages 0 – 21 who are eligible for EPSDT child health and dental care services. Thus, utilization will refer to the opportunity to receive health care services by engaging in the act of travel to non-emergency medical appointments. Utilization

will also be measured through the self-reported use of EPSDT or THSteps services. Utilization of self-reported health care visits using questionnaires is the most frequently used source of data because of the expense and difficulty obtaining data from the actual health records, such as individual medical or provider charts. Self-reported data on health care utilization have been found to be generally reliable and valid. However, there appears to be some bias toward under-reporting, especially among respondents who had a significantly higher number of health care visits because of the likelihood that some visits will be forgotten (10, 11). The ability to engage in accessing health services will be measured by exploring the real travel costs as well as the opportunity costs of engaging in the activity, such as waiting times and discomfort of taking the various types of transportation available.

Potential Contributions to Research

MTP must be analyzed at a broader level to understand the impacts transportation barriers have not only on those who currently access services via the program, but more importantly, the transportation barriers among those who do not use MTP services. Detailed empirical research is needed to connect the broad and ambiguous term "transportation," as a barrier to accessing medical care. With little existing research in the area and because so little is known about the Texas Medicaid population that does not use MTP services, this area is of particular interest for further research. At a minimum, this research will seek to definitively measure the impact of transportation as a barrier to care and the degree to which transportation is a barrier for different subgroups of the Texas Medicaid population. Further research in this area will help both state and federal policy makers better understand how transportation affects access to care and to devise efficient outreach programs to reach those

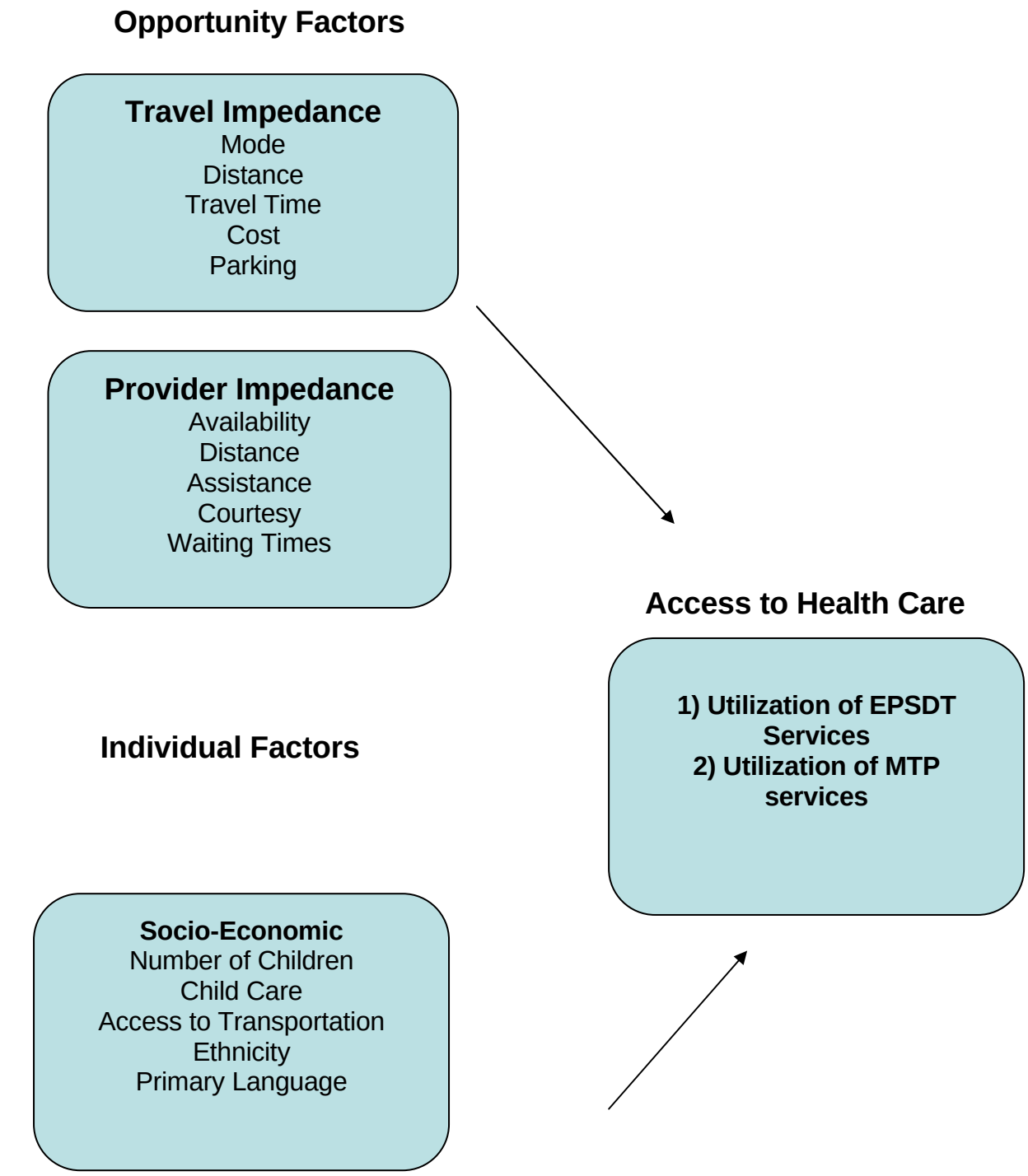

Figure 2: Opportunity and Individual Factors Influencing Access to Care

who are seriously impacted by transportation barriers and thus, improve utilization of preventive health care services. Because prevention of disease and effective disease management are widely recognized as the most effective methods for reducing the cost of health care, improving access to preventive services may actually decrease state and federal expenditures on Medicaid related services by avoiding expensive and inefficient use of emergency room care and unnecessary hospitalizations.

By drawing on Chapin's theory of access, this study examines two primary questions. First, how do socio-economic and travel impedance factors influence Medicaid recipient use of MTP services? This question, in and of itself, does not necessarily equate to greater access to health care services. Thus, to fully understand how travel impedance and socio-demographic factors influence access to care, we must also examine the use of EPSDT services. The second and more important question is how do the same socio-economic and travel impedance factors influence Medicaid recipient use of EPSDT services? This dissertation is organized as follows.

Chapter II provides a review of the literature, especially as it relates to access and utilization of health care among several dimensions. The dimensions of access and utilization of health care services are interdisciplinary, focusing on several primary themes that include public health, medical geography, and NEMT services. The chapter begins with a review and history of the Medicaid program and NEMT services. Socio-economic factors impacting utilization of health care services as well as travel time and distance are also addressed.

Chapter III provides a description of the survey design and methodology as well as the plan of analyses employed in this study. Understanding the importance of preventive care is important in framing the context of the overall research questions this study addresses.

This chapter begins with an explanation of the role of EPSDT services in increasing opportunities for disadvantaged children for better health. Despite increasing recognition of the importance of preventive services, such services are not sought after by patients as often as recommended.

Chapter IV provides an analysis of the factors affecting MTP utilization and EPSDT utilization. This chapter include includes general exploratory analysis, bivariate analysis, and cluster analysis. Many of the explanatory variables and their impacts on utilization were tested on a bivariate level using Chi-square tests and independent samples t-tests. MTP utilization is affected by a number of factors, including ethnicity, access to an automobile, the ability to pay for gasoline when going to the doctor or dentist, distance from the health care provider, the time to travel to the health care provider, the average age of the children per family and the number of children under the age of 5 per family. This chapter also includes a taxonomy developed through cluster analysis that identifies the various subgroups of MTP non-users.

Chapter V provides two multivariate models derived from binary logistic regression. The first is an analysis of how the various travel impedance and socio-demographic variables influence MTP utilization. The second is an analysis of how those same travel impedance and socio-demographic variables influence EPSDT utilization. The models are verified through discriminant analysis.

Chapter VI provides a discussion of the results found to affect utilization of MTP and EPSDT services. This chapter also suggests future policy initiatives that could improve health care access and the overall health for many children who currently underutilize MTP and EPSDT services. Also in this chapter is a discussion of the challenges and limitations of

the study. The chapter ends with suggested directions for future research as well as the contributions made to understanding transportation and preventive health care services.

CHAPTER II

DISCUSSION OF ACCESS: ITS IMPLICATIONS ON THE UTILIZATION OF PREVENTIVE HEALTH CARE SERVICES

The United States has arguably the most sophisticated, advanced and respected medical care in the world. Despite having the best trained health care providers and the best medical infrastructure ranking of any industrialized nation in the world, the United States compares poorly relative to other industrialized nations in the overall health of its citizens (12, 13). Many attribute the pluralistic system of health care coverage in the United States for its poor ranking because the degree to which individuals benefit from advanced health care services. These disparities are primarily a function of whether or not individuals or groups of people have health care insurance, which provides implicit access into the health care system (14). Health care coverage is provided primarily through a patchwork approach where most people receive their health insurance through the workplace while others receive health insurance by purchasing private coverage. The federal government, the single largest purchaser of health care services in the United States, finances health care programs such as Medicare, Medicaid, and the Veterans Administration (15). States cooperatively share in the costs of financing Medicaid with the federal government, the program that provides health coverage for the poor and near-poor (16). Medicaid has been instrumental in improving access to care in the United States as many of the inequities in health utilization rates and availability of health care

resources found prior to the enactment of Medicaid and Medicare legislation are less striking (17).

Medicaid: Historical Context

Congress established the Medicaid program under Title XIX of the Social Security Act of 1965. Title XIX created the Medicaid program to pay medical bills for low-income persons who have no other means to pay for care because private health insurance is either unavailable or unaffordable. Medicaid is a federal-state matching program in which both the federal and state governments must contribute specified percentages of the total expenditures. States have some latitude to design and implement their own Medicaid programs and as a result, Medicaid is operated somewhat differently in each of the 50 States and the District of Columbia. Since 1965, Medicaid has grown into a major component of the nation's health care system, covering more than 40 million low-income people at a cost of $169 billion annually (18). Generally, the Health Care Financing Administration, now known as the Center for Medicare and Medicaid Services (CMS), sets the federal medical assistance percentage for each state. In Texas, the matching rate for federal fiscal year 2003 was 59.99 percent (19). The State of Texas contributes the remaining 40.01 percent of most Medicaid costs (20).

Since its inception in 1965, Congress has transformed Medicaid from a narrowly defined program into one with broad coverage and complex eligibility criteria. As originally enacted, Medicaid coverage was available only for persons eligible who receive Aid to Families with Dependent Children (AFDC), now referred to as Temporary Assistance for Needy Families (TANF). TANF is a federal-state program of cash assistance for impoverished families. Each state sets its own income eligibility guidelines

for TANF. Texas has historically maintained low TANF income caps (16). As of 2003, the income cap for a parent with two children was $216 per month, or 17 percent of the federal poverty level (21). In 1972, federal law established the Supplemental Security Income (SSI) program which provided federally funded cash assistance for the elderly and disabled poor, and also established automatic Medicaid eligibility for these recipients (16).

Federal laws passed in the late 1980s mandated Medicaid coverage for groups of people ineligible for SSI or TANF, expanding eligibility to include a greater number of elderly, people with disabilities, children and pregnant women. As a result, the Texas Medicaid population tripled in just a decade, adding more than one million recipients between 1990 and 1995. In state fiscal year 1997, the Texas Medicaid program covered over 2.5 million residents. After hitting this peak in 1997, Medicaid roles in Texas began dropping. The implementation of welfare reform in Texas in January of 1997 coupled with a strong economy, resulted in the Texas Medicaid population bottoming out in September of 2000 with enrollment easing to 1.8 million. Since that time, the economy soured and the Texas Legislature streamlined the eligibility process. With more people out of work and fewer barriers to enrolling in Medicaid, the Medicaid population has been steadily climbing. Today, the Texas Medicaid program again provides health care benefits for nearly 2.5 million Texans with forecasts to increase to 2.6 million by the end of state fiscal year 2004 (22).

Children (birth through age 20) with Medicaid coverage are eligible to receive a broader amount, duration, and scope of medical services than adults. Early Periodic Screening and Diagnostic Testing (EPSDT), known in Texas as Texas Health Steps (THSteps), is a comprehensive prevention and treatment program for Medicaid eligible

children. EPSDT was created in 1967 as a Medicaid service, which all states were required to provide. Congress created the program to encourage Medicaid-eligible families to foster preventive patterns of health care for their children (23). An EPSDT or THSteps medical checkup includes a comprehensive and periodic evaluation of a child's growth, development and health status through:

- Medical history;
- A complete physical examination;
- Assessment of nutritional, developmental, and mental-health needs;
- Laboratory tests (including lead screening);
- Routine immunizations;
- Health education;
- Vision screening;
- Hearing screening;
- Dental screening, follow up care and some orthodontics; and
- Referrals to other health care providers (16).

The THSteps program ensures that the children of Texas have the opportunity to remain healthy by providing periodic medical and dental check-ups along with necessary medical treatment. The Texas Department of Health (TDH) has identified transportation as a key issue inhibiting the full use of medical and dental health care services (5, 24, 25). The original Title XIX legislation did not include language that requires states to provide NEMT to and from routine medical appointments. Medicaid transportation programs exist today because of court decisions that ruled states must assure access to covered Medicaid services. Medicaid recipients are entitled to NEMT, and both the states and

federal government must pay for those transportation services. Federal regulations now assert that states must "ensure necessary transportation for recipients to and from providers" as codified in 42 C.F.R. § 431.53 (26).

How states meet their federal mandate to ensure necessary transportation is largely determined by each state's interpretation of the law and the term "necessary." According to the Non-Emergency Transportation Technical Advisory Group, states may consider the following aspects in determining the necessity of transportation services:

- ✓ Transportation may be provided only for Medicaid-covered services;
- ✓ States must utilize the least expensive form available and appropriate for the client;
- ✓ Transportation is provided only to the nearest qualified provider; and
- ✓ No other transportation resources are currently available to the Medicaid recipient (27).

The ability of states to define the necessity of transportation services makes uniform comparisons across all states nearly impossible. Furthermore, the CMS, which oversees Medicaid, gives states considerable flexibility in shaping their own Medicaid programs and states vary dramatically among their provider payments, coverage, and regulations (16). This flexibility contributes not only to great variability in state NEMT programs, but the overall operation of each Medicaid programs across the country. For example, some states cover NEMT as an optional service for adults while Texas does not.

Despite such a program, many elderly, low-income, and minority individuals who need preventive care are transportation disadvantaged. The problem is particularly acute

in Texas. The Texas Legislature's Sunset Advisory Commission issued the following statement in a 1998 report:

"Transportation is among the most frequently cited barriers to service delivery for health and human services clients in Texas. Without transportation, clients are unable to access services for which they are eligible. Transportation is a problem primarily for those who do not own a personal automobile, or are unable to drive for other reasons, and thus considered "transportation disadvantaged." This can include people with a mental or physical disability . . . and low-income individuals. In 1997, approximately six million adult Texans or 31 percent of the population, qualified as transportation disadvantaged" (4 p.115).

Transportation barriers have produced significant access problems not only in Texas, but across the country. As a result, a number of class-action lawsuits have arisen across the country to deal with removing access barriers in state Medicaid programs. In these lawsuits, transportation is frequently cited as a barrier to accessing care. Plaintiffs have brought suits in Oklahoma, Tennessee, New York, Connecticut and Florida against state Medicaid programs to remove access barriers, especially for children through the age of 21 (28-31). The Texas Medicaid program has also been in court for similar circumstances. In the case of Linda Frew, et al. v. Don Gilbert, et al. (2001), it was the contention of the plaintiffs that "many Early Periodic Screening Diagnostic and Treatment (EPSDT) recipients do not receive needed services simply because they have no way to get there." The plaintiffs further contended that "transportation problems were significant barriers that impeded the Texas EPSDT (THSteps) population's access to health care services" (32). This suit remains ongoing today and the State of Texas

operates under a consent decree in which the parties agreed to settle the suit based upon improvements and actions the state would take in the Medicaid program to reduce barriers and improve access to care (32).

Transportation and Health Care

To date, most of the research has focused on transportation as a barrier to care, but rarely have researchers analyzed transportation in depth. Many studies indicate that transportation is a barrier to care, but rarely go further than indicating transportation as one of a sundry of barriers to care (33-36). A few studies have examined the impacts of transportation on health care to varying degrees (37, 38). The study from Lia-Hoagberg et al. found transportation to be a barrier to care, indicating that women with difficulties finding child care were also more likely to have transportation problems. Melnikow and Alemagno found the cost of transportation to be a barrier to care for low-income women, even when examining low cost transportation such as public transportation. A study of caregivers to Medicaid recipients in North Carolina found that Medicaid recipients encountered problems arranging transportation for dental care. In particular, many caregivers indicated not owning a private automobile and that free transportation provided by social services was both unreliable and inconvenient (39). Other research on transportation and health care has focused on disability and chronic illness. Debilitating conditions associated with chronic disease and disability can complicate access to care by inhibiting travel for health care services (40).

Despite having a large potentially eligible population, only a small fraction of the Medicaid population actually accesses NEMT services. Nationally, an estimated 3.4 million recipients or 10 percent of the covered population depend on Medicaid

transportation programs (26). In Texas, the population that accesses NEMT services through the Texas Medical Transportation Program (MTP) is even lower. An earlier study of MTP estimated that less than seven percent of the eligible population actually accessed services in state fiscal year 2001 (5). Texas has traditionally maintained low income guidelines for health and welfare programs, only minimally funding programs such as Medicaid to draw down the federal matching funds (41). The low poverty thresholds required to be eligible for Medicaid in Texas suggest that on average, many of those eligible for Medicaid in Texas are poorer than those in many other states and may experience even more transportation barriers to care due to a lack of private transportation or lack of money for alternative forms of transportation.

Other research on NEMT in Texas has largely focused on those who actually access services from MTP of Texas, primarily as a result of the lawsuit and consent decree (32). As a result, most of the current research has focused on the delivery of NEMT services, such as satisfaction of both Medicaid recipients and health care providers with current NEMT services within each Standard Metropolitan Statistical Area and the rural areas in each Texas Department of Health public health region. Current research has also focused on the reasonableness of transportation availability as well the reasons for recipient and provider dissatisfaction with MTP of Texas (5, 25). Although the unmet need for transportation assistance was a minor objective of the research, it was not explored in great detail. However one of the report's findings indicated that 25 percent of those who did not access services in state fiscal year 2001 also had unmet transportation needs (5). However, the current research left the

following question unanswered: Who are those that do not access the Texas Medical Transportation Program and what specific unmet transportation needs to they have?

Current Context

Prevention of disease and effective disease management are widely recognized as the most effective methods for reducing the cost of health care. In 2001, 14.1 percent of the U.S. gross domestic product was spent on health care. By 2010, that figure is expected to increase to over 16 percent (42). The bulk of health care expenditures in the U.S. are spent on hospitalization and intensive care, often for preventable conditions. Regular visits to health care providers by persons suffering from both acute and chronic conditions can lessen health care costs by reducing the likelihood that patients will be hospitalized later with complications stemming from their diseases both in the near- and long-term (12, 43, 44). Specifically, research has shown that savings can be achieved through timely access of adequate prenatal care for pregnant women (45-47) as well as regularly scheduled preventive checkups for children (48-50).

One of the largest barriers to increasing prevention of disease and improving disease management is a patient's limited access to medical services. Low-income women and children are especially vulnerable, accessing fewer preventive services than those in higher socioeconomic strata as well as having poorer overall health status (43). The impoverished are often disproportionately impacted because they often lack access to private transportation and must rely on public transportation, which is often inadequate even in urban areas. Public transportation in rural areas can be even more challenging (51-53). Travel-related costs, including time spent in travel, monetary costs of travel, and

discomfort related to travel are all aspects of mobility that can become barriers to care and should be minimized (52).

Understanding Access and Utilization: Health Care Services

Because access to health care is a complex issue, we must discuss access in detail to understand how better to measure it. Its components must be dissected in order to clearly comprehend true impact on utilization and health status. In an age of increasing competition for federal, state and local resources, researchers and providers that have an understanding of critical measures of health care access will be better able to define the challenges to improve the overall health of the population and to craft solutions. While there is no single agreed upon method for evaluating access to care in the United States, the work of a small group of pioneers studying these questions can shed some light on the course to follow.

One of the most notable of the pioneers in the field of assessing health care quality and access is Avedis Donabedian. Donabedian developed the "Structure, Process, and Outcome" model and is most famous for his work on quality of care and defining quality of care. Access issues comprise a major component of his conceptualization of quality of care. Consequently, his model acknowledges access issues as critical to the receipt of quality care and the achievement of positive health outcomes from the medical systems (54).

Lu Ann Aday has also been a leader in the field of access to care, especially for the nation's most vulnerable populations. She has examined the relative risk to vulnerable populations-- the ratio of risk of poor health among groups that are exposed to risk factors versus those that are not similarly exposed. She also addressed resource

availability, considering the availability and distribution of community health resources and their impact on health. Further, she has considered polices that have either exacerbated or alleviated the health problems of the poor. Her work in this area has led to the development of some measures to assess the appropriateness of care in various settings (43).

Other leaders in the field of access measurement include Ronald Andersen and Odin Anderson. These two health researchers based their theoretical model of access by using differing definitions of access as proxy measures. Their model included asking people about their current status of health insurance coverage, their inability to get care, their health status and the use of the emergency room as their usual source of care (55, 56).

Despite the international leadership in the area of measurement of health care indicators present in the United States, there are still many problems with adequately measuring access to care. The work of measuring access to care has been ongoing for over 60 years, but there remains a lack of consensus about the number of Americans who do not receive adequate health care. A vivid example of this can be found in the results of several prominent and well-respected health research agencies in the United States who all attempted to assess access problems during the 1980s and 90s. The Agency for Health Care Policy and Research found that about 6 percent of the uninsured population reported being unable to obtain the health care services they needed (57). A subsequent study by the National Center for Health Statistics conducted a similar study only a short time later and found 10 percent of the uninsured population could not obtain needed health care services (58). Finally, the Robert Wood Johnson Foundation also conducted a

similar study, but found an estimated 15 percent of the uninsured population was unable to get the care they thought they needed (59). Even though some of the differences may be accounted for through the research methodology, the real differences may be accounted for in the problems and difficulty associated with measuring access to care (60).

Most researchers who study access to care issues examine several indicators to make their assessments. The first, and most prominent of these measures is insurance coverage and whether the person has either public or private health insurance coverage. Experts agree that the prospect of having health insurance does not directly equate to access to care, but it is a major factor as an enabling characteristic in the United States because our country lacks any sort of universal health care program. Normally, some sort of payment mechanism is regarded as necessary to access the health care system and health insurance is viewed as a proxy measure for access to the health care system.

Although the premise of health insurance is one of a multitude of factors involved in measuring health care access, there are also a number of other financial and non-financial factors associated with access and utilization of health care services. (61, 62). Anderson and Newman developed a model identifying factors associated with access to health care, calling these the individual determinants of health care utilization. These factors can be summarized into three types of factors: predisposition factors, enabling factors, and illness factors as seen in Figure 3. While some researchers focus on the factors associated with gaining access to the health care systems, others focus on the factors that impede access to the health care system, also known as barriers. While health insurance may provide a means of access into the health care system, those with health insurance may face barriers to accessing health care. This has been especially true for the

Medicaid program. Many assumed that merely by creating the Medicaid in 1965, the program would assure that low-income families received adequate health care. However, more recent experience has shown that solely financing the provision of health care services does not guarantee that the services will be available or that they would be effectively utilized (23). High deductibles and co-payments may discourage individuals with health insurance from accessing health care services. Furthermore, with the proliferation of managed care, doctors are now acting as gatekeepers for the health care system. These gatekeepers are designed to limit use of unnecessary and expensive use of health care services.

While Andersen and Newman have provided researchers with a taxonomy for measuring access to health care services, there is also debate about how to operationalize these measures. Typically, researchers have measured access through one of two approaches, using patient questionnaires or appointment system data (63). In their review of the literature, Jones et al. underscored the difficulties measuring access to care because of the various methodologies and definitions involved. In their assessment of the two methodologies for measuring access to care, they found that using appointment data and questionnaires yielded different results. The difference in the two is largely because of the differing aims of the methodologies. Analyzing patient data records yielded access measures in terms of time until the next available appointment, while questionnaire data reflects patient perceptions in terms of need. While the two approaches often yield different results, they are valid measures because of measuring access to care has so many dimensions.

Predisposing Factors	Enabling Factors	Illness Factors
Demographic	***Family***	***Perceived***
• Age • Sex • Parental marital Status • Past Illness	• Family income • Health insurance • Type of regular source of care • Access to regular source of care	• Disability • Symptoms • Diagnoses • General state
Social Structure	***Family***	***Evaluated***
• Parental Education • Race/ethnicity • Parental occupation • Family region • Religion • Residential mobility	• Ratios of health personnel and facilities to population • Price of services • Region of country • Urban-rural character	• Symptoms • Diagnoses
Parent's Belief's		
• Values concerning health and illness • Attitudes toward health services • Knowledge about disease		

Figure 3: Individual Determinants of Health Service Utilization

Source: Andersen, R. and J. Newman. 1973. Societal and individual determinants of medical care utilization in the United States. Milbank Memorial Fund Quarterly. 51:95. (62).

Understanding Access: Transportation Services

Low-income populations are disproportionately affected by access barriers to care. In particular, transportation appears to be a significant barrier to accessing care because this population lacks access to private vehicles and most either walk or rely on other modes of transportation. The dominant form of transportation in the United States and in Texas is the automobile. Cities, suburbs and rural areas are designed almost exclusively for travel by car. Only in a select few areas are public transportation networks sufficiently developed that residents can live comfortably without a private vehicle. Just over 50% of American households report having public transportation services available, requiring many American households to rely on private automobiles for their transportation needs (64). Despite the fact that public investment continues to expand and building mass transit options, the utilization of public transit continues to drop as a percentage of urban travel (65). Unfortunately for many Texas residents who do not own a private vehicle, public transportation networks are insufficient to ensure easy access to medical or dental appointments even in the major metropolitan areas of the state.

With gasoline costs spiking, the costs of transportation have begun to rise, comprising a larger and larger proportion of the average American's household budget. In 2001, before the most recent gasoline price hikes, American households are seeing a greater proportion of their household budgets spent on transportation as Americans spent over 19% of their budgets on transportation expenses. Transportation expenses have recently become the 2nd largest household expense, ranking only behind housing at $7,633 per family each year. The bulk of these expenses go toward the vehicle purchase, yet operating expenses make up a significant portion of overall transportation costs.

Expenditures on gasoline, motor oil, insurance, and maintenance account for nearly 48% of overall transportation expenditures each year. With few options available, these high transportation costs are a compulsory expense for most Americans (64). Transportation expenses also disproportionately impact the poor. Although the working poor, such as many of those who qualify for Medicaid, spend less on transportation expenses than those in higher income brackets, they do amount to a significantly higher proportion of their income. For example, in 1999, those earning $8,000 or less annually spent nearly 10% of their personal income on transportation expenses. That figure is more than twice that of the total US population, which spends approximately 4% of their personal income on transportation expenses. This figure includes many of those who chose less costly forms of transportation, such a public transit, biking or walking. When examining poor households (those with incomes below $20,000) those who primarily used a private automobile for transportation, they incurred costs associated with operating a private vehicle of between 21% and 27% of household income (65, 66). Waller went on to discuss in detail why transportation has become such a big part of the budget for low-income households, including the fact that low income households often pay more for cars than those with higher incomes. They typically receive uncompetitive interest rates for car loans because they must use subprime financing companies for a loan. In addition, insurance companies use credit ratings to set insurance premiums for automobiles justifying this practice because drivers with poor credit scores are more likely to file claims.

Measuring the accessibility of transportation is also key in understanding access to health care. Like the measures of health care accessibility, there is also a divergence of

opinions in how to adequately measure the appropriate factors involved in measuring transportation accessibility. These measures are typically debated beyond the realm of health care researchers, developed primarily by urban and transportation planners who evaluate accessibility of transportation by examining how people reach services, goods, activities, and destinations (67). Generally, greater access is equated with a higher number of destinations within some defined time or distance range. Accessibility thus can be measured by examining movement from a starting location to one or more locations while examining such factors as travel mode, distance, time, and cost constraints. Leading researchers in the field of transportation accessibility have focused the majority of their research on behavioral factors by seeking to understand the individual's decision process in making transportation choices. These accessibility measures seek to assess individuals free to participate in travel activities. Other accessibility measures analyze the tradeoffs between the attractiveness of the opportunities and the costs involved to acquire the travel opportunity where opportunities are measured through the attractiveness of the travel option and the costs are measured not only through the monetary value, but through other costs as travel time and physical distance (68).

Over the years, transportation researchers have sought to characterize accessibility measures around the predominate theories in the field. These factors have been analyzed by researchers primarily around seven domains: 1) counting 2) total sums of distances, 3) closest available, 4) gross interaction potential, 5) probabilistic choices, 6) net and maximum benefit, and 7) absolute (69). Some of the most widely respected theories of accessibility measures have been summarized by Handy and Niemeier and can be found in the following three models: 1) cumulative opportunities model, 2) gravity-based

measures model, and 3) random utility theory. Cumulative opportunities are the simplest and are defined as measuring the spatial distribution of potential destinations and the ease of reaching those destinations. Gravity-based measures gauge the weight of activity at different destinations by cost, time, or distance to arrive. Finally, the random utility theory measures the probability of an individual making a choice depends on the utility of that choice against the utility of all other transportation choices (70). Among the accessibility measures, these measures are most typically classified as either zone-based or individual measures. Zone-based measures attempt to assess accessibility of individuals within a defined area, based on aggregate measures. These aggregate measures are then adjusted to provide more detail on other important accessibility characteristics, such as socio-economic variables. Individual measures seek to measure accessibility of the individual by assessing travel activities and other impedance factors (20).

