

**Does Cost-sharing in Medicaid Influence Unmet Health Care Need?**

by

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CERTIFICATE OF APPROVAL

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## **ABSTRACT**

### **Background**

Unmet health care need is a poorly understood topic in health care policy, and there has been little research on its contributors. The potential impact of unmet health care need on the population can be significant, and previous studies suggest that unmet health care needs may be influenced by medical debt, insurance type and lack of insurance, an individual's health and socio-demographic characteristics. Cost-sharing as a strategy for cost-containment by insurance providers may contribute to unmet health care need. Cost-sharing was introduced to the Oregon Health Plan in 2003 as a potential cost-containment strategy.

### **Objective**

To assess the impact of cost-sharing policy changes in the Oregon Health Plan on perceived unmet health care need among adults enrolled in the Oregon Health Plan.

### **Study Design**

This study is a secondary analysis using data from the 2003 Oregon Health Care Study, a prospective cohort study of adult Medicaid enrollees in the Oregon Health Plan. Individuals were surveyed about a number of personal characteristics, and 2,200 answered the survey, specifically answering the research question of interest, "does the introduction of cost-sharing explain why Medicaid-eligible Oregonians had a perceived health care need unmet in the six months following policy changes to the Oregon Health Plan?" Data were analyzed using both descriptive analyses and logistic regression.

### **Findings**

2,574 individuals were included in the descriptive analysis and the group was fairly evenly divided between OHP Plus (47%) and OHP Standard (53%). Interestingly, 869 (34%) had unmet health care needs, while the remainder did not. Of those with unmet health care need, there was disparity between members of OHP Plus (24%) and OHP Standard (42%) having unmet need. Among those with financial strain, 48% had unmet need, however, among those with medical debt greater than \$500, 52% reported unmet health care need. Multivariable logit model of unmet health care need found nine statistically significant variables, including financial strain, medical debt greater than \$500, original OHP group, education, depression, age, income as a percent of FPL, living arrangement, and clinic visits.

### **Conclusions**

Secondary analysis of individuals in the Oregon Health Plan after policy program changes occurred in 2003 found that unmet health care need is prevalent among the population, and that cost-sharing and underlying financial factors are directly related to self-reported unmet health care need. The findings suggest a need for further research in the area of unmet health care need. Policy makers in the state of Oregon should carefully consider the impacts of policy changes to the vulnerable population of Medicaid-eligible.

## **OBJECTIVES**

### ***Research Question***

Does the introduction of cost-sharing explain why Medicaid-eligible Oregonians had a perceived health care need unmet in the six months following policy changes to the Oregon Health Plan?

### ***Specific Aims***

Aim 1: Describe the population of Oregonians surveyed in the Oregon Health Care survey with regard to receiving needed health care.

- Characterize those individuals with a perceived unmet health care need (i.e. responded “yes” to the question “Was there a time in the past six months that you were unable to receive needed health care?”).
- Describe the individuals without a perceived unmet health care need (i.e. responded “no” to the same question).
- Compare the two groups with regard to covariates and potential confounding variables, in this dataset, to describe other influences of a perceived unmet health need.
- Seek covariates and confounding variables in four domains: socio-demographics, finances, health care utilization, and health.

Aim 2: Explain an individual’s unmet healthcare need in Oregon in relation to cost-sharing implementation in the Oregon Health Plan.

- Create a multivariate model, while controlling for covariates and confounders, which best explains unmet need in the Oregon Health Care survey taken in 2003.
- Create a policy statement regarding the impact of policy changes to the Oregon Health Plan in 2003 on the health of Medicaid-eligible Oregonians.

## INTRODUCTION

In the United States, unmet health care need is poorly understood. Public health researchers have seldom commented on what it means to have unmet health care needs, or translated those unmet needs into financial or other costs associated with morbidity and/or mortality. Hypothesizing that unmet needs will lead to increased use of expensive health care compared to preventive and primary care services, one could argue that these unmet needs may lead to an overall sicker population and a population in greater medical debt due to expensive services. This paper will explore how cost-sharing impacts unmet need among Medicaid-eligible Oregonians, using data from the Oregon Health Care Survey. This analysis will inform public policy decisions related to, and public awareness of, the problem of unmet healthcare need in Oregon, and the impact of cost-sharing on unmet need. More specifically, unmet need will be evaluated in the context of significant program changes to the Oregon Health Plan in 2003.

This paper is organized into five sections. The first section provides the background and foundation for the analysis through a review and synthesis of the relevant literature. This review highlights the problem of unmet health care need, the lack of specific research examining causes of unmet need, and the public health significance of the problem. Section One also reviews cost-sharing, how it has been used, and criticisms of the cost containment strategy. Finally, Section One touches on the covariates and potential confounders of unmet health care need. In Section Two, a methodological approach is developed in order to demonstrate how cost-sharing impacts unmet need among Medicaid-eligible Oregonians. This section includes a model building and statistical analytical strategy. Section Three presents the results of the

analysis, and Section Four discusses the strengths, limitations, and implications of the analysis. Finally, Section Five discusses the policy recommendations from the study findings, including suggestions for utilizing the model results in public health policy formulation and analysis, and concludes with a policy statement.

## **BACKGROUND**

### Unmet Health Care Need in the United States

In the United States, unmet health care need may be a reflection of decreased access to medical care. National estimates of unmet health care need show that unmet health care need varies between 16 and 25% of the population (1; 2). Access (to health care) was defined in medical literature in 1981, and was presented as a general concept that summarizes a set of more specific dimensions describing the fit between the patient and the health care system. Those specific dimensions are availability, accessibility, accommodation, affordability and acceptability (3). When discussing health care access, consideration of all five of these dimensions is necessary for completeness.

Access to health care has also been defined as the ability to obtain needed medical care (4). This definition likely represents the way the lay public employs the phrase "access to care". In 2005, the uninsured numbered 50 million with the vast majority (49.8 million) of those individuals under age sixty-five (5). Without continuous health care coverage, most individuals have extremely limited access to basic health care services. Basic health care services might include the availability of a medical safety net, the affordability of insurance, the accommodation of clinics or hospitals to provide care with a modified payment plan, the acceptability of Emergency Departments providing basic care, and the accessibility of transportation, child care and/or educational resources. Lastly, appropriate access to health care is defined by the Institute of Medicine's Committee on Monitoring Access to Personal Health Care Services as "the timely use of personal health services to achieve the best possible health outcome"(6).

### Public Health Significance of Unmet Health Care Need

Unmet health care need is plagued by a deficit of information regarding why individuals have unmet need. There are only a handful of studies that have evaluated unmet need specifically, and changing those factors influencing unmet health care need essentially relies on further research. Despite current limited knowledge of the causes of unmet health care need, there is general consensus about the public health impacts of the problem. It is hypothesized that individuals who have unmet health care needs will suffer increased morbidity and may require and use more expensive methods to ultimately receive care (7).

Limited access to health care can be detrimental to the health of both the individual and the population. Decreased access to health care leads to poorer health outcomes. Previous studies have demonstrated that the uninsured get less care, get care later, and often suffer adverse consequences because of delayed or forgone care (8). Higher hospitalization rates for chronic illnesses, including diabetes, hypertension, asthma, chronic obstructive pulmonary disease and congestive heart failure have been associated with decreased access to ambulatory care (9). Conversely, regular primary care results in higher health outcomes, including decreased morbidity and mortality (10, 11). A 1997 study by Schoen et al showed that 22% of uninsured individuals surveyed needed care in the past year but did not receive it compared to 14% of those insured with Medicaid and 7% of those privately insured (12).

### Previous Studies of Contributors to Unmet Health Care Need

Studying unmet health care need is inherently subjective because investigations consider individual perceptions of need. Ayanian et al encountered these challenges

when trying to address the issue of unmet need by comparing uninsured and insured adults' access to physicians using nationally representative survey data (Behavioral Risk Factor Surveillance System). Their findings suggested that uninsured individuals were more likely to report being unable to see a physician when needed due to the cost, and this was most likely in those of poor or fair health. Significantly, 86% of their survey sample was insured, compared to a national average of about 85%, suggesting their findings are applicable to Americans in general (7). However, that study did not look specifically at other important factors that may have led to the unmet need such as health care utilization, specific chronic illnesses, and specific financial barriers to receiving health care.

A second large study published in 2004 assessed the prevalence of unmet need in patients receiving primary care through the Los Angeles County Department of Health Services and found that out of 2500 participants interviewed, 33% reported they had delayed seeking medical care in the preceding twelve months. That study found significantly higher rates for delayed care among females, US-born individuals, employed patients, and those with poor health status and found there was no significant difference in rates of delayed care for people who had or had not made three or more visits to a physician during the preceding year. Twenty-five percent of patients indicated that they had gone without needed medical care because they had to spend their money for food, shelter, or clothing. Further analyses showed females, immigrants, and uninsured patients had higher rates of unmet need for health care. Additionally, patients who reported poor health status had higher rates of unmet need for health care than did patients reporting better health status. After adjustment for socio-demographic and other

patient characteristics in multivariate analyses, uninsured patients were more likely than individuals with any type of coverage for medical care to have unmet needs for health care due to competing priorities (i.e. having to pay for food, shelter, or clothing) (1).

The 1994 Access to Care Survey, sponsored by the Robert Wood Johnson Foundation, surveyed 3450 individuals via telephone interviews to further understand Americans' perceptions about whether or not they received all of the [health] care they needed. The study found that approximately 16% of Americans were unable to obtain at least one service they felt they needed; dental care was the most unmet need with 8.5% of the sample responding they were unable to receive dental care. Basic medical or surgical care was an unmet need for about 6% of the sample. The study also found that women were more likely than men to have unmet need, African-Americans more likely than Caucasians to have unmet need, and those with fair or poor health more likely than those with good or excellent health to have unmet need. The study also showed that the uninsured were more likely than the insured to have unmet need and the poor were more likely than the middle-income and affluent to have unmet need. That study was important because it included services other than basic medical/surgical when assessing for health care need; some of those other services included dental care, counseling, mental health services, prescription drugs, and eyeglasses (2).

