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Medicare Part D Coverage Gap: Who Falls In and What Beneficiaries Do to Avoid Entry

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Medicare Part D Coverage Gap: Who Falls In and What Beneficiaries Do to Avoid Gap Entry?

BY

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THESIS

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DEDICATION

To my husband for the compassion he showed me throughout this difficult process. His inspirational words lifted me up during times when I thought I might fail to complete this final project.

To my friend Meredith for her unconditional support by long distance phone calls. Your comedic voice mail messages and sarcastic responses to the obstacles life threw at me made the process bearable.

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by

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ABSTRACT

In 2006, the implementation of Medicare Part D offered seniors the benefit of government subsidized prescription drug coverage. The baby boomer generation is expected to retire at a rate of 10,000 per day for the next nineteen years. Research into health care and prescription drug coverage for this aging population is becoming relevant due to a increasing proportion of the population. Understanding the characteristics of individuals who reach the Medicare Part D coverage gap will assist in possible outreach, education, and future enrollment strategies. Identifying populations at risk of reaching the coverage gap can help focus interventions to address issues of access to medication among seniors.

This research project considers the previous literature published on beneficiaries who reached the aforementioned coverage gap where beneficiaries pay one hundred percent of prescription costs and applies it to a larger, more comprehensive data set. First, I identify characteristics of Part D individuals that influence the outcome of reaching the coverage gap. Then, I assess the effect a coverage gap has on drug adherence by analyzing out of pocket expenditures.

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Chapter 1

Introduction

Since 1966, the United States Medicare program has insured seniors over the age of sixty-five and individuals with certain disabilities. It covers a range of medical services, including hospital stays, physician visits, preventative benefits, and starting in 2006, prescription drugs. The Medicare program consists of two major components. The first is Hospital Insurance (HI), or Medicare Part A, which helps pay for hospital, home health, skilled nursing facility, and hospice care. The second, called Supplementary Medical Insurance (SMI), consists of Medicare Part B and Part D. Medicare Part B helps pay for physicians, outpatient hospitals, and home health care for "senior" or disabled individuals. Part D is the newest addition to Medicare and provides subsidized access to drug insurance coverage on a voluntary basis (Trustees, Insurance et al. 2011). The aforementioned programs offer essential medical services to a growing population of retiring individuals.

In 2010, 47.5 million people were covered by Medicare: 39.6 million aged sixty-five and older, and 7.9 million disabled (Trustees, Insurance et al. 2011). This number will increase substantially over the next ten years as the baby boomer generation reach the eligible age for Medicare and qualify for benefits. Total Medicare expenditures were $523 billion in 2010 and are projected under current law to increase in future years at a somewhat faster pace than either workers' earnings or the economy overall (Trustees, Insurance et al. 2011). The increasing demands on the Medicare program will force possible additional reform decisions regarding the benefits offered in the future. This analysis looks into the specific demographics that utilize the

prescription drug plans (PDP) offered in Part D and those who lack coverage to pay for the necessary prescriptions and the possible consequences that arise because of that.

The figure below shows a timeline detailing major changes to the Medicare program since its inception in 1966 to 2020 when the Obama Health Care Plan will complete the elimination of the coverage gap.

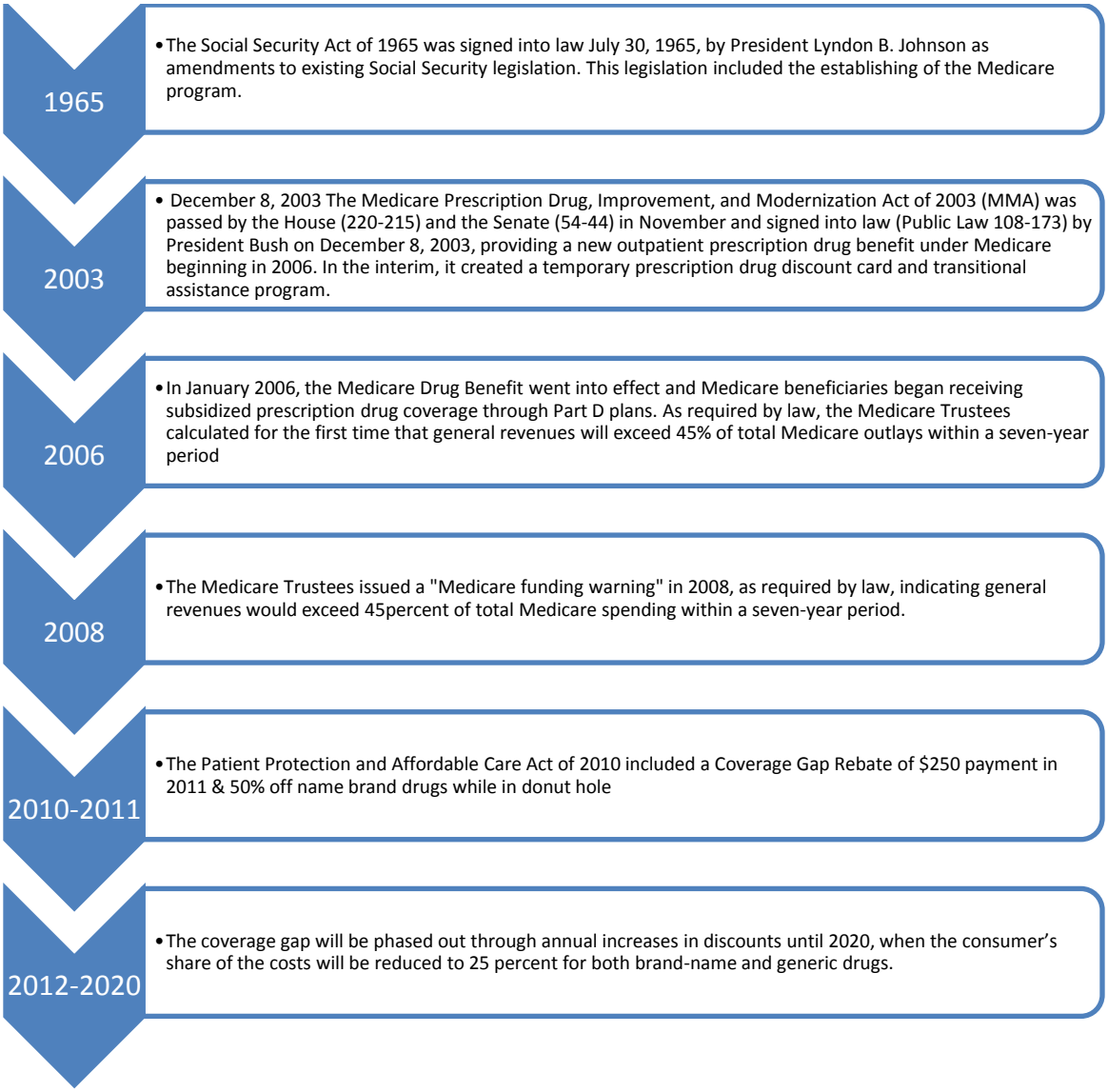

Figure 1: Medicare Part D Timeline

The Medicare Prescription Drug Improvement and Modernization Act (MMA) of 2003 represented the largest expansion of Medicare benefits since the program's inception. The MMA subsidized voluntary enrollment of Medicare eligible individuals in any of several PDPs with the ultimate goal of optimizing therapeutic outcomes by improving medication use and reducing adverse events (e.g. hospitalizations and ambulatory use). In 2007, Medicare Part D covered 24 million beneficiaries and cost the federal government $39 billion, an average of $1,600 per individual enrolled, not including out-of-pocket costs paid by the enrollee. In 2010, Part D had $62 billion in total expenditures, and the cost is projected to grow as per capita healthcare costs continue to outpace gross domestic profit (GDP) growth and as the baby boom generation ages (Aaron, Jeanne Lambrew et al. 2008; Trustees, Insurance et al. 2011). The Medicare Trustees Report estimates that 29.2 million individuals will be enrolled in Part D by 2011 with an intermediate estimate of 45.6 million enrolled by 2020 (Trustees, Insurance et al. 2011). The figure below shows the historical data and estimates for Medicare Part D enrollment from 2006-20. The supplementary table lists expenditures for Part D as a percentage of GDP. The projection period fully allows for the presentation of anticipated future developments, such as the impact of a large increase in enrollees during 2010-30. The increase in the number of beneficiaries will occur because the relatively large number of persons born during the period between the end of World War II and the mid-1960s (known as the baby boom generation) will reach eligibility age and begin to receive benefits. Moreover, as the average age of Medicare beneficiaries increases, these individuals will experience greater health care utilization and costs, thereby adding further to growth in program expenditures (Trustees, Insurance et al. 2011).

The two figures below show to important historical and estimated numbers associated with Medicare Part D. The first figure, Figure 2 shows the enrollment in Medicare Part D from the 2006 implementation to 2020. Figure 3 display's the expenditures on Medicare Part D as a portion of Gross Domestic Product.