In particular, the role of access variables has evolved over time, first accounting only for spatial factors (71) to later accounting both spatial and behavioral factors, such as the costs of transportation (72). Martinez has included attractiveness, what he defines as the perceived benefit of the trip as part of his accessibility model (73). This evolution of transportation accessibility measures permits analysis of the decisions made by individuals to travel or not. These factors that influence transportation are also known as impedance factors. Impedance is measured as the factors that burden or impede travel to a particular destination. Distance and time are the most common measures of impedance, but many other issues can factor into impedance such as cost, comfort, and topography (74). Other researchers have also recently noted other impedance factors, such as mode of transportation as well as behavioral factors such as work and family-related stress (75, 76).

Regardless of the type of accessibility measures, two components are almost universally present, the measurement of opportunity factors and the measurement of cost factors (20).

Because the automobile remains the dominate form of transportation in the United States, accessibility to an automobile is of particular interest. Thus, accessibility is greatly influenced by the availability of an automobile. Conversely, the unavailability of an automobile is a significant factor in limiting the mobility of the aged, the very young, and the very poor and is thus, a major impedance factor. Even if an individual owns or has access to an automobile, there are a host of operating costs, such as fuel, insurance, and repairs that can further inhibit mobility and these factors should be taken into consideration when measuring accessibility/impedance (77). Those without access to an automobile are forced into other modes of transportation, such as public transit. Where public transit is available, knowledge or lack there of is also an inhibiting factor. For example, do individuals possess knowledge about fares and routes (78)? This prerequisite knowledge acts as a filter, inhibiting or impeding the potential for mobility and thus access to the transportation network (77).

Combining Transportation and Medical Access: Medical Geography

While mobility and access to medical care seem to be different fields, researchers have begun to meld the two fields together into a discipline known as medical geography. Medical geography has been traditionally defined in two subsets of the discipline: the ecological approach to the spatial distribution of disease and the spatial analysis of health behavior and planning (79). Medical geography has also been described in similar fashion as the spatial analysis of health services, such as how people gain access to health services

and the impacts location has on the health of both individuals and communities (80). Medical geography studies the patterns of human health and disease through the analysis and the environmental and cultural factors that contribute to such conditions.

While the field of medical geography has existed for years, recent advancements in computer power, graphics and specifically with Geographic Information Systems (81) have stimulated innovations in the field (82). GIS has been especially helpful in the area of epidemiology, assisting public health workers in tracking the spread of epidemics, such as HIV/AIDs, cholera, and influenza. GIS also assists with comparisons of disease rates in different places and may help provide clues to causation or serve as a starting point for further investigation as well as the creation of maps showing the distribution of health-related phenomena.

While medical geographers have used GIS to analyze epidemiological trends, GIS is also being utilized to examine access to health care services because of the role spatial factors can play in the utilization of health care services. Researchers have focused on such spatial factors as time, distance, and cost as they relate to individual decisions about seeking and utilizing health care services (83-85). Most notably, researchers have traditionally analyzed two factors as they relate to accessibility of health care services, the location of the health care facility and utilization of health care services (52).

Defining Spatial Access

Medical geographers also use similar terms in defining and measuring health access as do health researchers. Both types of researchers often define health care access in terms of potential and realized access. Potential access is shaped by the size and distribution of health care facilities, the characteristics of the population, and the impact

of health care policy in planning efforts. Potential access represents probable entry into the health care system, not the actual utilization of health care services. It is only when individuals overcome barriers to health care and actual entry into the system is gained. Thus, utilization of health care services is achieved and realized access is gained (86). Kahn goes on to develop this theory into a typology of access based on spatial and aspatial aspects, defining spatial as the geographic dimensions of access to care and aspatial as the social aspects to care in a 2x2 matrix, represented in Figure 4. Kahn's typology enables researchers to differentiate and adjust for a fuller range of factors affecting access to health care by including both geographic access and socio-economic factors affecting access to care.

ACCESS DIMENSIONS	Spatial (Geographic)	Aspatial (Social)
Potential	Potential Spatial/ Geographic Access	Potential Aspatial/ Social Access
Realized	Realized Spatial/ Geographic Access	Realized Aspatial/ Social Access

Figure 4: Typology of Spatial and Aspatial Access

Source: Kahn, A. A. (1992). An integrated approach to measuring potential spatial access to health care services. *Socio-Economic Planning Science, 26*(4), 275-287. (86).

The Impacts of Distance on Access

Many health care planners assume that distance to the health care facility, in and of itself, is the primary culprit affecting utilization of health care services. As a rule, accessibility and utilization are inversely related to an individual's proximity to health care

resources (83, 87-89). As a result, most health care planners assume that patients will access services at the closest health care facility to reduce the costs associated with travel. A study of patients in Michigan suffering from breast cancer found that patients who lived greater distances from a radiation oncology facility were less likely to get radiation therapy and were more likely to undergo mastectomy (87). Goodman et al. found a strong association between hospital distance and the frequency of hospitalization (83). The type of health care the patient is seeking can also play a factor in utilization. Studies have shown that people are often more willing to travel greater distances when seeking specialty or what is perceived as higher quality care versus routine or lower quality care (90).

This premise seems to apply across a variety of socio-economic strata, but certain segments of the population seem to be more affected by distance than others. For example, a study of the effects of distance on the utilization of preventive care among children found that utilization was inversely related to distance only for central-city black children. The differences were not significant for white or Hispanic children. Thus, other factors seem to influence utilization patterns, such as access to an automobile, insurance type, educational status, and the age of the mother at birth (85). Inequality in access to care has prompted some research within the discipline of medical geography, but to this date, the research is limited. However, some studies have sought to examine access inequalities among social, geographic, and economic factors. A study in Perth, Australia found that geographic access was relatively equal across socioeconomic strata, yet those living in the poorest neighborhoods had difficulty making appointments at convenient times (evenings) and the quality of services was perceived as sub-par (91). In the United

States, few published studies have emerged integrating socioeconomic factors and GIS in accessing health care, but seems to garnering increased interest (92). Despite a lack of peer reviewed studies exploring geographical access to care, Young recommends future studies that will assess the barriers vulnerable populations face in accessing health care, such as transportation, economic constraints, and a lack of social support and child care.

Summary and Limitations of the Current State of Knowledge

Access to Health Care Services

Models of access exist on many levels and have the potential to address inequalities in access to care. The real difficulty in modeling or assessing access lies with the multiple and disparate socioeconomic variables that affect access. The lack of widely agreed upon methods to measure patient access to health care services pose vexing problems. While the historical framework and measures remain relevant today, there are a host of factors beyond simply measuring whether a payment mechanism exists for the delivery of health care. Simply having insurance does not guarantee access. It is only one of an assortment of factors affecting access. Thus, any study on access should include such factors as gender, income, race/ethnicity among others.

Disparate views of access also pose methodological considerations and argue for a range of approaches in measuring access. Questionnaires have strengths in being relatively inexpensive and effective method for gathering data from a large number of widely dispersed people. However, many access measures on questionnaires rely on respondent recall or perception and thus can introduce study bias. Using medical data, such as chart audits poses another set of problems. First and foremost, is the expense in gathering such data. Chart audits are often needed in the United States because we lack a

centralized system of medical records. Thus, health data, specifically on utilization of health care services to the individual level, are unavailable. Where data do exist, there is no standardization among definitions that make comparisons difficult.

Medical Geography and Transportation Planning

Transportation to health care facilities alone does not explain variations in access to and utilization of health care services. As with the case in solely measuring the accessibility of health care services, a myriad of other factors impact access to and utilization of health care. Thus, spatial proximity does not necessarily equate with the accessibility of health care service. Other factors affecting utilization and access are affordability, travel costs, and quality of care.

Because the field of medical geography as it relates to access is in its nascent stages, the discipline has yet to account for all factors that influence accessibility to health care. To date, the field is largely focused on a population's proximity to health care facilities as it relates to utilization of health care resources. However, many of these studies fail to consider access to various modes of travel and the total costs associated with the travel.

CHAPTER III

METHODOLOGY

Non-emergency medical transportation services provide both the means and the opportunity for Medicaid recipients to receive preventive care. We know however through the experiences of Medicaid and other types of health care insurance that providing both the means and the opportunity does not necessarily equate to access and utilization of health care services. The opportunity costs involved in accessing health care services are shaped by socio-economic factors, availability of transportation, and health care policy.

Study Design and Population

The study was conducted in the state of Texas, among Medicaid recipients eligible for EPSDT or THSteps services. When discussing the utilization of such preventive health services in Texas, the terms EPSDT and THSteps may be used interchangeably. Medicaid is a broad program that pays for medical assistance for certain individuals and families with low incomes and resources. Over a period of three decades, Medicaid transformed from a narrowly defined program available only to persons eligible for welfare benefits to a large program, now expanding to cover more low-income children, the aged needing nursing home care and the blind and disabled (16).

With the expansions, the single largest group of Medicaid beneficiaries remains children. In state fiscal year 2002, approximately 2 million Texans qualified for the Medicaid program. Of that amount, about 1.3 million were under the age of 21 and qualified for EPSDT services. EPSDT recipients make up the largest single proportion of

Medicaid recipients in the state, comprising 59% of the Texas Medicaid population. Despite their large numbers, children consume only 25% of the state's Medicaid expenditures. The aged consume the largest portion of Medicaid expenditures relative to their size, largely due to the high cost of nursing home care (see Figure 5).

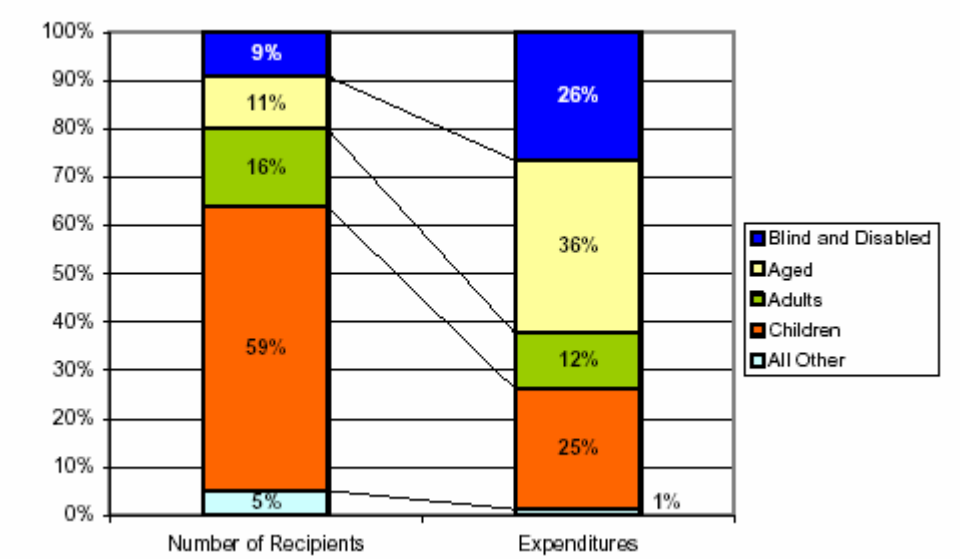

Figure 5: Texas Medicaid Beneficiaries and Expenditures – Federal Fiscal Year 2002

Source: Texas Health and Human Services Commission. *Texas Medicaid in Perspective: Fourth Ed.* Austin, TX: Author. (19).

With over 1.3 million Medicaid recipients in Texas under the age of 21 and eligible for both EPSDT and MTP or NEMT services, the potential subject pool was quite large. However, one goal of the research was to compare and contrast EPSDT recipients who utilize NEMT services and those who do not. The percentage of EPSDT recipients that utilize NEMT services is far smaller than the Medicaid population eligible for the

program. Approximately 6 percent of the EPSDT population actually utilize NEMT services each year (5). This is quite lower than national averages which typically estimate NEMT program usage among Medicaid clients at closer to 10% of the Medicaid population (26). Thus, one of the key definitions to drawing the sample was defining those who access and utilize the services (users) and those do not (non-users). In this study, MTP utilization is one of the dependent variables, representing either the use or non-use of MTP services in the past year. For purposes of this study, use of NEMT services is defined as:

- ✓ MTP user = The recipient used NEMT to provide bus passes or tokens, a taxi or cab, a van, reimbursement for the number of miles traveled to a from the doctor or dentist, or air fare, food and/or lodging during the past year.

- ✓ MTP non-user = The recipient did not use any NEMT services during the past year.

The second dependent variable in this study is EPSDT utilization. Respondents were asked to report the number of EPSDT checkups they received during the past year for the child drawn from the sample. This permitted comparisons across families with only one child as well as those with multiple children. Without such control on this variable, we feared that families with multiple children could potentially bias the number

of EPSDT visits during the last year higher by reporting the total number of EPSDT visits for the all children within the family.

Because EPSDT is reported as a ratio variable, we converted the variable into a categorical variable to better suit our multivariate analytical models. Study respondents were divided into two EPSDT utilization groups: high and low. The two groups was the product of the EDPST periodicity schedule (see Chapter IV for more detailed information on the EPSDT periodicity schedule). Infants are eligible for up to six EPSDT visits after their first year of life while adolescents (ages 14-20) are eligible for two EPSDT visits (medical and dental) each year. Furthermore, there are other opportunities for preventive care, such as mental health screenings, immunizations, and vision checkups that may or may not occur doing the standard EPSDT checkup, but still considered as part of the overall EPSDT program. Thus, the relationship is not perfectly linear. That is, there is a finite number of potential EPSDT visits per year and the appropriate number of EDPST visits depends squarely on the age of the child. Thus, it made sense to divide the study participants into two groups based on utilization (see Chapter V for a detailed explanation on developing this variable).

The sample also required a third designation because of the impacts distance plays on access. As discussed in the Chapter II, distance is often inversely related to utilization of health care services. Texas is a unique state, home to some of America's largest and well-developed urban cores such as Houston and Dallas. Meanwhile, Texas is also home to some of the most sparsely populated counties in the country. Although distance and utilization have been shown to be inversely related, urban EPSDT recipients reported greater difficulty accessing transportation than their rural peers. The types of

transportation available and accessed by urban and rural EPSDT recipients also differed (25). However, the differences between urban and rural EPSDT recipients have not been sufficiently explored and seem to be contrary to literature on the subject.

Despite the focus and interest in urban and rural differences, there are at least ten different classification systems available for assessing rural health (93). The U.S. Census Bureau is responsible for defining urban areas and rural areas for the federal government. The most precise definitions are those used by the U.S. Census Bureau that classify urban and rural differences among census tracts. Census tracks are geographic units defined by the U.S. Census Bureau which defines a neighborhood and contains an average of about 3,000 to 4,000 people (94). The Office of Management and Budget (OMB) is also responsible for developing urban and rural definitions, but these are solely for statistical purposes. The OMB definitions are classified at the county level as either metropolitan or non-metropolitan. Metropolitan counties (urban) are those with a recognized population nucleus and the adjacent communities that are highly integrated with the nucleus (95). Other classification systems seek to classify urban and rural at the zip code level or at the county level. Each of these classification systems has their tradeoffs between ease of use and accuracy of measurement.

The Texas State Data Center and Office of the State Demographer maintain the most current definitions of urban and rural for the State of Texas. Using the OMB definitions, each county in Texas is categorized into one of four categories: metro central city, metro suburban, non-metro adjacent (adjacent to either metro suburban or metro central city), and non-metro non-adjacent. Consistent with the OMB definition, we classified all counties with the designation, metro central city and metro suburban as

urban counties (see Figure 6). All counties with the designation non-metro adjacent and non-metro non-adjacent were classified as rural counties (96).

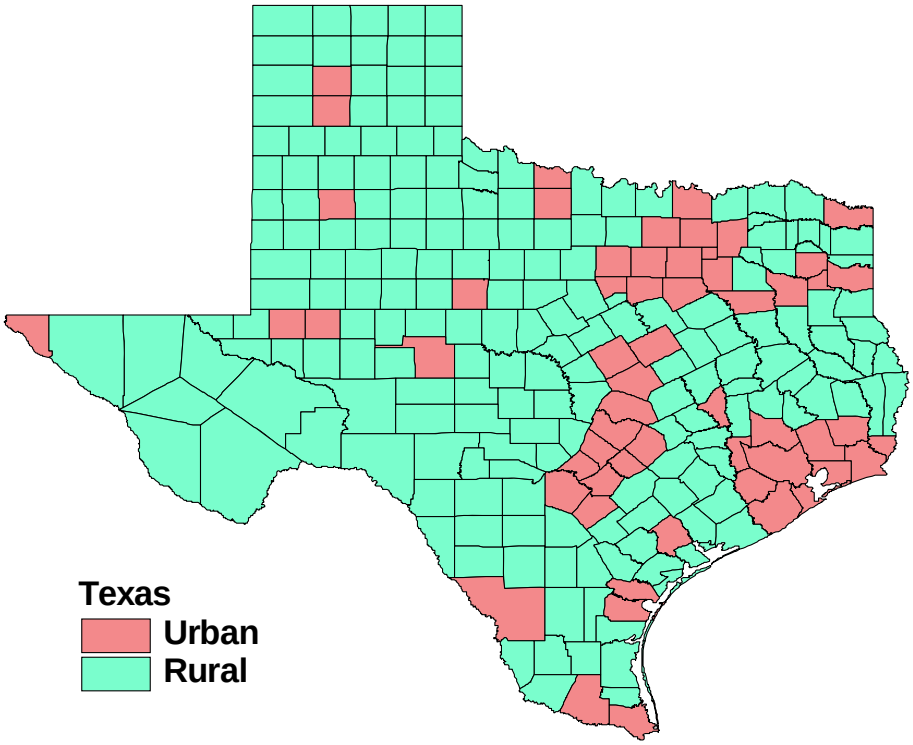

Figure 6: Urban and Rural Counties of Texas

Survey Design

A well designed survey has the characteristics of reliability and validity. Reliability is a measure of the instrument's consistency of measurement. Validity is a measure of the instrument's accuracy of measurement (97, 98). The survey employed for this study underwent several steps to ensure the accuracy and reliability of the instrument.

The instrument design was based on previous research on the MTP in Texas. The original survey was to examine Medicaid recipients' use, satisfaction, and knowledge of the MTP program as well as problems and barriers to service. We added several questions to the survey in order to further explore barriers and factors related to the accessibility of transportation services. The instrument included questions about the number of health care appointments, potential barriers to health care services, the level of transportation need, knowledge of the MTP program, and satisfaction with the program. The majority of the questions were closed-ended, with a set number of choices read to respondents. There were some open-ended questions which featured prompts interviewers used to engage respondents to encourage a more detailed response.

Many of the survey questions were based on existing questions from other MTP and transportation surveys. These steps were included in the process to improve the face and content validity of the instrument. Face validity assures that "on its face" the operationalization seems like a good translation of the construct (99). Members from the PPRI team met with TDH officials during the development of the survey instrument. To improve the face and construct validity of the instrument, one of the leading experts in the field of medical transportation reviewed the instrument prior to its deployment. As co-founder and former Executive Director of the Community Transportation Association of America, David Raphael has been in the forefront of transportation coordination efforts at the state and federal levels and is nationally-recognized for his work in the Medicaid transportation field. His review of the instrument resulted in the addition of several new questions as well as the modification of several questions to better measure client access and barriers.

The instrument was tested a number of ways to improve the consistency of the instrument, also known reliability. This improves the content of the instrument, which is a check of the operationalization against relevant content domain for the construct (99). The first step was a pilot test, which took place in September of 2002. By compiling and reviewing comments from the various sources as well as the results from the pilot test, the instrument was then modified and the remarks were incorporated into the final product to reduce measurement errors.. Reliability analysis using Cronbach's alpha showed that several important predictor variables had good internal consistency (100). This is important because the scales assembled to measure barriers are interrelated and designed to measure the underlying construct of access. This reliability analysis helps us know if our instrument can provide stable and reliable responses over a repeated administration.

Developing Variables for Analysis

While we gathered a good deal of data with the survey, there were a number of primary variables of interest in our analysis. The following is a list of the primary variables of interest collected for our analysis. The list includes a short description of the variable, the type of variable and coding where appropriate. These variables were included in the initial multivariate models as well as analyzed in the cluster analysis:

A. ETHNICITY – respondent ethnicity (White=1, Black=2, Hispanic=3, Other=4);
B. LANGUAGE – language of interview (English=1, Spanish=2);
C. RESIDENCE – respondent county of residence (Urban=1, Rural=2);
D. CHILDREN – a continuous variable of the number children responsible to the parent or guardian respondent;

E. AGE – a continuous variable of the age in years of the number of children in each household;

F. EPSDT - a continuous variable of the number of EPSDT visits during the last year;

G. CAR – automobile ownership or availability within the immediate household (0=no, 1=yes);

H. GAS - difficulty paying for gasoline (1=very difficult, 2=difficult, 3=easy, 4=very easy);

I. PARK – difficulty paying for parking expenses (1=very difficult, 2=difficult, 3=easy, 4=very easy);

J. FIND – general difficulty finding transportation (1=very difficult, 2=difficult, 3=easy, 4=very easy);

K. TIME – a continuous variable of average travel time to the doctor or dentist, and;

L. MILES – a continuous variable of average miles traveled to the doctor or dentist.

Sampling

The creation of four comparison groups (Rural MTP users, Urban MTP users, Rural MTP non-users, and Urban MTP non-users) provided four strata and the selection of clients for the study was conducted via a sampling plan dictated by finite population sampling theory. A simple random sample (i.e., a sample in which every client in the study population has equal probability of getting picked), as is standard in infinite population sampling, was not feasible for the finite population of EPSDT recipients targeted in this study. This was due to the fact that information on access to MTP was sought from a group of people scattered over a large geographic region in addition to which there were several subgroups of the population that were of interest to the study.

The adopted sampling plan ensured a sufficient sample size to provide statistically valid estimates of the study variables for the population as a whole and for those subgroups (97, 99).

In stratified random sampling, a probability sample of the study subjects is selected from the population through a sampling scheme that generally involves multiple stages of selection (97, 99). The specific complex sample design to be employed in each study is determined by factors such as the pertinent sampling frame, interviewer accessibility of subjects, and any natural clustering present in the population that would influence study variables of interest. Once the sampling design has been determined, the sample estimates are generalized to the entire population through each sample unit's probability of selection into the sample. The latter enters the estimation process via a "weight" assigned to each sample unit (101).

Sample Design

A representative sample of clients from the area under study was obtained through a stratified sampling scheme. First, the EPSDT recipients in the target population were divided into two mutually exclusive strata NEMT or MTP user/non-user status of the recipients, and the recipients' address as either urban or rural. Next, a simple random sample of clients was obtained from each of these strata.

Sample Size

In determining the sample size, cost, probability bounds on error of estimates, and the various subgroups of interest were taken into consideration. The frame of clients that was provided for sample selection had problems in the classification of MTP user and MTP non-user status. In both the user and nonuser groups, there were clients falsely

classified as belonging to the other. The number of such individuals was large enough to affect the required sample size. As this problem surfaced at the interview stage, it could be rectified only through increasing the number of contacts, as needed, to maintain the desired sample size within strata.

The previously mentioned misclassification of MTP user and MTP non-user status indicated that the frame totals might not accurately reflect the stratum population totals required here. On examination of the sample percentages of misclassified clients, however, it was deemed that the problem was negligible with regard to population totals within strata. A total of 1,214 surveys were completed in the four strata as indicated in Table 1.

Table 1: Sample Strata by MTP User/Nonuser and by Urban/Rural Residence

Strata	Frequency
User – Urban	308
User – Rural	300
Nonuser – Urban	301
Nonuser - Rural	305
Total	1214

The Survey

The survey was administered to EPSDT recipients, most of whom were parents or guardians of children enrolled in the EPSDT program. Parents and guardians were

chosen to complete the survey because they most typically make arrangements for transportation to and from medical appointments with their minor children. Medicaid recipients are eligible for EPSDT services until their 21st birthday. In the event that the EPSDT recipient was 16 years or older, EPSDT recipients who had used MTP services were interviewed to assess satisfaction with the MTP and the effectiveness and efficiency of services. THSteps recipients who had not recently used MTP were also surveyed in order to identify potential unmet transportation needs and reasons for non-use.

Prior to this study, some evidence existed to suggest that persons who cannot be reached by telephone may have proven to be different in important ways from telephone respondents. Nearly 95 percent of all households in the United States have telephone service (102). However, those without working telephones are disproportionately the poor and typically of the same socioeconomic strata as those on Medicaid. Despite fears of introducing bias because of inability to reach those without telephones, earlier research conducting in-person interviews have shown that Medicaid recipients in Texas without access to telephones have similar experiences with the NEMT than those with telephones (5, 24). Because of the additional expense involved in conducting in-person surveys and the lack of evidence of the introduction of bias, telephone methodology was viewed as appropriate.

Hispanics are the fastest growing segment of the national and Texas population. From 1990 through 2000, the Hispanic population in Texas grew by more than 53 percent. In the 2000 census, Hispanics accounted for 6.7 million of the Texas' 21 million residents. Nearly one and five Hispanics in the United States now call Texas home and the Hispanic population is expected to continue to grow in the coming years (103).

Despite making up only 32 percent of the population in Texas, Hispanics make up a far larger percent of the Texas Medicaid population, accounting for over 50 percent of all Medicaid enrollees (104). Because Hispanics make up a clear majority of those on Medicaid and it is unknown exactly what percent of the Hispanic population speaks English, the survey was available in both English and Spanish to fully capture the responses of Hispanic Medicaid clients without a full command of the English language.

The Public Policy Research Institute (PPRI) administered the questionnaire. PPRI is an applied, policy-relevant research organization and provides scientific research and evaluation services to both public and private sponsors including various federal, regional, state, and community agencies actively engaged in determining public policy. PPRI used a Computer Assisted Telephone Interviewing (102) system to conduct the EPSDT recipient survey. The CATI system manages the sample, displays the survey questions on a computer screen for the interviewer, and checks and records data entered by the interviewer. It substantially reduces errors by editing all entries during the interview, and by preventing invalid entries such as out of range dates and numbers. The program also eliminates the ability to of an interviewer to make errors in the administration of skip patterns in the survey.

Trained interviewers conducted most provider interviews during normal business hours. A toll free telephone number was made available to EPSDT recipients so that they could return calls at their convenience. Interviewers made at least five attempts to reach and interview the appropriate Medicaid recipient. All interviewers were provided with training manuals that covered standard survey procedures, as well as training materials designed specifically for this survey.

Study Methods – Tools Used

Methods used to analyze the data are intended to aid in: 1) identifying factors that promote and/or hinder the utilization of the MTP, and 2) identifying factors that promote and/or hinder the utilization of EPSDT services. Cluster analysis, binary logistic regression modeling serve as the primary analysis tools. Discriminant analysis was also employed to validate the final binary logistic regression models. All possible factors associated with utilization of MTP services were initially analyzed on a bivariate level using contingency tables, and Chi-square tests or t-tests where appropriate. SPSS software for Windows version 13.0 was employed for preliminary analysis and exploration of the data. In addition, SPSS was employed to analyze the data for the cluster analysis, binary logistic regression modeling and discriminant analysis.

Many explanatory variables and their impacts on utilization of MTP services were tested on a bivariate level using Chi-square tests and independent samples t-tests. The variables include socio-demographic factors; language of interview, ethnicity, residence (urban/rural), and number of children per family. The travel impedance factors include; automobile ownership or availability within the immediate household, the ability to borrow an automobile for medical or dental appointments, the ability to have a friend or relative drive for medical or dental appointments, difficulty with paying for gasoline when traveling to medical and dental appointments, difficulty with paying for parking and other expenses when traveling to medical and dental appointments, general difficulty with finding transportation for medical and dental appointments, average miles traveled one-way to the doctor or dentist, and average travel time to the doctor or dentist.

Cluster Analysis

In its most basic sense, cluster analysis is a classification method for grouping objects of similar kind into respective categories (105). Cluster analysis is a generic term used for a wide variety of techniques used by researchers searching how to organize data into meaningful structures or taxonomies. The technique is generally viewed as an exploratory data analysis tool which aims at sorting different objects into groups where the degree of association between the between two objects is highest if they belong to the same group. Although cluster analysis aids in developing meaningful structures among data, it does so without providing an explanation or interpretation as to why the structures exist (106).

K-means is a non-hierarchical approach to forming clusters and the user must specify the desired number of clusters, represented by the letter "k." The process starts with a single cluster with its center as the mean of the data. This cluster is split into two and the means of the new clusters are iteratively computed. These two clusters are again split and the process continues until the specified number of clusters is obtained. An important consideration in applying k-means clustering is estimating how many clusters are in the data and it can take several iterations of the analysis to determine the optimal number of clusters (107).

In this study, k-means cluster analysis is used to understand the difference among MTP non-users. As an enormous group, 94% of all Medicaid recipients, we know little about these Medicaid recipients neither as a group or as individuals (5). The k-means cluster analysis can begin to help us think about the various subgroups within the larger group of MTP non-users to better understand and identify certain segments of the population, particularly those with the greatest needs. As a result, k-means cluster analysis can help policy makers focus

their energies on identifying and assisting those with the greatest number of transportation barriers and lowest utilization rates.

The k-means cluster analysis attempts to classify MTP non-users to various subgroups based on the number and type of impedance factors they face. In particular, we want to better understand how the combination of certain impedance factors affects EPSDT utilization among MTP non-users. In this study, k-means cluster analysis is used to contribute to the definition of a formal classification scheme of MTP non-users in Chapter IV.

Binary Logistic Regression Model

Multiple regression analysis is a technique for investigating relationships between variables and serves three major purposes: 1) description, 2) control , and 3) prediction. It is a very powerful statistical procedure because of the ability to consider multiple independent or predictor variables at the same time in a single equation. As we fit a predictive model to our data, we can learn more about the relationships between several predictor variables and a dependent variable (108). Regression seeks to utilize linear data to find a line that best fits the data and is thus known as a tool among the general linear model (99).

Logistic regression is part of a category of statistical models called general linear models. The logistic regression has wide applicability in the social sciences. The logistic regression is derived from ordinary least squares regression analysis and is popular because of its explanatory power due to its ability to incorporate a number of variables into the model simultaneously (109). The logistic regression is a form of multiple regression, but is able to incorporate categorical dichotomous decisions or groupings that are measurable in only a small number of categories. As a result, the logistic regression allows one to predict a discrete outcome. In the case of our data, we will attempt to predict group membership for

MTP users and MTP non-users and group membership of low EPSDT utilizers and high EPSDT utilizers. The set of variables used in the logistic regression also provides great flexibility. The predictor or independent variables may be continuous, discrete, dichotomous, or a mix of any of these. Generally, the dependent or response variable is dichotomous (110).