#### Cost-Sharing in Theory and Practice

Cost-sharing is one of many cost-containment strategies insurance providers utilize to offset the growing cost of medical care by placing some of the costs of care upon the insured. Publicly funded insurance programs, such as Medicare and Medicaid, have historically prohibited or limited premiums and cost-sharing because those

programs serve a low-income population with very limited resources. This is contrasted to private insurance, where cost-sharing and premiums are the norm (13).

One of the major recent policy changes that occurred in Medicaid is the implementation of cost-sharing policies, which adds a new, additional financial burden to the Medicaid-eligible population. Some of the cost-sharing strategies include co-pays, premiums, lock-outs, and other cost-sharing options. These cost-sharing changes can lead to decreased access to health care and unmet need because of the increased financial burden to the individual. Individuals and families with very basic medical coverage often forego regular visits to health care providers because of the associated costs, including the costs of prescriptions, co-pays, and the cost of transportation (4).

#### Previous Studies of the Impact of Cost-Sharing

Individuals who receive public health insurance (e.g. Medicaid) often live with extremely limited resources of income and assets. Previous research has shown that cost-sharing in public health insurance can affect participation in the system, and additionally, can affect access to and use of health care (14). This population affected by cost-sharing changes is made up of individuals with low income who are likely to be adversely affected by even modest cost-sharing (15).

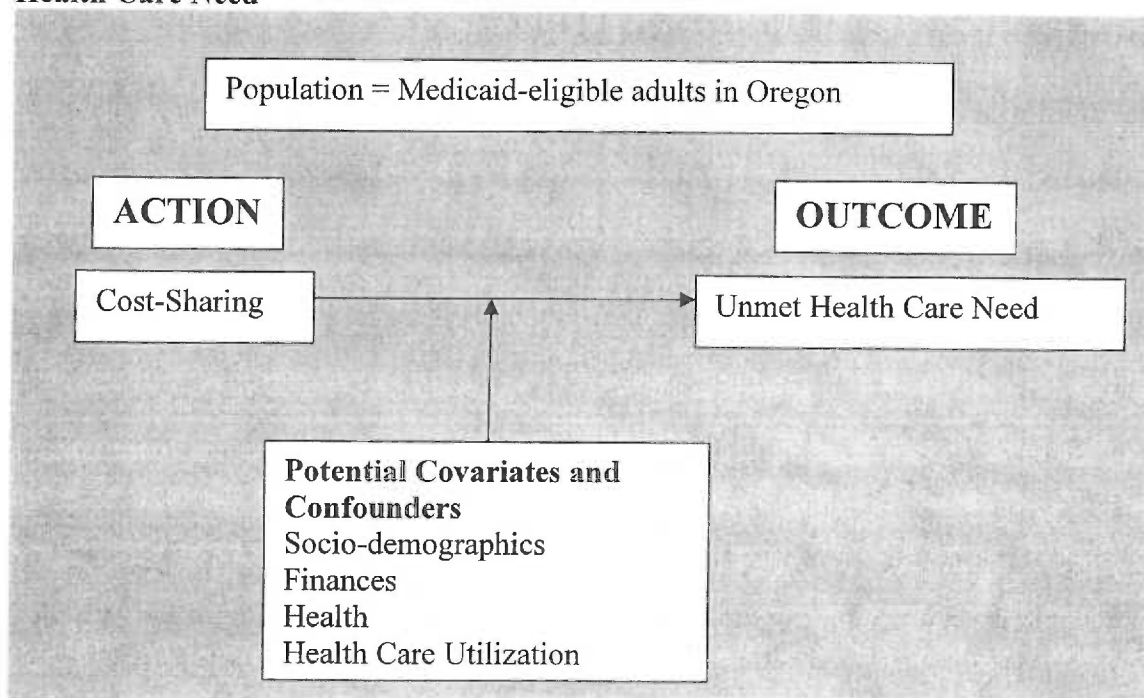
In Oregon, the cost-sharing that was added to the Oregon Health Plan in 2003, resulted in a 40% decreased enrollment in OHP Standard, the subgroup of the OHP that was newly subjected to cost-sharing changes (16). Those same cost-sharing policies also decreased access for those individuals who remained in the OHP (17). According to one recent study, there was a drop in enrollment of 46% during the year after cost-sharing changes were made to the OHP, specifically related to cost-sharing in the very poor. The

same study showed that of the individuals who left OHP because of cost-sharing, many did not find insurance elsewhere and remained uninsured (17).

### Theoretical Model of Relationship between Cost-Sharing and Unmet Health Care Need

After reviewing available literature on unmet health care need, the impact of cost-sharing on unmet need appears a worthy research topic. In order to study the topic of cost-sharing and unmet health care need, covariates and potential confounding variables must also be evaluated in order to understand their impact on this research topic. Those covariates/potential confounders can be categorized into four domains, including: socio-demographics, finances, health care utilization, and health. These domains build upon the previous literature by lumping together the variables already evaluated (or theorized) in relation to unmet health care need. Each domain of covariate/confounding variable also includes other often studied variables that might potentially explain unmet need.

**FIGURE 1: Schematic of Theoretical Pathway between Cost-Sharing and Unmet Health Care Need**



## Covariates and Potential Confounders of Relationship between Cost-Sharing and Unmet Health Care Need

### *Socio-demographics*

The United States is economically, ethnically and geographically diverse. These socio-demographic factors describe the population and how it might access basic services such as housing and healthcare. The socio-demographic character of the U.S. population is one potential piece that may help describe unmet health care need.

In the US, the estimated population in 2005 was 296 million people. Oregon has a population of 3,421,399 residents living on 98,386 square miles. The racial and ethnic make-up of Oregon is slightly different than that of the United States; most notably, Oregon is 90.8% Caucasian compared to 80.2% nationally and Oregon is home to 1.8% African-Americans compared to 12.8% in the United States. Other racial and ethnic breakdowns are similar between the United States and Oregon (18, 19).

Education data show that the 80.4% of the U.S. population attained a high school diploma (or its equivalent), and 24.4% of the U.S. population holds a bachelor's degree or higher. Oregonians are slightly more educated than the average U.S. citizen, with 85.1% of residents having at least a high school diploma (or its equivalent), while 25.1% have a bachelor's degree or higher (18).

### *Finances*

Unpaid medical bills and medical debt can adversely affect access to health care. Recent data showed that two-thirds of people with a self-defined medical bill or debt problem went without needed care because of cost, nearly three times the rate of those without these financial problems (20). In the United States in the year 2003, 12.5% of

people lived at or below the Federal Poverty line (the average poverty threshold in 2000 was \$17,603 per year for a family of four) (18; 21). In the same time period, 12.0% of Oregonians lived at or below the Federal Poverty limit (18).

According to the Medical Expenditure Panel Survey (MEPS) data collected in 1996, Americans spent an average of \$427 per-person, out-of-pocket annually on personal health care services. The mean out-of-pocket spending among users of health services increased for each additional chronic condition present; for example, the mean out-of-pocket spending was \$249 (in 1996 dollars) for persons without a chronic condition compared to \$1134 out-of-pocket costs for persons with three or more chronic conditions (22).

Americans are also deeply affected by debt. Consumer debt is a problem in the United States, and many Americans also experience medical debt. Medical debt includes owing money to doctors, laboratories and hospitals, as well as debt for services and products purchased with credit, such as medical supplies and pharmaceuticals. In 2001, 1.5 million American families filed for bankruptcy, and estimates indicate that 40-50% of all bankruptcies filed cite medical debt as one of the contributing factors (23). In 2003, the Commonwealth Fund Biennial Health Insurance Survey revealed that 77 million Americans have difficulty paying medical bills, have accrued medical debt, or both (15). Recent findings showed that in December 2001, more than half (58%) of all bankruptcy filings in the Central District of Illinois involved medical debt, and other estimates from bankruptcy attorneys estimate between 20-30% of all bankruptcy cases are related to a medical issue (24).

Financial debt and lack of insurance are particularly detrimental when they occur together. According to a recent study by The Commonwealth Fund, half of currently and recently uninsured adults have had problems paying their medical bills, with more than one third being contacted by a collection agency in the past year. Twenty-five percent of those uninsured in the study also had significant changes in their lives due to medical bills, including: 66% borrowed money from a friend or family member, 70% used most or all of their savings to pay off medical bills, and 50% had problems paying for basic necessities like food and rent (25).

### *Insurance*

In the United States, lack of health insurance is a barrier to health services and can result in unmet health care need (7). In 2005, the most recent data show that the uninsured in the U.S. numbered 50 million (5). In 2001 The Commonwealth Fund found that half of adults who were uninsured reported experiencing a time they went without needed medical care due to costs (25). Americans without insurance are less likely to have their children immunized, seek early prenatal care, obtain annual blood pressure checks, or see a physician (especially those in fair or poor health) (26). The uninsured are also much less likely than the insured, regardless of health status, to have any physician visit within the previous twelve months (26). Numerous studies have shown that the uninsured, especially those with low incomes, have higher unmet health care needs and poorer health than the insured (27; 28; 12; 29).

In 2006, 15.6% of Oregonians (approximately 575,719 individuals) were uninsured, and another 258,000 Oregonians experienced a gap in their health care

coverage during the year (30). These numbers have varied greatly over the past decade; however, they are now similar to the numbers of uninsured across the United States (16).