All Beneficiaries	
Calendar Year	Enrollment (Millions)
Historical Data:	
2006	20.3
2007	24.2
2008	25.6
2006	26.8
2010	27.8
Intermediate Estimates:	
2011	29.2
2012	32.8
2013	35.8
2014	37.4
2015	39.0
2016	40.8
2017	41.9
2018	42.9
2019	44.1
2020	45.6

***2011 ANNUAL REPORT OF THE BOARDS OF TRUSTEES OF THE FEDERAL HOSPITAL INSURANCE AND FEDERAL SUPPLEMENTARY MEDICAL INSURANCE TRUST FUNDS**

Figure 2: Enrollment in Medicare Part D Plans: All Beneficiaries

All Beneficiaries	
Calendar Year	**Part D (% of GDP)**
Historical Data:	
2006	33
2007	36
2008	38
2006	41
2010	43
Intermediate Estimates:	
2011	44
2012	47
2013	50
2014	51
2015	54
2016	56
2017	59
2018	61
2019	64
2020	67
2030	98

*2011 ANNUAL REPORT OF THE BOARDS OF TRUSTEES OF THE FEDERAL HOSPITAL INSURANCE AND FEDERAL SUPPLEMENTARY MEDICAL INSURANCE TRUST FUNDS

Figure 3: Part D Expenditures as Part of Gross Domestic Product

A controversial aspect of the Medicare Part D benefit design was the inclusion of a doughnut hole, or gap in coverage, defined as the difference in the initial coverage limit and the catastrophic coverage threshold. The gap was included to keep the cost of the program within the amount specified by the congressional budget resolution. The coverage gap, defined for the purpose of this paper, is when a beneficiary reached $2,400 in total drug costs and ended when catastrophic benefits started, i.e. total drug costs reached $5,451 (Florian Heiss 2007; Hoadley, Hargrave et al. 2007; Tseng, Dudley et al. 2009). The figure below references the

diagram created for the Hoadley paper, which visually gives a detailed breakdown of the out-of-pocket expenditures and total drug costs that define the coverage gap in Medicare Part D.

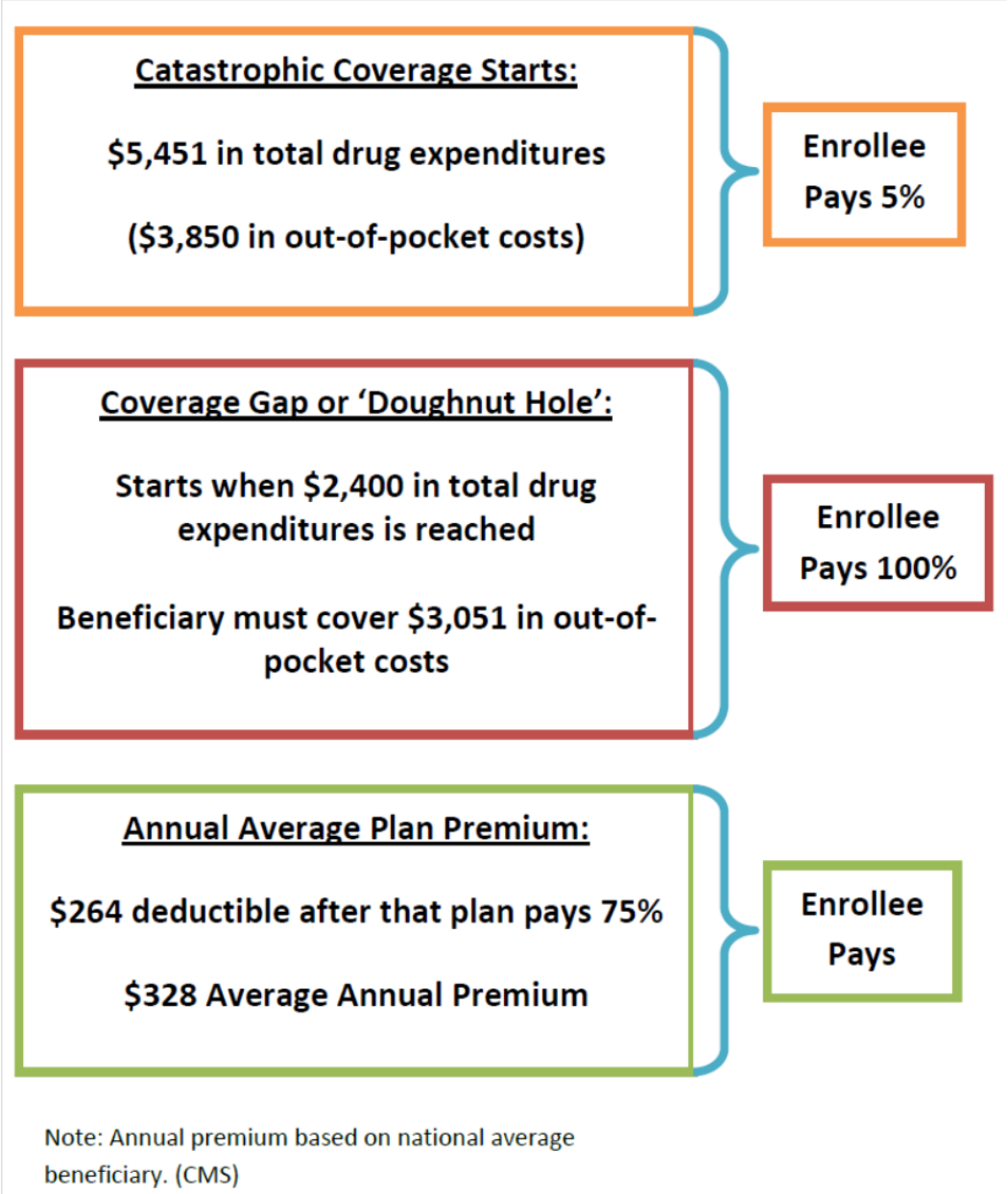

Figure 4: Medicare Part D Coverage Levels

Research suggests many Medicare Part D recipients are making suboptimal choices by either not enrolling in Part D or by choosing a suboptimal plan (Florian Heiss 2007; Lichtenberg

and Sun 2007; Zhang 2010). By incorrectly selecting a suboptimal plan, the gap can greatly affect elderly individuals' drug adherence, income, and health when faced with high, unsubsidized medication costs.

For most beneficiaries enrolled in Medicare Part D, the drug coverage offered by the PDPs sufficiently covers acute and chronic medication expenses. Several studies of the coverage gap found that around 40% of beneficiaries enter the gap with 10% reaching the out-of-pocket level to push them into catastrophic coverage (Hoadley, Hargrave et al. 2007). Further, research suggests that individuals who are close to reaching the gap, or have reached it, may stop taking medications, lower their medication adherence, or switch to less effective substitutes. The U.S. Department of Health and Human Services estimates that more than a quarter of Part D participants stop following their prescribed drug regimen when they hit the doughnut hole [CMS, Medicare.gov]. If at-risk beneficiaries can be identified before they enroll in a specific PDP, these individuals can select optimal plans that minimize their amount of out-of-pocket (OOP) drug costs while maximizing health outcomes.

For older and senior women, exorbitant OOP expenses can lead to crippling financial burden, precipitating medical debt and/or the avoidance of necessary medical care (Song, Chang et al. 2006). Coverage gaps also discourage older and senior women from seeking preventive health care and other needed services that could go a long way to prevent future illnesses and healthcare costs. As a result, high OOP costs and benefit gaps have potentially negative financial and health-related consequences for older and senior women.

Early analyses of the effects of Medicare Part D found an individual’s probability of reaching the gap depends not only upon income, but also upon socioeconomic status, education,

age, ethnicity, and gender (Daniel and Malone 2007; Bayliss, Ellis et al. 2010). In the analysis to follow, data is used from the Medical Expenditure Panel Survey for the three years after the plans' implementation in 2006 to evaluate whether the short-run effects previously observed, e.g. disproportionate likelihood of entering the gap for women versus men, hold over time. Then, possible correlation between OOP drug costs and drug non-adherence after an individual enters the coverage gap are assessed. Demographics and characteristics may be key in identifying at-risk populations before it is too late. The conclusions derived from this research could assist "seniors'" ability to navigate the sea of choices available with Medicare Part D PDPs and increase access to necessary medications.

Entry into the coverage gap will be defined by the 2007 listing of coverage entry when beneficiaries' total drug costs equal $2,400, and ends when a beneficiary has spent $5,451 in total drug costs and, therefore, the equivalent of $3,850 in OOP costs (Hoadley, Hargrave et al. 2007; Tseng, Dudley et al. 2009).

The second part of the analysis concentrates on the impact the coverage gap may have on elderly beneficiaries' drug adherence. The World Health Organization has researched and defined adherence to medication as the degree to which the use of medication by the patient corresponds with the prescribed regimen (Organization 2003; Organization 2003). Five categories have been identified in previous literature as reasons for medication non-adherence; they are expressed in the figure below. Examples associated with the five categories of non-adherence are:

1. Health System: Poor quality of provider-patient relationship, poor communication, lack of access to health care or lack of continuity of care.
2. Condition: Asymptomatic chronic condition disease, meaning there is a lack of physical cues as in mental health disorders.

3. Patient: Physical impairments like vision problems or impaired dexterity, cognitive impairment – be it psychological/behavioral.