The presence of a dichotomous dependent variable, such as MTP user or MTP non-user, presents problems for the ordinary least squares regression model because the primary assumption of linear regression is that the relationship between the variables is linear. When the outcome variable is dichotomous, this assumption is usually violated because the dependent variable stems from the fact that the probabilities have a maximum value of 1 (MTP user) and a minimum value of 0 (MTP non-user) (111). Thus, several pitfalls emerge. First, the predicted values may be outside the range of the dependent variable because the regression line can extend either upward or downward indefinitely as the values of the independent or predictor variables increase or decrease indefinitely. Depending on the slope of the line, the model can predict dependent values that either exceed 1 or fall below 0, which ultimately make no sense and have little predictive use (111). Secondly, the estimated standard errors of the coefficients will be incorrect and can lead to inappropriate conclusions regarding statistical significance. This is known as heteroscedaticity (112). Finally, in linear regression, an increase in a predictor variable is accompanied by a constant increase in the dependent variable. In some cases, this may be an invalid assumption because of problems at either low or high levels of the independent variable. For example, a nonlinear curve approximates linearity toward the middle of the relationship. However, as the values get closer to either 0 or 1, a larger change of the independent variable is required to have the

same impact as it did in the middle of the curve. Thus, to produce a change in the probability of an event occurring (the dependent variable) from .95 to .96 requires a much larger change in the independent variable than from a change in probably from .45 to .46 (111, 112). While transforming the data are an option, the binary logistic regression model expresses the multiple linear regression equation in logarithmic terms and thus overcomes the linearity violation assumption of the multiple regression equation (109, 113).

In this study, binary logistic regression is used to understand what factors most influence MTP utilization or the lack of MTP utilization. This question is of great importance because the vast majority of Medicaid recipients (94%) do not access MTP services (5). Furthermore, we also know that many Medicaid recipients are also transportation disadvantaged (4). Because there seems to be great disparity between actual utilization of MTP services and the perceived need of transportation services, this question is of critical importance. Thus, the dependent variable in this analysis will be MTP utilization (MTP user and MTP non-user). Accessing MTP services and thus health care can be affected by several travel related issues. These predictor or independent variables include a number of matters, including access to an automobile. Just as potential access to health care does not guarantee access to health care services, neither does owning an automobile. There are other factors that may constrain those on a limited budget, such as money for gasoline and parking, which create barriers for those seeking health care services. Health care access can also be impacted by the waiting times and the ability of clients to schedule appointments outside of normal working hours, especially for those who must work. Demographic variables also may affect the decision to access care, such as the number of children per family and the ages of those children as childcare is not provided as a benefit of the Medicaid

program. Furthermore, current policy limits ridership to only a parent or guardian and children in transit for a Medicaid covered service. Other factors that may also affect MTP utilization are language, especially those that do not speak English proficiently. It is within this context that the binary logistic regression analysis is employed to model the factors that contribute to MTP utilization. The question addressed using this analysis in Chapter V is:

- ✓ What socio-demographic and travel impedance factors influence MTP utilization?

Because access to transportation is one dimension of the total array of access to care, understanding how transportation and socioeconomic factors affect EPSDT utilization is also a critically important question. It can be argued that the same variables in understanding MTP utilization are also many of the same factors that affect EPSDT utilization; language, the number of children per family, access to an automobile, money for gasoline and parking, and having long waits in the office. It is also within this context that the binary logistic regression analysis can be employed to model the factors that contribute to EPSDT utilization. The question addressed using this analysis in Chapter V is:

- ✓ What socio-demographic and travel impedance factors influence EPSDT utilization?

Discriminant Analysis

Discriminant analysis is a statistical technique that focuses on the prediction of group membership. Originally involved in applications in biology and medicine, discriminant analysis now has wide applicability in a number of disciplines, including the social sciences. Computationally, discriminant function analysis is very similar to analysis of variance (ANOVA). Discriminant analysis is applicable when there is one dependent variable with

multiple independent or predictor variables, similar to the ANOVA and ordinary least squares regression. However, the primary difference between the ANOVA and ordinary least squares regression is the fact that the dependent variable must be categorical (110, 114).

Discriminant analysis has two primary purposes in research, predictive analysis and descriptive analysis. In predictive discriminant analysis (PDA), the multiple response variables (the independent variables) play the role of predictor variables. In descriptive discriminant analysis (115), the multiple response variables are viewed as outcome variables and the grouping variables are then viewed as the explanatory variable (independent variable). Essentially, the roles of the variables in PDA are reversed in DDA. PDA is most closely aligned with ordinary least squares regression analysis while DDA is most closely aligned with ANOVA or multivariate analysis of variance (MANOVA) (114). Because we are most interested in predicting MTP utilization and EPSDT utilization, the PDA technique is most appropriate for this study. Thus, our primary research question will be to see how accurately we can predict MTP utilization (MTP users and MTP non-users) and EPSDT utilization (High EPSDT utilizers and Low MTP utilizers).

While the methods are different, PDA and binary logistic regression both arrive at predicting group membership although in different ways. Each method has it advantages and disadvantages. As a general rule, logistic regression is preferred when the population is not normal and discriminant analysis is preferred when the population is normal. The logistic formula is robust against departures of normality and many of the variables associated with this data set violate the normality assumption. For example, the variable for measuring automobile accessibility (CAR) is a dichotomous variable with valid responses of either yes or no. Nearly all of the independent variables associated with this data set were not normally

distributed. The logistic regression also has other advantages, such as averting the need for a contingency table. The model creates a logistic or log-linear relationship table among the variable that replaces the contingency table which can be confusing with its large number of cells that often have too few observations per cell to be valid when using multiple variables in the equation (116).

Given the differences in the two models, a comparison of discriminant and logistic regression by Press and Wilson found that both models produced near identical results when testing on the same data despite their data violating normality. They go on to say that it is unlikely that the two methods would result in significantly different responses unless there are radical departures from normality among the predictor variables. Their final conclusion is to recommend the logistic regression over discriminant analysis when normality assumptions are violated. Although the logistic regression is preferred to that of the discrininant analysis, discriminant analysis is an appropriate technique for verifying the binary logistic regression model (107). Model verification is an important step in the model building sequence. Without verifying the model, we cannot provide good answers to the underlying questions under investigation. Discriminant analysis is employed in Chapter V to analyze and verify the findings from the binary logistic regression analysis:

- ✓ What socio-demographic and travel impedance factors influence MTP utilization?
- ✓ What socio-demographic and travel impedance factors influence EPSDT utilization?

CHAPTER IV

ANALYSIS

Undeniably, health care in the United States is among the best in the world for those who can access and receive the care this country has to offer. The United States leads the world in technological innovations and new treatment options that extend both longevity and quality of life. Yet health outcomes of many other developed nations, which spend far less on healthcare per capita, surpass those of the United States (Fuchs 1998). These assertions are a shock to many Americans who assume that United States healthcare system is the best in the world.

The poorer health care outcomes in the United States as opposed to other developed countries are often attributed to the disparities in access and availability of health care services that exist in the United States. In particular, people of color, those of low socioeconomic levels, and other vulnerable populations are more likely to experience barriers to health care and suffer from higher rates of mortality and morbidity. The most striking health disparities involve higher rates of cancer, birth defects, infant mortality, asthma, diabetes, and cardiovascular disease (Aday 2001). For example African American men have a rate of prostrate cancer that is twice that for white men. Also, African Americans and Hispanics account for only 25% of the nation's population, yet accounted for more than 55% of all AIDS cases in 1998. No single factor accounts for all or even a majority of the variation in health disparities. Instead, the factors related to health disparities are much deeper and the convergence of many factors that include race/ethnicity, gender, age, income, insurance status, health behaviors, housing status and occupation seem only to exacerbate the disparities

in overall health (Workgroup for the Elimination of Health Disparities 2000). Showing how the convergence of factors impacts health, a nationwide study of over 170,000 individuals found that people who are African American, lack health insurance, are overweight, smoke, have low income, and lack a college education are at much greater risk of morbidity and mortality than those with greater socioeconomic advantages (Putnam 2000).

Predictors of Populations at Risk

Aday developed a taxonomy of predictors of populations at risk. Aday's model (see Figure 7) goes well beyond the typical socioeconomic factors typically cited as barriers or factors that contribute to health disparities to include dimensions of social and human capital. Social capital is a term used to describe the way in which human lives are made more productive by the social ties and the value of social networks. Human capital is the investments in human skills and capabilities, giving them the ability to contribute to society (Putnam 2000; Aday 2001). Together, these factors or the lack of social and human capital combined with social status factors work together to increase health disparities among the nation's most vulnerable.

Health status for men and women differ for a number of reasons. Pregnant women or those in their child bearing years often require much more health care than men of the equivalent age. Yet hazardous working conditions often place men at greater risk of poor health than women. Health status also varies greatly buy social and demographic factors. Minorities face even more health challenges due to fewer resources. Limited economic and educational opportunities coupled with exposure to environmental risks leave many vulnerable (Aday 2001).

Social capital is yet another factor contributing to overall health and well-being. Several studies have sought to corroborate the fact that social connectedness is one of the most powerful determinants of well-being by establishing the relationship community integration and disease. Putnam contends that the more connected people are to their community, the less likely they are to experience illness. Social networks work on two dimensions toward improving care: tangible and intangible. Tangibly, they provide assets such as money, convalescent care, transportation, and childcare. Intangibly, these networks help reinforce healthier behaviors as isolated individuals are more likely to engage in risky behaviors. Those who typically have the least amount of social capital are those living alone or those in female-headed households. (Putnam 2000; Aday 2001).

Gary Becker is widely credited with having formulated and formalized the microeconomic foundations of the human capital theory and won the Nobel Prize in 1992. His theories created the framework for studying returns on education and wage differentials and their impacts on countries and their trade patterns. Simply put, human capital is an investment in people, typically education, expenditures on medical care, that provide skills, knowledge, improve health that enable people to work and contribute to society (Becker and Murphy 2001). Areas with high human capital investment tend to perform much better than areas with low human capital investment. For example, neighborhoods with poor schools, high unemployment rates and poor housing reflect low levels of investment in human capital. Areas with low human capital also tend to have lower overall health than areas with high levels of human capital investment (Aday 2001).

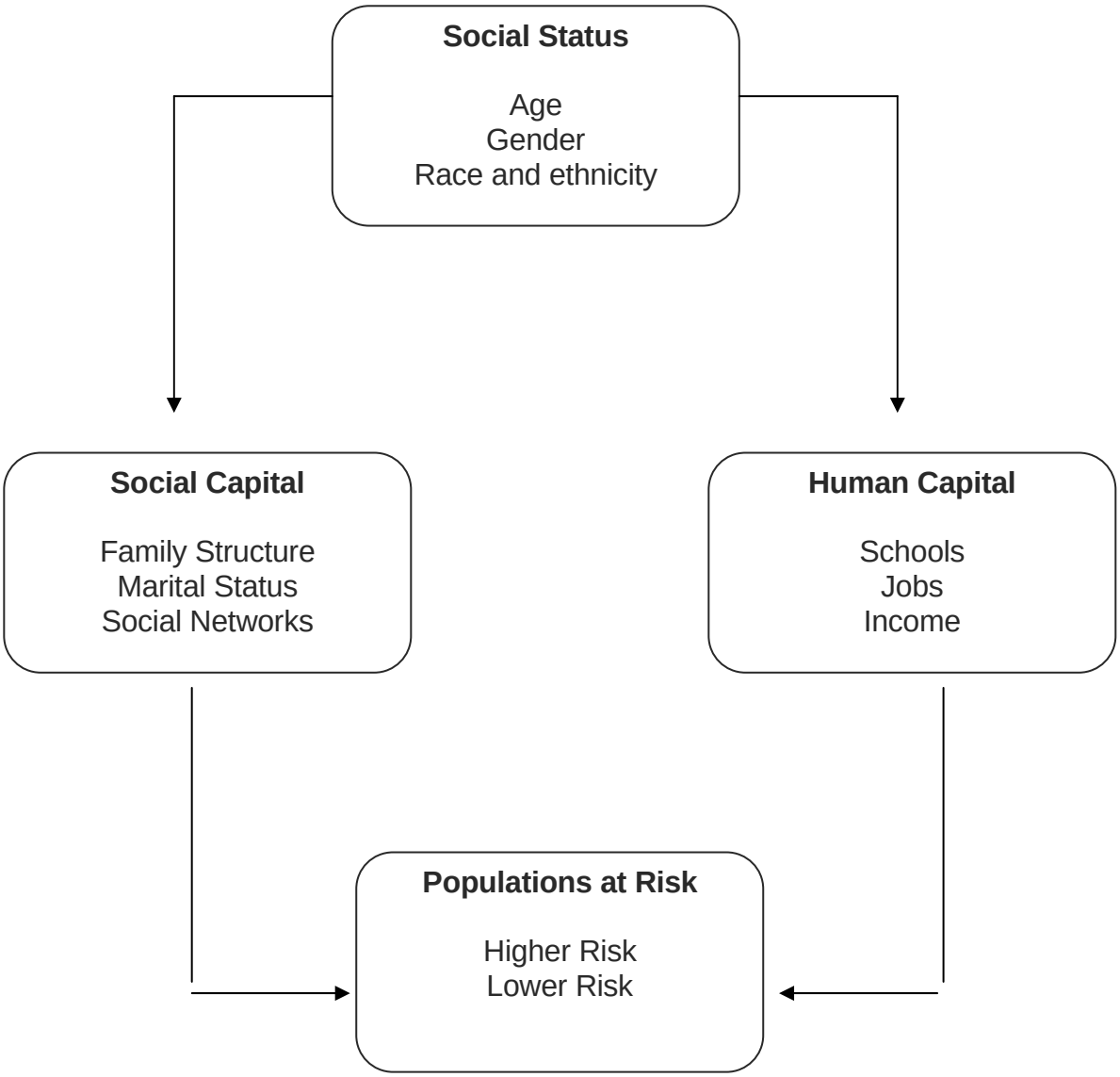

Figure 7: Predictors of Populations at Risk

Source: Aday, L.A. (2001). *At Risk In America: The Health And Health Care Needs of Vulnerable Populations In the United States*: *2md Ed.* San Francisco. Jossey-Bass. (43).

Demographic, social capital and human capital factors are all extremely important when considering the overall health and relative risks to the Texas Medicaid population. Using Aday's taxonomy for predicting relative risk, the Texas Medicaid population rates highly on all three dimensions. Children make up the largest share of the Texas Medicaid population. In state fiscal year 2003, 66 percent or 1.6 million of recipients were children (under the age of 21) (Texas Health and Human Services Commission 2005). About one-third of the children on the Texas Medicaid program come from families that meet Temporary Assistance for Needy Families (TANF) income guidelines. TANF stands for Temporary Assistance for Needy Families, which is the federal program that provides cash assistance or welfare benefits for families in need. This means that for a family of three receiving TANF benefits, they could earn no more than $188 per month or less, which is 17% of the federal poverty level (Texas Health and Human Services Commission 2003). The TANF income guidelines in Texas are some of the lowest in the country. Only Alabama ($164 per month), Mississippi ($120 per month) and Tennessee ($185 per month) had lower income caps than Texas in 2000 (State Policy Documentation Project 2000).

TANF coverage is targeted toward single-parent households, which in Texas are typically female-headed (84 percent) (Texas Health and Human Services Commission 2003). The most common TANF parent or guardian lives at or below the federal poverty level. They are most likely to be a female who is unemployed with children under the age of 11. The typical parent or guardian also dropped out of school between the 8th and 11th grade and has little or no job training. In addition to the lack of education, the typical TANF parent or guardian also has difficulty holding a job because of the lack of affordable child care and reliable transportation (16).

The Texas Medicaid program covers more children than those who are eligible for TANF (see Figure 8). Although the income guidelines for children and families that earn too much for TANF benefits are higher, they are still quite low and cover children only up the federally mandated Medicaid requirements. Figure 9 displays the monthly maximum income limits for a family of three. Medicaid covers prenatal and delivery services for pregnant women and their infants who have no other insurance up to 185% of the FPL or $2,045 per month for a family of three. Medicaid also covers health services for many low-income families who are otherwise ineligible to receive cash assistance (TANF) up to 100% of the FPL or around $1,105 per month for a family of three.

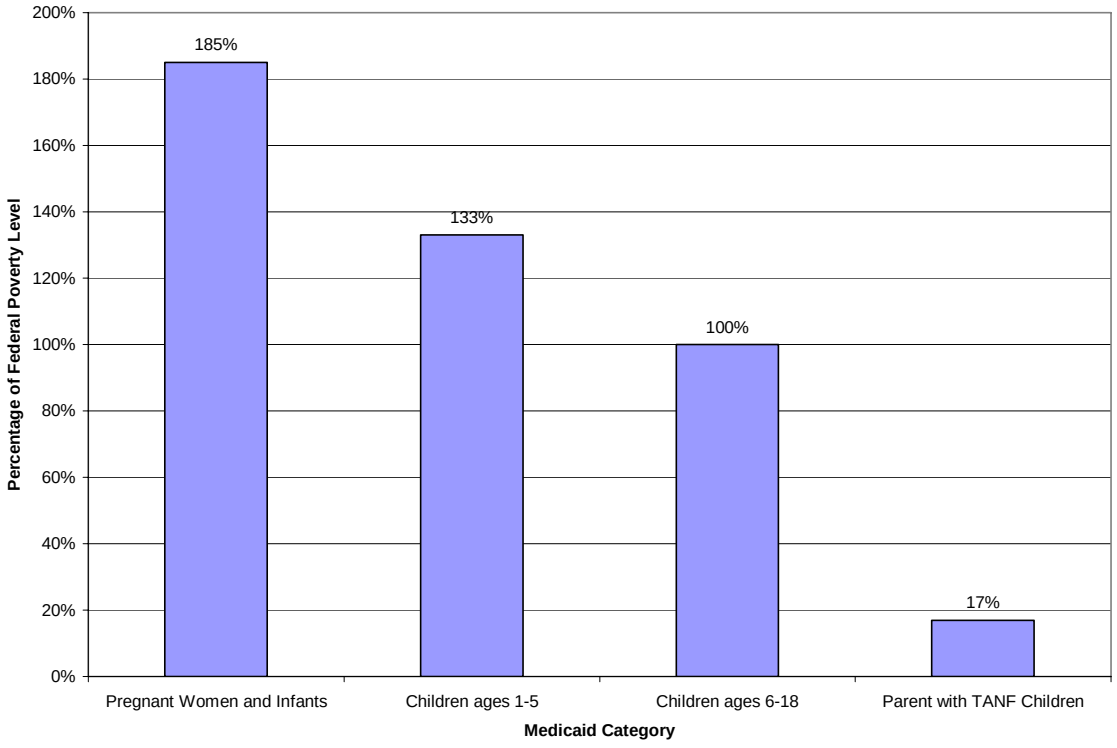

Figure 8: Texas Medicaid Maximum Poverty Levels by Program Type for State Fiscal Year 2003

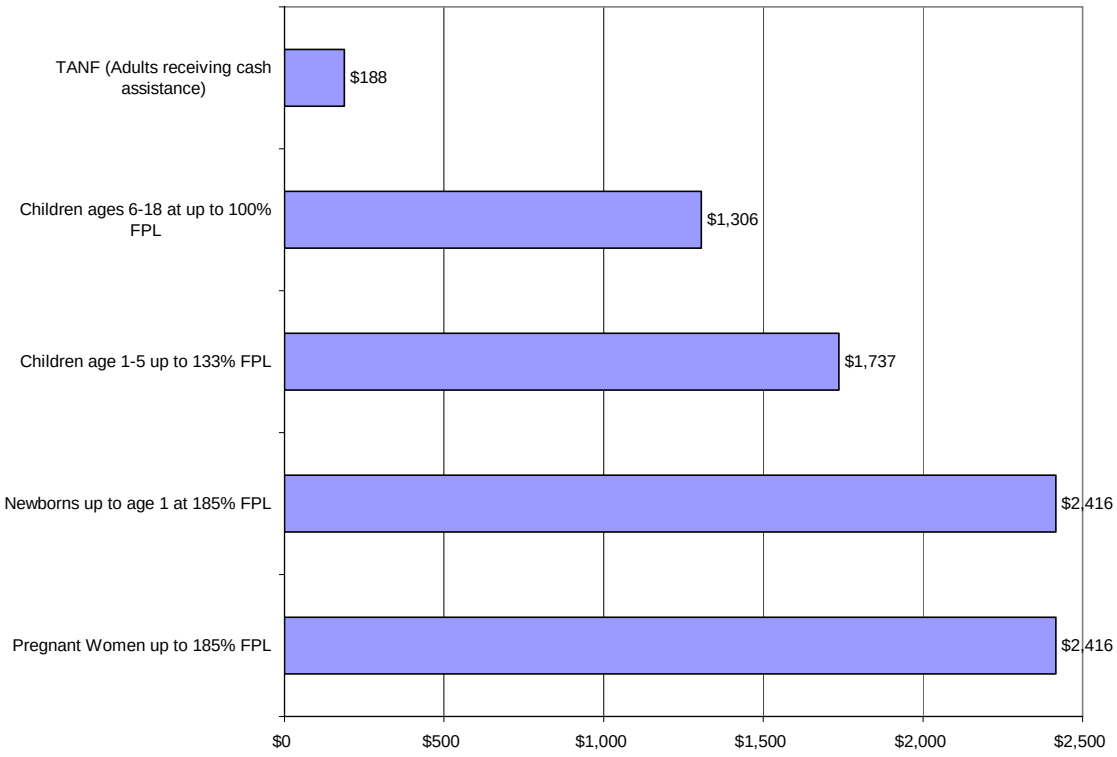

Figure 9 : Texas Medicaid Maximum Monthly Income Limits for State Fiscal Year 2003 (Family of 3)

The Texas Medicaid program is vastly overrepresented by minorities in its makeup. Racial and ethnic minorities account for a little less than 50% of the total Texas population, yet they constitute three-quarters of those who receive their health care through the Medicaid program. Hispanics constitute the largest single ethnic group among Texas Medicaid recipients, accounting for 51% of the population while representing only 35% of the state's population. African-Americans make up 19% of the Medicaid population, yet represent less

than 12% of the state's population. Conversely, whites make up around 26% of the state's Medicaid population yet account for about half of the state's overall population. (96, 104).

EPSDT and Prevention

The link between low socioeconomic status, social capital and human capital on health is clear. The Institute of Medicine (IOM) provides compelling evidence to support the fact that health care disparities on a number of conditions are a reality for our nation's most vulnerable, even when controlling for income and insurance (117). All of these disadvantages increase the likelihood that a poor child will be in poor health in addition to putting vulnerable children at greater risk of morbidity and mortality as adults.

Early detection and treatment can avoid or minimize the effects of many childhood conditions and the Medicaid program is an integral part of ensuring access to early treatment and detection. Compared with uninsured children, those with insurance either private or public (Medicaid), report greater access to primary care (115). During the Medicaid expansions of the late 1980s, a 2001 study found that the expansion of the Medicaid program significantly raised physician utilization for both black and Hispanic children (118). The Medicaid Early Periodic Screening Diagnostic and Treatment (EPSDT) program (known in Texas as THSteps) is the most prominent preventive care component of the Medicaid program. Because children's health care needs differ than adults, the EPSDT program was added to the Medicaid program under Public Law 90-248 in 1967 to promote better access to preventive care for Medicaid-enrolled children. The EPSDT program offers children comprehensive screening and treatment services to improve overall health status by reducing avoidable illness and disease (119).

Yet provider participation and Medicaid recipient participation remained quite low for a number of years, Congress included provisions in the Omnibus Budget Reconciliation Act of 1989 (OBRA 89). OBRA 89 defined the basic components of the EPSDT screen, which includes a basic checkup known as a well-child visit. In addition to a basic medical checkup, the well-child or EPSDT visit includes screenings for vision, dental and hearing services. (119).

Periodicity Schedule

Every age brings its own health concerns and challenges. To address health issues and various ages of development, Medicaid programs have a periodicity schedule by age for EPSDT checkups. States have some latitude to develop their EPSDT schedules, but they "must be provided at intervals that meet reasonable standards of medical practice" (119). Infants receive more checkups than adolescents to ensure that newborns are developing properly. For example, the THSteps periodicity schedule suggests eight EDPST visits for Medicaid children within their 18 months of life while adolescents (children 14 and older) receive only an annual checkup. Furthermore, different assessments, screenings and laboratory work are performed as appropriate for the child's age. The THSteps/EPSDT periodicity schedule is represented in Table 2 and Table 3.

Table 2: THSteps Periodicity Schedule for Children Birth through Eight Years Old

	Infancy/Early Childhood									Middle Childhood					
	Weeks		Months							Years					
	0	2	2	4	6	9	12	15	18	2	3	4	5	6	8
History															
Family	•	•	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Neonatal	•	•	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Physical, Mental Health, Developmental	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Physical Examination	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Measurements															
Height/Weight/BMI	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Head Circumference	•	•	•	•	•	•	•	•	•	•					
B/P											•	•	•	•	•
Nutrition	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Developmental		•	•	•	•	•	•	•	•	•	•	•	•	•	•
Mental Health		•	•	•	•	•	•	•	•	•	•	•	•	•	•
Sensory Screening															
Vision Screening	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Hearing Screening	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tuberculin Screening							×	✓	✓	×	×	×	×	×	×
Laboratory															
Newborn Hereditary Metabolic Testing	•	•	✓	✓	✓	✓									
Hgb or Hct					•	✓	•	✓	✓	•	✓	✓	✓	•	✓
Lead Screening					×	✓	•	✓	✓	•	×	×	×	×	
Hemoglobin Type	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Hyperlipidemia										×	×	×	×	×	×
Immunizations	•	✓	•	•	•	✓	•	✓	✓	✓	✓		✓	✓	✓
Dental Referral							•	✓	✓	•	•	•	•	•	•
Anticipatory Guidance	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Key	
•	Required, unless medically contradicted or against parental religious beliefs.
✓	Required as above, unless already provided on a previous checkup at the required age and documented on the health record with the date of service.
×	In answers on high risk assessment questionnaires or other screening show a risk factor, further screening is required.

Source: Texas Department of State Health Services. (2005).*Texas Medicaid Provider Procedures Manual.* Austin, TX: Author. (120).

Table 3: THSteps Periodicity Schedule for Children 10 through 20 Years Old

	Childhood				Adolescence						
	10	11	12	13	14	15	16	17	18	19	20
History											
Family	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Physical, Mental Health, Developmental	•	•	•	•	•	•	•	•	•	•	•
Behavioral Risk	•	•	•	•	•	•	•	•	•	•	•
Physical Examination	•	•	•	•	•	•	•	•	•	•	•
Measurements											
Height/Weight/BMI	•	•	•	•	•	•	•	•	•	•	•
B/P	•	•	•	•	•	•	•	•	•	•	•
Nutrition	•	•	•	•	•	•	•	•	•	•	•
Mental Health Assessment	•	•	•	•	•	•	•	•	•	•	•
Sensory Screening											
Vision Screening	•	•	•	•	•	•	•	•	•	•	•
Hearing Screening	•	•	•	•	•	•	•	•	•	•	•
Tuberculin Screening	•	•	•	•	•	•	•	•	•	•	•
Laboratory											
Hgb or Hct	✓	•	✓	✓	✓	✓	•	✓	✓	✓	✓
Hemoglobin Type	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
STD Screening		×	×	×	×	×	×	×	×	×	×
Pap Smear			×	×	×	×	×	×	•	•	•
Hyperlipidemia	×	×	×	×	×	×	×	×	×	×	×
Immunizations	✓	✓	✓	•	•	✓	✓	✓	✓	✓	✓
Dental Referral	•	•	•	•	•	•	•	•	•	•	•
Anticipatory Guidance	•	•	•	•	•	•	•	•	•	•	•

Key	
•	Required, unless medically contradicted or against parental religious beliefs.
✓	Required as above, unless already provided on a previous checkup at the required age and documented on the health record with the date of service.
×	In answers on high risk assessment questionnaires or other screening show a risk factor, further screening is required.

Source: Texas Department of State Health Services. (2005).*Texas Medicaid Provider Procedures Manual.* Austin, TX: Author. (120).

EPSDT Utilization

The evidence that links better health with people who get preventative health care is overwhelming. The EPSDT program is the cornerstone of the Medicaid preventive care program in ensuring that young people of Texas receive THSteps services before health problems become chronic and irreversible. Because Medicaid recipients face numerous barriers to accessing care, Medicaid policy-makers have worked over the years to reduce barriers so that vulnerable populations like those on Medicaid may have better access to services. These include the proliferation of managed care programs to increase the number and quality of providers participating in state Medicaid programs. Managed care has helped link Medicaid patients with a primary care provider or medical home to lesson the reliance on emergency rooms and clinics so that Medicaid patients have a usual source of care (121-123). The federal government has expanded Medicaid for pregnant women, making it easier for those with higher incomes to qualify (up to 185% FPL) (124). Yet despite these policy accomplishments that have improved access to care, numerous barriers remain, including transportation.

To assess the impacts of medical transportation services on utilization of the total number of health care services the child received during the past year and the total number of EPSDT services the child received during the past year, respondents were analyzed along the strata MTP users and MTP non-users. Indeed, utilization of MTP services does seem to impact the utilization of health care services (see Figure 10). Medicaid recipients that accessed the MTP program in the past year reported higher utilization ($p<.05$) of doctor and dentist visits during the last year than those that did not. Those that accessed MTP services reported having more than there additional health care

visits than their peers who did not access MTP services. The difference in these two groups is striking, but some of the differences may be attributable a relatively small group of children that require frequent healthcare services. Medicaid provides health care for many children with chronic or extraordinary medical needs who require numerous trips to health care providers. For example, some patients with kidney problems requiring hemodialysis may need visit a dialysis center up to three time a week (125). This speculation cannot be confirmed, but even when dropping all respondents reporting their number of health care visits three standard deviations above the mean, the differences between the groups ($p<.05$) remain significant.