### *Health Care Utilization*

Ambulatory medical care is the predominant method of providing health care services in the United States and occurs in a wide range of settings. The largest proportion of ambulatory care services occurs in physician offices, and approximately 10 percent of all ambulatory medical care visits in the United States occur in the Emergency Department (31). Difficulty using health care services such as physician offices and the Emergency Department due to barriers such as location, hours, and cost, may directly affect unmet health care need.

Health care utilization refers to how health care is used; in the United States, individuals use health care in order to treat disease, to prevent disease, to treat injury, to reduce pain or to obtain information about their general health. For most people in the United States, health care is obtained from a physician or health care provider in a clinic or hospital. According to the National Ambulatory Medical Care Survey (NAMCS) there were an estimated 910.9 million annual visits to physician's offices in the year 2004, with slightly more than one half (51.7%) being visits to a primary care provider (32).

However, Emergency Room visits account for a significant portion of health care utilization. In 2004, 110.2 million visits to the ER occurred, slightly decreased from the 113.9 million visits in 2003. Those ER visits were more likely to be made by people with Medicaid (80.3 per 100 persons with Medicaid) compared to those without insurance (44.6 per 100 persons with no insurance), and by both Medicaid recipients and the

uninsured compared to those with private insurance (20.3 per 100 persons with private insurance (31).

### *Health*

Individuals with chronic illnesses may under-use health care services, or have an unmet health care need, because they have a baseline increased need for health care above the need of the population that is healthy. Patients with chronic illnesses often have inadequate prescription drug coverage, and many cut back on medication use due to cost pressures (33). In 1996, an estimated 41% of the non-institutionalized U.S. population had one or more chronic conditions. Of those individuals with chronic conditions, 58% had only one condition, 24% had two conditions, and 18% had three or more conditions. Among the chronic conditions reported, the most prevalent include hypertension, diabetes, asthma, and upper respiratory infections, such as chronic bronchitis. Importantly, those data also showed that the prevalence of chronic conditions increased with increasing age, and that women were slightly more likely than men to have a chronic condition (22).

Higher hospitalization rates for asthma, diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), and hypertension (HTN) have been associated with less access to ambulatory care (9). It is hypothesized that better access to outpatient medical care would prevent hospitalizations for those diseases and those five chronic illnesses are considered markers of the quality of ambulatory care (34). One study showed that self-reported chronically ill<sup>a</sup> individuals tended to have more health conditions, use more physician care, and are less likely to be

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<sup>a</sup> Chronically ill defined as: any illness that lasted longer than three months or a condition always classified as chronic, such as diabetes, heart conditions, or a neoplasm (26)

privately insured when compared to acutely ill and well individuals, with well individuals more likely to be covered by health insurance. The combination of chronic illness and lack of insurance is a major barrier to receiving care, with the uninsured often not obtaining basic health care services (26).

One study assessing unmet need showed that severe, uncontrolled hypertension was found to be more common among patients who had no primary care physician (adjusted odds ratio, 3.5; 95% confidence interval, 1.6 to 7.7) and among those who did not comply with treatment for their hypertension (adjusted odds ratio, 1.9; 95% confidence interval, 1.4 to 2.5), even after controlling for insurance status (35).

#### Utility of a Theoretical Model

Understanding the unmet health care needs of individuals may help lawmakers and health care providers improve current access to health care, and more efficiently and comprehensively serve additional individuals. Specifically, in the State of Oregon, lawmakers and policy advisors could be better informed about how cost-sharing has impacted unmet need. If informed of the impact of cost-sharing, policy makers may ameliorate, via policy and programming, the effects of cost-sharing, and specifically, the effects of cost-sharing on unmet health care need. However, it is necessary to better understand how cost-sharing and other potential factors are related to unmet need.

#### Testing the Theoretical Model Among Oregon Health Plan Members

We can investigate unmet need in Oregon using members of the Oregon Health Plan. In 1994, the Oregon Health Plan (OHP) was implemented as an alternative and improvement to the traditional state-administered Medicaid program. In its original design and implementation, OHP added many uninsured people to the Medicaid program

and paid for this expansion by reducing the Medicaid benefit package; more people were covered, but for fewer services, in an attempt to provide basic health care to a larger number of Oregonians (36). The creation of OHP was successful in adding more than 100,000 Oregonians to Medicaid. Unfortunately, the inflated cost of health care and a severe economic downturn in Oregon forced the state legislature to control the rising costs of health care by dividing OHP into OHP Standard and OHP Plus (16). This new division of OHP in 2003 specified that OHP Plus serve the traditional Medicaid population, and created OHP Standard to serve the “expanded eligibility” population, those people for whom coverage had originally expanded in the initial form of the Oregon Health Plan. OHP Standard participants are offered fewer benefits than those in OHP Plus; additionally, OHP Standard members have the additional burden of cost-sharing, including co-pays, premiums, and administrative changes such as the elimination of previous premium exemptions for the homeless or individuals with no income or individuals experiencing domestic violence (17). These changes marked the first time OHP patients experienced cost-sharing. Since that time, many enrollees have left OHP and, of those individuals who left OHP, some remain underinsured or uninsured.

In the wake of policy changes to the OHP, cost-sharing became a significant aspect of the program. Furthermore, a study of the unmet health care need in OHP members is necessary to determine the impact of cost-sharing on unmet health care need in Medicaid-eligible individuals immediately following program changes to the Oregon Health Plan.

## **RESEARCH DESIGN AND METHODS**

### Study Design and Data Source

A secondary, cross-sectional analysis of unmet health care need among Oregon Health Plan (OHP) enrollees was conducted, using data from the Oregon Health Care (OHC) Study (data gathered 7/2003- 11/2005) by Bill Wright, PhD and Matt Carlson, PhD. The OHC Study was a prospective cohort study initiated to elucidate the impacts of cost-sharing on low-income participants in the OHP when the program was split into OHP Standard and OHP Plus in 2003. The OHC Study measured outcomes on insurance status, access, utilization, finances, and health outcomes for participating cohort members prospectively for three consecutive years.

I analyzed data to explore how cost-sharing relates to unmet health care need among Medicaid-eligible Oregonians under the OHP, while considering the impact of socio-demographic, financial, insurance, utilization, and health factors upon that relationship. The goal of this analysis was to create a parsimonious model from among the available variables that best explains unmet need among Medicaid-eligible Oregonians following policy changes to the OHP, using results of a multivariable logistic regression from Oregon Health Care Study data collected in 2003.

### Source Population

The OHC Study followed a cohort of Medicaid-eligible adults who were enrolled in the Oregon Health Plan (OHP) for at least thirty days prior to the initial wave of program changes (including division into the two programs, OHP Plus and OHP Standard, and the introduction of cost-sharing to OHP Standard) that occurred in

February 2003. The OHC Study selected a stratified random sample of 10,600 potential cohort members out of 416,618 members from Medicaid eligibility files, approximately divided evenly between adults in OHP Standard and OHP Plus. The 10,600 potential cohort members had a racial/ethnic breakdown of 62.6% Caucasian, 11.1% African American, 3.1% Asian or Pacific Islander, 10.3% Native American or Alaskan Native, and 12.9% Hispanic or Latino. Because the recruitment occurred after the program changes occurred, some of the originally targeted individuals (10,600) were deceased or moved out of Oregon when it was time to send the survey to the sample. After excluding those who had died, those moved out of state, and those without a valid current address, a cohort of 8260 (76%) people remained eligible for recruitment from the OHP roster. The cohort of 8260 was racially and ethnically similar to the targeted sample of 10,600: they were 62.8% Caucasian, 10.0% African-American, 3.5% Asian or Pacific Islander, 9.5% Native American or Alaskan Native, and 14.1% Hispanic or Latino. These 8260 people were sent an explanation of the cohort survey, a consent form, and a baseline survey (Wave 1) to return if they were willing to participate; 2783 (33.7%) participants returned the survey and joined the study panel.

**TABLE 1: Participation Rates for Wave 1 of OHC Study, by race/ethnicity**

OHP Group	Population	Eligible	Wave 1 Response
<b>Total Participants</b>	416,618	8,260	2,783
<b>Proportion of Participants by Race/Ethnicity</b>			
Caucasian	76.5%	62.8%	69.1%
African-American	4.7	10	8.1
Native American/Alaskan Native	2.3	9.5	9.3
Asian/Pacific Islander	2.9	3.5	2.1
Hispanic or Latino	12.5	14.1	11.4
Other	1.1	---	---

The enrolled cohort was surveyed each year for three consecutive years, using the identical survey questionnaire each year. Each annual survey constituted a “wave” of which there were three, in the fall seasons of 2003, 2004, and 2005. The last wave of surveys was sent during the fall of 2005 (33). Some participants left OHP at various times during the study; however, they remained part of the OHC Study cohort and were mailed each survey wave regardless of OHP enrollment status. For a timeline of sampling, recruitment and surveys, see Figure 2.

The survey questionnaire was designed by Bill Wright, PhD, Matthew Carlson, PhD and Tina Edlund, PhD, and included questions about insurance, finances, health care access, chronic illness, mental illness, demographic characteristics and self-reported health care status. The survey design was informed by various pre-existing instruments, including “CAHPS 2.0 Survey and Reporting Kit”; “Community Tracking Survey”; “Household Survey Instrument 2000-2001, Round Three”; and “The Access Project, The consequences of medical debt: Evidence from Three Communities, February 2003” (37). The final OHC survey instrument was validated using a series of cognitive validation interviews with approximately thirty OHP members. The technique involved discussions between principal investigators and OHP test subjects about the clarity of each survey question and whether questions made sense to subjects. Each survey tester was monetarily compensated for their time. Original analyses focused on the impacts of cost sharing on measures of insurance status, access, utilization, medical debt, and health status.