4. Therapy: Complexity of regimen or negative side effects.

5. Socioeconomic: Low literacy, high medication costs, or poor social supports.

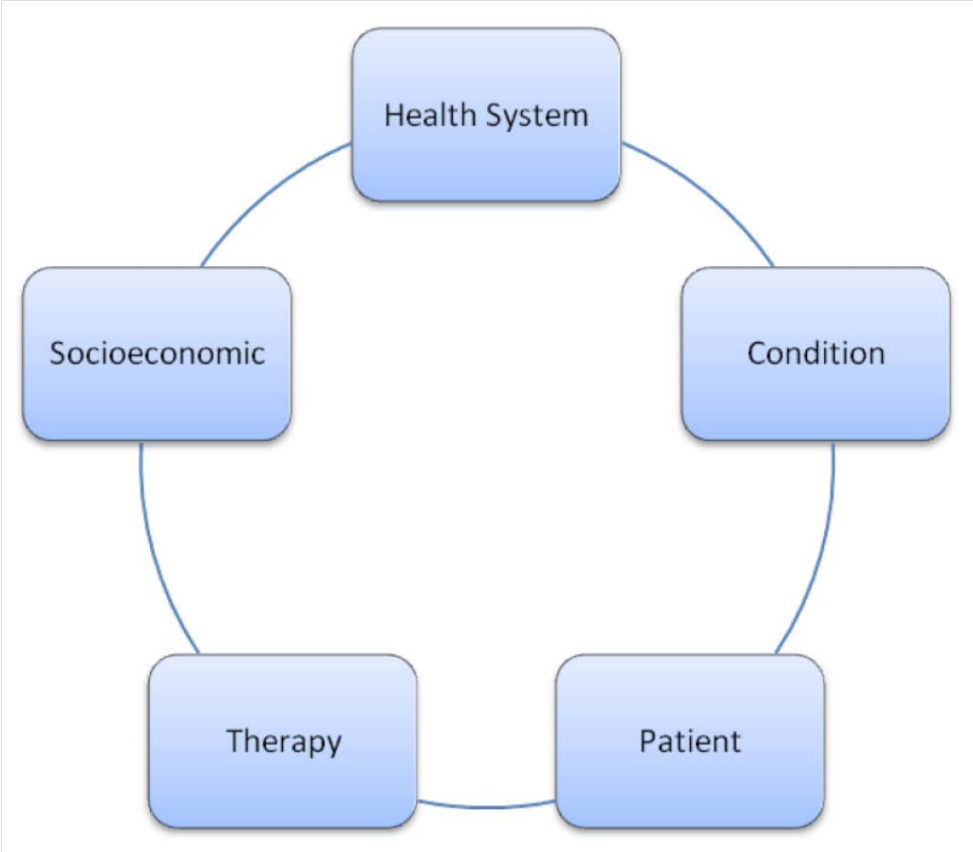

Figure 5: WHO: Five Reasons for Medication Non-Adherence

All of the factors within the five categories listed above impact the effectiveness of a patient's medication regiment and health outcomes (Organization 2003; Ho, Bryson et al. 2009). The second hypothesis of this paper focuses on the socioeconomic reasons for non-

adherence and the relationship with the lack of prescription drug coverage in Medicare Part D's coverage gap.

According to the analyses used throughout this project, women are almost 20-23% more likely to reach the coverage gap versus their male counterparts. This confirms the previous literature conclusion that reaching the coverage gap depends on more than income and co-morbidities. With 56% of the 2010 Medicare Part D population being women, further research into why they reach the coverage gap more often than men could make a substantial difference in future health outcomes (Trustees, Insurance et al. 2011).

Previous literature has concluded that there is a relationship between the coverage gap and drug adherence (Anonymous 2006; Hsu, Fung et al. 2008; Hsu, Price et al. 2010).While it was interesting to find there was positive correlation between gap entry and gender. The surprise was that gender did not pay a significant role on an individual's drug adherence.

Chapter 2
Literature Review

The Medicare Part D prescription drug benefit has been studied by numerous authors over the last five years since its implementation. In this section, those findings that are directly related to this analysis will be reviewed.

The first published articles about Medicare Part D concentrated on comparing the population of individuals age sixty-five and older before and after Medicare Part D was implemented (Patel and Davis 2006; Skrepnek, Denarie et al. 2008; Safran, Strollo et al. 2010). Knowledge regarding the coverage gap didn't appear until data started to accumulate, and

researchers discovered a significant amount of beneficiaries fell into the gap each year (Anonymous 2006; Delate, Raebel et al. 2008; Zhang, Donohue et al. 2009). Once individuals were identified as reaching the coverage gap further analysis could start on the variables that could explain why they exceeded the expenditure limit (Daniel and Malone 2007; Said, Li et al. 2009; Bayliss, Ellis et al. 2010; Ettner, Steers et al. 2010). Current published papers address the problems in identifying those individuals who reach the coverage gap or the affect the gap has on drug adherence. These analyses build off of both hypotheses, utilizing a comprehensive data set to make observational statements about the population for possible future research and interventions.

In 2006, Patel and colleagues commenced research into the newly-developed prescription drug subsidy program by studying how beneficiaries with higher drug utilization may face higher OOP costs. With the prescription drug benefit in its first year of implementation, specific data on Part D beneficiaries was unavailable, so the Medicare Current Beneficiary Survey Cost and Use data for 1997 through 2001 were used to estimate the impact of the standard Part D benefit upon drug expenditures. The results indicated that beneficiaries face substantial total and OOP annual expenditures for medications, causing most to reach the Part D benefit gap. Patel et al. argue that higher OOP costs may lead to reductions in spending and medication use, thereby causing treatment gaps, which, in turn, may lead to increased use of medical services (Patel and Davis 2006).

Daniel et al. (2007) discussed the implication of medication therapy management programs (MTMPs) on beneficiaries with drug expenditures above $4,000, multiple co-morbidities, and multiple prescription drugs. MTMPs benefit individuals who use several medications, those who have several health conditions, those who have questions or problems

with their medications, those who are taking medications that require close monitoring, those who have been hospitalized, and those who obtain their medications from more than one pharmacy. Using Medical Expenditure Panel Survey data from 2002-03, he examined the expenditures of older adults over the age of sixty-five on the probability of reaching the coverage gap. His results indicated that characteristics other than drug use, such as having functional limitations or requiring help with activities of daily living, can be used to identify potential MTMP candidates (Daniel and Malone 2007). The use of medication therapy programs might be able to assist individuals from reaching the coverage gap in the future because it can identify and manage the prescriptions and improve drug adherence.

Lichtenberg et al. (2007) used a difference-in-difference design to estimate the effects of Medicare Part D on seniors' prescription drug use and expenditures. His results indicated that although crowding out occurred due to Medicare Part D, it was not necessarily an inefficient program. In his analysis, crowding out implied that large increases in public spending are required to obtain relatively small increases in prescription drug use by the elderly. His results concluded that Medicare Part D reduced the total amount paid by patients by only a small percent. It increased the amount paid by third parties by a much larger percent. His conclusion was that overall Medicare Part D seems to have had a negligible impact on the overall price of prescription drugs. He conceded that while crowding out occurred with only negligible impacts on price, previous studies suggested an inverse relationship between copayments and compliance in all risk groups and indicated that Medicare Part D probably reduced Medicare Part A and Part B spending (Lichtenberg and Sun 2007).

Hoadley et al. (2007) analyzed nationwide patient-level retail pharmacy claims for Part D enrollees, and found that a large share of Medicare Part D enrollees who take prescription drugs,

and do not receive low-income subsidies, have spending in the coverage gap. Of those that fall into the coverage gap, only a small share will pass though the gap and eventually qualify for catastrophic coverage. Moreover, they found that some enrollees who reached that gap made changes to their drug regimen, including stopping their medications altogether (Hoadley, Hargrave et al. 2007).

Hsu et al. (2007) surveyed community-dwelling Kaiser Permanente-Northern California Medicare Advantage beneficiaries, age sixty-five or older, to assess beneficiaries' knowledge of cost-sharing and awareness of the coverage gap. They found that one third of beneficiaries reported cost-coping behavior, reduced adherence, or experienced financial burden. In multivariate analyses, beneficiaries with lower household income more frequently reported these cost responses. The conclusion was that limited knowledge is associated with fewer reports of cost responses overall but is associated with more reports of financial burden (Hsu, Fung et al. 2008).

Madden et al. (2008) noticed that the previous literature on Medicare Part D did not evaluate the impact of Medicare Part D on cost-related medication non-adherence (CRN), which has been a persistent problem among seniors in the United States. His research objective was to estimate changes in CRN and forgoing basic needs to pay for drugs following Part D implementation. He used the Medicare Current Beneficiary Survey and logistic regression analyses to isolate his results. The unadjusted, weighted prevalence of CRN was 15.2% in 2004, 14.1% in 2005, and 11.5% after Part D implementation in 2006. Madden et al. concluded that evidence exists for a small but significant overall decrease in CRN and the forgoing of basic needs following Part D implementation, but there was no net decrease in CRN after Part D for the sickest beneficiaries (Madden, Graves et al. 2008). His findings suggest that the intensive

medicine needs and financial barriers to access among the sickest beneficiaries may be related to other factors.

In 2010, data-rich articles on Medicare Part D began to appear in a variety of medical and economic journals. The literature consensus in the first five years after Medicare Part D's implementation is that characteristics of beneficiaries who reach the coverage gap, and the unintended consequence of non-adherence due to the coverage gap, were important indicators of Plan D's efficacy. Identifying individuals, who will reach the coverage gap, and intervening to decrease that number through beneficiary coverage education and medication therapy management, will mitigate the number of women who fall into the coverage gap each year.

Most of the relevant articles cited for this paper use data from the Medicare Current Beneficiary Survey, National Pharmacy chains, and phone surveys. Only two of them used MEPS data (Daniel and Malone 2007; Millett, Everett et al. 2010), and these studies were limited by data availability, focusing on the years before or directly after the implementation of Part D.