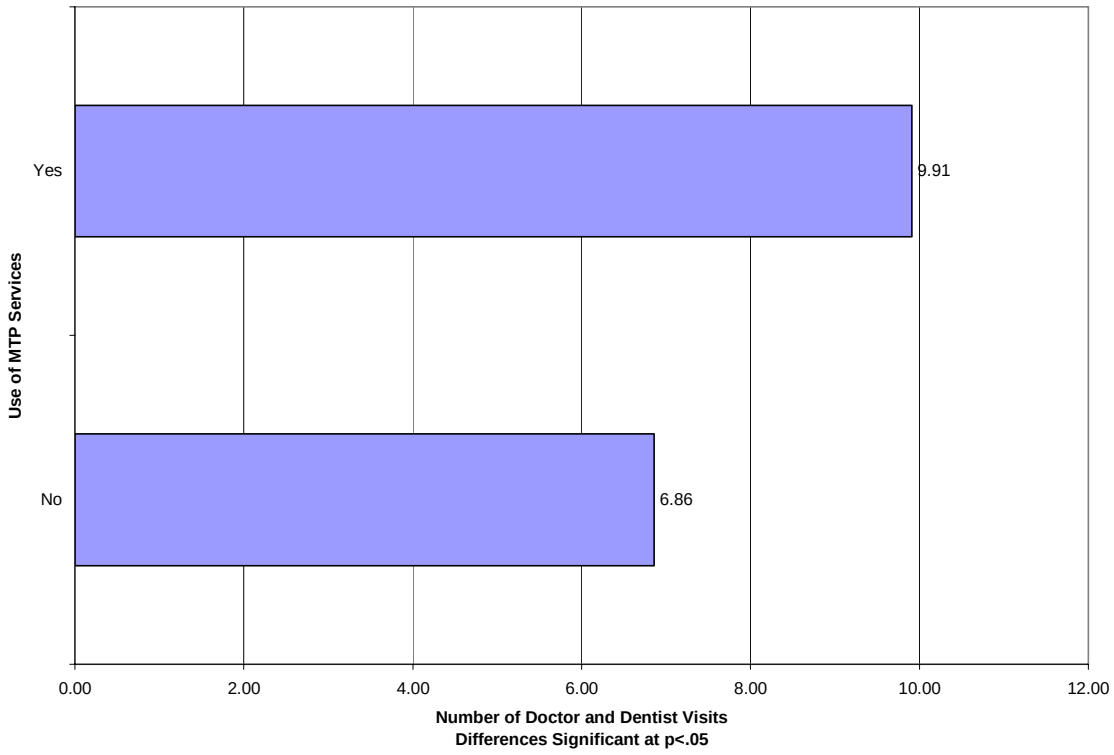

Figure 10: Average Number of Medical and Dental Visits per Year: MTP Users and MTP Non-users

A better measurement of access is EPSDT utilization. Because these checkups are scheduled at periodic intervals and are for preventive, not ambulatory care, it better measures access to similar services. When comparing EPSDT utilization among users and non-users of MTP services, those that access MTP services tend to report higher utilization ($p<.05$) of EPSDT services. Users of MTP services reported accessing almost one additional EPSDT visit (3.53) than those who did not access MTP services (2.64) (see Figure 11). When isolating the effects of the periodicity schedule by age, both groups of users and non-users of MTP services had similar distributions by age. Therefore both groups had similar opportunities for EPSDT visits as prescribed by the THSteps periodicity schedule, thus eliminating the potential biases of one group having greater opportunities for EPSDT visits than the other.

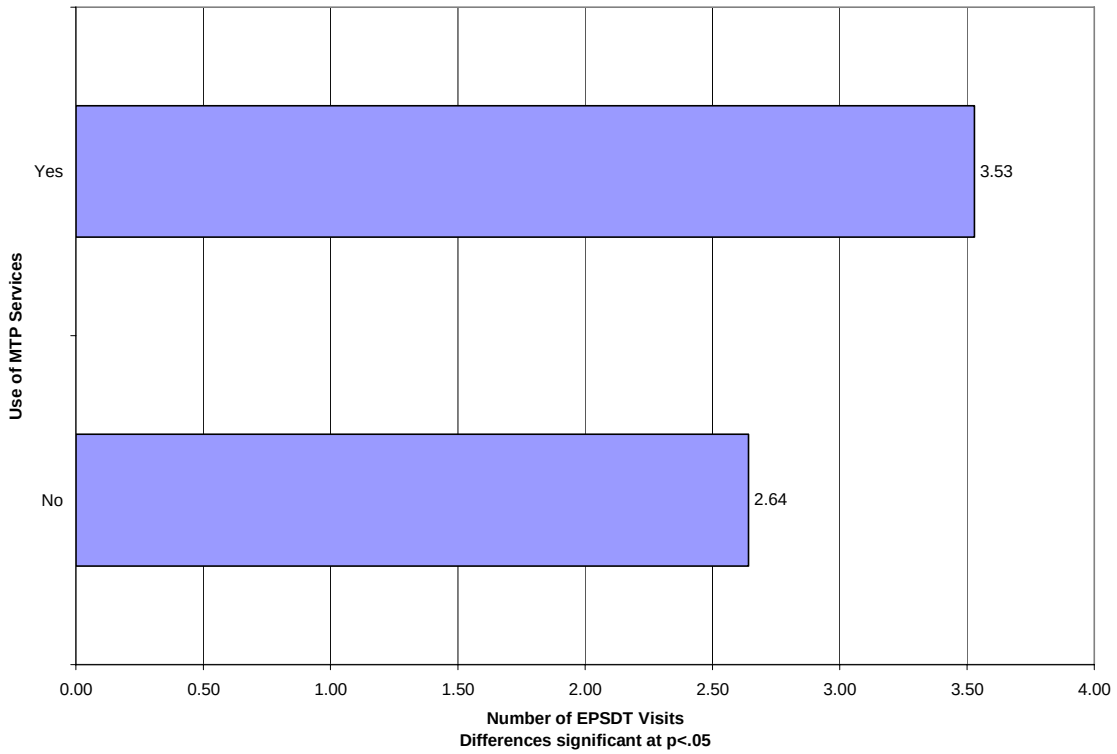

Figure 11: Average Number of EPSDT Visits During the Past Year: MTP Users and MTP Non-users

Selected Socio-demographic Factors

Studies of low-income and Medicaid recipients show that utilization of health care and other social services are associated with ethnicity, the number of children, urban and rural status (2, 12, 43, 126). However, the majority of these socio-demographic factors did not differ significantly among users and non-users of MPT services (see Table 4). Only ethnicity appears to be associated with use of MTP services.

Table 4: Socio-demographic Factors and Use of MTP Services

Socio-demographic Factors	*MTP Users (n=608)*	*MTP Nonusers (n=606)*	*Total*	*CHISQ Value P<0.05*
	n (row %)	*n (row %)*	*n (col %)*	
Interview Conducted in English?				
Yes	514 (50)	514 (50)	1028 (85)	.018NS
No	94 (50)	92(50)	186 (15)	
Primary Ethnicity				
White	149 (46)	172 (54)	321(26)	7.62
Black	130 (57)	97 (43)	227 (19)	
Hispanic	282 (49)	298 (51)	580 (48)	
Other	47 (55)	39 (45)	86 (7)	
Residence				
Urban	308 (51)	301(49)	609 (50)	.118NS
Rural	300(50)	305(50)	605(50)	
Number of Children				
1 Child	182 (53)	160 (47)	342 (28)	2.569NS
2 Children	198 (50)	203 (50)	401 (33)	
3 Children	111(47)	128 (53)	241 (20)	
4 Children	66 (49)	69 (51)	135 (11)	
5 or more children	49 (52)	46 (48)	95 (8)	

Language of Interview

Although Medicaid recipients in the state of Texas are of many nationalities and may have a primary language other than English, Spanish is by far the most widely spoken language among Medicaid recipients other than English. Thus, interviews were conducted in either English or Spanish. The majority of respondents in the study completed the survey in English (85%). Language of the interview appeared to have no impact on MTP utilization as those who speak Spanish as their primary language accessed MTP services at equal rates (15%).

Primary Ethnicity

The overall distribution of study respondents by ethnicity was nearly identical to that of the Medicaid program as whole. When examining users and non-users of MTP services, primary ethnicity was significant ($p<.05$). While all ethnic groups seem to be accessing MTP services, minorities reported higher utilization of MTP services than whites. Fifty-seven percent of African-Americans or blacks interviewed for the study reported using MTP services versus only 46% of whites. Of the three primary ethnic groups recorded for the study, only blacks reported utilization of MTP services in excess of 50%. Hispanics reported only marginally higher rates of MTP utilization of MTP services than whites with 49% of survey respondents indicating they had accessed MTP services in the past year versus only 46% for whites. While Medicaid provides potential access to care, Medicaid does not completely eliminate all health disparities nor disparities in access when comparing ethnic groups. For example, Hispanics seem to fair poorly when compared with whites in having a usual source of primary care for those covered by Medicaid (127).

Residence

Previous studies in the US suggest that there are significant differences in access and availability of health care services among rural and urban residents, with rural residents facing additional access barriers that their urban peers may not (126). In addition to health care services being less available for rural residents, rural monitories face even greater disadvantages in access health care services in certain areas (128). Despite these noted differences in the literature, there were no differences between urban and rural access among MTP users and non-users. MTP users were nearly evenly distributed among urban (51%) and rural (50%) residents. Among non-users, the distribution was nearly the same with 49% of MTP non-users living in urban counties and 50% of MTP non-users living in rural counties.

Number of Children

We were surprised that the number of children per household was insignificant when comparing MTP users and MTP non-users because of problems with childcare. The lack of childcare is noted as a barrier to services among families, particularly women, who need to travel to receive health care services (37). Families with multiple children at home are forced to take young children with them to their doctor or dentist appointments. Carrying more than one child may be a deterrent to accessing health care services. Furthermore, current MTP policies may actually exacerbate the access problems. Current MTP policy restricts ridership for families with more than one child to only the child receiving a Medicaid covered service and his/her parent or guardian. If a sibling is not receiving a Medicaid covered service, MTP is prohibited from paying for the transportation cost of a sibling (5). Thus, households with several small children would

seem to be at a disadvantage because finding childcare is most likely cost prohibitive for low income individuals eligible for the Medicaid program and many Medicaid families are headed by single parents.

To explore the impacts of family dynamics on MTP utilization, particularly the impact on families with young children at home, we examined three variables: 1) the number of children enrolled in EPSDT or Medicaid during the past year, 2) the average age of children in each family, and 3) the mean number of EPSDT visits for households with at least two children under the age of five at home (see Table 5). These factors seem to be important for a number of reasons. Family size or the number of children at home, especially for single-parent, low-income families may make health care access difficult because of childcare issues. These issues may be compounded by the age of the children at home, especially for families with young children who need supervision or childcare and many who may not be enrolled in pre-school or Head Start programs.

Table 5: Child Related Factors and the Use of MTP Services

Measure	MTP Users (n=608) (n=116)	MTP Nonusers (n=606) (n=123)	P-value (2-tail)
Number of children enrolled in EPSDT during the last year	2.38	2.46	.309 NS
Average Age of All Children	8.01	7.50	.035
Mean EPSDT Visits for households with 2 or more children under the age of 5	4.48	3.28	.024
Number of cases (n) varies slightly because of missing data. P-value is the two-tail probability value for t-test of difference between the two groups. Equal variances not assumed			

Number of Children Enrolled in ESPDT During the Last Year

Families of both MTP users and MTP nonusers had similar numbers of children eligible for Medicaid in each family. It is possible that families of both groups do in fact have more children at home, not eligible or enrolled in the Texas Medicaid program. For example, because of varying income guidelines, families may have some children that qualify for Medicaid and others who do not. Income guidelines become more stringent as children age. For example, Medicaid covers infants through their first birthday up to 185% FPL while covering children 6 to 18 only up to 100% FPL (19). Given the caveat on this variable, the number of children enrolled in EPSDT during the past year was not significant.

Average Age of All Children

Families that did not access MTP services (MTP non-users) tended to have slightly

younger children at home than those who did access MTP services (MTP users). The average age of all children at home among MTP non-users was 7.50 versus 8.01 for MTP users ($p<0.04$). While the difference in average age of all children was not great, about 6 months, this finding does seem to support the findings of earlier research in the area. The lack of childcare, especially for families with young children, may impose burdens that preclude parents from seeking preventive health care.

Mean EPSDT Visits for Households with 2 or More Children Under the Age of 5

Because childcare, or the lack of it, appears to be such a significant barrier to preventive health care services like EPSDT, we examined the mean number of EPSDT visits on a subset of the overall Medicaid populations. The subset was restricted to households with 2 or more children under the age of 5. MTP users (n=116), reporting an average of 4.48 EPSDT visits during the past year versus MTP non-users (n=123), who reported receiving an average of 3.28 EPSDT visits during the past year ($p<.024$). This finding neither confirms nor negates the policy problem of restricting ridership of siblings who are not accompanying family members on EPSDT checkups. However, the difference of more than 1.2 EPSDT visits during the last year for MTP users seems to underscore the fact that MTP non-users with multiple young children at home seem to experience more barriers to preventive care.

Travel Impedance Factors

The issue of access has many dimensions, but can generally be divided into two subtopics: access to health insurance and access to care. It is important to understand that although insurance programs such as Medicaid can facilitate access to care, also

known as potential access to care, it does not guarantee access or the subsequent utilization of care. There are almost a limitless number of barriers that can impede potential to realized access of health care services and for the poor, such as those on Medicaid, the barriers are much greater than those in higher socio-economic strata. Barriers can include enrollment, lack of a medical home, inadequate prenatal care, low immunization rates, the availability of providers, provider location, and transportation problems (124, 129-132).

Owning an Automobile

The private automobile remains the dominant form of transportation in the United States. In Texas, the automobile is extremely important, especially among the rural areas where public transportation systems are limited and residents face long trips for consumer goods that most urban residents take for granted. Texas is also home to several of the country's major metropolitan areas with developed fixed route bus systems in Houston, Dallas, San Antonio and Austin. However, only Houston and Dallas have operable mass transit systems at this point with limited light rail systems. Even in these major metropolitan cities, the automobile remains the dominant form of transportation. Thus, access to a private automobile is an important asset in seeking health care services and is a significant factor in MTP utilization ($p<.05$). About 75% of all respondents reported owning an automobile, however, MTP non-users were much more likely to report having access to an automobile within their immediate household. Eighty-five percent of MTP non-users reported having access to a private automobile versus only 66% of MTP users (see Table 6).

Table 6. Travel Impedance Factors and the Use of MTP Services

Transportation Factors	*MTP Users (n=608)*	*MTP Nonusers (n=606)*	*Total*	*CHISQ Value P<0.05*
	n (row %)	*n (row %)*	*n (col %)*	
Do you or someone in your immediate household own an automobile that you can regularly use to travel to doctor's appointments?				
Yes	399 (44)	515 (56)	914 (75)	60.50
No	208 (70)	91 (30)	299 (25)	
Can you or someone in your household easily borrow a car for going places like doctor's appointments?				
Yes	45 (60)	30 (40)	75 (25)	4.32
No	163 (73)	61(27)	224 (75)	
Are you regularly able to get a friend or relative to take you to doctor's appointments?				
Yes	104 (65)	56 (35)	160 (54)	3.474 NS
No	102 (75)	34 (25)	136 (46)	
Does lack of money for gas make it difficult to get to the doctor or dentist?				
Very Difficult	95 (64)	54 (36)	149 (13)	50.31
Difficult	272 (60)	188 (41)	460 (41)	
Easy	163 (39)	260 (62)	423 (37)	
Very Easy	45 (44)	58 (56)	103 (9)	

Table 6 continued

Transportation Factors	*MTP Users (n=608)*	*MTP Nonusers (n=606)*	*Total*	*CHISQ Value P<0.05*
	n (row %)	*n (row %)*	*n (col %)*	
Does lack of money for other expenses, such as parking, make it difficult to get to the doctor or dentist?				
Very Difficult	44 (55)	36 (45)	80 (8)	1.95 NS
Difficult	118 (53)	105 (47)	223 (22)	
Easy	263 (50)	272 (50)	535 (53)	
Very Easy	87 (48)	94 (52)	181 (18)	
Generally speaking, would you say that finding transportation for you is?				
Very Difficult	53 (32)	25 (68)	78 (7.5)	12.589
Difficult	134 (35)	74 (65)	208 (20)	
Easy	283 (43)	210 (57)	493 (48)	
Very Easy	124 (47)	109 (53)	233 (23)	

Borrowing an Automobile

The question on borrowing an automobile was asked only to those who responded "no" to the previous question about owning or having access to an automobile within the immediate household (n=299). MTP users were less likely to have the ability to borrow an automobile than MTP nonusers ($p<.05$). Among MTP users, 78% reported an inability to borrow an automobile versus 67% of MTP non-users.

Friend or Relative

This question, the ability to regularly get a friend or relative to take you to doctor's or dentist's appointments was also asked only to the subset of those who responded "no"

to the previous question about owning or having access to an automobile within the immediate household (n=299). Of respondents reporting the ability to get a friend or relative to take them to the doctor or dentist, the Chi-square test revealed that there were no differences between MTP users and MTP non-users. MTP users were split almost evenly among those who reported having the ability of a friend or relative to take them to their doctor's appointments (50%) and those who did not (50%). MTP non-users reported different greater access to friends and relatives with automobiles (62%) than those who did not (38%).

Money for Gasoline

Owing an automobile requires money for operation. For many, a most significant operating expense in owning an automobile is gasoline. In calendar year 2002, the average price for a gallon of self-serve regular unleaded gasoline in Texas was $1.27 (133). While the price of gasoline in 2002 was very inexpensive by historical measures, the burden of purchasing gasoline for those on Medicaid with limited incomes seems very significant for a large portion of the population. The results showed that respondents who utilized MTP services (MTP users) were more likely to report difficulties with paying for gasoline than those who did not (MTP non-users) ($p<.05$). A majority of MTP users (64%) reported that lack of money for gasoline was either "very difficult" or "difficult" for going to the doctor's or dentist's office versus 43% of MTP non-users. Despite MTP non-users reporting less difficulty paying for gasoline for medical trips, the relatively high number of MTP non-users reporting difficulty may be cause of alarm given the fact that MTP non-users generally reported fewer EPDST visits than MTP users.

Money for Parking and Other Expenses

In addition to gasoline, there are a number of other expenses associated with operating an automobile, one of which is parking. In many areas, especially densely populated urban areas, parking may be difficult and expensive to find. MTP users and non-users reported no differences in their ability to pay for parking expenses. A majority of MTP users (68%) and MTP non-users (72%) reported that a lack of money for parking or other expenses had little impact on their ability to go to the doctor or dentist. Despite the majority of both MTP users and non-users reporting few problems with paying for parking expenses, a sizeable minority reported difficulties paying for such expenses. Overall, nearly 30% of the respondents indicated that paying for such expenses was either "difficult" or "very difficult." Although statistically insignificant, the percentage of MTP users (32%) reported slightly more difficulty paying for parking other expenses versus MTP non-users (28%).

Multiple Impediments

Medicaid respondents without access to an automobile within their immediate household seem to face multiple transportation barriers. Among all Medicaid recipients responding to the survey, about 19% (n=299) reported having neither access to an automobile within their immediate residence nor the ability to easily borrow an automobile, making them reliant on other forms of public transportation. When examining the differences between MTP users and non-users, more than twice the number of MTP users (27%) reported neither having automobile access within their immediate residence nor the ability to easily borrow an automobile versus only 10% for MTP non-users. When examining all respondents, a little more than 10% (n=123)

reported neither owning an automobile, the ability to borrow a car nor have a friend or relative to take them to their doctor's or dentist's appointments. This subgroup of MTP non-users seems to face the greatest number of transportation impediments. Overall, MTP users (15%) tended to report having less access to transportation among the three aforementioned dimensions versus five percent for MTP non-users. This finding seems to indicate that the MTP program is doing a good job of assisting those with numerous transportation barriers. However, less than 10% of the Medicaid population accesses MTP services. On the surface, the five percent of MTP non-users that have multiple barriers seems like a small number. Given the size of the Medicaid population (2.6 million), this means that about 120,000 Medicaid recipients face these multiple transportation barriers and do not rely on MTP for assistance with their transportation needs.

Findings for those who reported difficulties with paying for gasoline and parking expenses were similar to those who reported multiple barriers with personal transportation. Twenty-two percent (n=231) of all respondents indicated that a lack of money for parking and gasoline made traveling to the doctor or dentist "difficult" or "very difficult." While paying for gasoline was by far the most reported barrier, about 38% of respondents reported having difficulties paying for both parking and gasoline. Among those that reported difficulties with parking and gasoline, 42% were MTP non-users while 58% were MTP users. Although those with multiple barriers seem to be accessing MTP services at greater rates, certainly this subset of the Medicaid populations could potentially benefit from MTP services.

Those that do not access MTP services (MTP non-users) and who reported difficulties paying for both gasoline and parking comprise about eight percent of the total Medicaid population. Again, while this number seems small on the surface, when factoring the entire Medicaid population in Texas of 2.6 million, this translates into over 187,000 Medicaid recipients that face barriers to health care services because of their inability to afford gasoline, parking and other expenses associated with in traveling for their medical and dental appointments.

Distance and Travel Times

There are numerous studies documenting the relationship between health care and barriers such as income and education. While the study of geographic barriers and health care is in its nascent stage, the field has progressed within past decades with the proliferation of geographic information systems and the personal computer (134). Today, the recognition that long distances and spatial accessibility of health care providers plays and obvious role in the access of health care services in both urban and rural areas. Recent studies have documented the evidence of the inequalities in distribution of health care providers (135) and that travel distances do impact the probability of utilization of certain health care services (80, 136).

When examining the distribution of both distance and travel times to the doctor or dentist, the distribution was positively skewed with several outliers. While the majority of Medicaid patients reported traveling relatively short distances for their medical and dental appointments, a substantial number reported traveling very long distances. The rural nature of Texas and its vast geographic expanse requires some Medicaid clients to travel great distances for care. For example, Presidio County with an area of 3,855 square miles

had only one licensed physician practicing in the entire county in 2001 (137). In counties with more practicing physicians, access for Medicaid patients is hampered by provider unwillingness to participate in the Medicaid program. Over the years, providers have elected not to participate in the Medicaid program citing burdensome administrative issues and low reimbursement rates from state Medicaid programs (138). As a result, some respondents indicated traveling up to 700 miles and several hours one way for their medical care. This fact is not surprising, especially for a select few that need specialty care.

The skewed distribution of the data violate the assumption of normality for the independent samples t-test. However, the t-test is robust to departures from normality with large sample sizes (n>30), except in the case with extreme outliers or strong skewness (139). To limit extreme outliers and to reduce the biases that might be introduced into the findings by eliminating data, we examined the data via a boxplot to eliminate only the extreme outliers. A total of 34 records were eliminated from the analysis when examining travel distance and 39 records were eliminated from the analysis when examining travel time to reduce the impacts of a making a Type II error.

Removing the records from the variables reduced the skewness of the data. When analyzing all valid cases for travel distance, the skewness statistic was 5.1 with a standard error of .085. When removing the 34 records from the analysis, the skewness statistic drops to 1.5 with a standard error of .087. When analyzing all valid cases for the travel time, the skewness statistic was 12.8 with a standard error of .077. When removing the 39 records from the analysis, the skewness statistic drops to 1.4 with a standard error of .079. As a rough guide, a skewness value more than twice its standard error is taken to indicate

a departure from symmetry. Thus, removing the extreme outliers from the analysis decreased the skewness a great deal, but the data remain positively skewed as seen in Figure 12 and Figure 13.

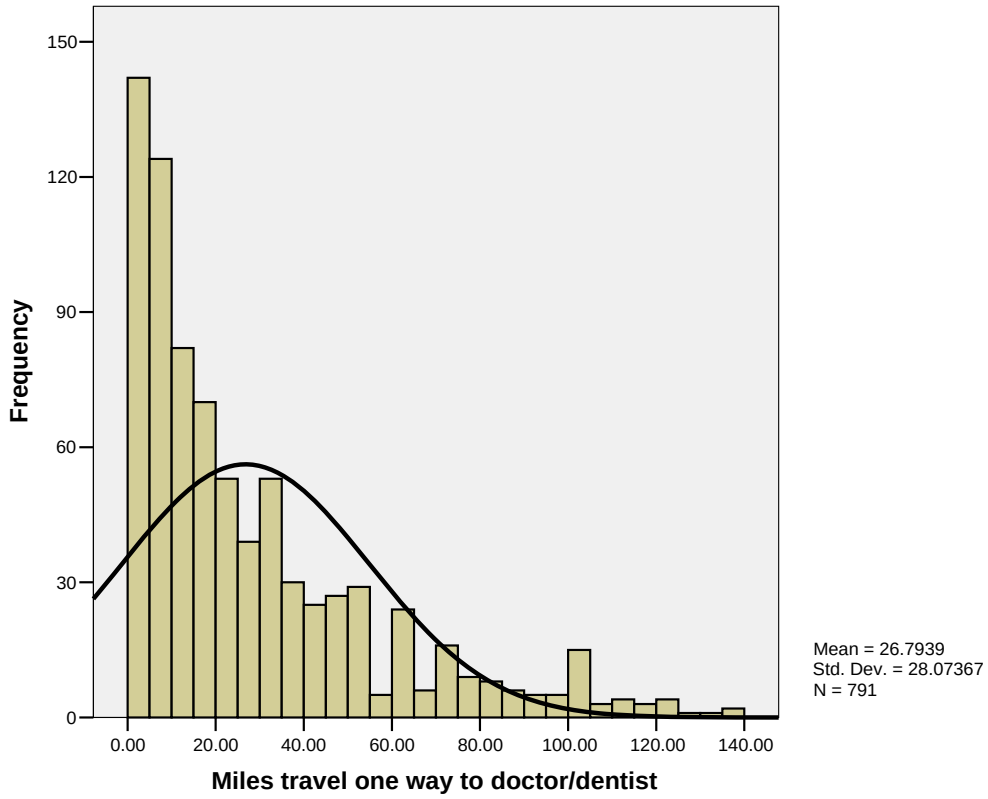

Figure 12: Distribution of the Variable: Total Miles Traveled One-Way to Doctor/Dentist

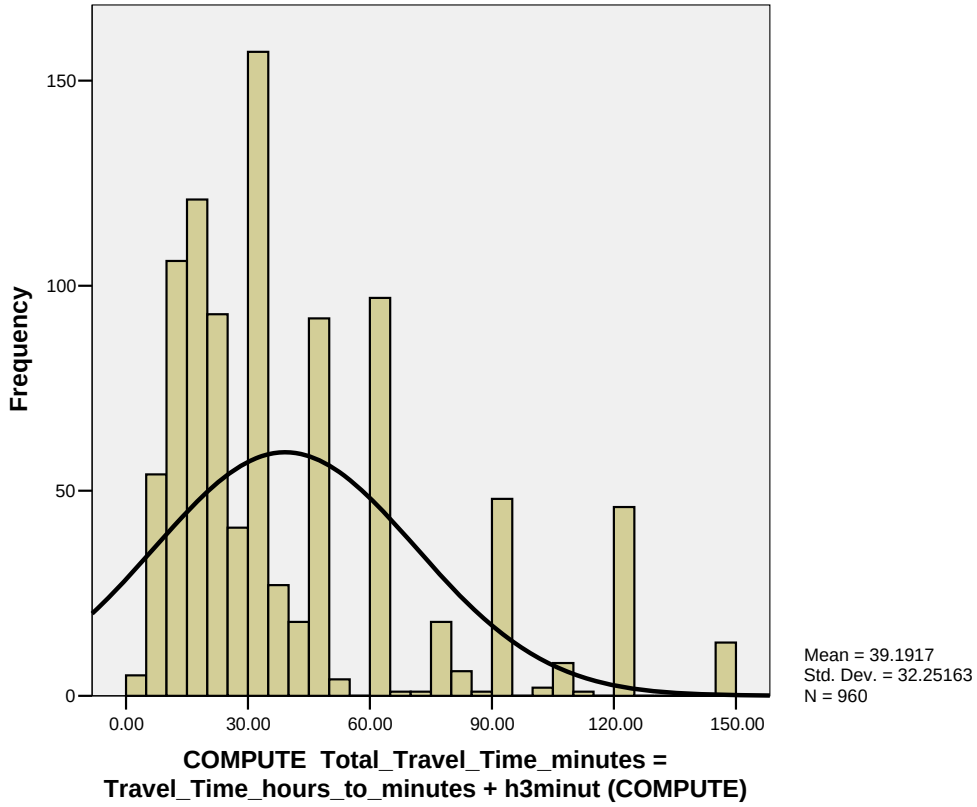

Figure 13: Distribution of the Variable: Total Travel Time in Minutes Traveled One-Way to the Doctor or Dentist

Table 7. Distance Factors and Use of MTP Services

Measure	MTP Users	MTP Nonusers	t-test value *P<0.05*
Average miles traveled one-way to the doctor or dentist	30.8 (n=444)	21.7 (n=347)	4.658
Average travel time in minutes to doctor or dentist	44.6 (n=551)	32.0 (n=409)	6.295
Number of cases (n) varies slightly because of missing data. P-value is the two-tail probability value for t-test of difference between the two groups. Equal variances not assumed			

Average Miles to Doctor or Dentist

Both MTP users and MTP non-users reported traveling significant distances to their medical and dental appointments. Average miles traveled each way for medical and dental appointments had a significant overall effect on use of MTP services ($p<.05$). MTP users reported traveling greater distances to visit a doctor or dentist than MTP non-users (see Table 7). On average, MTP users reported traveling 30.8 miles for their doctor or dentist appointments while MTP non-users reported traveling only 21.7 miles per one-way trip. This is a difference of over nine miles per one-way trip or a total of more than 18 miles for the entire trip. Despite the differences between MTP users and MTP non-users, the standard deviation for both groups was quite large. The standard deviation for MTP users was 29.9 and 24.7 for MTP non-users underscoring the great variability of distances that Medicaid recipients travel for their medical and dental appointments.