## Data Management

For this current analysis all 2783 Oregon Health Care Study panel members, the entire initial cohort from Wave 1 of sampling, were considered. All individuals who responded to the first wave of surveys (fall, 2003), who answered the survey question regarding unmet health care need, and who were under age sixty-five at the time of survey, were included in this analysis. After application of the above criteria, the sample available for analysis was 2574 (reduced from 2783 for non-response to the unmet need question and age greater than sixty-five).

Participants were classified as “having unmet need” and “not having unmet need”, if they answered “yes” and “no” to the question “Was there a time in the last six months when you needed health care but did not get it?”, respectively.

### *Missing data*

Cases for which there were missing data in any of the variables included in this analysis (including potential confounding variables) were excluded from logistic regression analysis. However, these cases were included in descriptive and univariate analyses evaluating relationships between the dependent variable and covariates/potential confounding variables if the case responded with an answer to those variables.

### *Recoding*

Recoding was done after careful consideration of each variable. Seven covariates or potential confounding variables were not recoded because they were either continuous or dichotomous variables and did not need further manipulation for analysis.

One continuous variable was recoded into three categories and treated as a categorical variable throughout the analysis; the variable “Income as a Percent of the

Federal Poverty Level” was reduced to the following three categories, 0-25% FPL, >25-100% FPL, and >100%FPL.

Seven categorical variables in the analysis began with multiple levels of possible answers (polychotomous), but were reduced to dichotomous variables. The variable “clinic visits” was recoded from seven possible responses (“how many visits in the last year: none, one, two, three, four, five, six, seven or more”) to a dichotomous variable with possible answers: none, one or more. Other variables were recoded into the simplest form, due to the paucity of previous literature on these particular variables. For example, the variable “married” was recoded from five responses (“married, divorced, separated, widowed, or never married”) into a dichotomous variable: married, not married. The variable “living arrangement” was recoded from seven responses (“live alone, live with partner or spouse, live with parents, live with other relatives, live with friends, live with paid attendant and other”) into a dichotomous variable: live alone, live with others. One of these variables (depression) had three answer choices “yes”, “no” and “I don’t know”; these were recoded into “yes” and “no” only, with the answers “I don’t know” being recoded as missing. These were recoded as missing because they made up a small proportion (4.6 %) of the total answers for those questions and comparisons among the three levels would not likely add significance compared to excluding those individuals from the analysis and looking only at a dichotomous variable.

The variable, “debt”, was created by adding two variables together. Two polychotomous categorical variables dealt with average debt and were recoded to the midpoint of each category, then added together to obtain a total debt variable. Then, this new debt variable was dichotomized into “medical debt <\$500, medical debt ≥ \$500”.

Another variable created for this analysis, “number of chronic illnesses”, and was created by adding the number of chronic illnesses reported by each individual (the chronic illnesses surveyed were: diabetes, asthma, hypertension, emphysema, and congestive heart failure). This new variable had six possible answer choices (0-5), and was further condensed into a dichotomous variable, with the options of zero chronic illnesses, one or more chronic illnesses. Another newly created variable was “financial strain”, created by combining four co-varying variables assessing the impact of medical bills on individuals’ lives. The new variable, “financial strain”, was created by an answer of “yes” to any of the four variables, and thus, categorized as “strain”, and an answer of “no” to all four variables categorized as “no strain”. Table 2 provides details on the recoding of each independent variable.

### *Variables*

The dependent variable in this analysis relates to the self-reported ability of the study participants to obtain needed health care. This was assessed in one question: “Was there a time in the last six months when you were unable to get needed health care?”. Individuals responded yes or no: all non-responses to that question were coded as missing and those cases were excluded from analysis.

The independent variable used in this analysis comes from the original OHP group to which the individuals belonged, OHP Plus and OHP Standard. Covariates were drawn from four separate areas; socio-demographic factors, financial factors, health care utilization, and health. Previous literature has not described unmet health care need extensively; therefore, the covariates chosen for initial consideration were done so based on the variables used in the previous, but limited, research and on availability within this

dataset. The four domains that encompass all of the identified potential covariates in this study were chosen because at least one variable type from each domain has been studied with regard to unmet need in the past; this is an extension of those previous studies.

Variables considered covariates included marital status, living arrangement, financial strain, medical debt, depression, ER visits and clinic visits. Details of the potential covariates evaluated in this analysis can be found in Table 3.

Variable selection is discussed further in the model building strategy section below. However, for categorical covariates, contingency tables were created for each covariate and the dependent variable, analyzed using chi-square test and likelihood ratio chi-square test, with particular attention paid to any table with a zero cell. No contingency tables had a cell with a zero. Continuous covariates were investigated using univariable logistic regression models with the dependent variable, obtaining the estimated coefficient, the estimated standard error and the likelihood ratio test for the significance of the coefficient and the univariable Wald statistic.

### *Confounders*

Potential confounding variables were drawn from the same four separate areas as covariates; socio-demographics, finances, health care utilization, and health.

Confounders were variables that conceivably both affected the dependent variable and the independent variable of interest. Potential confounding variables were also evaluated using univariate analysis between the confounders and both the dependent and independent variables and were significant in those relationships with a p-value of  $\leq 0.25$ . Confounders in this analysis include age, gender, education, employment, race, Hispanic, income as a percent of the Federal Poverty Limit, and chronic illness.

**TABLE 3: Variables Evaluated in Analysis of Unmet Health Care Need**

Independent Variables	Type	Categories/Values
Original OHP group	categorical	OHP Plus, OHP Standard
<b>Socio-demographic</b>		
Age	continuous	integer between 18-65
Gender	categorical	male, female
Marital Status	categorical	married, not married
Living Arrangement	categorical	lives alone, lives with others
Education	categorical	H.S.diploma or less, some college or more
Hispanic	categorical	hispanic, non-hispanic
Race	categorical	white, non-white
Employment	categorical	employed, not employed
<b>Financial</b>		
Financial Strain	categorical	yes, no
Total Medical Debt	categorical	greater than \$500 debt, less than \$500 debt
Income As % Of Federal Poverty Limit	categorical	0% -25%, 26-100% and greater than 100% FPL
<b>Health</b>		
Number of Chronic Illnesses	categorical	zero, one or more
Depression	categorical	yes, no
<b>Health Care Utilization</b>		
ER Visits	categorical	zero, one or more
Clinic Visits	categorical	zero, one or more

## Statistical Analysis

The statistical analysis includes simple descriptive statistics for each variable, as well as univariable and multivariable analyses of the effects of each variable on the dependent variable.

### *Descriptive Analysis*

Results of the overall descriptive analysis are presented in Table 4. Univariate analyses were performed, utilizing t-tests for the continuous variables and chi-square tests for the categorical variables, comparing the covariates and confounding variables in the presence of the dependent variable. The results of these univariate analyses are reported for both “having unmet need” and “not having unmet need”, and are displayed in Table 5.

### *Model Building Strategy*

To test the relationship between the independent variable and the dependent variable, a univariate analysis was employed using simple univariable logistic regression. Additionally, to investigate the relationship of covariates with the dependent variable, and to test the relationship between the potential confounders and both the independent and dependent variable, analyses were employed using simple univariable logistic regression.

Using the Wald statistic for statistical significance, any variable (both covariate and confounder) with a univariable logistic regression p-value  $\leq 0.25$  was considered to be a candidate for a multiple logistic regression model. This candidate inclusion criterion is consistent with that proposed by Hosmer and Lemeshow (38). The results of the univariate logistic regressions are displayed in Table 6.

Multivariable logistic regression was initially performed on a group of variables including the independent variable and covariates. This group of variables came from those covariates that were found to be significant (at  $p \leq 0.25$ ) from univariable analysis with the dependent variable; this group totaled nine variables. The logistic regression was performed using an enter methodology with variables added to the model and the regression performed. After this initial enter method, the model was evaluated and the most non-significant variable was removed if removing it made the overall model more significant using both the negative 2 log likelihood ratio and the Hosmer and Lemeshow statistic.

Six variables remained in the model prior to adding the potential confounders, one by one, to the model. The potential confounders were determined based on their potential effect on both the independent and dependent variable and whether they were statistically significant at  $p \leq 0.25$  for both the relationship between the confounder and the independent variable and the confounder and the dependent variable, and four were considered for inclusion in the model. After each potential confounder was added to the model, the overall significance of the new model was compared to the model without the confounder; if the new model was statistically significant from the model without the confounder, then that confounder was retained in the overall model. This resulted in three of the four potential confounding variables being added to the model. None of the confounders changed the odds ratio of the independent variable by more than 10% when included in the model.

At this time, it was important to evaluate the scale of each of the variables in the model. The continuous variables in the model were checked for linearity. Age was the

only continuous variable in the model at this stage. This variable was graphed against the dependent variable (using Loess curves) to obtain the correct scale of the variable. It was determined that the variable age followed a quadratic curve, so a second-order age variable (age squared) was added to the model.

No potential interactions were conceived of, and therefore, no potential interactions were evaluated in the model. The model was also checked for any evidence of covariance among variables included in the model, and there was no significant covariance among variables included in the final model.

Goodness-of-fit of the preliminary final model was assessed using the Hosmer-Lemeshow (H-L) Tests because there was one continuous variable (age) included in the preliminary final model. The H-L test resulted in a goodness-of-fit statistic,  $\hat{C} = 4.499$ , with a corresponding p-value of 0.810. This test statistic was not significant at traditional levels ( $p < 0.05$ ), and therefore the null hypothesis is not rejected; the model represents a good fit of the data because the null hypothesis states that the model fits the data. The model, at this point, represents the *final model* in this analysis and is shown in Table 7.