The three studies closest to this work are those by Ettner, Roblin, and Daniel, which are mentioned above. Ettner's and Roblin's papers stand out because both came to the conclusion that females had a greater probability of falling into the coverage gap than males. Ettner used pharmacy data from 2005-06 with census data and examined the co-morbidities and demographics associated with drug entry and exit. The results indicated that 15.9% reached the coverage gap, and women had a 25% higher chance of gap entry than men (Ettner, Steers et al. 2010). Roblin employs a different data set from Kaiser Permanente Georgia to identify Medicare Advantage Prescription drug plan enrollees who meet or exceeded the Part D coverage gap in two consecutive years and identify characteristics that put them at risk for repeat entry. Interestingly, while most studies found an increased likelihood of coverage gap entry with

increased patient age and co-morbidities, Roblin found a positive association of repeat gap entry among females (Douglas W. Roblin and Matthew L. Maciejewsji 2011). Methodologically, this work most closely follows Daniel et al., which also used the MEPS data.

Chapter 3
Methods

Data:

The Medical Expenditure Panel Survey (MEPS) is a nationally representative survey that provides representative estimates of health care use, expenditures, payments, health insurance coverage, and demographic information for the U.S. civilian non-institutionalized population. The sample is drawn from respondents to the National Health Interview Survey conducted by the U.S. National Center for Health Statistics. The Survey is split into three separate parts: the Household component (HC), the Medical Provider Component (MPC), and the Insurance component (IC). The Household component includes five rounds of patient interviews covering two full calendar years. Using computer assisted personal interviewing (CAPI) technology, the information about each participating household member is collected and compiled from interview to interview. One reporting individual, on behalf of his/her family, provides the data collected for each reported household. The set of households selected for each panel of the MEPS HC constitute a subsample of households participating in the year survey. This dataset provides a representative sample of the U.S. civilian non-institutional population, including black and Hispanics, recognizing an oversampling of minorities.

The Household Component (HC) represents the core survey in which households and individuals within households are sampled. Detailed, self-reported data are collected on

demographic characteristics, health conditions, health status, income, health insurance coverage, and employment. The HC uses an overlapping panel design in which data are collected over a series of five rounds (interviews) over a two and a half year period for each panel. The collected data, however, cover a complete two year period. A new overlapping panel is sampled and launched each year. Annual data are then generated by combining the last three rounds (3, 4, and 5) of the previous panel and the first three rounds (rounds 1, 2, and 3) of the new panel. Since MEPS began in 1996 with panel 1, this study will use data from collection rounds in years 2006, 2007, and 2008. Any expenditure data obtained from the MEPS-HC were self-reported data (Quality 2011).

This data used for our analysis come from the Full Year Health Care Consolidated files for 2006, 2007, and 2008. Analyses were run separately for each year to identify specific variables related to the descriptive statistics. Then, the sample size data files were consolidated and weighted to create a population that is representative of the United States to run the regression analysis.

The chart below illustrates the timing and relationship between panels, rounds, and calendar years. For example, looking at the data collection by panel, panel 12 consists of five rounds of interviews; with rounds 1-3 providing data for 2007 and rounds 3-5 providing data for 2008. Looking at the data collection by year, data for the year 2008 consists of data collected from rounds 3-5 of panel 12 and rounds 1-3 of panel 13.

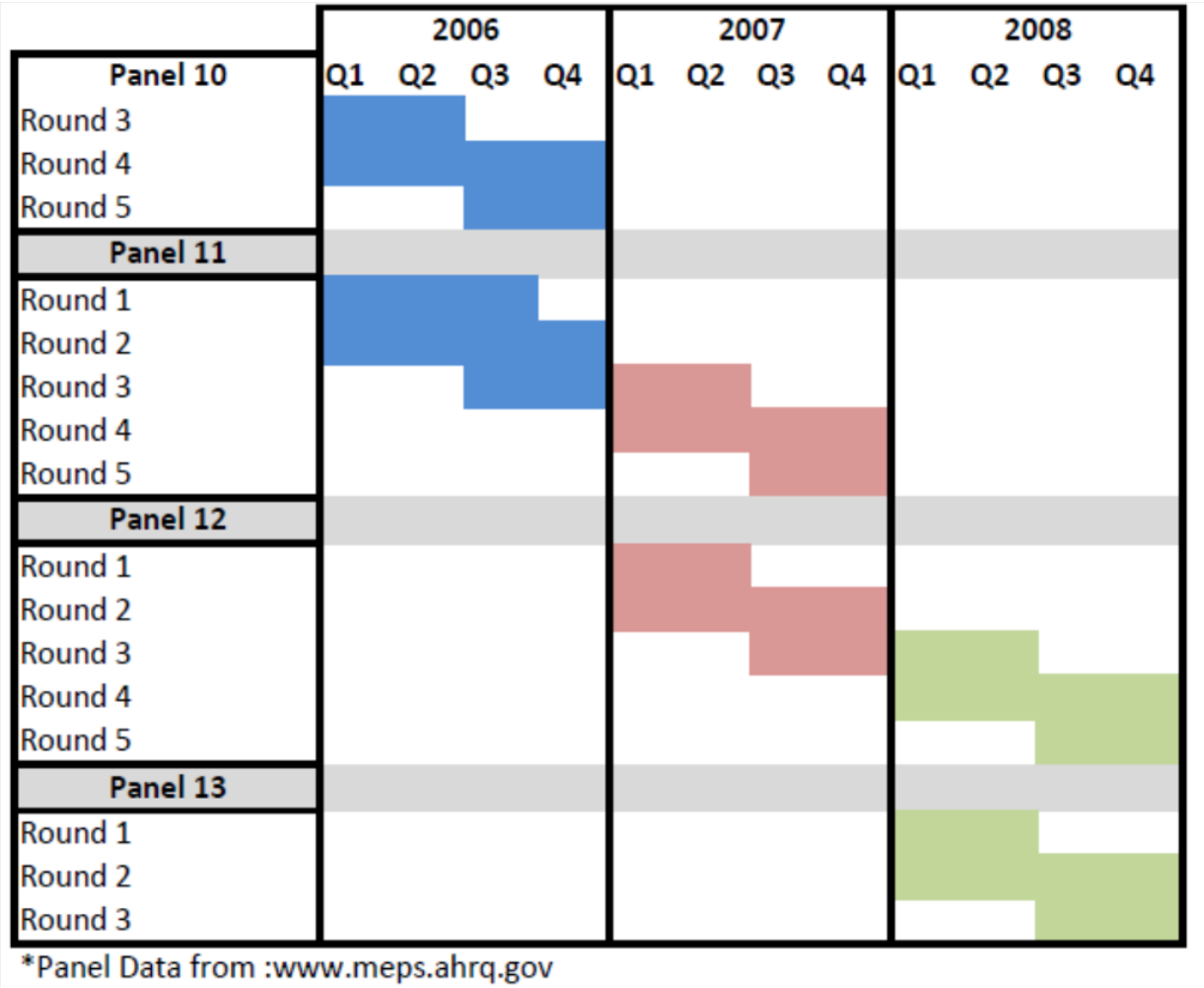

Figure 6: MEPS Panel Design for 2006-2008

Statistical Analysis:

The initial statistical analysis was performed by acquiring the relevant data from the Medical Expenditure Panel Survey (MEPS). The population of Medicare Part D eligible individuals was defined as anyone over the age of sixty-five at the start of 2006. The expenditure criteria for gap entry and exit came previously mentioned articles. Then, important variables were flagged, as identified by the literature, along with a subset of additional markers to allow us to control for gender. Once the data were parsed and processed, descriptive statistics for each

year (2006 through 2008) were assembled to establish the overall characteristics of the population.

The data sets were then combined and weighted using STATA 11.0 to give an overall population estimate for the United States, given the original sample size. Next, a bi-variate two by two analysis was run on all variables for those that entered the coverage gap to acquire p-values and identify significance.

Survey-weighted logistic regression identified factors associated with meeting the expenditure threshold. Unbiased population point estimates were obtained by adjusting for survey non-response, post stratification, and oversampling of blacks and Hispanics using MEPS person-level weights. The standard errors were adjusted for non-independence of observations due to complex multistage sampling by specifying the strata and primary sampling units for each respondent.

For the multivariate analysis, we used a generalized linear model (GLM). The basic GLM mathematical model is defined as:

$$y_i = \beta_1 x_{i1} + \cdots + \beta_p x_{ip} + \varepsilon_i = x_i'\beta + \varepsilon_i, \qquad i = 1, \ldots, n,$$

The level of the individual beneficiary reaching the coverage gap was defined as a binary outcome coded 1 or 0, based on the level of out-of-pocket expenditures. We also coded a measure for the characteristics of reaching the gap, which can be between 0 and 1. The “variable gap” is a measure of the total contribution of all the independent variables used in the model. When this model is run with no covariates, the output will produce a constant which, if exponentiated, will be the estimate of beta. When covariates are included, the exponential of the constant term will be a fitted beta, or the reference combination of the covariates. The exponential of a coefficient for a covariate will be the relative risk for that covariate.

Each of the regression coefficients describes the size of the contribution of that risk factor or characteristic. A positive regression coefficient means that the explanatory variable increases the probability of the outcome, while a negative regression coefficient means that the variable decreases the probability of that outcome; a large regression coefficient means that the risk factor strongly influences the probability of that outcome, while a near-zero regression coefficient means that that risk factor has little influence on the probability of that outcome.

Logistic regressions were used to estimate the probability of reaching the coverage gap as a function of age, gender, ethnicity, income, co-morbidity, reported health, education, and drug expenditures. The basic logit mathematical model is defined as:

$$P(y=1 \mid \mathbf{x}) = P(y=1 \mid x_1, x_2, \ldots, x_a),$$

Where **x** is used to denote the full set of explanatory variables. In this case y is a gap indicator, and x contains all the various individual characteristics a beneficiary may have that could affect gap entry. These include age, co-morbidity, gender, income, ect. To specify the logit model the assumption is that the response probability is linear in a set of parameters. When y is a binary response variable (i.e. taking on values of 0 or 1) the equation looks like the one below:

$$P(y=1 \mid \mathbf{x}) = G(\beta_0 + \beta_1 \text{gender} + \beta_2 \text{race} + \beta_3 \text{income} + \beta_4 \text{co-morbidity} + \beta_5 \text{income} + \ldots \beta_a x_a)$$

The resulting parameter estimates were used to provide models of patients reaching the gap and standardized to the underlying population characteristics.