Average Travel Time

While distance is an important factor in assessing access, travel time is an important variable for examining access to care, especially in urban areas where congestion and spatial dimensions of health care providers are quite important. Both social and spatial dimensions have been shown to increase the difficulty for low-income minorities in the central city to access jobs (140). While not specifically studying health care access, average commute times for both the private automobile and public transportation was found to be much longer for the poor and especially those living in low-income neighborhoods who did not own an automobile (141). Following this logic, one would tend to believe that the majority of health care providers are also not located

within low-income neighborhoods, forcing those seeking to care to travel greater distances than one might otherwise expect.

While we assessed only Medicaid recipient travel time for dental and medical care, it would seem to hold true that low-income populations also seem to experience rather long journeys when accessing care. Both MTP users and MTP non-users reported average travel times for accessing medical or dental care in excess of 30 minutes. Travel time was significantly different among the two groups ($p<.05$). MTP users reported traveling an average of 44.6 minutes for their medical or dental appointments while MTP non-users reported traveling an average 32 minutes. Despite long average travel times, great variability also existed among average travel times. The standard deviation for MTP users was 34.5 while the standard deviation for MTP non 27.4.

Examining both travel distances and travel times seem to indicate that MTP users spend more time traveling as well as traveling greater distances. A number of factors may explain the differences, such as MTP users accessing specialty care that may not be available in their neighborhood or community. The advent of Medicaid managed care has also shifted a great deal of care that was once provided by city and county health departments to private providers. Often, the city and county health clinics were located and more accessible to lower income neighborhoods. Medicaid managed care has shifted some, but not all of this care to private providers whose practices are often in suburbs or closer to larger medical centers, such as hospitals (142). Despite this evidence, these assertions can neither be confirmed nor denied with the data.

Developing a Taxonomy

The previous data analysis results in rich information about the barriers and difficulties that many Medicaid recipients face in accessing health care. Explaining why Medicaid recipients have difficulties getting to their medical and dental appointments is much more complicated than simply saying, "transportation" barriers. Thus, the problem poses more important areas of inquiry, such as how to organize the data in a meaningful way so as to understand the subtleties of the various subgroups within the larger group of Medicaid recipients. Even if it were possible to remove nearly all impediments to health care, we would most likely find that individual utilization of preventive health services, such as EPSDT services, would continue to vary. Therefore, it could be misleading to draw conclusions and make policy based on raw response rates, even of the magnitude detected in the previous analysis. Recognition of this fact indicates a more refined examination of the question of medical transportation is required.

Although the Medicaid population is of low-socioeconomic strata, they are a diverse group of individuals and differ in many ways. For example, our previous analysis has shown that Medicaid recipients have varying degrees of access to automobiles. Some face difficulties with paying for gasoline while others do not. For this reason, developing a taxonomy or systematic categorization of these subgroups of the Medicaid population into a coherent scheme may be useful in targeting those that need the most assistance.

Cluster analysis offers the ability to reveal natural grouping within a collection of data and suggests groupings that are not readily apparent based on complex input. While the cluster analysis technique suggests groupings or clusters of similar units, it does not explain why the clusters exist. Clustering analysis is popular among a number of different

data types and applications, such as data mining and knowledge discovery to pattern recognition and classification (106).

There are several different methods available for cluster analysis. The two most basic methods are hierarchical and non-hierarchical. The basic difference between the two is that with hierarchical clustering, observations must remain together once they have joined a cluster. Nonhierarchical clustering does not impose these restrictions. The k-means method of clustering is the most common technique of nonhierarchical clustering. The name is derived from the fact that the analyst chooses the number of clusters (k) from which to fit the data. The "means" relates to the sum of distances or sum of the squared Euclidean distances from the mean of each cluster (107, 109).

The advantages of the k-means clustering algorithm are clear. The process is relatively simple and fast. The process starts with a single cluster with its center as the mean of the data. This cluster is then split into two and the means of the new clusters go through several iterations until the specified number of cluster is obtained. This is accomplished by successive iterations that assign each point to its nearest cluster and then points belonging to the same cluster are averaged to get the cluster centroids until they become stable (143). Because of the number of iterations that the computer must calculate, the non-hierarchical method is preferable to the hierarchical method for larger files with hundreds or thousands of records (107).

Developing the Scales for the Clusters

One of the primary issues in performing cluster analysis is examining the scales of the variables. Variables that represent entirely different scales can be problematic in cluster analysis. For example, when clustering respondents on the variables GAS and

MILES, the standard deviation of MILES is much greater than that for GAS and would dominate the solution. To avoid this problem, there are a number of options. First is to standardize each variable using a z score. The z score norms each variable with a mean of zero and a standard deviation of 1. Another method of standardization is to norm the variables from -1 to +1 which some researchers believe produces superior results to standardizing z scores (107).

We developed a standardized scale for each variable of interest. Each response was assigned a numerical value which indicated where on the scale such a response would fall between -1 and +1. Each of the categories within each response was assigned equal distances between -1 and +1. For example, questions with two possible responses were assigned -1 or 1; questions with three possible response categories were assigned -1, 0 or +1; questions with for possible categories were assigned a -1, -0.33, +0.33, or +1.

Questions with interval based responses, such as the average time driven one way to the doctor or dentist posed some unique challenges and did not readily translate to the chosen method of standardization. To standardize the variables EPSDT, TIME, MILES, and CHILDREN we sorted the data into tertiles. This approached permitted us to assign each response into one of three categories. For example, respondents that reported utilizing EPSDT visits in the upper tertile were assigned a value of +1. Those that underutilized EPSDT services and were in the lowest tertile were assigned a value of -1. The primary advantage to this approach is that it permitted the inclusion of scale variables in the analysis with the other ordinal and nominal variables so that a clearer pattern could emerge in the analysis. However, this method is also not perfect. Questions with fewer

categories, and thus wider ranges between numerical values weigh heavier on the outcomes when calculating the clusters.

The variable MILES was dropped from the final analysis because of the large number of missing data (42%) from this question. We estimate that because many Medicaid recipients do not own a car and thus do not drive to their medical and dental appointments, they were unable to estimate the distance, and to a lesser degree, the time they traveled. However, variable TIME had a higher response rate with less than 30% of the responses missing. This is important because only cases with complete data on all variables of interest can be included in the final analysis. Although the missing data for this variable is quite high, the literature suggests this is an important variable worthy of consideration and thus it was included in the final analysis. As a result, 273 of the 606 of the cases contained data for all variables of interest in the cluster analysis, for a match rate of 45%.

The Clusters

Because MTP non-users have lower THSteps or EPSDT utilization than MTP users, this analysis focused exclusively on MTP non-users. The overall goal of this analysis is to identify subgroups within the overall group of MTP non-users that are experiencing significant transportation barriers that leads to lower THSteps or EPSDT utilization. By identifying these groups, policy makers can more readily address certain segments of the population to help those with severe access problems and low utilization of preventive services to overcome those barriers and begin to lead healthier lives.

By examining impedance factors faced by MTP non-users, our analysis resulted in an optimal solution of four clusters (see Figure 14). For ease of identification, each cluster was named, resulting in the following four groups:

- ✓ *The Expense and Child Hindered*: Rural Medicaid recipients who generally do own an automobile, but have difficulties paying for operating expenses and have a large number of children at home;
- ✓ *The Time and Child Hindered*: Primarily urban Medicaid recipients who generally do not own an automobile, but report few barriers to transportation. They also typically have a large number of children, yet are low utilizers of THSteps preventive care services;
- ✓ *The Undaunted*: Urban Medicaid residents who typically own an automobile, yet face long travel commutes to their medical and dental appointments and have some difficulties with travel expenses. However, this group has the smallest number of children at home, and;
- ✓ *The Motivated*: Rural Medicaid residents who typically own an automobile who face a number of expense-related barriers, yet have the highest utilization of EPSDT or THSteps preventive care services. This group also has the lowest number of children among the four clusters.

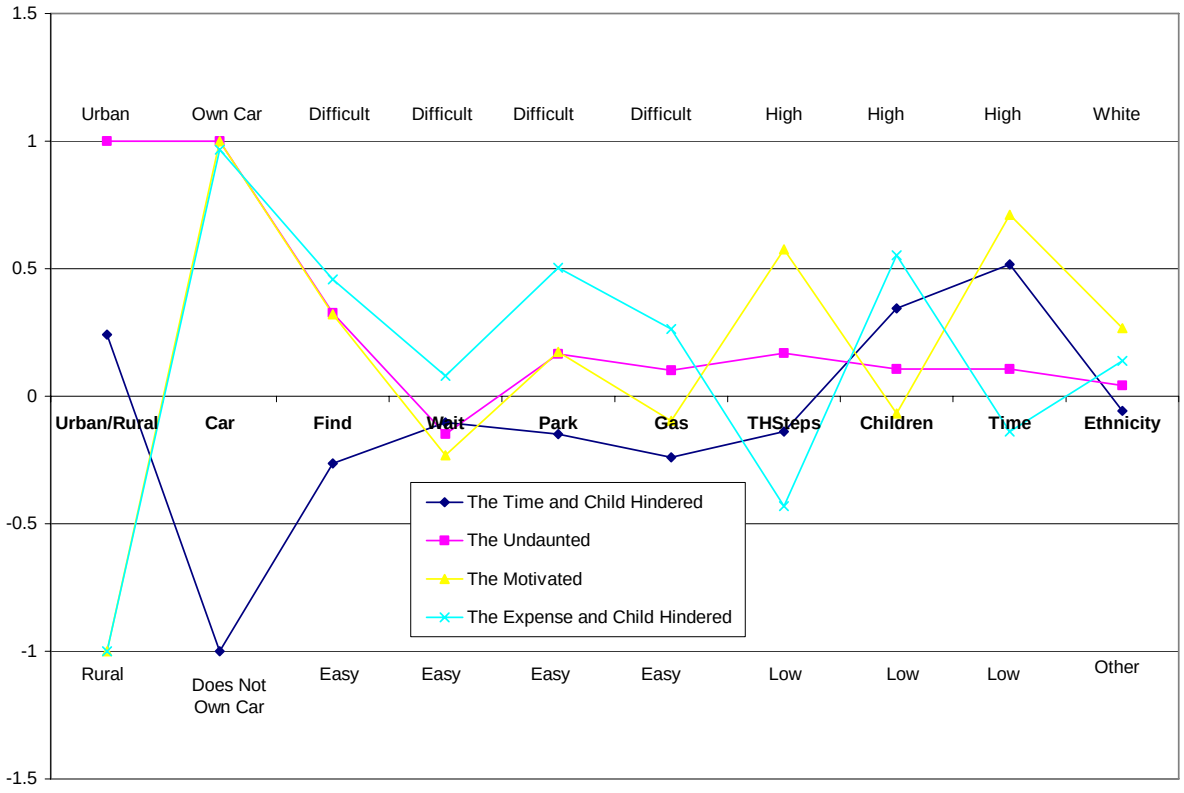

Figure 14: Profiles of k-Means Cluster Solution

Interpreting the Clusters

In painting a picture of the four clusters, there are several factors to keep in mind. The clusters in and of themselves do not provide information about which variables are the most important in the cluster analysis. The F test from an ANOVA analysis is not valid for testing differences between clusters because the clusters have been chosen to maximize the differences among cases in different clusters, the assumptions of the F test is (144). However, the F test values are useful as a guide to identifying the most important variables in the clustering. Those with the largest F values are the most significant in developing the clusters. As seen in Table 8, the variable CAR (F=2199.36) as the most important variable in the clustering. Surprisingly, the variable RESIDENCE

(F=715.13) also played an important factor in the clustering, which was not readily apparent from the previous bivariate analysis. However, variables with only two possible choices, such as RESIDENCE and CAR, can appear to overly influence the cluster analysis or cluster membership (107). The fact that CAR and RESIDENCE are viewed as the most significant variables in developing the clusters should be viewed cautiously. However, due to the fact that the F statistic for CAR is so high, we should not underestimate its overall influence on the overall cluster membership assignments (see Table 8).

The Automobile and Child Hindered

The Automobile, Time and Child Hindered constituted 11.4% of the MTP non-user respondents. This group primarily consists of urban residents without an automobile. They are also largely Hispanic. Of the four groups, virtually all of the respondents in this category neither own a personal car nor have access to one. Thus, it was not surprising to see that they reported fewer problems with paying for parking or gasoline than their peers in the other clusters. The most surprising finding among this cluster was the fact that this group tended to report less difficulty finding transportation (variable FIND*)* than their peers. This is surprising due to the fact that this group is without access to a private automobile and forced to find other means of transportation for their medical and dental appointments. This finding is even more unexpected due to the fact that no one is this group accessed MTP services. However, given the fact that this group reported the lowest commuting times (TIME*)* to their medical and dental appointments may be a contributing factor in their ability to FIND transportation.

Table 8: F Tests in ANOVA Table by Cluster

	Cluster		Error		F
	Mean Square	df	Mean Square	df	
Residence	76.89	3	.108	254	715.12
Car	34.03	3	.015	254	2199.36
Finding Transportation	3.57	3	.226	254	15.82
Wait	1.04	3	.303	254	3.43
Parking	3.01	3	.249	254	12.11
Gas	2.21	3	.264	254	8.38
THSteps	10.63	3	.503	254	21.13
Children	4.32	3	.572	254	7.55
Time	8.54	3	.500	254	17.08
Ethnicity	.93	3	.383	254	2.43

The Automobile and Child Hindered also tended to have large families. Among the four groups, this group has larger families than either *The Motivated* or *The Undaunted.* It is easy to imagine that having a large family with several children, especially small children and no private automobile could impede access to preventive health care services. This appears to be the case and Medicaid recipients in this group tended to reporting having low utilization rates of THSteps or EPSDT services.

The Undaunted

The Undaunted comprise the largest group of the four clusters, making up 43.4% of the cases. They are also more likely to be an ethnic minority, either Black or Hispanic. This group consists of urban residents who own an automobile, but face relatively high challenges across all barrier categories. This group was most likely to report finding transportation as difficult despite virtually all households in this category owning a private automobile. The difficulty in access that this group faces seems to stem from the numerous barriers this group faces. While this group reported barriers among virtually all categories, the level of difficulty faced by this group was not as high as other groups. For example, *The Undaunted* tended to report moderate levels of difficulties in paying for parking and gasoline to travel to their medical and dental appointments. This group also tended to have moderate family sizes (two or more children) and also reported moderate commuting times to their medical and dental appointments.

Despite this constant barrage of barriers, *The Undaunted* also reported moderate levels of EPSDT utilization. This fact suggests, that as a group, *The Undaunted* are able to overcome many of the transportation barriers to receive their preventive care services. Because this is the largest group of MTP non-users, this bodes well for the Medicaid program and the Texas population as a whole in suggesting that a large portion of the Medicaid population is indeed overcoming numerous barriers to find and utilize preventive care services.

The Motivated

The Motivated are the second largest of the four groups. Although this group is roughly half the size of *The Undaunted*, they comprise 22.9% of the respondents. *The*

Motivated also share many of the same characteristics of *The Undaunted*, but differ in some key areas. Like *The Undaunted, The Motivated* also experience numerous barriers in obtaining preventive health care services, such as EPSDT checkups, but appear to have more success in overcoming those barriers.

One of the biggest differences between this group and *The Undaunted* is that members of this group are most likely to be rural residents and the group most likely to be white. Members of this group also are likely to own an automobile or have access to an automobile within their immediate household. Despite having access to an automobile, *The Motivated* are likely to experience moderate difficulties with parking expenses. However, they do differ from their *Undaunted* peers in that they report fewer problems with gasoline expenses. Among the three clusters (*The Undaunted, The Motivated,* and *The Expense and Child Hindered)* that were most likely to have access to an automobile within their immediate household, *The Motivated* reported the lowest difficulty with paying for gasoline expenses. In fact, this group was the only group biased toward reporting that paying for gasoline expenses were "easy." *The Motivated* reported the highest barriers with travel time and among the four groups, were the most likely to report having high commuting times to their medical and dental appointments. When considering that this group consists primarily of rural residents, this finding is not surprising.

The Motivated reported the highest utilization of EPSDT checkups among all four groups. Despite long travel times, difficulty finding transportation and difficulties with parking expenses, as a group, *The Motivated* overcame these barriers to receive their EPSDT checkups. This is also a favorable finding, suggesting that a large segment of the

Medicaid population is quite motivated to overcome distance and expense to seek out the preventive care for their children, giving them the opportunity to grow up healthier.

The Expense and Child Hindered

The Expense and Child Hindered were the third largest of the four clusters, consisting of 22.5% of MTP non-users. Like *The Time and Child Hindered*, this group faces several impediments that are overly burdensome. Medicaid recipients from this group are most likely to be rural residents who also own an automobile or have access to one within their immediate household. However, as a group, *The Expense and Child Hindered* reported having burdensome barriers with parking and gasoline expenses. Among the four groups, *The Expense and Child Hindered* reported the highest levels of difficulties in paying for parking and gasoline. This group was also most likely to have large families and report the largest number of children (3 or more per household) relative to the other three groups.

Despite living primarily in rural areas, *The Expense and Child Hindered* reported the lowest travel times when seeking medical or dental care. This is surprising given the fact that most of these are rural residents and the scarcity of providers accepting Medicaid in rural areas is well documented. Even though the majority of *The Expense and Child Hindered* group members have access to a private automobile, they were also the most likely to report difficulties in finding transportation and having to wait for long periods of time in their doctor's of dentist's office. The cumulative effect of these barriers adds up to the lowest utilization of EPSDT checkups among the four groups. *The Expense and Child Hindered* group reported, by far, the lowest rates of utilization of EPSDT checkups. It appears clear that the impact of expenses, frustration with long waits in the doctor's or

dentist's office and the impact of multiple children make it quite difficult for these group members to seek out and obtain adequate preventive care through their EPSDT checkups. It seems clear that the impact of expenses, frustration with long waits in the doctor's or dentist's office and the challenges of managing large families make it quite difficult for these group members to seek out and obtain adequate preventive care via the EPSTD system. Although we cannot definitively say because of data limitations, it is quite likely that individuals within this group may be suffering the health consequences due to their inability to access care.

Summary of Clusters

One of the most interesting aspects of the cluster analysis is that inverse relationship between EPSDT utilization and barriers. This relationship is most pronounced with the variable CHILDREN. Although MTP non-users with the most barriers reported fewer EPSDT visits than their peers with fewer barriers, the relation between family size or the number of children is most striking. For example, *The Expense and Child Hindered* reported having the greatest number of children and also reported having the lowest utilization of EPSDT checkups. *The Time and Child Hindered* reported having family sizes somewhat smaller than *The Expense and Child Hindered* and reported utilization rates of EPSDT checkups just above those in *The Expense and Child Hindered* cluster.

Because this correlation seemed to exist in the clusters, we examined the relationship between CHILDREN and EPSDT among MTP non-users. We also wanted to see if the same relationship existed among MTP users. A Pearson r correlation of the variables CHILDREN and EPSDT resulted in a significant negative relationship among

the two variables (r=-.102, p<.05 (see Figure 15). The greater number of children a family reported, the lower utilization of EPSDT checkups. However, the relationship was rather weak, as the Pearson correlation coefficient of r = -.102 suggests, thus explaining only a fraction of the total variability of utilization of EPSDT services.

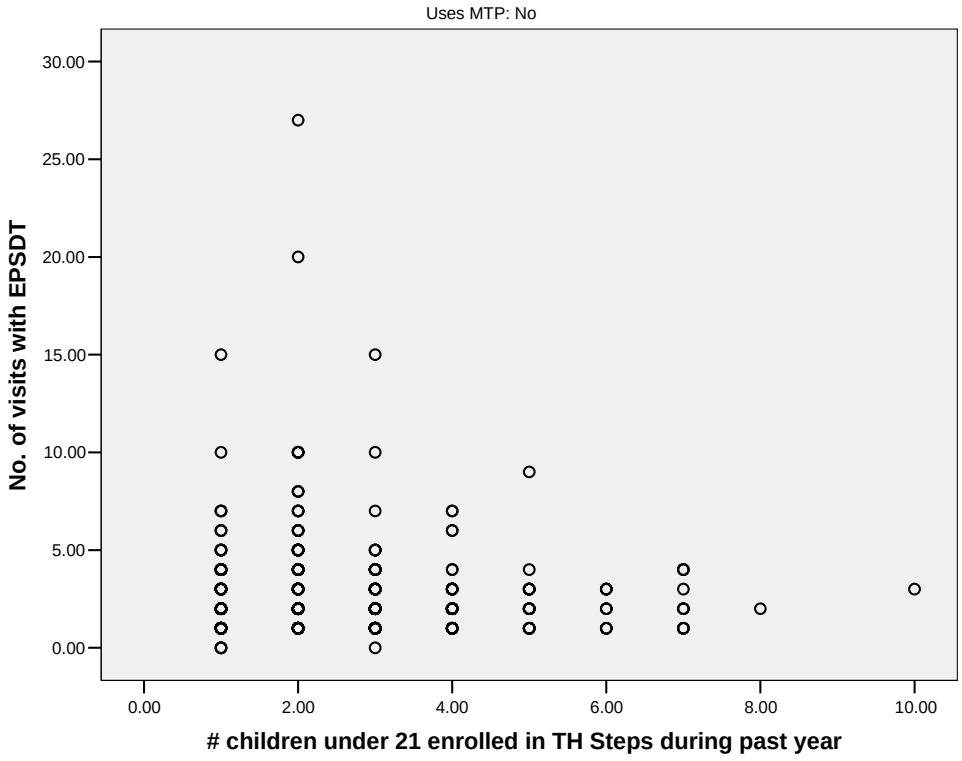

Figure 15: Correlation of EPSDT Visit and Number of Children per Family – MTP Non-Users Only

Because we wanted to know if the same relationship existed for MTP users, we performed the same analysis on this population. A negative relationship also exists among MTP users for the variables CHILDREN and EPSDT, however, the relationship was not significant. The value of the Pearson correlation coefficient was -.063 as shown in Figure 16.

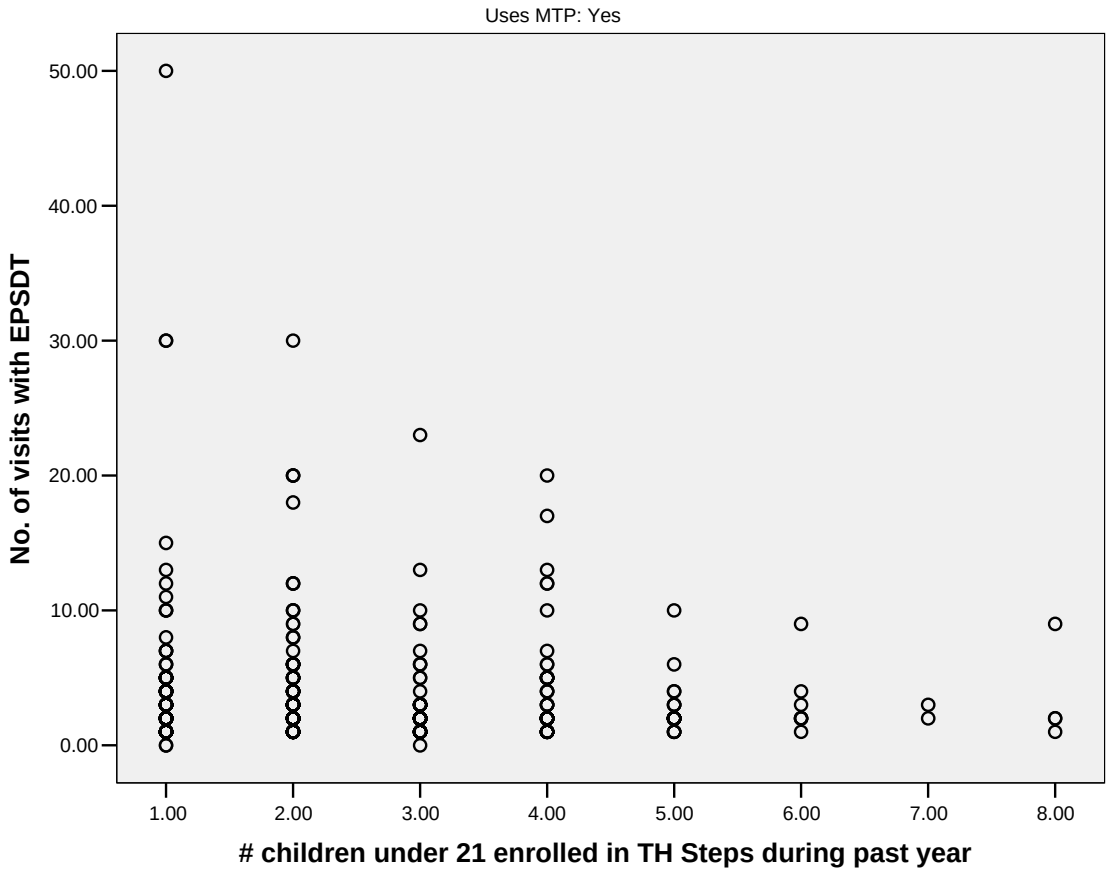

Figure 16: Correlation of EPSDT Services and Number of Children per Family – MTP Users Only

Summary of Findings

The impact of "barriers" on access to care has been studied in depth. However, these studies have primarily sought to categorize nearly all Medicaid recipients as facing the same barriers. Despite this premise based on the previous literature, Medicaid recipients are certainly low-income, but face different obstacles and barriers when seeking health care services. These findings suggest that Medicaid recipients do differ on a number of key factors: access to automobiles, difficulties experienced in paying for transportation-related expenses, the number of children in a family, ethnicity and most importantly, utilization of the EPSDT checkups.

While MTP users have higher utilization rates of EPSDT checkups than their MTP non-user peers, the problem of transportation access is not easily defined in terms of a simple cause or solution. We know that simply having access to an automobile does not necessarily translate into higher utilization rates of preventive care services. The problem is more complicated for some, especially those with difficulty paying for travel-related expenses and who have several children at home for which to care. With the typical Medicaid household headed by a single female, it is little wonder that EPSDT utilization is inversely related with family size. Although we did not inquire about daycare or help with caring for children while going to preventive care services such as EPSDT, this is almost certainly a problem faced by large Medicaid families.

CHAPTER V

LOGISTIC REGRESSION ANALYSIS OF TRANSPORTATION USE AND BARRIERS

The exploration of various impedance factors and their impact on use and utilization has yielded an abundance of fruitful information on Medicaid utilization and access of transportation services. Our research goal was to answer questions about how both monetary and non-monetary costs associated with transportation limit individual access and utilization of services. We explored other factors, such as how family size seems to compound the transportation problem. While each of these factors are interesting in the abstract, the analysis of transportation impediments as a whole is incomplete without truly understanding how these factors converge to impede utilization of preventive health care services and which ones are truly the most important factors. Multivariate analysis can assist in understanding how the convergence of these factors works together and identifying the barriers that contribute the greatest to the problem of access and utilization.

Thus, it is important to explore how the various characteristics of Medicaid recipients (socioeconomic factors and transportation factors) jointly affect utilization of MTP services and EPSDT or THSteps services. To analyze these impacts, we use the logistic regression model. When considering a dependent variable (MTP user and MTP non-user), a binary logistic regression is most appropriate. When there are more than two possible situations of the dependent variable with multiple unordered categories, the multinomial logit model is an appropriate choice of models (113). Both models are quite

similar and vary only in available options of the dependent variable. As a matter of simplicity, the term logistic regression will be used to describe the processes when discussing the model in general terms for the remainder of the chapter. Logistic regression is very similar to ordinary least squares regression only that the outcome variable or dependent variable is categorical instead of continuous. (110).

With ordinary least squares regression, the outcome variable (*Y*) is predicted from the equation of a straight line:

$$Y = \beta_0 + \beta_1 \chi_1 + \beta_2 \chi_2 + ... + \beta_n \chi_n + \varepsilon_i$$

where β_0 is the Y intercept, β_n is the coefficient of the straight line, X_n is the value of the predictor variable and ε is the residual term. The logistic regression differs somewhat from ordinary least squares regression in the fact that instead of predicting the value of Y from a set of independent variables $X_1, X_2 \ldots X_n$, the logistic regression predicts the probability of Y occurring. The logistic regression equation from which we predict the probability of Y is as follows:

$$P(Y) = \frac{1}{1 + \ell^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + \varepsilon_1)}}$$

The logistic regression equation shares some of the same attributes of the ordinary least squares regression equation. The part of the equation in the parentheses is identical to the ordinary least squares regression equation (110). However, there are several key differences. Ordinary least squares regression cannot be used to predict the value of dichotomous dependent variable. In such cases, the data are usually coded as 0 or 1. Because ordinary least squares regression employs a straight line to fit the data, it is

often the case that the values less than 0 or greater than 1 are predicted, which is outside the range of the two probabilities. Also, dichotomous variables tend to violate the homogeneity of variance assumption, key to the ordinary least squares regression equation because of a functional relationship between the standard deviation and mean of the dependent variable (107).

Crucial to the interpretation of the logistic regression is examining the value of the exponential β; also know as the odds ratio. The odds of an event occurring are defined as the probably of an event occurring divided by the probably the even will not occur:

$$odds = \frac{P(event)}{P(nonevent)}$$

and are developed as an overall odds ratio of the event of interest, such as MTP utilization. The exponential β is also used to determine the change in overall odds as applied by various predictor (access to a car, number of children) variables. Therefore, for any given predictor variable, the difference in coefficients determines the directional change in the odds between the categories (110).