## RESULTS

The results of the analysis are presented in two sections. The first section presents descriptive characteristics of the respondents, and compares those characteristics among individuals who did and did not have unmet health care need. The second section lays out the results of the multivariable logit model.

### *Descriptive Analysis*

Based on the responses to the survey question of interest, 2,574 individuals were included in the analysis. Descriptive characteristics of all 2574 individuals are shown in Table 4. Respondents had a mean age of 40, were predominantly female (68%), married (57%), and poorly educated (high school diploma or less among 63%). Respondents were also predominantly white (68%), and were unemployed or retired (69%). The group was fairly evenly divided between OHP Plus (47%) and OHP Standard (53%). In terms of the financial characteristics of respondents, the respondents were fairly evenly divided between those without financial strain (55%) and those with financial strain (45%), and predominantly had medical debt less than \$500 (75%). Respondents' incomes fell into 3 subgroups of a percentile of the Federal Poverty Limit (%FPL), 0-25% (35%), 26-100% (50%) and >100% (15%). Respondents' health characteristics revealed that the majority had one or more chronic illnesses (61%) and they were nearly evenly divided between those with depression (42%) and those without depression (58%). In terms of their utilization of health care, the majority of respondents did not use the ER once within the six months prior to the survey (66%) and the vast majority visited a clinic one or more times in the six months prior to the survey (75%).

Descriptive characteristics of all 2574 individuals with regard to the dependent variable are shown in Table 5. Of the 2,574 respondents, 869 (34%) had unmet health care needs, while the remainder did not report unmet health care need. The analysis revealed independent significant differences in several of the socio-demographic, financial and health characteristics studied, and those differences were most notable when comparing those individuals who had unmet need compared to those who did not report unmet health care need. For individuals reporting unmet health care need, there was a disparity between members of OHP who had unmet health care need, with 24% of OHP Plus members reporting unmet need compared to 42% of OHP Standard members reporting unmet health care need. Socio-demographic characteristics revealed that among respondents with unmet health care needs, the mean age was 38 years old (compared to the mean age of 41 years old for individuals not reporting unmet health care need). Sixty-six percent of women reported health care needs met compared to 68% of men; likewise, 35% of women reported unmet health care need compared to 33% of men. Married individuals reported 33% unmet health care need compared to unmarried individuals who reported 36% unmet health care need. Individuals who lived alone reported 24% unmet health care need compared to 36% of individuals who lived with other people reporting unmet health care need. In terms of education, for those individuals with a high school education or less, 70% did not report unmet health care need while 30% reported having an unmet health care need. Likewise, for individuals with education exceeding high school, 60% did not report unmet need while 40% reported having an unmet health care need. Among white respondents, 35% reported unmet need (65% did not report unmet need) and among respondents of color, 31%

reported unmet need while 69% did not report unmet health care need. Hispanic individuals reported 29% unmet health care need (71% did not report unmet need) compared to non-Hispanic individuals who reported 35% unmet health care need (while 65% did not report unmet need). Employed respondents reported unmet health care need (38%) more frequently than unemployed respondents reporting unmet health care need (32%). For the financial characteristics of the respondents, among the individuals with financial strain, 48% reported unmet health care need compared to 22% unmet health care need among those individuals without financial strain. Among those with medical debt greater than \$500, 52% reported unmet health care need compared to individuals without medical debt greater than \$500 who reported only 27% with unmet health care need. Among the individuals who reported unmet health care need, their income fell into the following %FPL categories, 0-25%FPL (37%), 26-100%FPL (31%) and >100%FPL (37%). Respondents' health characteristics revealed that among the individuals with one or more chronic illness, 33% had an unmet health care need compared to 35% of individuals without any chronic illness who reported unmet health care need. Among the individuals with depression, 40% had an unmet health care need compared to those without depression who only reported 29% with unmet health care need. In terms of their utilization of health care, the individuals who visited an ER more than one time reported 39% unmet health care need compared to the individuals who did not visit an ER in the six months prior to survey who reported 31% unmet health care need. Individuals who visited a clinic one or more times in the 6 months prior to survey reported only 31% unmet health care need compared to 43% of individuals reporting unmet health care need who did not visit a clinic.

### *Multivariable Analysis*

The multivariable logit model of unmet health care need developed in the analysis included nine variables that were statistically significant ( $p < .05$ ).

The three following variables exhibited the largest odds ratios from the multivariable model: financial strain, medical debt greater than \$500, and original OHP group. The variable financial strain had an odds ratio of 2.586; the odds of having unmet need among those individuals with financial strain is 2.6 times the odds of having unmet need among individuals without financial strain. The variable medical debt greater than \$500 had an odds ratio of 2.136; the odds of having unmet need among those individuals with medical debt of \$500 or more is 2.1 times the odds of having unmet need among individuals with medical debt less than \$500. The original OHP group variable had an odds ratio of 1.734; the odds of having unmet health care need among those individuals in OHP Standard was 1.7 times the odds of having unmet need among the individuals in OHP Plus.

The three variables exhibiting the next highest odds ratios from the multivariable model were education, depression and age. The variable education had an odds ratio of 1.613; the odds of having unmet need among those individuals with higher than a high school education were 1.6 times the odds of having unmet need among individuals with a high school diploma or less. The variable depression had an odds ratio of 1.595; the odds of having unmet need among individuals with depression was 1.6 times the odds of having unmet need among individuals without depression. The variable age squared had an odds ratio of 0.999; the odds of having unmet need between the age of 18 and 65 was shown to have a differential effect based on the quadratic relationship between age and

the log odds of unmet need. Older individuals had greater unmet need compared to those individuals one year younger until the age of 24, when the estimated odds of unmet need decreased with age. For example, the estimated odds of unmet need was 0.1% greater for individuals aged 23 compared to individuals aged 22. However, the estimated odds of unmet need was 0.1% greater for individuals aged 23 compared to individuals aged 24. Lastly, at the higher ages, the estimated odds of unmet need decreases; the estimated odds of unmet need was 5.4% less for individuals aged 51 compared to individuals aged 50.

The three variables in the multivariable model exhibiting the lowest odds ratios were income as a percent of FPL, living arrangement, and clinic visits. Income as a percent of FPL was polychotomous, and referenced upon its own referent category in the analysis; income 26-100% of FPL had an odds ratio of 0.701. The odds of having unmet need among individuals with income between 26-100%FPL was 0.7 times, or 2/3, as likely as those individuals with income between 0-25%FPL. Likewise, the income group greater than 100%FPL had an odds ratio of 0.720; the odds of having unmet need among individuals with income greater than 100%FPL was 0.7 times, or 2/3 as likely, as those individuals with income between 0-25%FPL. Living arrangement had an odds ratio of 0.666; the odds of having unmet need among individuals who live alone is 0.67 times, or two-thirds as likely, as the odds of having unmet need among individuals who live with others. The variable clinic visits had an odds ratio of 0.509; the odds of having unmet need among individuals who visited a clinic one or more times was 0.5 times, or half, the odds ratio of having unmet need among individuals who did not visit a clinic.

## DISCUSSION

When assessing the factors associated with unmet health care need, the literature is sparse, and very few studies have incorporated surveys with targeted questions on the subject. The results of this analysis showed that unmet health care need is not only quite prevalent among the population, but that several key policy-relevant factors may help explain the problem.

The first factor relates to cost-sharing. Cost-sharing, as previously described, is a cost-containment strategy used by many insurance companies to offset some of the costs of health care onto the consumer. Some cost-sharing strategies include co-pays, premiums, and lock-outs, among other options. The modeling results showed that, all other things constant, individuals in OHP Standard (the group directly affected by cost sharing) were almost twice as likely to have unmet health care need compared to individuals in OHP Plus. Although there is not a wealth of literature on the impacts of cost-sharing, this research shows that cost-sharing had the unintended consequence of unmet health care need among the group of OHP Standard. The mechanism of how cost-sharing impacts unmet need was not explicitly investigated during this analysis; however it can be theorized with two possible mechanisms. Either cost-sharing causes individuals to leave OHP Standard and thus become uninsured and the effect of uninsurance causes unmet need, or cost-sharing is a barrier to obtaining needed health care due to costs of co-pays or premiums or other financial outlays for cost-sharing and directly prohibits obtaining needed health care.

The second, and perhaps most logical factor relates to a person's financial and economic situation. Among the respondents reporting unmet health care need, the

majority (68 percent) had incomes at or below the federal poverty level. Individuals with financial strain, and those with debt greater than \$500, were more than twice as likely to have unmet health care need than those without financial strain and without debt. When considering these effects, the imposition of cost sharing may create an additional burden on individuals at risk for unmet health care need because it may act to exacerbate financial stress. The analysis also suggests that clinic visits had an impact on the study population's unmet health care needs. In particular, the multivariable analysis showed that individuals who do not visit a clinic are more than two times more likely to report unmet health care need than those that do make clinic visits. Because clinic visits were associated with co-pays and other direct financial impacts, it is conceivable that individuals in OHP Standard may have foregone clinic visits due to the cost, and they probably did not have the chance to improve their health or ameliorate their underlying unmet health care need.