Maximum likelihood estimation (MLE) was used instead of ordinary least-squares or weighted least-squares due to the nonlinear nature of the model. The MLE provides the simplest way of estimating parameters in an unconditional distribution. The basic MLE model is given in the equation below:

$$\hat{\sigma} = \sqrt{\frac{\sum (x_i - \hat{\mu})^2}{n}}.$$

A probit analysis was run in addition to the logistic regression to determine if there was a significant difference in the results. In a probit model, we assume that the probability density function (PDF) of the error term is a standard normal distribution. The model is also estimated by using a maximum likelihood algorithm. The coefficients from the probit model are difficult to interpret because they measure the change in the unobserved variable and the change in one of the explanatory variables. In this analysis, another measure called “marginal effects” was used to compare the two.

The logit model is very similar to the probit model, except it is assumed that the function has a logistic distribution instead of a standard normal. Probit and logit models are among the most widely used members of the family of generalized linear models in the case of binary dependent variables. The conventional wisdom is that, in most cases, the choice of the model is largely a matter of preference.

The second hypothesis postulates the possible relationship between drug adherence and the coverage gap. The key assumption for the null hypothesis was that people in the coverage gap are less adherent to their medications. Poor adherence to drug therapies or managed care plans for chronic conditions severely comprises the effectiveness of treatment. This is a critical issue congruent with the Medicare Part D coverage gap from both the perspective of quality of life and of health economics. The literature suggests there is a link between the coverage gap threshold and increased costs due to in-patient and emergency department use(Raebel, Delate et al. 2008). Improving adherence by limiting the amount of the population that falls into the

coverage gap each year would provide a significant positive return by prevention of adverse health outcomes.

The analysis for the hypothesis will extend the eligible population into three discrete gap groups (i.e. 1 = individuals who did not hit gap, 2 = individuals in gap at end of year, and 3 = individuals who got through gap). For each drug code, the individual sum of the quantity was standardized using the annual prescription data. The resulting z-scores represent the individual's annual usage of the drugs. For the chronic conditions, the z-scores of treatment drugs were averaged to produce a z-score for the individual annual use of drugs used for treatment of the chronic conditions. This adherence proxy allowed for testing a change either positive or negative into the different mind sets of beneficiaries surrounding the coverage gap.

A proxy variable was used because given the lack of data on the relevant variable for adherence, which was RX fill dates, a related but not identical variable of z-scores for drugs prescribed was used in place of the unobserved variables in the analysis. The z-score variable corresponded to a point in a normal distribution and as such described how much a point deviates from a mean or specification point.

Variables:

The variables included to start the separate logistic and probit regressions are listed in the figure below. Additional variables covering specific demographics and co-morbidities are listed in multiple tables listed among the appendices.

	Variables Necessary for Hypothesis 2: Drug Adherence	
Gap Entry	***PMDLAY42***	***TC Codes to Create Groups***
	PMDLR42	***Hypertension***
	RX Quantity	***Diabetes***
	RX National Drug Code	***High Cholesterol***
		Arthritis
		Depression
		Asthma

Figure 7: Basic Logit/Probit Regression Model Variables

The MEPS dataset, including the household component, the prescribed medications files, and the office event files for 2006-08, lacked usable prescription fill dates to include as variables related to adherence. A proxy variable using the z-score of each subject by chronic condition was used to measure adherence across all National Drug Codes. Then the drug quantity was summed by individual and drug code. The mean (mu) and standard deviation (stddev) was calculated for each code. The standardized z-score for each individual by drug code and chronic condition group (given by the equation (x - mu)/(stdev)) was estimated. Using the standardized z- score as a measure of adherence it was applied across all drug codes. The above method allowed all negative scores to equal non adherence and all positive scores to equal adherence. The variables for chronic condition by drug code are listed out below:

Hypertension: TC Codes 42,44,47,48,49,55,303,340

Diabetes: TC Codes 99,372,373

Hyperlipidemia (High Cholesterol): TC Codes 19,173,174,241,252,316,317

Arthritis: TC Codes 192,194, 257,284

Depression: TC Code 249

Asthma/COPD: TC Codes 125,130,131

Each of the six above condition descriptions above were weighted and run individually by gap group in STATA to get the mean and confidence intervals. Then an analysis of variance (ANOVA) was completed controlling for all extremely significant demographics that might explain means falling outside of the determined confidence intervals. An analysis of variance (ANOVA) involves comparing random samples from several populations. In this case there were three gap groups along with each condition. The ANOVA technique was used to test the adherence by testing the equality of the means among the three gap groups.

Chapter 4
Results

Descriptive Analysis

Tables 1-4 show mean values or proportions of the variables included in the analysis for the sample as a whole and for each of the variables in the study. These variable sets form the basis of the models in the multivariate analysis.

The results from the weighted files of the population from 2006 through 2008 are presented in Table 5. The actual number of observations for individuals over the age of sixty-five was 14,258, which gave an estimated population size of 149,217,142. The average age was seventy-four years; 58% were women and 70% were white. The average annual income was $24,366. In the sample reported, 30% of individuals reached the coverage gap within the range defined at total drug expenditures greater than $2,400, with only 8% exiting the gap to qualify

for catastrophic coverage. In terms of health, 23% of patients reported poor or fair physiological health, while 10% reported poor to fair psychological health. Almost 97% of the individuals had been married at least once in their life, and 35% had completed twelve years of education. Surprisingly, when only considering those elderly individuals who had reached the coverage gap, 60% had completed at least twelve years of education or more.

Table 5 shows the spread of respondent characteristics and drug insurance coverage. Elderly individuals were generally covered by Medicare, with at least 50% carrying private insurance for at least some part of the year. Only 10% of the population qualified for Medicaid and only 0.5% were uninsured for the entire year. The most common ailments suffered by the elderly were high blood pressure, high cholesterol, arthritis, and diabetes. 11% suffered from myocardial infarctions, 21% suffered from other manifestations of heart disease, and 11% suffered from stroke.

Overall, after running statistical analyses to find the p-values for all variables, we observed that the characteristics of being Hispanic, living in urban areas, having tricare insurance, other public A insurance, and other public B insurance did not correlate significantly to patients entering the coverage gap. The variables other option A and other option B assisted in further editing sources of insurance. Specifically if the respondent reported some type of managed care and paid something for the coverage, Other Public A Insurance (OPAJA08 – OPADE08); and if the respondent did not report any managed care, Other Public B Insurance (OPBJA08 – OPBDE08) (Quality 2011).

Results for P values were defined as being "very significant" or "extremely significant" depending on the size of the P value. Results with a P value less than or equal to 0.05, were said to be significant while a P value less than 0.001 was considered extremely significant.

The P value was defined as a probability, with a value ranging from zero to one. It is the answer to the question: If the populations really have the same mean overall, what is the probability that random sampling would lead to a difference between sample means as large (or larger) than was observed. Reporting results using P values means that random sampling from identical populations would lead to a difference smaller than you observed in the P value percent minus one hundred of experiments and larger than you observed in P value percent of experiments.

Regression Analysis:

Many coefficients were dropped out of the regression analysis due to statistical issues. All other races, besides black and white, were not included because they only accounted for a total of 10% of the estimated population. The second variable used for education, based on highest degree earned, was not included because of the high percent of people who reported “other degree.” There was no way to isolate what degrees fell into the specific category or if the same person reported a degree twice. Number of years of education was used in the regression analysis instead. Living in an urban area and if the respondent was comfortable speaking English were both dropped due to less significant p-values. The region variable was merged into two categories because the Northeast, Midwest and South had a population size of 31% while the West was significantly different. Income was grouped into three categories where the reference group was $20,000-$35,000 per annum compared to the high and low income groups.

Significant predictors of gap group membership were evaluated using logistic regressions and are shown in Table 6. Risk factors significantly associated with reaching expenditure threshold included, age, physiological and psychological reported health, gender, and race, and whether the individual has issues related to stroke, angina, smoking, income, and body mass index. Females were 24% more likely than males to encounter the coverage gap (odds ratio = 1.238), while the elderly having a BMI (body mass index) greater than 30% were 54% more likely than normally weighted individuals (odds ratio = 1.535). Elderly who reported fair to poor physiological health were 59% more likely to encounter the gap compared to those reporting average health (odds ratio= 1.586). Individuals who reported fair to poor mental health were only 20% more likely to reach the gap (odds ratio =1.203). Income was not as strong a predictor as had been originally assumed, with only 2% of the lowest income (less than $20,000 per annum) group reaching the gap (odds ratio=1.018), while those making between 20,000-$40,000 per annum increased their chances by 17% compared to the wealthiest group (odds ratio = 1.166).

Marginal effects estimation and probit regressions were run in addition to the logistic regressions to compare any significant differences. Tables 7-9 provide the details for the marginal effects and probit regression. Table 10 concludes the differences and identifies which variables were significant for both types of regression and marginal effects.