From the previous results of the Chi-square and t-test analyses, theory, and previous research, we initially assumed that MTP utilization or lack of utilization was affected by a number of socio-demographic and travel impedance factors. These include:

A. ETHNICITY – respondent ethnicity (White=1, Black=2, Hispanic=3, Other=4);
B. LANGUAGE – language of interview (English=1, Spanish=2);
C. RESIDENCE – respondent county of residence (Urban=1, Rural=2);

D. CHILDREN – a continuous variable of the number children responsible to the parent or guardian respondent;

E. AGE – a continuous variable of the age in years of the number of children in each household;

F. EPSDT - a continuous variable of the number of EPSDT visits during the last year;

G. CAR – automobile ownership or availability within the immediate household (0=no, 1=yes);

H. GAS - difficulty paying for gasoline (1=very difficult, 2=difficult, 3=easy, 4=very easy);

I. PARK – difficulty paying for parking expenses (1=very difficult, 2=difficult, 3=easy, 4=very easy);

J. FIND – general difficulty finding transportation (1=very difficult, 2=difficult, 3=easy, 4=very easy);

K. TIME – a continuous variable of average travel time to the doctor or dentist, and;

L. MILES – a continuous variable of average miles traveled to the doctor or dentist.

The initial binary logistic regression model included all of the above variables except EPSDT and MILES. We exempted EPSDT from the initial model because it was deemed an inappropriate predictor variable for utilization of MTP services. The variable MILES was also dropped from the initial model because of the aforementioned problems with missing data for this particular variable. The large number of missing data for this question most likely was the result of respondents who did not own an automobile and because they do not drive, find it difficult to estimate distances accurately. Also, the variable TIME is a more accurate and meaningful variable for measuring spatial aspects of

commuting because it better captures the barriers that urban recipients face in traffic congestion and mass transit options rather than purely a measurement in distance.

The initial binary logistic output produces preliminary information about the model results. The first of these is a classification table which indicates the results of the model always predicting the most common outcome category (see Table 9). In this case, the most common outcome category among all valid cases in the model is for MTP users. Thus, the model correctly predicts all of the MTP users only. In this step, the model does not predict MTP non-users, but the 59.1% accuracy for MTP users will serve as our baseline to evaluate the final binary logistic regression model.

Table 9: Baseline Model Classification Table – MTP Utilization

Observed	Predicted		
	MTP User	MTP Non-user	% Correct
MTP User	472	0	100
MTP Non-User	326	0	0
Overall Percentage			59.1

A second table produced by the binary logistic regression output is the test of model coefficients. This table provides information to determine if the variables included in the final model improve the prediction of the log odds (see Table 10). The model Chi-square is a statistical test of the null hypothesis that the coefficient for all other terms in

the model are zero and thus is equivalent to the overall F test in an ordinary least squares regression model. Using this table, we reject the null hypothesis that the model does not improve the log odds because of the highly significant finding ($p<.001$) and thus conclude that the set of variables does indeed improve the prediction of the log odds.

Table 10: Test of Model Coefficient – MTP Utilization

	Chi-square	Df	Significance
Model	68.518	11	.001

One of the measures of how well the model performs fallows from an examination of the ability of the model to accurately classify the cases into the two categories of MTP utilization; MTP users and MTP non-users. The overall predictive accuracy of the model is 65.5% (see Table 11). The model appears to do a relatively good job of predicting MTP use, but only a fair job of predicting MTP non-users. However, this model does show some improvement over the initial model (Table 9) that always predicts the most common outcome category (MTP user) in the data set. Because our predictive model does only a fair job of predicting MTP non-users, further examination and refinement of the model are necessary to improve the accuracy of the model.

Table 11: Initial Model Classification Table – MTP Utilization

Observed	Predicted		
	MTP User	MTP Non-user	% Correct
MTP User	358	114	78.3
MTP Non-User	163	163	46.9
Overall Percentage			65.5

The initial analysis showed that several of the original variables of interest did not significantly affect MTP utilization jointly. The variables CHILD, PARK, WAIT, RESIDENCE, ETHNCITY, TIME, and LANGUAGE were shown to be insignificant (see Table 12). The variables, CAR, GAS were highly significant ($p<.001$), while the variable FIND was approaching significance at $p<.070$. We also wanted to test to the interaction of the variables CAR and CHILD to see what effects the combination of these two variables had MTP utilization. The interaction of these two variables also failed to reach statistical significance.

Table 12: Summary of Initial Variables in Equation – MTP Utilization

Variable	DF	Probability (P<.05)
Constant	1	.056
CHILD	1	.356
CAR	1	.006
GAS	1	.000
PARK	1	.156
WAIT	1	.425
FIND	1	.072
RESIDENCE	1	.245
ETHNICITY	3	.632
TIME	1	.298
LANGUAGE	1	.926
CHILD X CAR	1	.821

In refining the model, we included all of the variables that were significant in the first iteration of the model (CAR and GAS) and also included some variables that appear to be important for a variety of issues, but were not significant. Included in the final model were FIND and CHILDREN and the interaction of CHILDREN and CAR. The variable FIND was included because it was close to being significant in the initial model. Although the variable CHILDREN was not significant in the first iteration of the model, our previous bivariate analysis and the literature seem to suggest that children, especially

young children, can be a barrier to care. Although we were unable to specifically identify single women in our analysis due to data limitations, childcare is a significant issue for households headed by a single women and thus we made the decision to include CHILDREN in the final model. For the same reasons, we also included the interaction of CHILDREN and CAR in the final model due to the presumption that inaccessibility to an automobile coupled with a large family would put further pressure on families seeking preventive health care services.

The final model resulted in an improvement in the accuracy in classifying MTP utilization. Although the overall predictive accuracy of the model went down from 65.5% from the initial model to 61.2% in the final model, the accuracy improved most for predicting our variable of interest – MTP non-users (see Table 13). The final model increased the accuracy from 46.9% to 71.2% in predicting MTP non-users, an increase of 24.5%. The resulting loss in overall accuracy was reduction in correctly classifying MTP users, which dropped from 78.3% to 52.4%. Although this drop in overall accuracy and accuracy in predicting MTP users is lamentable, our original goal was to successfully classify MTP non-users to determine the factors related to their non-use of program services. Furthermore, Medicaid recipients who do not access MTP services outnumber their peers who access MTP services nearly 10:1.

Table 13: Final Binary Logistic Regression Model Classification Table – MTP Utilization

Observed	Predicted		
	MTP User	MTP Non-user	% Correct
MTP User	300	298	50.2
MTP Non-User	164	430	72.4
Overall Percentage			61.2

As in the case with the initial model, only two variables were significant in the final model. These were also the same variables found to be significant in the initial model, CAR and GAS (see Table 14). The variable CHILD was not significant, meaning that the number of the children in each family had no joint impact on MTP utilization. Also, the interaction of the variables CAR and CHILD failed to reach significance. This finding was most surprising due to the fact that both lack of an automobile and the multiple children within the family are often cited as barriers to care as well as the results from our bivariate analysis. Furthermore, an increase in children was found to be negatively associated with EPSDT utilization as discussed in Chapter IV. However, utilization of EPSDT checkups does not equate directly with MTP utilization because of the low overall utilization of MTP services. The variable FIND was also not significant, but as in the case of the initial model, this variable approached significance ($p<.087$), but fell below the generally accepted level of statistical significance at $p<.05$.

Table 14 Summary of Initial Variables in Equation

Variable	DF	Probability (P<.05)	Exp (B)
Constant	1	.541	.106
CHILD	1	.146	1.136
CAR	1	.000	3.540
GAS[1]	4	.000	
GAS (Very Difficult)	1	.005	.398
GAS (Difficult)	1	.012	.477
GAS (Easy)	1	.788	.924
FIND	1	.087	1.146
CHILD X CAR	1	.359	.911

[1] The references category for this variable was "Very Easy"

From the binary logistic regression, we can develop probabilities and determine how each of the significant factors either increase or decrease the overall probability. The overall odds of a Medicaid recipient in Texas accessing MTP services is about 6/100 or about 6% (5). Thus, the reverse of that, a Medicaid recipient who does not access the MTP program is 94/100 or about 94%. Using the following formula, we can develop the overall probability of a Medicaid recipient being an MTP non-user:

$$prob = \frac{odds}{1 + odds}$$

$$prob = \frac{\frac{94}{100}}{1+\frac{94}{100}} \text{ or } .94$$

Thus, the initial odds of a Medicaid recipient being a MTP non-user is .94. When examining the significant factors from our final binary logistic regression model, we take the values from the exponentiated betas (exp (β)). The exp(β) is the effect of one unit change in an independent variable as expressed in terms of the odds ratio (107).

The variable CAR was coded 0=Yes and 1=No for analytical purposes. This differs slightly from the original coding scheme to allow the ownership or access to a private automobile within the immediate household to be the reference category. Thus, we can then understand how the impact of being without access to a private automobile affects MTP utilization. The exp(β) of CAR was 3.540. When computing the overall probability of Medicaid recipients who either own an automobile or have access to one in their immediate household, the probability increases to .982, a substantial change covering virtually all Medicaid recipients with cars. Thus, Medicaid recipients with automobiles are much more likely to be non-users of MTP services, close to a probability of 1.

The other significant variable from the final logistic regression model was the variable GAS, which captured the difficulties Medicaid recipients had in paying for gasoline to travel to their medical and dental appointments. The variable GAS was coded 1=Very Difficult, 2=Difficult, 3=Easy or 4=Very Easy. Because this variable had more than two potential response categories, we contrast coded (also know as "dummy" coding) to represent and compare the subgroups on this particular variable.

Contrast coding is useful because the process enables us to use a single regression equation to represent multiple groups (99). Because we wanted to know how the difficulty in paying for gasoline impacted MTP utilization, response four or "very easy" was used as the reference category. Variables with an exp(β) less than 1.00 will reduce the effect. In the case of GAS and the categorical response of "very difficult," the exp(β) = .398. Thus, when computing the overall probability for respondents who reported that paying for gas was "very difficult" the probability for those who are MTP non-users drops to .86 or an 8% increase that the respondent would access MTP services. For respondents who reported that paying for gas was "difficult," the probability that they would be an MTP non-user drops to .88. These findings underscore how the difficulties paying for gasoline impact Medicaid recipient reliance on social support programs such as MTP.

Verifying the Model

There are some unique problems when verifying a logistic regression equation. With logistic regressions, the more unequal the numbers in the categories, the more cases are needed. Also, the problem of missing data can cause problems because of listwise deletion that makes holding out enough sample to cross-validate results difficult. One method to cross-validate the results without having a hold-out sample is the use of the discriminant analysis technique. Discriminant analysis is related to both regression and multivariate analysis. There are two types of discriminant analysis: descriptive discriminant analysis (115) and predictive discriminant analysis (PDA). PDA is the most common use of discriminant analysis and is used to predict or identify group membership (107). The type of output from PDA is very similar to that of the binary logistic regression and thus

serves as a good cross-validation technique for our overall predictive model because of its ability to predict group membership when membership is currently unknown. Also, discriminant analysis is unreliable when testing a larger number of independent or predictor variables. Thus, we employ the logistic regression to find the most appropriate model and then validate the model with a smaller set of predictor variables using the discriminant analysis technique.

The discriminant model is derived from the following function:

$$F_k = D_0 + D_1 X_1 + D_2 X_2 + \ldots D_p X_p$$

where F_k is the score on the function K, the D_i's are the discriminant coefficients, and the X_i's are the independent or response variables. The maximum number of functions K that can be derived is equal to the minimum number of predictors (p) or the number of groups -1 (107).

Discriminant analysis has many of the same assumptions as with other general linear model techniques. First, the model assumes that the predictor or independent variables are either interval or ratio scale. However, ordinal variables measured on a Likert scale can be treated as interval variables and do not violate this assumption. Nominal variables may be included in the model if they are given dummy coding. A second assumption of discriminant analysis is that the distribution is normal, although this assumption can be violated as the sample size rises. A final assumption of the discriminant analysis is that the covariance matrices of the comparative groups are equal (114).

The preliminary results of the discriminant analysis were promising. The canonical correlation, which is equivalent to the Pearson correlation coefficient, measures the association between the discriminant scores and our grouping variable, MTP utilization. The canonical correlation = .279, indicating a modest correlation and thus, a discriminant model with some predictive utility. However, the low correlation coefficient does indicate that a significant proportion of the variation is not explained by the model.

The Box's M test of equality of covariances ($p<.05$) rejects the hypothesis of equality. Because the data violate the assumption of homogeneity of variance, this can lead to classification problems, meaning that our resulting predictions about MTP users and MTP non-users may be less than optimal. We correct for this problem by using separate group covariance matrices which is performed in a subsequent section (107).

Variables measured on difference scales are compared from the output of the standardized canonical coefficients (see Table 15). In combination with the data from the group centroids (see Table 16), the direction of the relative impact of the predictor variables can be determined. Because the function for MTP non-user is positive, higher scores from variable's standardized canonical coefficient will be associated with membership as a MTP non-user. Consistent with the final logistic regression model, there is a positive relationship with the variable CAR. Respondents who reported either owning or having access to an automobile within their immediate household are most likely to be MTP non-users. The variable GAS also has a moderate impact on group membership as well. Respondents who reported having less difficulty with paying for gas are also most likely to be MTP non-users. Since CAR has the largest standardized

canonical coefficient, this suggests that this is the most significant variable in predicting group membership, whether or not a respondent accesses MTP services.

There is one slight difference in the discriminant and final binary logistic regression model. The discriminant model does not permit the inclusion of interactive variables, so the interaction of CAR and CHILD was not included in the discriminant model. However, because the interaction of CAR and CHILD was not significant in the final binary logistic regression model, the inability to include this interaction in the discriminant should have little or no influence on the final classification.

Table 15: Standardized Canonical Discriminant Function Coefficients - – MTP Utilization

Variable	Function
CAR	.744
CHILDREN	.134
FIND	.193
GAS	.484

Table 16: Functions of Group Centroids – MTP Utilization

Categories	Function
MTP USER	-.289
MTP NONUSER	.292

While the interpretation of the impact of the coefficients on MTP utilization is informative, the primary objective of predictive discriminant analysis is correctly classifying group membership. Each of the final four variables in the discriminant model had very few cases with missing data. Of the 1214 cases, only 32 (2.6%) were excluded from the final model because of missing data. Thus, when examining the classification table, the discriminant analysis classified MTP membership (MTP user and MTP non-users) nearly identically to that of the binary logistic regression model. The discriminant model had nearly the same success in predicting MTP non-user membership as did the binary logistic regression model. The discriminant model correctly classified 73.8% of all MTP non-users while the binary logistic regression model correctly classified 72.4% of all MTP non-users, a difference of less than one percent. The findings were nearly the same in classifying MTP users. Although the model is less accurate for predicting MTP user membership, the classification results for the binary logistic regression (50.2%) and the discriminant analysis (49.3%). were extremely close. The overall success of the models was also similar, with the binary logistic regression model correctly classifying 61.2% of all cases while the discriminant analysis showed a slight improvement, correctly classifying 61.5% of all cases (see Table 17).

Table 17: Discriminant Analysis Model Classification Table – MTP Utilization

Observed	Predicted		
	MTP User	MTP Non-user	% Correct
MTP User	293	301	49.3
MTP Non-User	154	434	73.8
Overall Percentage			61.5

The discriminant analysis and the binary logistic model produced nearly identical results, suggesting that both models do a relatively good job at classifying MTP non-users. However, the discriminant analysis model did violate the assumption of homogeneity of variance. The violation of the homogeneity of variance assumption may cause the model to classify some cases incorrectly. To overcome this violation, we repeat the discriminant analysis using separate covariance matrices rather than the pooled covariance matrices. We then compare the classification results from the discriminant analysis run with separate covariance matrices to the previous analysis with the pooled matrices (107).

The resulting classification scheme running the discriminant analysis with separate covariance matrices resulted in slightly different results (see Table 18). The overall classification for both groups was nearly unchanged. The discriminant analysis using separate covariance matrices classified 61.2% of the cases correctly, while the discriminant analysis using pooled covariance matrices was 61.5%. The biggest changes came within correctly classifying the two groups of interest – MTP users and MTP non-users. The discriminant analysis using separate covariance matrices successfully classified 80.8% of all

MTP non-users, an increase of seven percent using the pooled covariance matrices model. The model using separate covariance matrices saw a decrease of 49.3% to 41.8% in classifying MTP users, a decrease of 7.5%. Because the overall predictive model using separate covariance matrices is nearly identical to that using the pooled covariance matrices and the binary logistic regression, we can determine that the violation of the homogeneity of variance assumption most likely has little impact on the model. Thus, the discriminant model using pooled covariance matrices appears to be a good cross-validation of the binary logistic regression model.

Table 18: Discriminant Analysis Model Classification Table – Separate Covariance Matrices – MTP Utilization

Observed	Predicted		
	MTP User	MTP Non-user	% Correct
MTP User	248	346	41.8
MTP Non-User	113	475	80.8
Overall Percentage			61.2

EPSDT Utilization

While the model for predicting membership of MTP non-users was successful, MTP utilization in and of itself explains only part of the health care services access problems. While Medicaid recipients may choose to access MTP services or attempt to overcome their own transportation barriers, the primary goal of preventive health care is

the actual utilization of EPSDT or THSteps checkups. Previous analysis demonstrated the great variability in accessing EPSDT checkups. The question now is, how do the various impedance factors contribute to EPSDT utilization, irrespective of MTP utilization? We know that some Medicaid recipients face a multitude of barriers, while others face only a few. Thus, what are the most important barriers in predicting low EPSDT utilization and how do these variables interact together?

Following the same approach in examining multivariable impacts on MTP utilization, we can also employ the same methods in examining EPSDT utilization. The binary logistic regression can aid in understanding the important factors in understanding the differences and characteristics of high and low utilizers of EPSDT checkups with discriminant analysis acting as a suitable cross-validation model. The variable to measure EDPST utilization is a continuous variable and thus, suggesting that multivariate regression might be the most appropriate analytical tool given our set of predictor variables. However, recall that the EPSDT periodicity schedule is not linear. Infants are eligible for up to six EPSDT visits after their first year of life while adolescents (ages 14-20) are eligible for two EPSDT visits (medical and dental) each year. These visits include a well defined list of procedures and test that are typically part of every visit. However, there times when the EPSDT well-child checkup does not correspond with schedules for other types of preventive care, such as immunizations, Tuberculin Screening, mental health evaluations, nutrition counseling. Although these may occur outside the traditional EPSDT well-child checkup, they are still considered EPSDT services and makes determining an exact number of appropriate EPSDT visits difficult to determine. Furthermore, the relationship is not linear and the appropriate number of EDPST visits a

child is eligible for depends squarely on the age of the child. Thus, a multivariate linear regression model is inappropriate for predicting EPSDT utilization.

Our strategy for analyzing the result was then based on dividing the individuals into one of two groups based on their self-reported utilization of ESPDT services: high and low utilizers. This strategy seemed most appropriate for the following reason. The ability to develop classifications (such as high, medium and low utlizers) among clear lines was constrained because of missing data on many of the variables for AGE. Without an ability to accurately determine each child's age, it was impossible to know even approximately how many EPSDT visits they could potentially be eligible to receive. We the developed classification groupings based on EPSDT utilization from MTP users and non-users. Recall that MTP users utilized EPSDT services at higher rates than MTP non-users. On average, MTP users (3.5) reported nearly one additional EPSDT visit than their MPT non-user (2.6) peers.

In our analysis of EPSDT utilization, we are only interested in the utilization of MTP non-users so that we can better understand the transportation problems faced by those without assistance from the MTP. Thus, the average utilization among MTP non-users was used to set the standard for those classified as high EPSDT utilizers. Because we can only use whole numbers for utilization of services, we determined 3 EPSDT visits to be the minimum threshold for those classified as high EPSDT utilizers. Furthermore, this cut point for the data provided us with two relatively equal categories. Low utilizers were classified as children who received between 0 and 2 EPSDT services during the past year.

The initial binary logistic regression model examining EPSDT utilization contained the same variables as did the initial binary logistic regression model examining MTP utilization. The initial model included the variables CHILD, CAR, GAS, PARK, WAIT, FIND, RESIDENCE, ETHNICITY, TIME, and LANGUAGE. These variables seemed appropriate predictors of EPSDT utilization because of the results from the Chi-square analysis and cluster analyses in Chapter IV as well as from the literature. Although the Chi-square tests in Chapter IV did not directly examine the differences in EPSDT utilization, the cluster analysis using those same variables on MTP non-users, seems to suggest that these could be important predictor variables in determining EPSDT checkup utilization.

The original classification table predicts only the most common outcome category (see Table 19) for a baseline measure. The most common category is "low" EPSDT utilization. For example, if we were to predict that all Medicaid recipients were "low" EPSDT utilizers, then we would be accurate about 59% of the time. Thus, the model correctly predicts all of the low EPSDT utilizers only. Predicting the most common occurrence (Low EPSDT utilizers) will serve as a baseline from which to compare the results of the final binary logistic regression model.

Table 19: Baseline Model Classification Table – EPSDT Utilization

Observed	Predicted		
	EPSDT - Low	EPSDT - High	% Correct
EPSDT – Low	397	0	100
EPSDT - High	267	0	0
Overall Percentage			58.7

The preliminary analysis also consists of examining the test of model coefficients. This table provides information to determine if the variables included in the final model improve the prediction of the log odds (see Table 20). The model Chi-square is a statistical test of the null hypothesis that the coefficient for all other terms in the model are zero and thus, is equivalent to the overall F test in an ordinary least squares regression model. Using this table, we cannot reject the null hypothesis since the Chi-square statistic is not significant ($p<.160$). Thus, the initial model does not improve the overall log odds. This finding is most likely because of the inclusion of a number of variables that do not contribute to predicting EPSDT utilization.

Table 20: Test of Model Coefficient – EPSDT Utilization

	Chi-square	Df	Significance
Model	15.529	11	.160

Since our initial model does not significantly improve the overall ability to predict EPSDT utilization, the initial model classification table is rather moot. However, we can examine the summary table of initial variables in the equation to refine the model. Much like our binary logistic regression model predicting MTP utilization, several of the predictor variables need to be removed to refine the model.

The initial analysis showed that several of the original variables of interest did not significantly affect EPSDT utilization jointly. The variables, GAS, PARK, WAIT, FIND, RESIDENCE, ETHNICITY, and TIME were insignificant (see Table 21). The variables CHILD, CAR, and LANGUAGE were all significant ($p<.05$).

In refining the model, we dropped out the variables that were clearly not significant in an effort to improve the predictive model. Those variables included PARK, WAIT, ETHNICITY and TIME. Although the variables GAS, and FIND were not significant in the initial model, previous bivariate analysis and the literature suggest they are probable predictors of ESPDT utilization. Therefore we kept the variables GAS and FIND for the final model. The variable RESIDENCE was also statistically insignificant, however the findings from the cluster analysis seemed to suggest some difference, at least among MTP non-users, in EPSDT utilization among urban and rural Medicaid residents. Thus, the variable RESIDENCE was also included in the final model.

Table 21: Summary of Initial Variables in Equation – EPSDT Utilization

Variable	DF	Probability (P<.05)
Constant	1	.431
CHILD	1	.041
CAR	1	.006
GAS	1	.348
PARK	1	.754
WAIT	1	.824
FIND	1	.225
RESIDENCE	1	.280
ETHNICITY[1]	3	.882
ETHNICITY (WHITE)	*1*	*.720*
ETHNICITY (BLACK)	*1*	*.901*
ETHNICITY (HISPANIC)	*1*	*.934*
TIME	1	.642
LANGUAGE	1	.012

[1] Reference Category is "Other"

The final model did result in an improvement in the accuracy of classifying EPSDT checkup utilization. The overall accuracy was improved only modestly, from 58.7% to 62.9%, an increase of 4.2% (see Table 22). The most notable improvement came in predicting low EPSDT utilizers, the primary group of interest. The final binary

logistic regression model does a very good job, accurately classified 93.3% of low EPSDT utilizers. However, the model is a poor predictor of high EPSDT utilization, only accurately classifying 15.2 % of all cases.

Table 22: Final Binary Logistic Regression Model Classification Table – EPSDT Utilization

Observed	Predicted		
	EPSDT - Low	EPSDT - High	% Correct
EPSDT – Low	512	37	93.3
EPSDT - High	296	53	15.2
Overall Percentage			62.9

Because the initial model did not contribute to improving the log odds or predictive power, we must reexamine the model coefficients of the final model (see Table 23). Using this table, we can reject the null hypothesis since the chi-square statistic is not significant ($p<.001$). Thus, the final model does improve the overall log odds or the predictive power of the model.

Table 23: Test of Model Coefficient – EPSDT Utilization

	Chi-square	Df	Significance
Model	34.693	6	.001

Because we know that our final model does improve the accuracy of predicting EPSDT utilization, we can now examine the significant predictor variables in our final model. Three variables of the six variables were significant at $p<.05$ with a two variables approaching statistical significance. The variables CHILD, GAS and LANGUAGE were all significant at $p<.05$. Two variables were approaching statistical significance; FIND ($p<.091$) and CAR ($p<.082$), but did not exceed the $p<.05$ level for general statistical significance. However, since this research is primarily exploratory in nature, a confidence level of $p<.10$ is often considered as a tool to identify variables of interest for subsequent research (97, 145). Thus, despite the fact that these two variables did not exceed $p<.05$, these variables could still be important predictor variables. However, the fact that the variable CAR was insignificant was surprising due to the fact that the automobile is associated with access on nearly every dimension. The variable RESIDENCE was clearly insignificant ($p<.207$), indicating that Medicaid recipients in urban and rural areas appear to access EPSDT services at similar rates (see Table 24).

Table 24: Summary of Final Variables in Equation – EPSDT Utilization

Variable	DF	Probability (P<.05)	Exp (B)
Constant	1	.914	1.054
CHILD	1	.004	.806
CAR	1	.082	1.371
GAS	1	.045	1.199
FIND	1	.091	1.178
RESIDENCE	1	.207	.833
LANGUAGE	1	.000	.436

As we did with the binary logistic regression results predicting MTP utilization membership, we can develop probabilities to determine how each of the significant predictor variables impacts the overall probabilities of group membership. We developed the overall odds of group membership of low EPSDT utilizers from our sample, using the baseline categorization from our initial binary logistic regression model (see Table 19). Low EPSDT utilizers comprise about 59% of the sample, the overall probability of a Medicaid recipient being a low EPSDT utilizer is .59.

Applying the values from the exp(β), we determine the effect of the predictor or independent variables in on the overall probability given a certain situation. The most highly significant variable was LANGUAGE. Although we captured data only in terms of English and Spanish speakers, there are certainly other Medicaid recipients who speak neither of these two languages. However, Spanish and English are the predominant

languages spoken in Texas. The exp(β) for LANGUAGE = .436. Because this number is less than one, it actually reduces the odds of being a low EPSDT utilizer. Thus, when computing the overall probability of Medicaid recipients who speak Spanish, the probability of their being a low EPSDT utilizer drops to .21. This finding is contrary to most literature, suggesting that language barriers inhibit utilization of health care services.

CHILD was also a significant variable in the final model, capturing the number of children per family. Like the variable LANGUAGE, the exp(β) for CHILD was also less than one. The effect of exp(β) = .860 for the variable CHILD, also reduced the odds of being a low EPSDT utilizer. Computing the overall probability of Medicaid recipients with more than one child at home, the probability that they will be a low EPSDT utilizer is reduced slightly to .54. This finding is also contrary to the literature as well as some of our initial bivariate findings suggesting that children with larger families do indeed have more barriers in seeking care than those who do not. However, the impact of children is a very small reduction in the overall probability.

The final significant variable was GAS, which captured the difficulties Medicaid recipients had in paying for gasoline to travel to their medical and dental appointments. The exp(β) for GAS = 1.199, meaning that it has an overall increasing effect on low utilization of EPSDT services. Thus, respondents who reported having difficulty paying for gasoline were also more likely to be low utilizers of EPSDT services. The probability of respondents with difficulty paying for gasoline being low utilizers of EPSDT services increases to .63. Clearly respondents that have difficulty paying for gasoline also have lower utilization levels.

Verifying the Model

The discriminant model is an appropriate technique in verifying a binary logistic regression as discussed in the preceding section. With the same data set and difficulties posed by using a hold-out sample for validation, discriminant analysis is the most appropriate technique for cross-validating group membership among low EPSDT utlizers. Because we are most concerned with predicting group membership, the predictive discriminant analysis (PDA) technique is our model of choice.

The preliminary results of the discriminant analysis showed a rather weak association between the discriminant scores and our grouping variable, EPSDT utilization. The canonical correlation =.188, indicating that the model has some predictive utility. This low canonical correlation is most likely due to the fact that the model is a poor predictor of high EPSDT utilization which also reduced the overall predictive power of the model. However, since we are most concerned with predicting low EPSDT utilization, the rather low canonical correlation coefficient is only of modest concern at this point.

The Box's M is a test of equality of covariances. The Box's M was statistically significant ($p<.001$) which leads us to reject the hypothesis of equality of covariances. Because the data violate the assumption of homogeneity of variance, this can lead to classification problems, meaning that our resulting predictions about low EPSDT utlizers and high EPSDT utlizers may be less than optimal. We correct for this problem by using separate group covariance matrices which is performed in a subsequent section.

Variables measured on difference scales are compared from the output of the standardized canonical coefficients (see Table 25). In combination with the data from the

group centroids (see Table 26), the direction of the relative impact of the predictor variables can be determined. Because the function for low EPSDT is positive, higher positive scores from variable's standardized canonical coefficient will be associated with membership as a low EPSDT utilizer. The findings of the discriminant model are consistent with that of the binary logistic model. The variables that were all statistically significant in the binary logistic regression model also contribute the most to group membership in the discriminant model (LANGUAGE, CHILD, and GAS). The variable LANGUAGE had the highest level of statistical significance among the three ($p<.001$) in the binary logistic regression model and was also the variable that contributed most to group membership in the discriminant model. First, the language of the interview was the most important predictor variable in membership as a low EPSDT utilizer. The variable CHILD was also found to be a significant contributor to group membership. The final variable, GAS, because of its low canonical discriminant function coefficient is not a significant predictor of group membership.