The findings in this analysis are important because this study was undertaken immediately following policy changes to the Oregon Health Plan and the information captured on unmet need occurred immediately after the policy changes in 2003. The findings are also important because, in general, the reasons for unmet health care need remain poorly understood. Previous studies have only studied the factors that might be related to unmet need in an elementary way, and furthermore, there are only a handful of studies evaluating unmet need as the primary outcome. This analysis is novel in its question and evaluation of unmet health care need in the Medicaid-eligible population in Oregon. This analysis is also unique in that a theoretical model was created to explain the relationship between cost-sharing and unmet health care need. Because unmet health

care need is infrequently studied, a simple framework to approach the topic, such as the one devised in this study, may be useful for further research.

### *Strengths*

One strength of this study is its direct approach to the question of unmet health care need. A review of the previous literature on cost-sharing and unmet health care need shows that a small number of studies have looked at unmet health care need, with even fewer studies specifically asking the research question directing this analysis. Of those studies, unmet need was often bundled with health insurance status. This analysis looked specifically at unmet need in a population that was insured during recruitment, but which experienced policy changes to their insurance. As a result, part of the population (OHP Standard) was exposed to significant financial strain and a high probability of becoming uninsured, while the other part of the population (OHP Plus) was not exposed to new financial strain. This study takes advantage of this unique natural experiment.

Another advantage to this study is that it approaches the factors related to unmet health care need through a simple, organized theoretical framework. This framework, encompassing the areas of health, financial, socio-demographic and health care utilization effects, serves to clarify and categorize many potential covariates (including those not addressed in this study) into areas relevant for policy analysis.

An additional strength of this study is its emphasis on the source population of individuals with Medicaid-eligibility. Although often studied, these individuals are very important for health policy analysis because they are often marginalized, ignored, underrepresented and are at-risk for significant medical problems due to lack of access and delay of care. This study in Oregon was a tremendous opportunity to directly learn

about Oregon Health Plan members and the unique aspects of their health care and access to health care.

### *Limitations*

There are several limitations to this study. One limitation of this particular study was also one of its strengths, the source population. Because the study participants were recruited from eligible Oregon Health Plan members, this study can only be extended to the Medicaid-eligible population in Oregon. There is a lack of generalizability to the United States population, or even the general population of Oregon. This study does not inform us about unmet health care need in any group except the Medicaid-eligible in the State of Oregon.

Another limitation of this study is that the survey of OHP members occurred after the 2003 changes occurred to OHP, and therefore, no baseline data were collected on individuals prior to the first survey in the Oregon Health Care Study. Without any baseline information, it is difficult to understand the observed differences in unmet health care need, and whether these differences existed prior to the policy changes in 2003.

An additional limitation of this study is that it is a secondary analysis of previously collected research. This research was conducted on a moderately sized sample of Medicaid-eligible individuals in Oregon, and the data collected specifically for the original study may not have included the suite of variables with an eye toward studying unmet health care need. Indeed, some important variables may have been excluded in the Oregon Health Care Study, and therefore, are not available for secondary analysis. Given the model's goodness of fit statistics, potential covariates may be

missing from the data and the model building for this analysis may not be optimal for representing unmet health care need.

Along these lines, the analysis uses cross-sectional, rather than longitudinal data analysis in studying unmet need. The data collected for the Oregon Health Care study were collected during three cycles, as part of a longitudinal study design. However, for this analysis, only the initial survey cycle was analyzed. Cross-sectional analyses are less robust than other study designs because of the lack of time frame and the inability to draw conclusions on cause and effect. It is impossible to know for sure if the unmet health care need reported in this study caused the program changes in the Oregon Health Plan, or if the policy changes in the Oregon Health Plan caused the unmet health care need, although logically it seems that the later is much more likely than the former. However, it is very plausible that the changes in the Oregon Health Plan directly influenced the unmet need reported in this study given the time frame of policy changes followed by survey administration after OHP program changes had taken effect.

Lastly, another important limitation to this study is its potential for recall and response bias. Individuals in this study answered survey questions by self-report, therefore subjecting the study to recall bias. Information bias is potentially involved in this study because individuals were asked to report many findings or experiences over the six-twelve month period prior to survey and the potential for inaccurate reporting was somewhat high. This potential bias likely resulted in a nondifferential misclassification (if any bias exists) because there is no reason to suspect that individuals responded differently to questions in a systematic way. Therefore, there is no reason to suspect that the Odds Ratio for the OHP group variable is biased away from the null hypothesis.

Response bias is also potentially involved in this study because of the study design; the population was over-sampled for racial/ethnic diversity, yet the responders to the study (the study sample) were overwhelmingly white. Response bias might also be due to the fact that there were 8260 individuals offered enrollment in the study with only 2783 individuals returning the study survey. No information is available for the individuals who did not respond to the survey, so it is unclear how the non-responders differ from those who did respond to the survey. Based on the recruitment design, more Caucasian individuals responded to the survey, and other racial and ethnic groups responded in much smaller numbers. This may have biased the study in unknown ways. The individuals who did not respond may be systematically different than those who did respond. The individuals who did not respond may be very affected by unmet need, or may be very healthy and have no unmet need. No information about the socio-demographics of the non-responders was available for this researcher to further investigate. It is known that the non-responders were from all racial and ethnic groups, and did not respond at an equal rate, so there is less reason to believe that a specific racial group is systematically misrepresented by this study.

#### *Further Research*

Thirty-two percent of individuals analyzed in this study were found to have unmet health care need. If applied to the larger US population, a potentially large number of individuals across the country may have unmet health care need. Without additional data, however, such a generalization is not possible, and this topic will remain poorly understood. Future research should therefore focus on unmet health care need in the

general population of the United States, in both the insured and the uninsured populations.

Additional research should also focus on omitted variables. Many other potential variables, such as geography, access to transportation, proximity to safety-net clinics may play a crucial role in unmet health care need and deserve further investigation. Those variables were not included in this dataset, and therefore did not play a part in explaining unmet health care need among the population studied in this analysis. These variables, however, likely play an important role in the evolving understanding of influences on unmet health care need.

Of similar importance, additional research should focus on the mechanism by which cost-sharing affects unmet need. Based on the findings in this analysis, it is unclear if cost-sharing influences unmet need directly due to financial burden prohibiting access to care or if cost-sharing initiates a series of events leading to uninsurance and therefore unmet health care need. Understanding this mechanism can serve to inform any future policy changes surrounding cost-sharing.

Finally, any additional research in the area of unmet need should continue to focus on the Medicaid-eligible population. This particular population has individuals with low income and often many health care needs, and is likely the most affected by any policy changes where cost-sharing is introduced or where additional financial strain is incurred. These individuals seem to be at higher risk for further decline in access to health care and unmet health care needs. It also seems appropriate for additional research to be directed at the issue of cost-sharing, how it affects the poor, and other possible unintended consequences other than those shown in this analysis.

## **POLICY RECOMMENDATION**

Unmet health care need is an important public health issue because of the potential significant delay to health care many individuals experience. This delay has significant economic and social costs, which sound public policy could serve to mitigate. To this end, and considering the results of this analysis, the following two general policy recommendations should be considered.

1. Re-think and re-evaluate cost-sharing approaches in existing or anticipated health care policy in Oregon.

Because this study was undertaken immediately following policy changes to the Oregon Health Plan, the information captured on unmet need occurred after the policy changes and is temporally significant. From a public health perspective, this study could inform administrators of the OHP on the relationship of cost-sharing on unmet health care need, and should be considered when discussing further cost-sharing strategies or the growing unmet health care need in Oregon. Specifically, policy analysts and legislators should consider cost-benefit analysis of cost-sharing on the Medicaid population. Although cost-sharing is thought to be an effective economic policy to contain the costs in a health care system, in a publicly-funded health care system, as seen from this research, it appears that one of the unintended consequences of cost-sharing is unmet health care need. Unmet need, in turn, forces individuals to rely on emergency health care, thus causing overall increase in the cost of health care, even in a system where an attempt has been made to contain costs. The true cost-benefit of cost-sharing should be evaluated in light of research showing increased unmet health care need and the implications of that unmet health care need.

2. Tailor programs around modifiable factors associated with unmet health care need.

This study showed that there are concrete, modifiable factors that might explain unmet health care need in the Medicaid-eligible population of Oregon. This study implies that there are policy implications that could improve the health of this population by affecting change in the modifiable factors and/or recognizing those variables that place individuals most at risk for unmet health care need and decreasing that risk through policy change. For example, medical debt >\$500 is associated with unmet health care need in this study. If health policy could be directed at individuals with that burden of medical debt to assist with repayment or no cost-sharing (i.e. no co-pays or premiums) when visiting a clinic or hospitalization if that individual is actively repaying the debt, this may be one way to decrease the unmet health care need for individuals in debt. Another example would be aimed at specific age categories; in this study, the mean age for those with unmet need was lower than the mean age for those without unmet need, so social/health policy directed at younger people may assist with decreasing the unmet health care need in a younger population.