Adherence Analysis

The second phase of the analysis modeled a proxy variable for adherence to test the hypothesis that medication adherence was correlated with the coverage gap. Table 10 starts with the distribution of individuals who reached each gap group by gender. 66.1% of women did not reach the gap, 24.7% fell into the gap, and 9.2% went though the coverage gap. Males were lower with 70.6% not reaching the gap, 20.9% falling into the gap, and 8.5% reaching

catastrophic coverage. The data was summed by the national drug code through the designated chronic condition groups. Then using the standardized z-score the means and confidence intervals were collected to compare conditions by gap groups. Tables 11-13 provide the details for each model and analysis but there are several significant differences in the usage levels between groups. The p- values and 95% confidence intervals were used to see which coefficients had the smallest significance level First, the group that did not reach the gap all had significantly lower than average usage meaning the p values <.05. The condition means were analyzed by looking to see if the coefficient was negative or positive and if the confidence intervals were overlapping between the difference groups. Hypertension had a mean of (-.072), diabetes (-.075), high cholesterol (-.104), arthritis (-.094), depression (-.144), and asthma (-.077).All were negative along with negative non-overlapping confidence intervals signifying that they were less adherent than the average. Group three which passed though the gap only had two conditions that were significantly higher than the average. Hypertension with a positive lower confidence interval of (.016) and asthma (.019).

The ANOVA or analysis of variance alaysis, based on the conditions and gap, distinguished which variables used in the gender regression analysis impacted dug adherence.The impacted was based on if there was a significant p-valuse associated with the coefficients. The ANOVA analyzed the overlap in confidence intervals in each condition group controlling for demographics. The model relating to the hypertension gap had a p-value of (<.001) signifying very significant, income was significant with (.028), and BMI (.037) had significant p values. Diabetes had significant p values associated with education (<.001) and income (.035). Income (.003) and BMI (.001) were also extremely significant variables for high cholesterol. Body Mass index was the only significant variables associated with depression with

a p-value at (.036). Age with a p-value of (.019) and region with (.023) were the only significant variables to asthma. The only condition that did not have an extremely significant p value for the initial model was arthritis with the gap value of (.071). While, BMI was significant (.032).Tables 14-19 show the results and number of observations for each weighted group. The graph below summarizes the change in usage of drugs for chronic conditions for those that did not reach the gap (1), those that reached the gap (2), and those that went though the gap and qualified for catastrophic coverage (3).

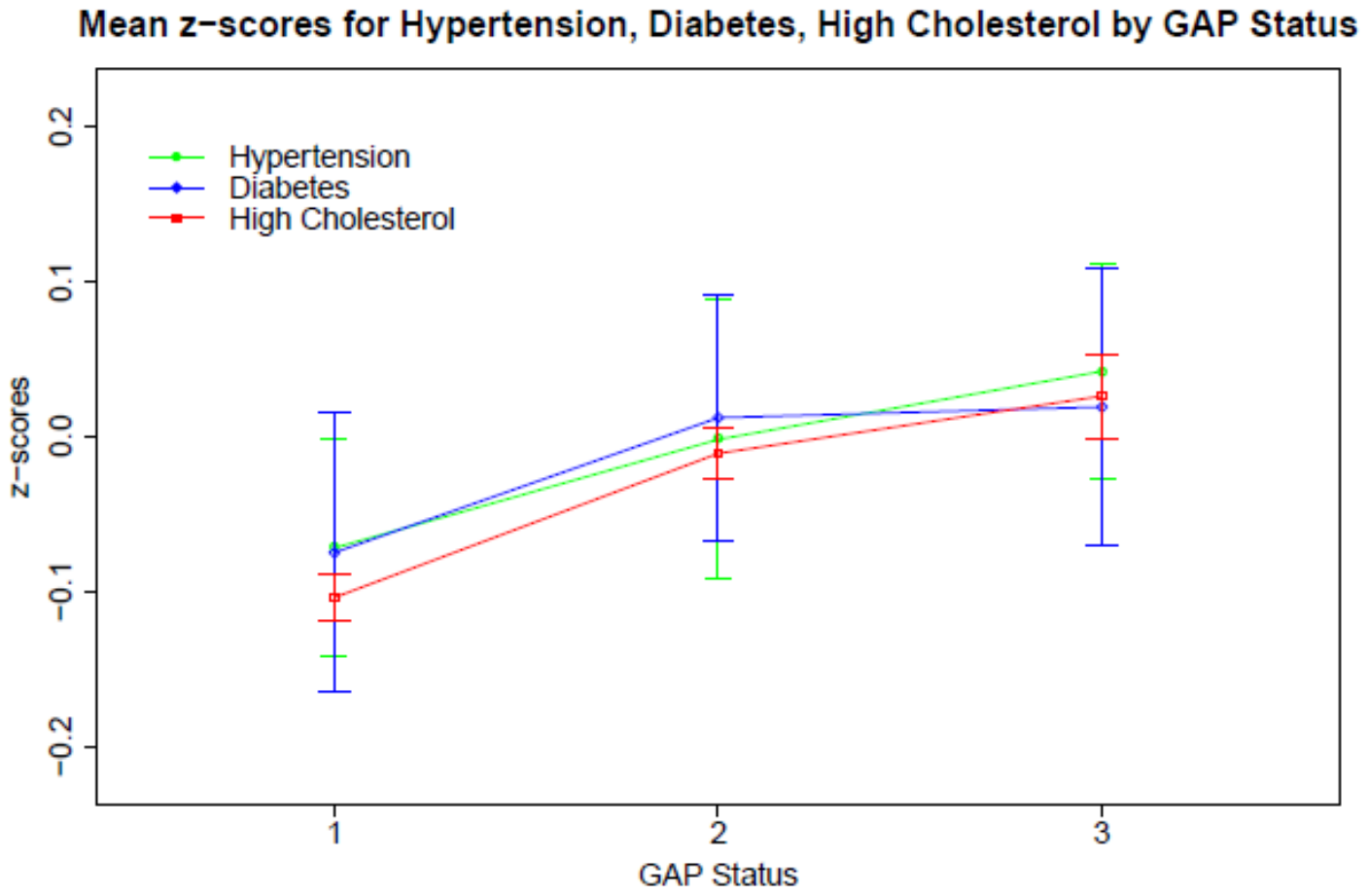

Figure 8: Mean Z Scores for Hypertension, Diabetes, and High Cholesterol by Gap Groups
(*The bars above represent the 95% confidence intervals)

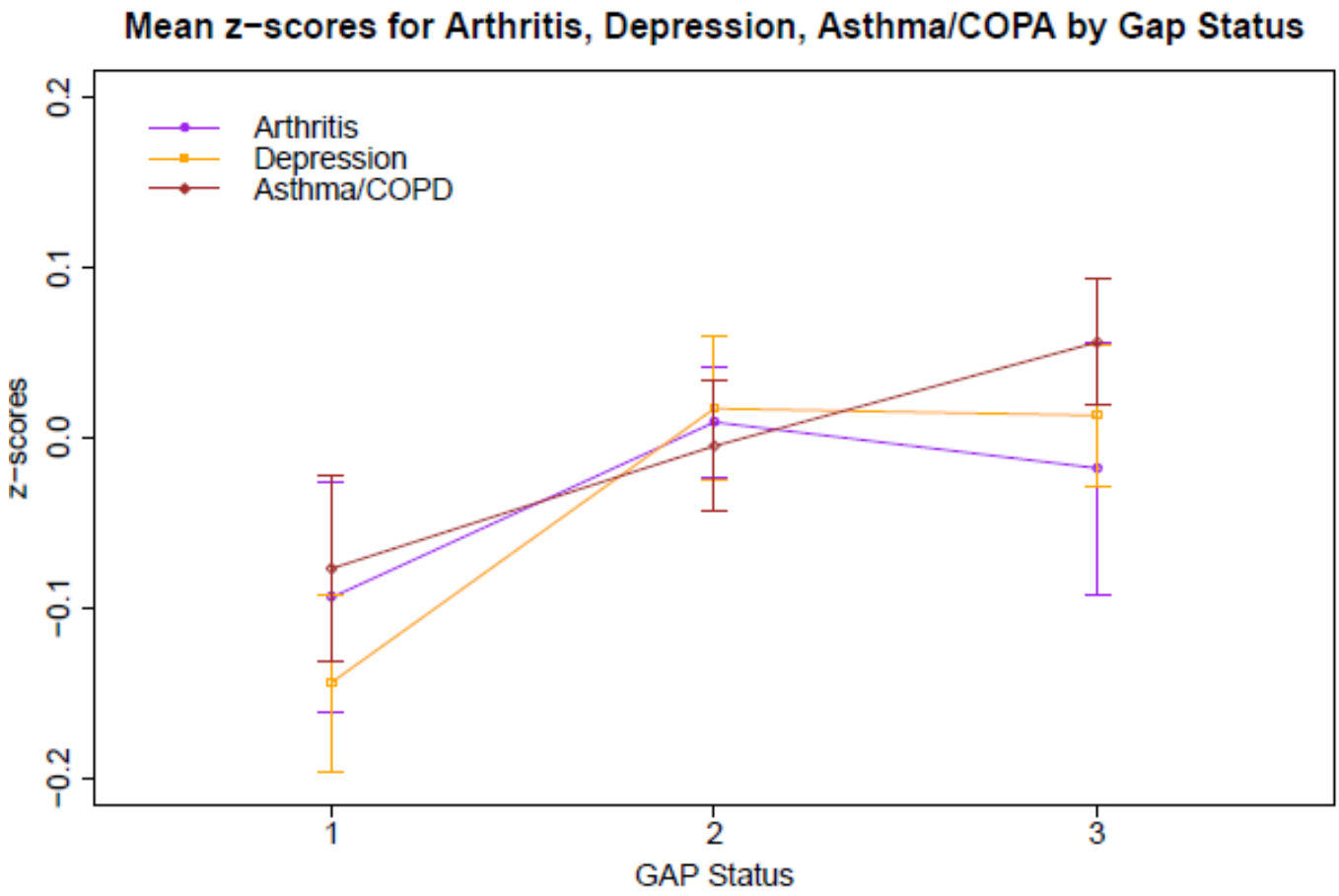

Figure 9: Mean z scores for Arthritis, Depression, and Asthma by Gap Group

(*The bars above represent the 95% confidence intervals)

Chapter 5: Discussion

Limitations:

First, due to the significant results associated with the female gender, one should worry about any omitted variable bias. It is possible that there may be a variable associated with the female gender not included in the regression that is biasing the results. Each regression was ran starting with only relevant variables to the model and then all additional variables were added that were thought to have a possible effect on the outcome. The likelihood associated with gender only changed by a percent or two (which is not significant enough to warrant bias).