Despite the agreement among the two models, there are two areas where the models appear to contradict one another. While both models indicated that the variable LANGUAGE was an important variable in predicting EPSDT utilization membership, the findings generated by the binary logistic model suggested that those who speak Spanish further reduced the overall probability of low EPSDT utilization membership. However, the positive nature of the standardized canonical coefficient for the variable LANGUAGE (.647) and the positive group centroid of low EPSDT utilization (.152) suggests that Spanish-speaking respondents are more likely to be LOW EPSDT Utilizers. The same is true for the variable CHILD. The binary logistic regression model showed

that families with higher numbers of children reduced the probability of low EPSDT utilization membership. The discriminant model contradicts this finding, suggesting that families with higher numbers of children (.542) have a greater likelihood of low EPSDT utilization membership. While these contradictions are important, the strengths of discriminant analysis are not in interpreting the standardized canonical coefficients, but the predictive ability of correctly assigning group membership (107). The binary logistic regression model is a better technique than discriminant analysis in analyzing how the predictor variables influence group membership.

Table 25: Standardized Canonical Discriminant Function Coefficients – EPSDT Utilization

Variable	Function
CAR	-.301
CHILDREN	.524
FIND	-.349
GAS	-.368
LANGUAGE	.647

Table 26: Functions of Group Centroids – EPSDT Utilization

Categories	Function
High EPSDT Utilizer	-.239
Low EPSDT Utilizer	.152

Similar to the results of the discriminant model predicting MTP utilization membership, the discriminant model predicting EPSDT utilization also had few cases with missing data. The original data set included 1214 cases of which only 91 (7.4%) cases were excluded from the overall analysis because of missing data. The results of the discriminant classification model were nearly identical to those of the binary logistic regression when predicting EPSDT utilization membership (High or Low). The overall predictive model was acceptable, successfully predicting 63% of all cases. The overall predictive model as computed from the binary logistic regression was nearly identical at 62.9%. Both models also predicted membership among the two groups equally well. Consistent with the binary logistic regression results, the discriminant analysis also was a poor predictor of high EPSDT utilization membership. The binary logistic regression correctly predicted 15.2% membership of high EPSDT utilizers while the discriminant model predicted only 12%. However, both models do a much better job of predicting group membership of low EPSDT utilizers. The binary logistic regression model correctly classified 93.3% of all low EPSDT utilizers while the discriminant model correctly classified 95.4% of all low EPSDT utlizers (see Table 27). In both instances, the difference between the predictive accuracy of both models was less than four percent.

Table 27: Discriminant Analysis Model Classification Table – EPSDT Utilization

Observed	Predicted		
	High EPSDT Utilization	Low EPSDT Utilization	% Correct
High EPSDT Utilization	307	42	12.0
Low EPSDT Utilization	589	524	95.4
Overall Percentage			63.0

Although both models support the overall findings of low EPSDT utilization membership, the discriminant model also violates the assumption of homogeneity of variance. The violation of the homogeneity of variance assumption may cause the model to classify some cases incorrectly. However, running the same discriminant analysis classification scheme with separate covariance matrices resulted in identical predictive results as did the model with pooled covariance matrices model Thus we can determine that the violation of the homogeneity of variance assumption has no overall impact on the model and thus, appears to be a good cross-validation of the binary logistic regression model.

Summary of Findings

Medicaid recipients are faced with multiple barriers in accessing care. In analyzing utilization of MTP services, access to an automobile either through direct ownership or access within the immediate household is clearly the most important variable. This finding comes as no surprise in that the MTP was established for those who face

transportation barriers. Clearly, those without access to a private automobile are hindered in accessing health care services. Although access to a private automobile is a very important factor in predicting MTP utilization, it does not explain all the variability. In fact, the ability to operate an automobile is also an important factor, specifically paying for gasoline. Those that have less difficulty paying for gasoline are also likely to be MTP non-users.

Most curious was the fact that the number of children in the household had no impact on the final model. Numerous studies as well as some preliminary data analyses suggested that families with at least several children at home would encounter more barriers to care and thus, would be less likely to use MTP services. We also hypothesized that the interaction of children and access to an automobile would significantly impact MTP utilization. We were especially surprised by our findings that indicated this was not the case. We had anticipated that the MTP policy that restricts ridership to only the children traveling for medical care would substantially constrain use of MTP services. Thus, these data suggest that for families with several children at home, this policy seems to have no impact on deterring MTP utilization.

While our model successfully classified MTP non-user membership for about 74% of the population, the overall size of the Medicaid population must be considered to fully understand the ramifications of our classification scheme since only 6% of the Medicaid population in Texas actually accesses MTP services. In 2002, the there were approximately 1.7 million children enrolled in the Texas Medicaid program (146). Therefore, about 1.5 million Medicaid recipients did not access MTP services. Although our binary regression model suggests that the majority of those who do not access MTP

services own a car and have little difficulty with paying for gasoline expenses, there remains about 440,000 Medicaid recipients (100% - 74% correctly classified = 26%) that were not classified by our binary logistic regression or discriminant model. Thus, our cluster analysis seemed to identify various subgroups within MTP non-users that could potentially benefit from MTP services.

The results of the EPSDT utilization were also surprising on several dimensions. Most surprising was not the fact that language played such an important part in predicting EPSDT utilization, but the fact that Spanish speakers reduced the overall probability of low EPSDT utilization membership. Most of the literature in the area of access barriers seems to indicate that language is one of the key barriers to accessing care. However, there is a small cadre of evidence that suggests that first generation immigrants are more likely to access care than their peers, especially among Hispanics (147). This may help explain the fact that Spanish-speakers may be accessing care at higher rates than English-speakers.

The other surprising outcome in examining the factors predictive of EPSDT utilization was the contribution family size or the number of children per family played in the analyses. Although this variable was significant, it actually was shown to decrease the probability of low EPSDT utilization membership. This finding is also contrary to the literature in the area which suggests that poor families with many children at home often experience barriers in seeking care because of a number of barriers that include having to carry small children when traveling or finding childcare for those who stay behind when siblings go for care with their parent or guardians. While the amount of variance

accounted for in this analysis was low, we expected family size to reduce EPSDT utilization.

A final finding of the binary logistic regression of EPSDT utilization membership was not surprising; the difficulty of respondents paying for gasoline. Respondents that reported difficulty in paying for gasoline were more likely to be low utilizers of EPSDT services. This factor is important, particularly as the price of gasoline increases to new levels.

Because our model was most accurate in predicting low EPSDT utilization membership, we can say with some certainty that difficulty paying for gasoline is a key barrier in low utilization of EPSDT services. Although the overall model was not nearly as accurate in predicting group membership for high EPSDT utilization membership, we can assume that there are important predictor variables that were not included in our survey.

CHAPTER VI

CONCLUSION AND POLICY IMPLICATIONS

Chapin explored the fundamentals of his theory of access (1974), contending that two things must occur: 1) the desire to engage in the activity and 2) the opportunity to engage in the activity. With social services, such as health care, theories such as Chapin's as well as the other basic tenets of marketing research have morphed into a discipline known as social marketing. Social marketing uses the same marketing principles to promote ideas, attitudes and behaviors instead of merely consumer products (148). Social marketers have engaged in a number of activities to promote better health among people of all demographic and economic strata, but in particular to reach those of low socio-demographic strata because of their generally poorer overall health status. Social marketing campaigns have sought to increase childhood immunizations, encourage individuals to either refrain or stop smoking, the benefits of breastfeeding and diabetes prevention (149-152). In particular, the Texas Department of Health, now known as the Texas Department of State Health Services, has engaged in social marketing through mass mailings to encourage use of MTP services (5). These social marketing strategies have all sought to increase the desire to engage in improving individual health.

Despite our inability to specifically measure the motivations of Medicaid recipients seeking preventive care, we have controlled for this factor indirectly through the design of our study. Accessing EPSDT checkups most likely requires a different set of motivations for seeking care than those motivated to reduce pain or discomfort because they preventive in nature. We have to assume that all of these Medicaid recipients

are motivated to seek care other than simply to relieve acute or chronic symptoms or pain. This type of utilization of health care is very different from ambulatory care. Thus, we now have a better understanding of the types of impediments that seem to chip away at or negatively influence these underlying motivations of Medicaid recipients to seek preventive care.

Our study sought primarily to deal with the second supposition of Chapin's theory, the opportunity to engage in travel. The ability to engage in travel is a complex phenomenon. Clearly, access to an automobile is the key variable, but there are many other factors at work. It is clear why Aday (2001) says that having access to insurance does not guarantee access to health care services. For this, among other reasons, MTP of Texas assists Medicaid recipients with transportation needs to reduce this significant barrier to health care service use. It is clear that those who access MTP services receive more EPSDT services than those who do not. Yet despite the best efforts of MTP, many Medicaid recipients do not access MTP services and many have lower rates of EPSDT utilization. Access to MTP services seems most influenced by access to an automobile. However, automobile ownership also comes with operating expenses, of which paying for gasoline seems to be a big barrier for many.

EPSDT utilization is also influenced by the same factors as MTP utilization. Yet this relationship is slightly more complicated because of the convergence of factors associated with utilization. As expected, lack of access to an automobile negatively influences EPSDT utilization. However, barriers such as language and large families, factors traditionally associated with lower utilization, were shown to positively influence EPSDT utilization.

Health Care Utilization and MTP

MTP users access care at greater rates than MTP non-users. Because MTP users may have poorer general health status, the overall utilization of health care services is not a good measure since it was impossible to adjust for this factor. However, access of EPSDT services is an appropriate measure because all Medicaid recipients under the age of 21 are on the same periodicity schedule because of the preventive nature of the services. On average, MTP users accessed an additional preventive EPSDT service each year relative to MTP non-users. This seems to indicate that for those who access MTP services, the program works in increasing opportunities to use preventive care.

While removing transportation barriers is clearly a significant barrier for many Medicaid recipients, it clearly is not the only factor. Thus, the increased utilization of ESPDT services among MTP users is most likely not due simply to the utilization of MTP services. There are likely some very real differences between those that access MTP services and those do not. This returns us, at least in part, to our earlier discussion of motivation. For starters, the utilization of MTP services requires at least some persistence and motivation on behalf the Medicaid client. Medicaid clients typically must contact MTP representatives to arrange transportation services and thus, MTP utlizers may be more motivated to seek services than their MTP non-utilizing peers. Further, we know little about the health status between those who access MTP services and those that do not. Although focusing on preventive care delivered through ESPDT checkups removes some biases because the periodicity schedule for all Medicaid children is the same no matter their health status, sicker children may be accessing a greater number of EPSDT services simply because of their increased needs.

Socio-demographic Factors

For the most part, socio-demographic factors were not associated with MTP utilization. Language, often cited as a barrier to many social and health care services, was not associated with MTP utilization. The very broad measure of residence by urban and rural counties also was not associated with MTP utilization. The most surprising finding was family size, especially given the fact that MTP policy restricts ridership to only those children who are receiving EPSDT services. Because most Medicaid families are headed by single households and the low incomes of Medicaid families, we presumed that families with many children would have difficulty accessing MTP services. This turned out not to be the case as family size was not associated with MTP utilization.

Despite the fact that family size was not associated with MTP utilization, several other family dynamic factors did show some association. Overall family size, that is, the number of children per family was shown to have no association with MTP utilization. The number of children in families for both MTP users (2.38) and MTP non-users (2.46) was roughly equal. However, average age of all the children per family was associated with MTP utilization. The average age of all children per family of MTP users was about 6 months higher than families of non-users. Although the number of children per family appears to have no impact on MTP utilization, the age of the children does appear to matter. Families with older children may have more opportunities for day care, be it Head Start programs, kindergarten or school, and this may explain the difference in average age of the children in the families among MTP user and MTP non-users. Again, because MTP policy restricts ridership to only those children who are receiving EPSDT services, this may explain why MTP non-users have younger children at home. Because

such families may not be able to find childcare for young children not receiving health care services and children may not accompany their parents or siblings when MTP provides the transportation service, families with young children may have greater difficulty accessing MTP services. While we cannot say for certain this is the case, it is clear that among families with young children at home, families that do access MTP services report greater utilization of EPSDT visits than those who do not. Among families with 2 or more children five or under at home, MTP users reported greater utilization, 1.2 greater EPSDT visits than MTP non-users.

The only socio-demographic variable associated with MTP utilization was ethnicity. Blacks or African-Americans were more likely to be MTP users while whites were more likely to be MTP non-users. Hispanic MTP users and MTP non-users were nearly equal in number. It is not clear why utilization differs by ethnicity, especially since Medicaid families are of the same economic strata. However, utilization rates do vary by ethnicity among various types of health care and social services. Black and Hispanics traditionally have some of the lowest utilization rates of health care services. For example, Black children are particularly vulnerable, having the lowest immunization rates that are consistently below the national average. In 2003, Hispanic children across all age groups were the least likely to have seen a physician in the past year, compared to white and black children. Hispanic children were up to three times more likely than white children to have had no physician visits (153). Thus, the comparative higher rates of MTP services among African Americans relative to their proportion of the Medicaid population is seen as a positive development.

Travel Impedance Factors

Medicaid recipients face a number of travel-related obstacles in accessing health care services. Many of those obstacles were associated with MTP utilization. Not surprising, automobile ownership, or access to a car within the immediate household, was inversely related with use of MTP services. More simply stated, Medicaid recipients who do not own an automobile or have access to one within their immediate household were much more likely to access MTP services. Yet access to an automobile does not preclude many Medicaid recipients from accessing MTP services. A substantial portion of MTP users (66%) reported owning an automobile, signaling their difficulty with operating expenses. Although the majority of MTP non-users reported access to a private automobile, 15% indicated no access to an automobile.

Despite having access to an automobile, many other travel impediments remain, such as the lack of money for gasoline, and parking. Difficulty paying for gasoline was associated with MTP utilization. Among MTP non-users, 39% of respondents indicated that paying for gasoline was either difficult or very difficult, underscoring the fact that access to an automobile does not necessarily equate to health care access or service use because of the expenses involved in operating a vehicle. A majority of MTP users indicated difficulties paying for gasoline (60%), yet the MTP is designed to alleviate such hardships by providing reimbursement on a per mile basis for those who use a private automobile (their own or one belonging to a friend/relative) when accessing Medicaid-related services. While paying for expenses such as parking was not associated with MTP utilization, the expenses also remain a challenge for subgroups within MTP users and non-users. Twenty-three percent of MTP nonusers and 27% of MTP users reported that

paying for expenses such as parking made going to the doctor or dentist either "difficult" or "very difficult." Again, while MTP users are assisted with such expenses, a significant proportion of the population also struggles with such expenses.

Distance and travel time were also associated with MTP utilization. MTP non-users travel fewer miles for their medical and dental appointments than MTP users. MTP non-users also spend less time in route than MTP users. Although MTP non-users reported traveling fewer miles for their medical and dental appointments than MTP users, the average one-way distance was 21.7 miles. MTP non-users (32 minutes) also reported lower travel times than MTP users (44.6 minutes). These two facts seem to indicate that for many Medicaid recipients without access to an automobile, walking is most likely not an option, especially for those with young children. The dearth of providers available for Medicaid patients is well documented as physicians are not typically located in poor neighborhoods forcing Medicaid clients to travel further than one might expect for medical and dental care. Although many county and city health departments once provided EPSDT and other Medicaid services, these clinics have increasingly returned to essential public health activities, such a disease control and prevention as Medicaid managed care has proliferated in the State of Texas. Increasingly, Medicaid services are offered through managed care arrangements with physicians in private practice, who typically are not located in large urban and poor neighborhoods in many of Texas' cities (142).

More telling of the transportation difficulties that Medicaid clients face was the fact that recipient sentiment in overall difficulty finding transportation was also highly associated with MTP utilization. MTP non-users (41.2%) were much more likely to

report finding transportation for medical and dental appointments was either "difficult" or "very difficult" than MTP users (26.6%). The fact that the MTP non-user population is such a substantial proportion of the overall Medicaid population suggests that there is a significant proportion of the Medicaid population that could significantly benefit from MTP services. In particular, those with access to an automobile could benefit from assistance with operational expenses Medicaid clients are facing with their transportation needs for medical and dental appointments. While it is not clear that such impediments are the sole reason for the discrepancies in EPSDT utilization rates, it is clear that those with transportation problems do utilize EPSDT services at a lower rates, this fact serves in making the case that MTP provides valuable access to services that may reduce overall costs over time as children are screened and treated earlier for problems that may be preventable or may become chronic over time.

MTP Non-user Subgroups

MTP non-users are an enormous group, comprising well over one million children. Even though virtually all of these children are quite poor, common sense would dictate that there are numerous differences within this subgroup. While we know that most MTP non-users have access to an automobile, there is a significant portion that does not. We also know that access to an automobile does not necessarily translate into higher EPSDT utilization because other factors appear to inhibit access, such as paying for gasoline, parking and difficulties with caring for young members of larger families. Thus, the "group" concept from marketing research provides a means to understand which Medicaid recipients report poor utilization rates of EPSDT services and a clearer understanding of the barriers they face in accessing care. The characteristics of the

individuals in each group can provide insights about the different types of MTP non-users in Texas. To summarize the four groups or clusters were defined as follows:

- ✓ *The Expense and Child Hindered*: Rural Medicaid recipients who generally do own an automobile, but have difficulties paying for operating expenses and have a large number of children at home;
- ✓ *The Time and Child Hindered*: Primarily urban Medicaid recipients who generally do not own an automobile, but report few barriers to transportation. They also typically have a large number of children, yet are low utilizers of THSteps preventive care services;
- ✓ *The Undaunted*: Urban Medicaid residents who typically own an automobile, yet face long travel commutes to their medical and dental appointments and have some difficulties with travel expenses. However, this group has the smallest number of children at home, and;
- ✓ *The Motivated*: Rural Medicaid residents who typically own an automobile who face a number of expense-related barriers, yet have the highest utilization of EPSDT or THSteps preventive care services. This group also has the lowest number of children among the four clusters.

Automobile access has been a major factor for access in other analyses and it is no different when examining the various subgroups of MTP non-users. Although automobile access is a major factor, other factors also play important roles in accessing care. Children seem to play a big role from two groups: *The Automobile, Time and Child Hindered* and *The Expense and Child Hindered*. Both of these groups were low utilizers of EPSDT services and collectively, made up a third of all MTP non-users. While these

groups shared low levels of utilization, they also shared another common theme of reporting high levels of barriers. As their group labels imply, *The Automobile, Time and Child Hindered* reported poor access to an automobile and long commutes for their medical and dental care. *The Expense and Child Hindered* reported difficulties with a myriad of expenses, not just paying for gasoline, but parking expenses as well.

The remaining two groups fared much better in accessing EPSDT services, *The Undaunted* and *The Motivated.* These groups reported higher rates of EDPST utilization than their peers. *The Undaunted* tended to report a variety of difficulties, none of which were overbearing when compared to the other groups. Among the four groups, *The Motivated* reported the highest levels of utilization of EPSDT services, yet also reported having the smallest family sizes (i.e., number of children at home). They also reported the longest commute times to their medical and dental appointments, yet also tended to report that paying for gasoline was not a significant problem.

What these groupings tend to show is that serious differences exist among MTP non-users. Transportation as a component to accessing preventive health care services defies simple explanations and stereotypes. It is a complex and multifaceted phenomenon. What we now know is that within the subgroups of MTP non-users, individuals face varying degrees of difficulty accessing care. Some are seemingly able to overcome those barriers while others are not. However, the one fact that seems to be the most dramatic among the four groups is that the number of children per family is inversely proportional to EPSDT utilization in each of the four groups. Certainly there are other factors contributing to low utilization rates, but the two groups that seem to experience the most barriers also have the highest number of children per family. The

culmination of these barriers for *The Time and Child Hindered* and *The Expense and Child Hindered* seem to contribute to the low utilization rates of these group members.

Joint Effects on Utilization

Most MTP non-users either own their own automobile or have access to one within their immediate household. The fact that automobile ownership or easy access to one is the primary factor in predicting MTP non-users is not surprising. Consistent with our findings from other analyses, either owning a car or relatively easy access to an automobile does not explain all the variability among MTP users and non-users. Our previous analysis continues to support these findings. Simply stated, while automobile ownership is important, the ability to operate an automobile is also a very important predictor variable. Specifically, the most important variable in operating an automobile is paying for gasoline. Medicaid recipients that have both access to an automobile and the ability to pay for gasoline are much less likely to utilize MTP services. While this finding does not necessarily preclude this group from accessing MTP services, it certainly helps us better understand the dynamics that influence use. As a group, this finding seems to indicate that the MTP program is not sufficiently meeting the critical needs of large segments of the population that do not use MTP services. Given the fact that the group of MTP non-users is extremely larger and coupled with the findings from earlier sections, there are some particular subgroups within the larger MTP non-user population that have clearly demonstrated transportation barriers and poor utilization of EPSDT services. This fact should not be overshadowed by the limitations of the multivariate model.

While MTP utilization or lack there of explains how some Medicaid recipients overcome various transportation barriers it does not tell us how successful Medicaid

recipients are at accessing EPSDT services. As in the case with the multivariate model predicting MTP utilization, the multivariate model predicting EPSDT utilization was also supported by findings from the earlier bivariate analysis. However, different factors emerged in predicting EPSDT utilization. The most interesting of these findings was that Spanish-speaking recipients tended to access EPSDT services at higher rates than English-speaking Medicaid recipients. While the number of children per family was not a determining factor in utilizing MTP services, it was a determining factor in EPSDT utilization. However, families with more children were more likely to be higher users of EPSDT services than those with smaller families. Automobile operating expenses again played an important role as a predictor variable as Medicaid recipients who reported difficulties paying for gasoline were more likely to be low users of EDSDT services.

Limitations of the Data

There are a number of limitations in the methodology employed in this study. These limitations include the costs involved in collecting data, recall bias, the ability to capture all pertinent data and an inability to verify all information. The following list provides an articulation of the limitations of this study.

- ✓ This project was sponsored by the Texas Department of Health (TDH). The primary goal of the data collection effort was to monitor MTP satisfaction with program services and identify the reasons MTP non-users choose not to use the program. Because TDH's primary research questions were different than those targeted in the analyses reported herein, a limited number of questions were allowed to be added to the questionnaire. As a result, other important questions that might

contribute to or limit our understanding of transportation access to health care (e.g., educational attainment, childcare options at home) were not included in the data collection effort and thus not available as part of this study.

- ✓ Cost considerations also limited the number of surveys. Again, TDH's primary research objective was examining current MTP user satisfaction and some of the reasons Medicaid recipients do not access MTP services. A survey design of 600 surveys for both groups (MTP users and MTP non-users) provides a sampling error of + or – 2%. However, when examining the subgroups within the two larger groups of interest, the error rate increases. For example, while the cluster analysis provides useful information about MTP non-users, the predictive ability of the clusters should be interpreted cautiously.
- ✓ Recall bias is a concern in this study. Specifically, we are concerned about respondents' ability to remember, and remember accurately, events related to ESPDT utilization. There is no way to conclusively evaluate how well our survey population recalled their children's EPSDT utilization without recourse to detailed medical records. In the case of this study, the costs associated with such a validation effort were prohibitively expensive. Therefore, we cannot definitively know whether some survey respondents were systematically underreporting EPDST utilization or other respondents were over reporting EPSDT utilization. Both add error to our measure of EPSDT utilization and in the end, may neutralize each

other. A better measure of EDPST utilization would be chart audits. However, chart audits are extremely expensive and time consuming.

- ✓ Examining both time and distance in miles were perceived to be an important variable in examining and predicting EPSDT and MTP utilization. However, it was clear that many respondents had difficulty answering these questions, particularly the question pertaining to distance. With a significant number of Medicaid recipients without access to an automobile, it seems likely that with the large number of respondents who indicated they did not know the answer to this question and the large standard deviation among those who did answer this question calls into question the quality of data. Therefore, these data were excluded from the analyses when appropriate to reduce any biases on the findings.
- ✓ Surveys conducted by telephone are by their nature restricted to only households with telephone service. While a larger proportion of US households have telephone services, the percentage of those with telephones among low income populations such as the Medicaid population raises concerns that the exclusion of households without telephone service may result in biased survey estimates. Because many respondents indicated difficulty paying for travel-related expenses, one must also assume that other basic goods are services are also equally difficulty to pay. Telephone services are subject to disconnection and for Medicaid recipients who may be struggling with such bills; the chosen methodology most certainly excludes the viewpoints of such potential

respondents. Despite the data that suggests that those without telephone access experience similar barriers and utilization rates of MTP services, more research is most likely needed to fully understand the barriers those without telephone face in accessing care. This is particularly important due to the fact that it is most often incumbent upon the Medicaid recipient to schedule their own transportation with MTP. Those without telephones would be at a clear disadvantage in trying to schedule both medical and dental appointments as well as transportation.

- ✓ Although Spanish and English are the predominant languages spoken in Texas, there are substantial subgroups of the Medicaid population that lack proficiency with these two languages. In Houston, significant populations of Vietnamese are eligible for Medicaid services. As a result, Medicaid recipients such as these and others who lack proficiency in either English or Spanish were excluded from the survey and our analysis. The effect of the exclusion of such Medicaid recipients is expected to be small since these groups are relatively small in respect to the overall Medicaid population.
- ✓ The fact that there were no differences in urban and rural areas in the state was surprising, especially given the well documented problem with scarcity of providers in many rural areas of the state as well as the abundance of literature on the subject. The vast geographic expanse of Texas, especially given the size of some of Texas' 254 counties would also seem to impede access. For example, Brewster County is equal to the

combined areas of Connecticut and Rhode Island combined (154). The lack of any significant finding here is most likely due to the definitions we employed for classifying urban and rural areas of the state. Classifying urban and rural areas at the county level most likely clouds or distorts urban and rural access effects.

Future Work

We know that those who utilize MTP services also report higher utilization rates of EPSDT services. While we can feel secure in the fact that knowing that the MTP reduces transportation barriers for those seeking Medicaid services, we do not know if MTP, in and of itself increases EPSDT utilization. The question remains, are there other factors at work that may contribute to higher EPDST utilization rates among those who access MTP services? For example, are MTP users more motivated to seek health care services than MTP non-users? The use of such social service programs often requires at least some, if not significant initiative among users to access program services. MTP services are no different and future studies of MTP should work more from Chapin's model on access, specifically the want or desire to engage in the activity. While we have done a relatively thorough job at addressing a good portion of the barriers that seemingly negatively impact Medicaid recipients in seeking care, we do not fully understand their motivations that reinforce or positively influence those seeking care. For purposes of this study, we worked from the assumption that all Medicaid recipients were equally motivated to engage in the task of seeking preventive care in response to building on Chapin's model. The more we know about the vast and significant differences among Medicaid recipients in their transportation barriers and access to care, we should seek to understand

the motivations they have in seeking care. TDH has sought to decrease barriers in making appointments and seeking care, Medicaid recipients must ultimately bear the initiative and responsibility of making their health care appointments and contacting MTP to arrange for transportation services if necessary.

To their credit, TDH and the plaintiff's attorneys' in the case of Frew et al. v. Gilbert et al. understand the importance of assessing and evaluating the program on a regular basis to identify potential problem areas. Both have also sought to understand the barriers to use of MTP services, however, those barriers have largely focused on operational and programmatic issues. While improving customer service and quality of care is important, clearly the reasons that many elect not to utilize MTP services are not that simple. Although poor response time and customer service may discourage some from seeking MTP and EPSDT services, more research is needed to fully understand why clients, especially those with significant transportation or other barriers, do not access MTP nor EPSDT services.

While it may seem counter intuitive to focus on the MTP non-users, we know that MTP non-users account for the bulk of the Medicaid population. Another future study might be to better understand the dynamics and differences within the subgroup of MTP non-users. The evidence from this study suggests that mass marketing campaigns, such as postcard mailings from TDH aimed at increasing utilization and general knowledge of MTP services may be inappropriate due to the vast differences within the various subgroups of MTP non-users. For clients with multiple barriers, awareness of MTP services alone may not increase utilization of MTP services nor increase EPSDT utilization.

Operating expenses, particularly for those with access to an automobile seem to add additional hardships for many Medicaid families. Gasoline, in particular was cited as a significant impediment by many respondents. This survey was largely conducted in 2003 when gasoline prices were much lower than they are today. The average price of a gallon of regular unleaded gasoline in Texas during the time period in which the survey was administered was $1.38 a gallon. In March of 2006, the average price of a gallon of regular unleaded gasoline in Texas was $2.28 a 65% increase in price (155). With energy costs spiking and the demonstrated difficulties many Medicaid recipients reported with energy costs, the potential adverse impact on EPSDT utilization is worrisome and worthy of immediate consideration.

Urban and rural differences have not been sufficiently addressed and there remains good reason to study this issue further. When examining rural and urban areas of the state, future studies should seek to better define this variable. One choice might be to adopt the U.S. Census Bureau's definitions of urban and rural by using census blocks. Although it would add a layer of complexity to sampling and analytical methodologies, a more precise definition of urban and rural areas in Texas might conclusively end the debate on this subject.

Policy Implications

Increasing utilization of EPSDT services among the millions of Texas children receiving Medicaid services is an important policy and health objective. On the surface, the concept of increasing access and utilization of services such as MTP to reduce barriers to health care services seems a simple one. However, the research on the various subgroups within the MTP non-users suggests that simple solutions are unrealistic and

that increasing utilization poses vexing questions. Because the Texas Medicaid population is so large and diverse, no single approach to increasing MTP utilization is likely to address all needs.

The group concept developed with the cluster analysis provides a means to understand which Medicaid recipients do not access MTP services and those with low utilization rates. These groupings can be an especially useful tool for thinking about policy as the characteristics of the individuals within the clusters provide insights about the different types of MTP non-users. With this knowledge, we can develop more effective and targeted policy strategies in increasing EPSDT utilization.

Since increasing EDPST utilization is an important state and national policy objective, the most sensible strategy would be to start with those with the greatest needs and the lowest utilization rates. Because these individuals tend to be of the same group, identifying these individuals should not be overly burdensome or difficult to accomplish. Some of the pertinent information to identify potential low EPSDT utlizers with high barriers is currently gathered during Medicaid eligibility screenings. For example, lack of access to an automobile is highly associated with MTP utilization. During Medicaid eligibility screenings, potential clients are asked about their assets, which include car ownership. While the data from this question is only one, but a significant variable in predicting MTP and EPSDT utilization, Medicaid eligibility workers could also begin to ask other questions to identify those clients most at risk of low EPSDT utilization. These screenings could help place individuals in one of the risk clusters and identify them for appropriate marketing, assistance, and outreach.