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## **APPENDIX**

**Figure 1: Schematic of Theoretical Pathway between Cost-Sharing and Unmet Health Care Need**

**Table 1: Participation Rates for Wave 1 of Oregon Health Care Study, by race and ethnicity**

**Figure 2: Recruitment and Survey Timeline for the Oregon Health Care Survey**

**Table 2: Original Coding and Recoding of Variables Used in Analysis**

**Table 3: Variables Evaluated in Analysis of Unmet Health Care Need**

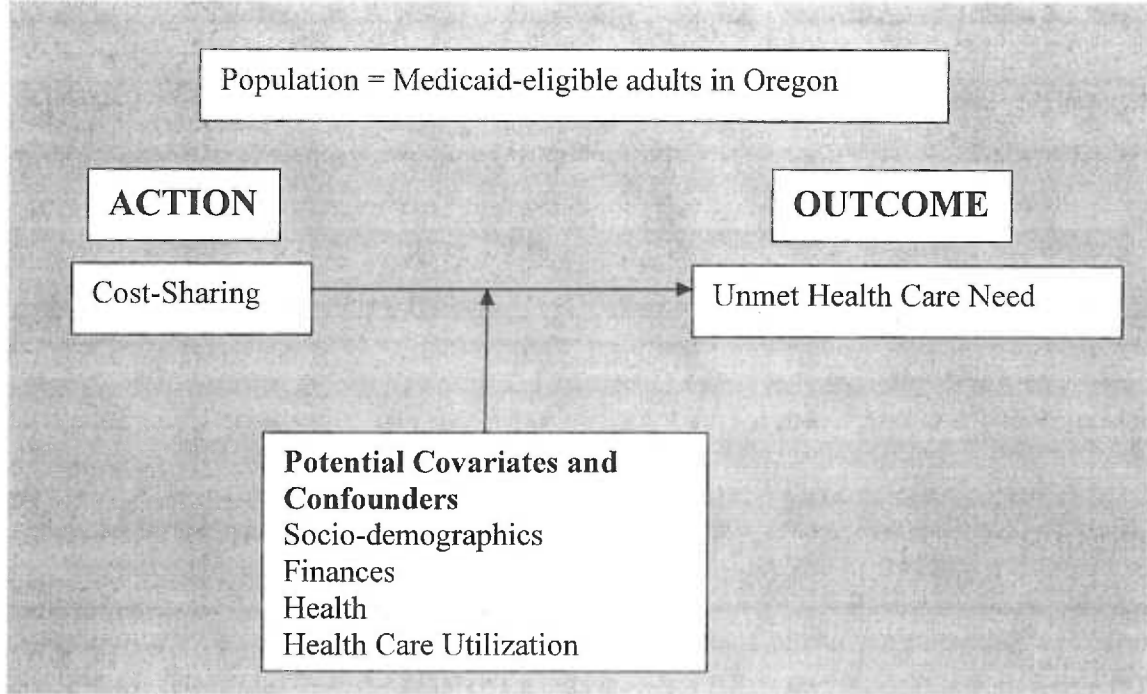
**Table 4: Baseline characteristics of OHP study group for each variable of interest**

**Table 5: Descriptive Analysis of Independent Variables in Terms of Ability to Obtain Needed Health Care**

**Table 6: Odds Ratios for each Independent Variable using Univariate Regressions on Unmet Health Care Need**

**Table 7: Estimated Coefficients, Standard Errors, Two-Tailed p-Values and 95% Confidence Intervals for the Final Model Explaining Independent Variables and their Relationship with Unmet Health Care Need**

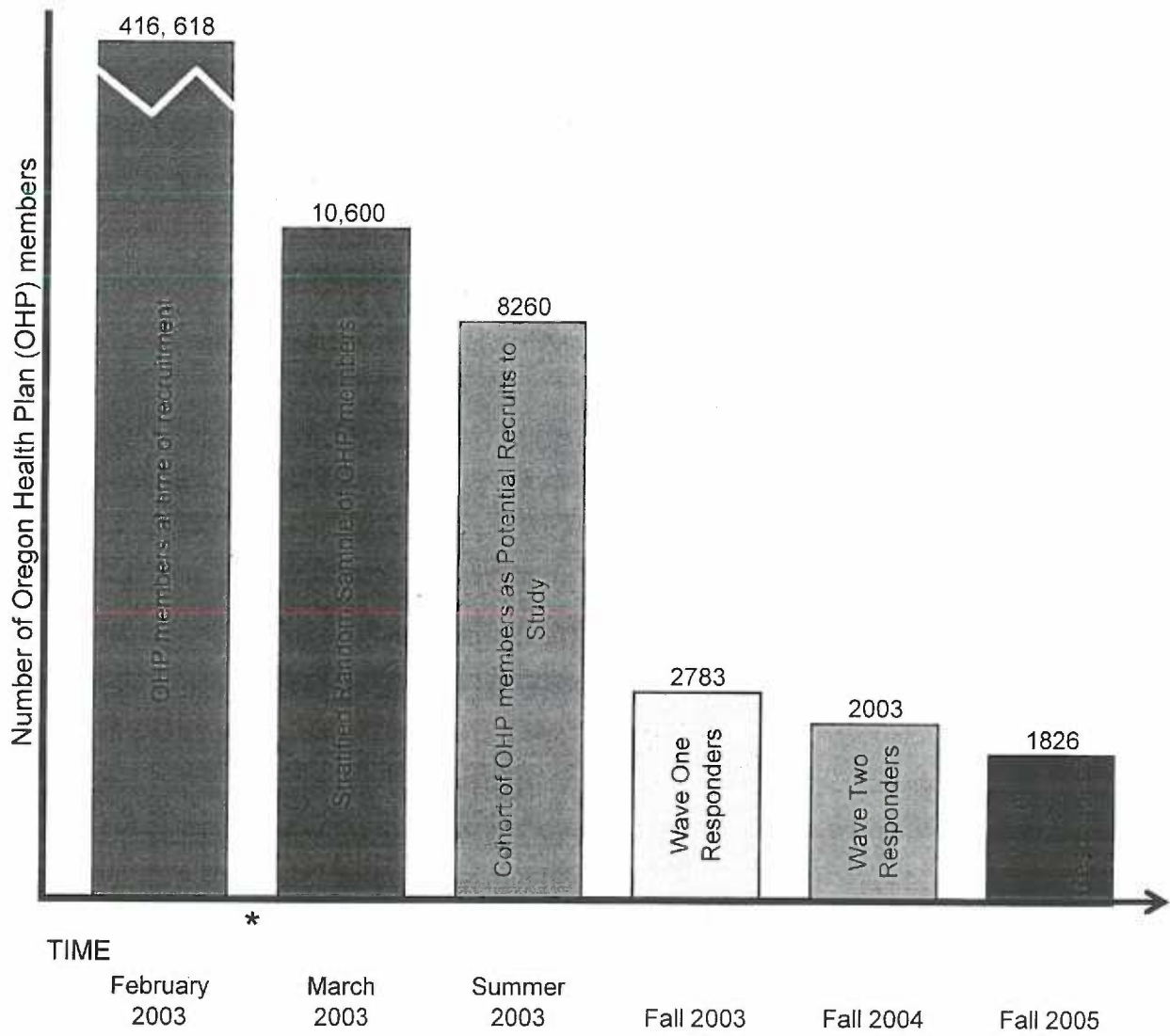
**FIGURE 1: Schematic of Theoretical Pathway between Cost-Sharing and Unmet Health Care Need**



**TABLE 1: Participation Rates for Wave 1 of OHC Study, by race/ethnicity**

OHP Group	Population	Eligible	Wave 1 Response
<b>Total Participants</b>	416,618	8,260	2,783
<b>Proportion of Participants by Race/Ethnicity</b>			
Caucasian	76.5%	62.8%	69.1%
African-American	4.7	10	8.1
Native American/Alaskan Native	2.3	9.5	9.3
Asian/Pacific Islander	2.9	3.5	2.1
Hispanic or Latino	12.5	14.1	11.4
Other	1.1	---	---

**Figure 2: Recruitment and Survey Timeline for the Oregon Health Care Survey**



\* Indicates time of program changes to the Oregon Health Plan (OHP)- plan was split into OHP Plus and OHP Standard

TABLE 2: Original Coding and Recoding of Variables Used in Analysis

Variables	Values	Recoding	Final Coding for Analysis
OHP group	OHP Plus OHP Standard	0 1	0 - OHP Plus 1 - OHP Standard
<b>Socio-demographic</b>			
Age	continuous	---	---
Gender	female male	0 1	0 - female 1 - male
Marital Status	married divorced separated widowed never married	1 0 0 0 0	1 - married 0 - not married
Living Arrangement	Live alone live with partner or spouse live with parents live with other relatives live with friends live with paid attendant/companion other	1 0 0 0 0 0 0	1 - live alone 0 - lives with others
Education	Less than high school high school diploma or GED some college completed 2 year degree program completed 4 year degree program graduate school	0 0 1 1 1 1	0 - HS diploma or less 1 - more than high school
Hispanic	yes no	1 0	1 - yes 0 - no
Race	White Black or African-American American Indian/Alaskan Native Asian Native Hawaiian/Pacific Islander Other	0 1 1 1 1 1	0 - white 1 - non-white
Employment	Yes, employed Yes, self-employed Not currently employed, retired Not currently employed	0 0 1 1	0 - employed 1 - not employed
<b>Financial</b>			
<b>Financial Strain</b>			
"In the last 6 months, have family and/or friends loaned or given you money so you could pay your medical bills?"	yes no	1 0	If sum = 0, then 0 - no financial strain Else, 1 - financial strain
"In the last 6 months, have you cut back on your food budget to cover health care costs or to pay medical bills?"	yes no	1 0	
"In the last 6 months, have you skipped paying other bills, paid bills late or paid less than the minimum payment to cover health care costs or to pay medical bills?"	yes no	1 0	
"In the last 12 months, have you filed for bankruptcy because of your medical bills?"	yes no	1 0	
Income As % Of Federal Poverty Limit	continuous	0 1 2	0 - 0-25% FPL 1 - 26-100% FPL 2 - >100% FPL
<b>Debt</b>			
"About how much money do you currently owe to a doctor, clinic or hospital for your own medical bills?"	\$0 \$1-25 \$26-50 \$51-75 \$76-100 \$101-300 \$301-500 \$501-1000 \$1001-5000 \$5001-10,000 \$10,001-15,000 more than \$15,000	midpoint midpoint midpoint midpoint midpoint midpoint midpoint midpoint midpoint midpoint midpoint	Sum 0 - <\$500 debt 1 - ≥\$500 debt
"About how much money do you currently owe to a credit card company, bank, or private loan company for your own medical bills?"	\$0 \$1-100 \$101-300 \$301-500 \$501-1000 \$1001-5000 \$5001-10,000 \$10,001-15,000 more than \$15,000	midpoint midpoint midpoint midpoint midpoint midpoint midpoint midpoint midpoint	
<b>Health</b>			
Number of Chronic Illnesses	0 1 2 3 4 5	0 1 1 1 1 1	0 - zero 1 - one or more
Depression	yes	1	1 - depression