Second, external validity asks whether the results concluded from this analysis are generalizable and if so, by whom. MEPS is a large, stratified, random sample survey and should be an accurate representation of the U.S. demographic.

Third, this study relies on self-reported data, which has the potential for errors in collection, reporting, and imputation. Respondents may not accurately report their income, education, or understand how to answer a particular question. MEPS tries to limit reporting error by significant editing, coding , and accuracy checks before releasing the data causing a three year lapse between collection and availability.

Finally, while the proxy measurement used in this analysis provides insight into availability of medication, it does not provide information on the timeliness or consistency of drug refilling. The adherence variable is normalized and due to the lack of prescription fill dates in the data can not differentiate if one person was more consistent or timelier with their refill behavior over another.

Discussion:

Individuals over the age of sixty five are heavy users of medical services because of a disproportionally high prevalence of chronic and acute health conditions. Health coverage is especially critical because health care and prescription drugs are expensive and costs are rising fast. In fact, health costs continue to climb at a pace that exceeds the growth of income and social security benefits. Action is necessary to address both the exhaustion of the HI trust fund and the anticipated excess growth in all Medicare fund expenditures (Trustees, Insurance et al. 2011).

Key points to take away from these analyses are that gender and race are both significant criteria in identifying individuals who will reach the coverage gap. This hypothesis is significant because it shows a persistence of gender and race differences in prescription drug utilization among Medicare beneficiaries. Women in this analysis are more likely to reach the coverage gap than males and face significant decline in their health due to income constraints once inside the gap. This can increase the levels of non-adherence to prescription drug regiments, causing higher rates of hospitalizations and greater cost passed along to tax financed government programs.

The large number of women who reach the gap, versus other groups, present health equity issues, especially when developing a functional and equitable healthcare policy in the United States. Rising drug costs during the coverage gap will mean that an increasing number of women may be faced with hard choices about their health care and other supportive services they need to maintain their well-being. The aforementioned analyses point out that equity among the Medicare Part D beneficiaries is not occurring in our current system.

Further, research into women's health care and prescription drug usage needs to happen to ascertain why they are not reaching an optimal amount of drug coverage. It is possible that

with additional outreach another variable related to gender, that is not gathered in current questionnaires or literature, could account for the discrepancy in gap entry.

The results from the second hypothesis demonstrate that there may be a difference among the groups of individuals who reach the gap. Those associated with gap group one whom did not actually enter the gap showed to be the least adherent to their medication. The rationale could be that they are less adherent because they are trying to avoid the gap. The second gap group, who did reach the gap, was more adherent to their medications which could have caused them to fall into the gap but was still not as adherent as the final group. The final gap group which passed though the gap to reach catastrophic coverage was the most adherent. This could be because they knew they would have enough medication costs to send them though the gap. Meaning, that by filling their prescriptions as prescribed would push them though the gap and back to coverage as quickly as possible. This finding is significant because breaking the gap into three groups separates out possible trends in adherence that each group might face, which has not been done in the previous literature.

Another interesting aspect of the adherence hypothesis was that the significant p values for each condition in the ANOVA analysis related to why individuals might have that condition. For example, individuals who purchased medication for diabetes had an extremely significant p values associated with education level, BMI, and income. An individual suffering from diabetes may not have the education or the money to understand the relationship between healthy meals, high weight, and their condition. It is possible that interventions based on the variables with significant p values for each condition could help lower the amount of individuals who reach the gap. Further research with data including prescription fill dates could address some of the limitations associated with the limited adherence proxy in this analysis.

Conclusions:

There are many barriers seniors encounter as they strive to maintain optimal health as they grow older, especially in a population faced with chronic conditions and managed care therapies. This paper attempts to add to the review of what is known about the coverage gap and what seniors do to avoid entry. The idea of drug adherence is closely tied with blame, be it the patients, doctors, or insurance companies that pay the bills. By 2020, Medicare Part D should eliminate the coverage gap and possibly all the adherence problems addressed in this paper. Realistically, what is required instead is a multidisciplinary approach that develops means of accurately assessing not only adherence, but those factors, like the coverage gap, that influence it. Early introduction of reform changes increase the time available for affected individuals and organizations, including health care providers, beneficiaries, and taxpayers to adjust their expectations. With prompt action the necessary research and reform possibilities can be developed in time to address these challenges.

Appendix for Tables:

Table 1:

For Age 65 and older for years 2006

Master Table of Variables 2006 (n=3,883)

Characteristics	Variable Name and Percent breakdown of Population
Weighted pop size per year	
Age	age
65-69 (reference group)	1,162 (29.9%)
70-74	899 (23.2%)
75-79	792 (20.4%)
80-84	570 (14.7%)
85+	460 (11.8%)
Gender	sex
Male	1,624 (41.8%)
Female	2,259 (58.2%)
Race/ethnicity	racex
White	3,067 (79.0%)
Black	603 (15.5%)
Amer Indian/Alaska Native	26 (0.7%%)
Asian	144 (3.7%)
Native Hawaiian/Pacific Islander	8 (0.2%)
Multiple races reported	35 (0.9%)
Hispanic	hispanx
Yes	513 (13.2%)
Education	educyr
>12	1,234 (35.0%)
12	1,218 (32.7%)
<12	1,273 (34.2%)
Degrees attained	hideg
No Degree	1,289 (33.7%)
GED	149 (39%)
High School Diploma	1,559 (40.7%)
Bachelor's Degree	376 (9.8%)
Master's Degree	197 (5.1%)
Doctorate Degree	75 (2.0%)
Other Degree	185 (4.8%)
Living in Urban Area	msa
Yes	3,044 (78.4%)

Language Spoken at Home	langhm42
English	3,370 (87.4%)
Spanish	359 (9.3%%)
Other language	128 (3.3%)
Comfortable speaking English	enghme42
Inapplicable	3,396 (87.5%)
Yes	189 (4.9%)
Region	region_42
Northeast	638 (16.4%)
Midwest	813 (20.9%)
South	1,545 (39.8%)
West	887 (22.8%)
Married	marry_x
Married	1,984 (51.2%)
Widowed	1,253 (32.2%)
Single	435 (11.2%)
Divorced	56 (1.4%)
Separated	150 (3.9%)
Income	rtlp06
Family income % of poverty line	povcat
Less than 1.00 times poverty line	664 (17.1%)
1.01 to 1.24 times poverty line	349 (9.0%)
1.25 to 1.99 times poverty line	700 (18.0%)
2.0 to 3.99 times poverty line	1,039 (26.8%)
4.00 or more times poverty line	1,131 (29.1%)
Overall Health (Self Reported)	rthlth31
Excellent	558 (14.6%)
Very Good	980 (25.6%)
Good	1,179 (30.8%)
Fair	790 (20.6%)
Poor	327 (8.5%)
Mental Health	mnhlth31
Excellent	1,024 (26.7%)
Very Good	1,114 (29.1%)
Good	1,238 (32.3%)
Fair	362 (9.4%)
Poor	95 (2.5%)
Mean BMI	bmindex53
Underweight/normal <25%	1,332 (35.7%)
Overweight 25-29%	1,432 (38.4%)
Obese >30	969 (26.0%)
Coverage	inscov
Any private	1,911 (49.2%)
Public only	1,924 (49.6%)
Uninsured	48 (1.2%)

Private Ins	prve
Covered for at least 1 day	1,772 (45.6%)
Tricare	Triev
Covered for at least 1 day	233 (6.0%)
Medicare	mcrev
Covered for at least 1 day	3,802 (97.9%)
Medicaid	mcdev
Covered for at least 1 day	693 (17.8%)
Other Public A	oparv
Covered for at least 1 day	34 (0.9%)
Other Public B	opbev
Covered for at least 1 day	64 (1.6%)
Uninsured all of 06	unins
Covered for at least 1 day	48 (1.2%)

Table 2:

For Age 65 and older for years 2007

Master Table of Variables 2007 (n=6,991)

Characteristics	Variable Name and Percent breakdown of Population
Weighted pop size per year	
Age	age
65-69 (reference group)	2,116 (30.3%)
70-74	1,612 (23.1%)
75-79	1,393 (19.9)
80-84	1,005 (14.4%)
85+	865 (12.4%)
Gender	sex
Male	3,030 (43.3%)
Female	3,961 (56.7%)
Race/ethnicity	racex
White	5,893 (84.3%)
Black	1,082 (15.5%)
Amer Indian/Alaska Native	16 (.2%)
Asian	0
Native Hawaiian/Pacific Islander	0
Multiple races reported	0
Hispanic	Hispanx
Yes	867 (12.4%)
Education	Educyr
>12	2,361 (35
12	2,252 (33.4%)
<12	2,127 (31.6%)
Degrees attained	Hideg
No Degree	2,177 (31.5%)
GED	245 (3.5%)
High School Diploma	2,928 (42.3%)
Bachelor's Degree	747 (10.8%)
Master's Degree	350 (5.1%)
Doctorate Degree	140 (2.0%)
Other Degree	329 (4.8%)
Living in Urban Area	msa
Yes	5,513 (78.9%)
Language Spoken at Home	langhm42
English	6,082 (87%)
Spanish	621 (8.9%)
Other language	275 (3.9%)