A screening tool could be created and easily scored to assist policy makers in determining the appropriate outreach for those most in need. *The Expense and Child Hindered* are among the lowest EPSDT utilizers and should be targeted first. These individuals typically have access to an automobile, but clearly need assistance with child care and operating expenses. Policy makers may want to devise social marketing campaigns specifically targeting these individuals to promote the most appropriate types of assistance that MTP provides. Because individuals in this group tend to either own or have access to automobiles, MTP should market the services the program provides in paying for gasoline, parking and other related transportation services. While MTP is well-equipped to assist individuals with operating expenses, child care provides both logistical and monetary challenges. In these times of strained state budgets where states such as Texas are limited, it is unlikely that assistance with child care could be a priority.

The Time and Child Hindered is a second group worthy of consideration for immediate assistance. This group also underutilizes EPSDT services, but faces different challenges than *The Expense and Child Hindered*. *The Time and Child Hindered* neither has access to nor owns an automobile, so assisting this group with operational expenses is inappropriate. Instead, MTP might focus on marketing their available assistance with alternative forms of transportation services, such as mass transit options, vans, and/or taxis. This group is largely rural in nature and faces long travel commutes for medical and dental appointments. There are a number of rural transit programs in Texas that consist of some fixed route transportation buses and van service. MTP transportation options and services could be marketed at a local level and in conjunction with rural transit operators where appropriate. While far from ideal from a consumer perspective,

expanding mass transit options is certainly the most cost effective because of the low costs of such services.

In addition to expanding transportation options for Medicaid and underserved populations, policy makers should also examine the locations in which care is delivered. The Texas Medicaid program might find it more effective to take the care to the patient rather than relying on the patient to come to the provider. Mobile health clinics are in use in many parts of the country and also in Texas. They typically provide care to the uninsured and underserved – that is those living in areas without adequate provider capacity. Other new methods that are gaining traction in delivering care to patients without adequate access to care include telemedicine, which is simply the delivery of health services via remote telecommunications. Although the field is still in a nascent stage, it is growing more and more common and the leaps in technological improvements continue to improve its delivery. School clinics might also be another effective tool in delivering care. Delivering care on site at with school-based health clinics, as is done in some locations in Texas, removes the need for transportation. However, school-based clinics are not without their problems, including funding and recent flaps over the type of services and health education offered at many clinics around the use of contraceptives (156).

While *The Undaunted* and *The Motivated* do better as a group in accessing EPSDT services, it would be a mistake to completely ignore the needs of these two groups. Both face challenges in their own right, but seem to do better jobs of overcoming the barriers they face. Furthermore, members of these groups do not report barriers with the same severity as either *The Time and Child Hindered* or *The Expense and Child Hindered.* However,

members from these groups tend to have access to automobiles and report moderate levels of barriers. *The Undaunted* tend to report moderate levels of difficulty with paying for gasoline and parking expenses, yet seem to do a good job of overcoming these barriers. *The Motivated* have the most difficulty with paying for parking expenses and long commutes. Resource permitting, outreach could focus on the barriers for these groups of Medicaid recipients, but clearly they somehow are overcoming their challenges and seeking out health care services.

Contributions to Research

Across the broad spectrum of Medicaid recipients, we found that Medicaid recipients defy simple typologies and stereotypes. In regard to Chapin's theory, we found that applying his theories was equally complex in applying this theory toward Medicaid recipient motivation for engaging in access and the opportunities to engage in access. While we did not explore the motivational questions for access, we must assume that various levels of motivation to engage in access of health care services vary among Medicaid recipients due to the great variation is access of MTP and EPSDT services. We found that many parents and guardians accessed EPSDT services at high rates for their children while others did not. This leads us to the second component of Chapin's theory, the opportunity or means to engage in the activity. Many Medicaid recipients face enormous transportation barriers, thus blocking their means to engage in the activity. These barriers include lack of an automobile, difficulties paying for operating expenses and child care.

What Chapin's work does not address is how these factors converge to impact access to care. Access to care is not a simple yes or no question, there are varying degrees of access and this can be demonstrated among the various utilization rates of both MTP and EPSDT

services. This is important to understand because of the different need and barriers that Medicaid clients face. Simply eliminating some transportation barriers or increasing the motivation to seek health care services will not result in a linear increase in EPSDT utilization. The fact that Medicaid clients have varying needs and barriers dictates that solutions for increasing EPSDT utilization will remain challenging, especially as our knowledge of the various subgroups of within the Medicaid population is limited. Despite these limitations, our work does provide a starting point from which to move forward and provides a better understanding of the complex factors that limit access to preventive health care services among the Medicaid population.

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APPENDIX A

TEXAS DEPARTMENT OF HEALTH
MEDICAL TRANSPORTATION PROGRAM
USER AND NON-USER SURVEY

(Scenario #1 for parents or guardians)

Hello, this is _____ calling from the Public Policy Research Institute at Texas A&M University. May I speak with _____? In cooperation with the Texas Department of Health we are conducting a survey of parents and guardians of children enrolled in Texas Health Steps (THSteps), the Medicaid program for Texans under the age of 21. We are interested in your opinions about the Medical Transportation Program.

In order to determine the effectiveness of this program we are seeking information on the program from parents and guardians of Texas Health Steps individuals up to the age of 21 about getting help from the Medicaid program with transportation to medical or dental appointments. [Child's name] was randomly selected by the Texas Department of Health for this study.

Please be assured that all responses are strictly confidential. Neither your name nor telephone number will be attached to the survey. Your participation is voluntary. You may refuse to participate in the study and it will in no way affect you ability to get health care or use the Medical Transportation Program. If you elect to participate, you can stop the interview at any time. The interview will take approximately 15 minutes. I would like to ask you a few questions about the Medical Transportation Program.

(Scenario #2 for parents or guardians when it would be better to talk to the child e.g., 16 or 17 year old patient)

APPROPRIATENESS OF TALKING WITH THE CHILD INSTEAD. (IF THE PARENT OR GUARDIAN INDICATES THAT THE SON/DAUGHTER WOULD BE THE BETTER RESPONDENT, THEN ASK):

If your [son/daughter] makes most of [his/her] trips to the doctor alone, perhaps they would be the better person to speak with. Who would you suggest we speak with? Is it alright with you if I could ask [him/her] some questions about the Medical Transportation Program? Please be assured that all responses are strictly confidential. Neither you nor your child's names, nor telephone number will be attached to the survey. Your participation is voluntary. You may refuse to participate in the study and it will in no way affect you ability to get health care or use the Medical Transportation Program. If you elect to participate, you can stop the interview at any time. The interview will take approximately 15 minutes. I would like to ask you a few questions about the Medical Transportation Program.

(**Scenario #3 for clients themselves)**

Hello, this is _____ calling from the Public Policy Research Institute at Texas A&M University. May I speak with _____? In cooperation with the Texas Department of Health we are conducting a survey of individuals enrolled in Texas Health Steps (THSteps), formerly known as EPSDT, or the Early Periodic Screening, Diagnosis and Treatment Program. This program is the Medicaid program for Texans under the age of 21. We are interested in your opinions about the Medical Transportation Program.

In order to determine the effectiveness of this program we are seeking information on the program from Texas Health Steps individuals up to the age of 21 about getting help from the Medicaid program with transportation to medical or dental appointments. You were randomly selected by the Texas Department of Health for this study. Please be assured that all responses are strictly confidential. Neither your name nor telephone number will be attached to the survey. Your participation is voluntary. You may refuse to participate in the study and it will in no way affect you ability to get health care or use the Medical Transportation Program. If you elect to participate, you can stop the interview at any time. The interview will take approximately 15 minutes. I would like to ask you a few questions about the Medical Transportation Program.

ASK OF ALL HOUSEHOLDS THE GENDER OF CLIENT (IF SPEAKING WITH PARENT OR GUARDIAN OF CLIENT) OR DETERMINE GENDER OF CLIENT FROM THEIR VOICE. GENDER SHOULD BE CAPTURED **BEFORE** ANY QUESTIONS THAT REQUIRE A GENDER ARE ASKED.

A1 First of all, how many children under 21 in your household have been enrolled in Texas Health Steps during the past year?
(record exact number)
(if only one child listed do not ask f6)

____ ____

None	97	(skip to A4)
Don't know	98	
Refused	99	(skip to A4)

A2 What [are/is] their [ages/age]?
(record exact ages in years, if less than one year old record as '0')

____ ____		____ ____
____ ____		____ ____
____ ____		____ ____
____ ____		____ ____
____ ____		____ ____
Don't know	98	
Refused	99	

For the remainder of the survey we are interested in the experiences [you have/child's name has] had with Texas Health Steps and the Medical Transportation Program .

A4 During the past year about how many times [have you/has child's name] gone to a dentist or doctor?
(record exact number)

____ ____ (IF NONE OR ZERO, THEN TERMINATE AS NOT QUALIFIED)

Don't know	998	
Refused	999	(skip to A4)

A5 Were any of these visits to a doctor or dentist for a checkup with EPSDT (Early, Periodic, Screening, Diagnosis and Treatment) or Texas Health Steps, the state's Medicaid program for children under the age of 21?

Yes	1	
No	2	(skip to next section)
Don't Know	8	(skip to next section)
Refused	9	(skip to next section)

A6 What was the total number of doctors and dentists visited for a checkup with EPSDT or Texas Health Steps during the past year? **(record exact number)**

____ ____

Don't know	98
Refused	99

I would like you to think about all transportation by people living in your household, not just for trips related to medical needs. We are interested in travel around your area, not long distance travel.

TB1 How do you usually get around?

Drive myself (DO NOT ASK TC1)	1
Ride with a family member (DO NOT ASK TC1)	2
Ride with a friend or neighbor (DO NOT ASK TC1)	3
I take the bus (SKIP TO TB3)	4
I call for a taxi (DO NOT ASK TT1)	5
I walk	6
Other: (specify)_____	7
Don't know	8
Refused	9

TB2 First, think about city or public buses, are buses available where you live?

Yes	1
No (SKIP TO TT1)	2
Don't Know	8

TB3 If you wanted to, could you take a bus to the following:

		Yes	No	DK	RF
A.	To where you work	1	2	8	9
B.	To your child's or children's school	1	2	8	9
C.	To pick up groceries	1	2	8	9
D.	To go to your child's or children's doctor	1	2	8	9
E.	To go to your child's or children's dentist	1	2	8	9

TB4 During the past year, about how often do people in your household use city or public busses for transportation? Would you say?

Most of the time	1
Frequently	2
Seldom	3
Never	4
Don't know	8

TB5 I'm going to read a list of reasons people have given for **not** taking the bus. As I read each phrase, please tell me if this is a reason that you don't take the bus?. (READ ITEM) Is that a reason or not? RANDOMIZE

		Yes	No	DK	RF
A.	I have a car now or have someone that can give me a ride	1	2	8	9
B.	The bus stop is too far from my home	1	2	8	9
C.	The bus does not go where I need it to go	1	2	8	9
D.	It is too expensive	1	2	8	9
E.	It is not comfortable	1	2	8	9
F.	I don't feel safe riding the bus	1	2	8	9
G.	I don't feel safe waiting at the bus stop	1	2	8	9
H.	The drivers are not courteous	1	2	8	9
I.	It is not comfortable	1	2	8	9
J.	The bus does not run on time	1	2	8	9
K.	The hours of operation are inconvenient	1	2	8	9
L.	Physically unable to take the bus	1	2	8	9

TB7 Think about the time it takes you to travel using the bus. Would you say trips usually take

A very long time	1
A long time	2
A short time	3
A very short time	4
Don't know	8

TB8 Do you think the bus can be counted on to get you where you need to go on time.

All of the time	1
Most of the time	2
Seldom	3
Almost never	4
Don't know	8

TT1 Next, think about taxis, are taxis available where you live?

Yes	1
No (SKIP TO TC1)	2
Don't Know	8

TT2 During the past year, about how often do people in your household use a taxi? Would you say?

Most of the time	1
Frequently	2
Seldom	3
Never	4
Don't know	8

TT3 I'm going to read a list of reasons people have given for **not** taking a taxi. As I read each phrase, please tell me if this is a reason that you don't take the bus?. (READ ITEM) Is that a reason or not? RANDOMIZE

		Yes	No	DK	RF
A	I have a car now or have someone that can give me a ride	1	2	8	9
B	It is too expensive	1	2	8	9
C	It is not comfortable	1	2	8	9
D	I don't feel safe riding in a taxi	1	2	8	9
E	The drivers are not courteous	1	2	8	9
F	It is not comfortable	1	2	8	9
G	The taxis are never on time	1	2	8	9
H	The hours of operation are inconvenient	1	2	8	9
I	Physically unable to take a taxi	1	2	8	9

TT4 Think about the time it takes you to travel using the bus. Would you say trips usually take

A very long time	1
A long time	2
A short time	3
A very short time	4
Don't know	8

TC1 Next, think about a personal care, does someone in your household own a car or can you borrow one or get rides from someone else?

Yes	1
No (SKIP TO NEXT SECTION)	2
Don't Know	8

TC2 During the past year, about how often did people in your household use a personal car? Would you say?

Most of the time	1
Frequently	2
Seldom	3
Never	4
Don't know	8

TC3 I'm going to read a list of reasons people have given for making it difficult to own a personal car. As I read each phrase, please tell me if this is a reason that makes it difficult to own a car?. (READ ITEM) Is that a reason or not?
RANDOMIZE

		Yes	No	DK	RF
A.	Don't have a driver's license	1	2	8	9
B.	Denied or had your car insurance canceled	1	2	8	9
C.	Car insurance is expensive	1	2	8	9
D.	Gasoline is expensive	1	2	8	9
E.	Maintenance is expensive	1	2	8	9
F.	Car is unreliable	1	2	8	9
G.	Cannot afford a car payment	1	2	8	9
H.	Other: (Specify)	1	2	8	9

TC4 How comfortable is taking a personal car?

Very comfortable	1
Comfortable	2
Somewhat uncomfortable	3
Very uncomfortable	4
Don't know	8

TC5 Do you think a personal car can be counted on to get you where you need to go on time.

Most of the time	1
Frequently	2
Seldom	3
Never	4
Don't know	8

Now I am going to read you a list of possible reasons which may make it difficult for [you/child's name] to get medical or dental services at the doctor or dentist.

B7 Would you say that the lack of money for gasoline to get [child's name] to the doctor or dentist makes it very difficult, difficult, easy, or very easy for [you/him or her] to get medical or dental services at the doctor or dentist?

Very difficult	1
Difficult	2
Easy	3
Very Easy	4
Not Applicable	5
Don't know	8
Refused	9

B8 What about other expenses, such as parking, while going to the doctor or dentist? **(repeat choices if necessary)**

Very difficult	1
Difficult	2
Easy	3
Very Easy	4
Not Applicable	5
Don't know	8
Refused	9

B9 What about having to wait too long in the doctor's or dentist's office?
(repeat choices if necessary)

Very difficult	1
Difficult	2
Easy	3
Very Easy	4
Not Applicable	5
Don't know	8
Refused	9

B4 Would you say that finding transportation to the doctor or dentist is very difficult,
difficult, easy or very easy?
(repeat choices if necessary)

Very difficult	1
Difficult	2
Easy	3
Very Easy	4
Not Applicable	5
Don't know	8
Refused	9

B1a Do you, or someone in your immediate household own an automobile that you can regularly use to travel to doctor's appointments?

Yes	1 (Skip to B11)
No	2
Easy	3
Don't know	8
Refused	9

B1b Can you or someone in your household easily borrow a car for going places like a doctor's appointment?

Yes	1
No	2
Easy	3

Don't know	8
Refused	9

B1c Are you regularly able to get a friend or relative to take you to doctor's appointments?

Yes	1
No	2
Easy	3
Don't know	8
Refused	9

B11 Are there any other reasons which make it difficult for [you/child's name] to receive health care services at your doctor or dentist?

Please Specify: _____

B13 During the past year how often [have you/has child's name] missed appointments with the doctor or dentist because of problems with transportation. Would you say often, sometimes or never?

Often	1
Sometimes	2
Never	3 (Skip to C1)
Don't know	8 (Skip to C1)
Refused	9 (Skip to C1)

C1 Next, I would like to ask you if any of the following services from the Medicaid Medical Transportation Program are available to help [you/child's name] get to the doctor or dentist. Does the Medicaid Medical Transportation Program provide free bus passes or tokens?

Yes	1
No	2 (Skip to C1a)
Don't know	8 (Skip to C1a)
Refused	9 (Skip to C1a)

C2 During the past year how often [have you/have you and child's name] used bus passes or tokens to see the doctor or dentist. Would you say often, sometimes or never?

Often	1
Sometimes	2
Never	3
Don't know	8
Refused	9

C1a From your house, how easy is it to get to a city bus stop that can take you to your regular Medicaid doctor or dentist's office?

Very easy	1
Somewhat easy	2
Not very easy	3
Not easy at all	4
Don't know	8
Refused	9

C1b When you get off the bus, how easy is it to get to [your/you children's] regular Medicaid doctor or dentist's office?

Very easy	1
Somewhat easy	2
Not very easy	3
Not easy at all	4
Don't know	8
Refused	9

C1c How long does it take to get to appointments with [your/your children's] Medicaid doctor or dentist if you have to travel by city bus?

Hours	___
Minutes	___

C3 Are taxis or cabs paid for in order for [you/child's name] to see the doctor or dentist?

Yes	1
No	2 (Skip to C4a
Don't know	8 (Skip to C4a)
Refused	9 (Skip to C4a)

C4 During the past year how often [have you/have you and child's name] used taxis or cabs to see the doctor or dentist. Would you say often, sometimes or never?

Often	1
Sometimes	2
Never	3
Don't know	8
Refused	9

C4a How easy is it to get to [your/you children's] regular Medicaid doctor's office or dentist's office using taxis or cabs?

Very easy	1
Somewhat easy	2
Not very easy	3
Not easy at all	4
Don't know	8
Refused	9

C5 Are vans available to take [you/child's name] to see the doctor or dentist?

Yes	1
No	2 (Skip to C7)
Don't know	8 (Skip to C7)
Refused	9 (Skip to C7)

C6 During the past year how often [have you/have you and child's name] used vans to see the doctor or dentist. Would you say often, sometimes or never?

Often	1
Sometimes	2
Never	3 (Skip to C7)
Don't know	8 (Skip to C7)
Refused	9 (Skip to C7)

C6a How easy is it to get to [your/you children's] regular Medicaid doctor's office or dentist's office using vans?

Very easy	1
Somewhat easy	2
Not very easy	3
Not easy at all	4
Don't know	8
Refused	9

C7 Is payment for the gasoline costs for the number of miles traveled to and from the doctor or dentist available for [you/child's name]?

Yes	1
No	2 (Skip to C9)
Don't know	8 (Skip to C9)
Refused	9 (Skip to C9)

C8 During the past year how often [have you/have you and child's name] been paid for the number of miles traveled to and from the doctor or dentist. Would you say often, sometimes or never?

Often	1
Sometimes	2
Never	3 (Skip to C7)
Don't know	8 (Skip to C7)
Refused	9 (Skip to C7)

C9 Are air fare, food and/or lodging available for [you/child's name] to get necessary health or dental care if they are long distances from your home?

Yes	1
No	2 (Skip to Next Section)
Don't know	8 (Skip to Next Section)
Refused	9 (Skip to Next Section)

C10 During the past year how often [have you/have you and child's name] used air fare, food and/or lodging to get necessary health or dental care long distances from your home? Would you say often, sometimes or never?

Often	1
Sometimes	2
Never	3
Don't know	8
Refused	9

Skip situations after C SECTION is asked.

3 Situations:

Situation 1. None of the services are available (that is : c1, c3, c5, c7, and c9 are ALL "NO", " DON'T KNOW", or "REFUSE").

These are asked D1 – D9, E1 – E5, F1 – F9A, G7, H1 – H6, and I4. These are "not available or unaware of availability" non-users.

Situation 2. Any or all of the services are available (that is: any or all of C1, C3, C5, C7, or C9 is/are "YES") and this/these available service(s) is(are) never used (that is: C2, C4, C6, C8, and C10 are: not asked, "NEVER", "DON'T KNOW", OR "REFUSE").

These are asked D2 – D9, E1 – E5, F1 – F9A, G7, H1 – H6, I4. These are "available but never used" non-users.

Situation 3. Any or all of the services are available (that is: any or all of C1, C3, C5, C7, or C9 is/are "YES") and any or all of these services are used (that is: any or all of C2, C4, C6, C8, or C10 are "OFTEN", OR "SOMETIMES").

These are asked all questions but D1. These are users.

We just talked about bus tokens or passes, cab or taxi payments, vans, mileage payment, air fare, food and lodging. All of these things are provided by the Medical Transportation Program.

D1 Have you heard about the Medical Transportation Program prior to this survey?

Yes	1
No	2 (Thank them and terminate)
Don't know	8 (Thank them and terminate)
Refused	9 (Thank them and terminate)

I am going to ask you about a variety of sources from which you may have heard about the Medical Transportation Program. Did you learn about it from:

		Yes	No	DK	RF
D2	A friend, relative or neighbor?	1	2	8	9
D3	[Your/child's name] doctor or dentist?	1	2	8	9
D4	A pamphlet or brochure?	1	2	8	9
D5	Through radio or television?	1	2	8	9
D6	An (EPSDT) or Texas Health Steps worker?	1	2	8	9
D7	The public health department?	1	2	8	9
D8	The Department of Human Services, which includes AFDC, Medicaid and Food Stamps?	1	2	8	9
D9	Did [you/child's name] learn about the Medical Transportation Program from any other sources? Please specify _____	1	2	8	9

Now I would like to read a list of possible ways that the doctor or dentist may help their patients who are having difficulty with getting transportation to their office. Please tell me if the doctor or dentist office has helped [you/child's name] contact the Medical Transportation Program in any of the following ways.

		Yes	No	DK	RF
E1	Did the doctor or dentist office give [you/child's name] the telephone numbers for the transportation service?	1	2	8	9
E2	Did the doctor or dentist office have an outreach person, social worker or case manager who helped [you/child's name]?	1	2	8	9
E3	Did the doctor or dentist office contact the transportation service for [you/child's name]?	1	2	8	9
E4	Are there any other ways that the doctor or dentist office assisted [you/child's name] in getting transportation services? Please specify: _____	1	2	8	9

There may be occasions when [you do/child's name does] not use the Medical Transportation Program. Please tell me if any of the following are reasons why [you have/child's name has] not used the Medical Transportation Program.
(rotate f1-f9)

		Yes	No	DK	RF
F1	[You/child's name] used other ways to get to the doctor or dentist office.	1	2	8	9
F2	The Medical Transportation Program is too difficult to use.	1	2	8	9
F3	[You have/child's name has] to wait too long to schedule transportation.	1	2	8	9
F4	[You do/child's name does] not trust the Medical Transportation Program.	1	2	8	9
F5	The Medical Transportation Program is available only for sick people, not for regular checkups.	1	2	8	9
F6	You cannot take all of your children with you. **(do not ask f6 if a1=1)**	1	2	8	9
F7	Medical Transportation Program staff or drivers are disrespectful.	1	2	8	9
F8	The Medical Transportation Program is not consistently on time.	1	2	8	9
F9	The 1-800 number does not work well.	1	2	8	9
F9a	Are there any other reasons why [you have/child's name has] not used the Medical Transportation Program? Please specify _____	1	2	8	9

G1 How easy or difficult is it for [you/child's name] to use Medical Transportation Program services? Would you say very easy, somewhat easy, somewhat difficult or very difficult?

Very easy	1
Somewhat easy	2
Somewhat difficult	3
Very difficult	4
Don't know	8
Refused	9

G2 How often do you have to reschedule [your/child's name] appointments with the doctor or dentist so that you can use Medical Transportation Program services? Would you say always, most of the time, sometimes, seldom or never?

Always	1
Most of the Time	2
Sometimes	3
Seldom	4
Never	5
Don't Know	8
Refused	9

G3 How often did [you/child's name] not receive medical or dental services because [you were/child's name was] late for scheduled appointments due to Medical Transportation Program delays or transportation not showing up? Would you say often, sometimes or never?

Often	1
Sometimes	2
Never	3
Don't Know	8
Refused	9

G4 How often [do you/does child's name] have to wait a long time before an appointment is scheduled to start due to having used Medical Transportation Program services? Would you say always, most of the time, sometimes, seldom or never?

Always	1
Most of the Time	2
Sometimes	3
Seldom	4
Never	5
Don't Know	8
Refused	9

G5 How often [do you/does child's name] have to wait a long time after an appointment with the doctor or dentist while waiting to be picked up by the
Medical Transportation Program? Would you say always, most of the time, sometimes, seldom or never?

Always	1
Most of the Time	2
Sometimes	3
Seldom	4
Never	5
Don't Know	8
Refused	9

G6 How much advance notice [do you/do you and child's name] have to give to the Medical Transportation Program in order to schedule transportation services?
(record verbatim)

_____

G6a [Are you/Is child's name] able to use Medical Transportation Program services for late afternoon or after school doctor or dentist appointments during the week?

Yes	1
No	2
Not applicable	3
Don't know	8
Refused	9

G7 Does your doctor or dentist have weekend and/or evening hours?

Yes	1
No	2 (Skip to H1)
Don't know	8 (Skip to H1)
Refused	9 (Skip to H1)

G8 [Are you/Is child's name] able to use Medical Transportation Program services for these hours?

Yes	1
No	2 (Skip to H1)
Don't know	8 (Skip to H1)
Refused	9 (Skip to H1)

H1 Now think about all the times that [you have/child's name has] gone to the doctor or dentist during the past year. On average, about how many miles [do you/do you and child's name] have to travel one way?
(record number of miles)

____ ____

Don't know	998	(skip to H3)
Refused	999	(skip to H3)

H2 What is the farthest [you have/you and child's name have] had to travel one way to go to the doctor or dentist?
(record number of miles)

____ ____
Don't know 998
Refused 999

H3 On average, how long does it take [you/you and child's name] to travel one way to the doctor or dentist?
(record number of hours and number of minutes)

____ (number of hours)
____ (number of minutes)
Don't know 998 (skip to H6)
Refused 999 (skip to H6)

H4 During the past year, what is the longest time it has taken [you/you and child's name] to travel one way to the doctor or dentist?
(record number of hours and number of minutes)

____ (number of hours)
____ (number of minutes)
Don't know 998
Refused 999

H5 What is the **one main** form of transportation that [you/you and child's name] used most often to go to the **doctor** during the past year? Would you say bus, van, car, taxi, other or did you mainly walk?

Bus	1
Van	2
Car	3
Taxi	4
Other (Specify) _____	5
Walk	6
Don't know	8
Refused	9

H6 What is the **one main** form of transportation that [you/you and child's name] used most often to go to the **dentist** during the past year? Would you say bus, van, car, taxi, other or did you mainly walk?

Bus	1
Van	2
Car	3
Taxi	4
Other (Specify) _____	5
Walk	6
Don't know	8
Refused	9

I1 Would you say the Medical Transportation Service staff or drivers [you/you and child's name encounter] are very courteous, somewhat courteous, not very courteous, or not courteous at all?

Very courteous	1
Somewhat courteous	2
Not very courteous	3
Not courteous at all	4
Not applicable	5
Don't know	8
Refused	9

I2 I would like to ask you about [your/you and child's name] level of satisfaction with the Medical Transportation Program services [you have/child's name has] received. [Are you/Are you and child's name] very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied or very dissatisfied?

Very satisfied	1 (Skip to I4)
Somewhat satisfied	2 (Skip to I4)
Neither satisfied nor dissatisfied	3 (Skip to I4)
Somewhat dissatisfied	4
Very dissatisfied	5
Don't know	8 (Skip to I4)
Refused	9 (Skip to I4)

I3 Why?
(record verbatim)

_____

I4 Can you think of any ways to make the Medical Transportation Program better?
(record verbatim)

_____

I5 Finally, generally speaking, would you say that finding transportation for you is:

Very difficult	1
Difficult	2
Easy	3
Very easy	4
Not applicable	5
Don't know	8
Refused	9

I6 What best describes your racial/ethnic background? Would you say White, Black, Hispanic, American Indian, Alaskan Native, Asian, Pacific Islander, or other?

White	1
Black	2
Hispanic	3
American Indian/Alaskan Native	4
Asian/Pacific Islander	5
Other (Specify)_____	6
Don't Know	8
Refused	9

That completes the survey. Thanks for your cooperation!

REASONS FOR SURVEY

Interviewers,

Listed below are commonly asked questions by respondents and suggested answers to these questions. This sheet will be in your interviewing station.

Q: How did you get my telephone number?

A: It was provided by the Texas Department of Health as randomly selected Texas

Health Steps-enrolled individuals.

Q: What is the purpose of this survey?

A: The Texas Department of Health would like to get the opinions of parents and guardians regarding the Medical Transportation Program for children under the age of 21 participating in Texas Health Steps (THSteps) Program, formerly known as the Early Periodic Screening, Diagnosis and Treatment Program (EPSDT).

Q: I am not sure if I want to talk about any of these issues.

A: Please be assured that all of your responses are completely anonymous and strictly confidential. Your name will not be attached to the survey findings. Only aggregate data on 5,100 will be returned to the Texas Department of Health at the conclusion of the study.

If the respondent has any other questions or would like to speak with someone, they can call Dr. Craig Blakely, Dr. James Dyer or Steve Borders of the Public Policy Research Institute at (979) 845-8800 or David Autry of the Texas Department of Health at (512) 458-7729.

VITA

Name:	Stephen Boyce Borders
Address:	Grand Valley State University, School of Public and Nonprofit Administration, 401 W Fulton St., Grand Rapids, MI 49503
Email Address:	borderss@gvsu.edu
Education:	B.A., Psychology, The University of North Carolina at Chapel Hill, 1991 M.S.H.P., Healthcare Administration, Southwest Texas State University, 1996 Ph.D., Urban and Regional Science, Texas A&M University, 2006