Utilization			
	no	0	0 - no depression
ER visits	none	0	0 - no visits to ER
	one	1	
	two	1	1 - one or more visits to ER
	three	1	
	four	1	
	five	1	
six	1		
Clinic visits	none	0	0 - no visits to clinic
	one	1	1 - one or more clinic visits
	two	1	
	three	1	
	four	1	
	five	1	
	six	1	
seven or more	1		

**TABLE 3: Variables Evaluated in Analysis of Unmet Health Care Need**

Independent Variables	Type	Categories/Values
Original OHP group	categorical	OHP Plus, OHP Standard
<b>Socio-demographic</b>		
Age	continuous	integer between 18-65
Gender	categorical	male, female
Marital Status	categorical	married, not married
Living Arrangement	categorical	lives alone, lives with others
Education	categorical	H.S diploma or less, some college or more
Hispanic	categorical	hispanic, non-hispanic
Race	categorical	white, non-white
Employment	categorical	employed, not employed
<b>Financial</b>		
Financial Strain	categorical	yes, no
Total Medical Debt	categorical	greater than \$500 debt, less than \$500 debt
Income As % Of Federal Poverty Limit	categorical	0% -25%, 26-100% and greater than 100% FPL
<b>Health</b>		
Number of Chronic Illnesses	categorical	zero, one or more
Depression	categorical	yes, no
<b>Health Care Utilization</b>		
ER Visits	categorical	zero, one or more
Clinic Visits	categorical	zero, one or more

**TABLE 4: Baseline characteristics of OHP study group for each variable of interest (N=2574)**

Variables used in study	Frequency or (Mean)	Proportion or (Std Err)
<b>Dependent Variable</b>		
Able to Get Needed Health Care		
Yes	1705	66.2
No	869	33.8
<b>Independent Variables</b>		
OHP group		
OHP Plus	1214	47.2
OHP Standard	1360	52.8
<b>Socio-demographic</b>		
Age	(39.88)	(0.24)
Gender		
Male	804	31.6
Female	1,739	68.4
Marital Status		
Married	1,441	57.2
Not Married	1,078	42.8
Living Arrangement		
Lives Alone	532	21.1
Lives With One Or More Others	1,995	78.9
Education		
High School or less	1,483	62.6
More than High School	887	37.4
Hispanic		
Hispanic or Latino	301	12.1
Not Hispanic or Latino	2,192	87.9
Race		
White	1,746	67.8
Not white	828	32.2
Employment		
Employed	788	31.5
Not employed	1,717	68.5
<b>Financial</b>		
Financial Strain		
Yes	1141	45.0
No	1393	55.0
Medical debt greater than \$500		
Yes	568	25.5
No	1663	74.5
% Income as FPL		
0-25%	881	35.5
26-100%	1229	49.6
>100%	369	14.9
<b>Health</b>		
Number of Chronic Illnesses		
0	950	38.9
1 or more	1491	61.1
Depression		
Yes	1024	41.7
No	1434	58.3
<b>Utilization</b>		
Number Of Visits To ER		
Zero	1682	66
One or More	866	34.0
Number Of Visits To Clinic		
Zero	633	24.9
One or More	1,906	75.1

**TABLE 5: Descriptive Analysis of Independent Variables in Terms of Ability to Obtain Needed Health Care(N=2574)<sup>#</sup>**

Independent Variables	Able to Get Needed Health Care		p-value
	Yes (n = 1860 )	No (n= 887)	
OHP group			
OHP Plus	919 (75.7)	295 (24.3)	<0.001
OHP Standard	786 (57.8)	574 (42.2)	
<b>Socio-demographic</b>			
Age (Mean, Std.Err.)	40.63 (0.31)	38.4 (0.39)	<0.001
Gender			
Male	543 (67.5)	261 (32.5)	0.312
Female	1139 (65.5)	600 (34.5)	
Marital Status			
Married	970 (67.3)	471 (32.7)	0.124
Not Married	694 (64.4)	384 (35.6)	
Living Arrangement			
Lives Alone	402 (76.4)	130 (23.6)	<0.001
Lives With One Or More Others	1269 (63.6)	726 (36.4)	
Education			
High School or less	1038 (70.0)	445 (30.0)	<0.001
More than High School	535 (60.3)	352 (39.7)	
Hispanic			
Hispanic or Latino	214 (71.1)	87 (28.9)	0.053
Not Hispanic or Latino	1435 (65.5)	757 (34.5)	
Race			
White	1130 (64.7)	616 (35.3)	0.018
Not white	575 (69.4)	253 (30.6)	
Employment			
Employed	487 (61.8)	301 (38.2)	0.002
Not employed	1167 (68.0)	550 (32.0)	
<b>Financial</b>			
Financial Strain			
Yes	590 (51.7)	551 (48.3)	<0.001
No	1087 (78.0)	306 (22.0)	
Medical debt greater than \$500			
Yes	274 (48.2)	294 (51.8)	<0.001
No	1223 (73.5)	440 (26.5)	
% Income as FPL			
0-25%	556 (63.1)	325 (36.9)	0.011
26-100%	845 (68.8)	384 (31.2)	
>100%	232 (62.9)	137 (37.1)	
<b>Health</b>			
Number of Chronic Illnesses			
Zero	619 (65.2)	331 (34.8)	0.313
One or more	1001(67.1)	490 (32.9)	
Depression			
Yes	617 (60.3)	407 (39.7)	<0.001
No	1021 (71.2)	413 (28.8)	
<b>Utilization</b>			
Number Of Visits To ER			
Zero	1161 (69.0)	521 (31.0)	<0.001
One or more	528 (61.0)	338 (39.0)	
Number Of Visits To Clinic			
Zero	364 (57.5)	269 (42.5)	<0.001
One or more	1312 (68.8)	594 (31.2)	

<sup>#</sup> Data presented as number (percentage) unless otherwise specified

**TABLE 6: Odds Ratios for each Independent Variable using Univariate Regressions on Unmet Health Care Need**

Independent Variables	Independent Variable x Unmet Health Care Need				
	Coeff.	Std. Err.	p-value	OR	95% CI
Original OHP Study Group (OHP Standard)	0.822	0.087	<0.001	2.275	1.920 - 2.696
<b>Socio-demographic</b>					
Age	-0.015	0.003	<0.001	0.985	0.979 - 0.992
Gender (male)	-0.092	0.091	0.312	0.912	0.764 - 1.090
Marital Status (married)	-0.131	0.085	0.124	0.878	0.743 - 1.036
Living Arrangement (alone)	-0.570	0.111	<0.001	0.565	0.455 - 0.703
Education (more than HS)	0.428	0.089	<0.001	1.535	1.289 - 1.827
Hispanic (yes)	-0.261	0.135	0.053	0.771	0.592 - 1.004
Race (non-white)	-0.214	0.091	0.018	0.807	0.676 - 0.964
Employment (unemployed)	-0.271	0.090	0.003	0.763	0.640 - 0.909
<b>Financial</b>					
Financial Strain (yes)	1.199	0.088	<0.001	3.317	2.793 - 3.940
Medical debt greater than \$500 (yes)	1.093	0.101	<0.001	2.982	2.448 - 3.633
Income as a % of FPL					
Income between 0-25% FPL	---	---	0.011	---	---
Income between 25-100% FPL	-0.252	0.093	0.007	0.777	0.648 - 0.933
Income greater than 100% FPL	0.010	0.128	0.937	1.010	0.785 - 1.299
<b>Health</b>					
Chronic Illness (one or more)	-0.088	0.088	0.313	0.915	0.771 - 1.087
Depression (yes)	0.489	0.086	<0.001	1.631	1.376 - 1.932
<b>Utilization</b>					
Number Of Visits To ER (one or more)	0.355	0.087	<0.001	1.427	1.202 - 1.693
Number Of Visits To Clinic (one or more)	-0.490	0.094	<0.001	0.613	0.509 - 0.737

**Table 7: Estimated Coefficients, Standard Errors, Two-Tailed p-Values and 95% Confidence Intervals for the Final Model Explaining Independent Variables and their Relationship with Unmet Health Care Need (N=2208)**

Independent Variables	Multivariable x Unmet Health Care Need				
	Coeff.	Std. Err.	P-value	OR	95% CI
Original OHP group	0.55	0.115	<0.001	1.734	1.384 2.173
Age	0.046	0.031	0.142	1.047	0.985 1.114
Living Arrangement	-0.407	0.146	0.005	0.666	0.500 0.886
Education	0.478	0.111	<0.001	1.613	1.298 2.004
Financial Strain	0.950	0.116	<0.001	2.586	2.062 3.243
Deb > \$500	0.759	0.119	<0.001	2.136	1.693 2.696
Depression	0.467	0.116	<0.001	1.595	1.271 2.002
Number Of Visits To Clinic	-0.676	0.131	<0.001	0.509	0.393 0.658
Income as % of FPL					
0-25%	---	---	---	---	---
26-100%	-0.355	0.121	0.003	0.701	0.553 0.888
>100%	-0.329	0.162	0.043	0.720	0.524 0.989
Age <sup>2</sup>	-0.001	<0.001	0.057	0.999	0.998 1.000