Comfortable speaking English	enghme42
Inapplicable	6,0959 (87.2%)
Yes	307 (4.4%)
Region	region_42
Northeast	1,194 (17.1%)
Midwest	1,512 (21.7%)
South	2,698 (38.7%)
West	1,574 (22.6%)
Married	marry_x
Married	3,739 (53.3%)
Widowed	2,111 (30.2%)
Single	779 (11.1%)
Divorced	88 (1.3%)
Separated	273 (3.9%)
Income	rtlp06
	26,483 Mean
Family income % of poverty line	Povcat
Less than 1.00 times poverty line	1,022 (14.6%)
1.01 to 1.24 times poverty line	583 (8.3%)
1.25 to 1.99 times poverty line	1,248 (17.8%)
2.0 to 3.99 times poverty line	1,996 (28.6%)
4.00 or more times poverty line	2,142 (30.6%)
Overall Health (Self Reported)	Rthlth42
Excellent	907 (13%)
Very Good	1,872 (26.9%)
Good	2,324 (33.4%)
Fair	1,420 (20.4%)
Poor	443 (6.4%)
Mental Health	mnhlth31
Excellent	1,733 (24.9%)
Very Good	2,008 (28.8%)
Good	2,311 (33.2%)
Fair	723 (10.4%)
Poor	191 (2.7%)
Mean BMI	bmindex53
Underweight/normal <25%	2,465 (36.6%)
Overweight 25-29%	2,518 (37.4%)
Obese >30	1,744 (25.9%)
Coverage	Inscov
Any private	3,297 (47.2%)
Public only	3,613 (51.7%)
Uninsured	81 (1.2%)
Private Ins	Prve
Covered for at least 1 day	3,097 (44.3%)
Tricare	Triev

Covered for at least 1 day	368 (5.3%)
Medicare	Mcrev
Covered for at least 1 day	6,850 (98%)
Medicaid	Mcdev
Covered for at least 1 day	1,127 (16.1%)
Other Public A	Oparv
Covered for at least 1 day	40 (.6%)
Other Public B	Opbev
Covered for at least 1 day	154 (2.2%)
Uninsured all of 06	Unins
Covered for at least 1 day	81 (1.2%)

Table 3:

For Age 65 and older for years 2008

Master Table of Variables 2008 (n=3,384)

Characteristics	Variable Name and Percent breakdown of Population
Weighted pop size per year	
Age	age
65-69 (reference group)	1,041 (30.8%)
70-74	826 (24.4%)
75-79	651 (19.2%)
80-84	475 (14%)
85+	391 (11.6%)
Gender	Sex
Male	1,448 (42.8%)
Female	1.936 (57.2%)
Race/ethnicity	Racex
White	2,771 (81.9%)
Black	600 (17.7%)
Amer Indian/Alaska Native	13 (.4%)
Asian	0
Native Hawaiian/Pacific Islander	0
Multiple races reported	0
Hispanic	Hispanx
Yes	425 (12.6%)
Education	Educyr
>12	1,185 (36.2%)
12	1,099 (33.5%)
<12	993 (30.3%)
Degrees attained	Hideg
No Degree	1,017 (30.4%)
GED	97 (2.9%)
High School Diploma	1,452 (43.5%)
Bachelor's Degree	371 (11.1%)
Master's Degree	179 (5.4%)
Doctorate Degree	60 (1.8%)
Other Degree	164 (4.9%)
Living in Urban Area	Msa
Yes	2,719 (80.4%)
Language Spoken at Home	langhm42
English	2,915 (8601%)
Spanish	278 (8.1%)
Other language	162 (4.5%)

Comfortable speaking English	enghme42
Inapplicable	
Yes	3,064 (91.6%)
Region	region_42
Northeast	549 (16.3%)
Midwest	713 (21.2%)
South	1,305 (38.8%)
West	792 (23.6%)
Married	marry_x
Married	1,797 (53.2%)
Widowed	1,008 (29.8%)
Single	372 (11%)
Divorced	57 (1.7%)
Separated	146 (4.3%)
Income	rtlp06
	25,742 Mean
Family income % of poverty line	Povcat
Less than 1.00 times poverty line	526 (15.5%)
1.01 to 1.24 times poverty line	280 (8.3%)
1.25 to 1.99 times poverty line	618 (18.3%)
2.0 to 3.99 times poverty line	987 (29.2%)
4.00 or more times poverty line	973 (28.8%0
Overall Health (Self Reported)	Rthlth42
Excellent	481 (14.4%)
Very Good	889 (26.6%)
Good	1,123 (33.6%)
Fair	608 (18.2%)
Poor	241 (7.2)
Mental Health	Mnhlth42
Excellent	860 (25.7%)
Very Good	954 (28.6%)
Good	1,129 (33.8%)
Fair	321 (9.6%)
Poor	78 (2.3%)
Mean BMI	bmindex53
Underweight/normal <25%	1,129 (34.8%)
Overweight 25-29%	1,276 (39.3)
Obese >30	842 (25.9%)
Coverage	Inscov
Any private	1,550 (45.8%)
Public only	1,806 (53.4%)
Uninsured	28 (.8%)
Private Ins	Prve
Covered for at least 1 day	1,459 (43.1%)
Tricare	Triev

Covered for at least 1 day	165 (4.9%)
Medicare	Mcrev
Covered for at least 1 day	3,324 (98.2%)
Medicaid	Mcdev
Covered for at least 1 day	500 (14.8%)
Other Public A	Oparv
Covered for at least 1 day	15 (.4%)
Other Public B	Opbev
Covered for at least 1 day	87 (2.6%)
Uninsured all of 06	Unins
Covered for at least 1 day	28 (.8%)

Table: 4

Demographics or Characteristics by Health Issues for each year 2006-2008

Demographics or Characteristics Health Issues	Variable Name	Percent of Population 2006	Percent of Population 2007	Percent of Population 2008	Total Percent for entire population
Deaf, Yes, no	Deaf42	39, (4.7%)	62, (4.3%)	23, (8.4%)	
Blind, Yes, no	Blind42	31, (6.5%)	54, (6.1%)	24, (7.0%)	
Diabetes, Yes, no	Diabdx	862, (21.7)	1,600 (23.2%)	841, (25%)	**20.4%**
Asthma, yes, no	Asthdx	404, (10.6%)	665, (9.5%)	291, (8.6%)	**9.2%**
High Blood Pressure, Yes, no	Hibpdx	2,525 (66.6%)	4,688 (68.0)	2,336 (69.3%)	**65.2%**
High Cholesterol, Yes, no	Choldx	1,988 (52.9%)	3,901 (56.8%)	2,042 (60.6%)	**57.1%**
Coronary Heart Disease, Yes, no	Chddx	461 (12.2%)	1,096 (15.9%)	725 (21.5%)	**16.6%**
Angina Diagnosis, Yes, no	Andidx	263 (7.0%)	558 (8.1%)	338 (10.0%)	**8.5%**
Heart Attack, Yes, no	Midx	400 (10.6%)	746 (10.8%)	430 (12.8%)	**11.3%**
Other Heart Disease Diagnosis, Yes, no	ohrtdx	571 (15.1%)	1,325 (19.3%)	883 (26.2%)	**21.0%**
Stroke, Yes, no	strkdx	384 (10.1%)	791 (11.5%)	460 (13.6%)	**11.1%**
Arthritis, Yes, no	Arthdx	1,939 (51.4%)	3,802 (55.3%)	1,974 (58.6%)	**54.7%**
Currently Smoke, Yes, no	Adsmok42	385 (11.1%)	628 (10.0%)	307 (10.0%)	**9.0%**

Table: 5

Demographics or Characteristics of weighted Population on Individuals Who Reached the Coverage Gap

Demographics or Characteristics	N	Estimated % of population	P-Values
Year	149,217,142		**.113**
2006		27.9%	
2007		29.4%	
2008		30.5%	
Gender	149,217,142		**<0.001**
Female		31.5%	
Male		26.5%	
Age	149,217,142		**<0.001**
65-69		26.2%	
70-79		29.5%	
80-85+		32.5%	
Race	149,217,142		**.010**
White		29.8%	
Black		26.8%	
Amer Indian/Alaska Native		26.2%	
Asian		24.1%	
Native Hawaiian/Pacific Islander		17.0%	
Multiple races reported		27.3%	
Hispanic	149,217,142		**.039**
Hispanic		26.4%	
Not Hispanic		29.5%	
Education	146,122,598		**.012**
>12		28.5%	
12		28.8%	
<12		31.7%	
Highest Degree	148,175,826		**.003**
No Degree		32.2	
GED		28.6	
High School Diploma		29.0	
Bachelor's Degree		26.8	
Master's Degree		26.7	
Doctorate Degree		25.6	

Other Degree		32.1	
Diabetes	147,953,192		**<0.001**
Yes		53.1%	
No		23.2%	
Asthma	174,937,536		**<0.001**
Yes		47.4%	
No		27.4%	
High Blood Pressure	174,783,061		**<0.001**
Yes		36.0%	
No		16.6%	
Cholesterol	174,184,213		**<0.001**
Yes		36.7%	
No		19.3%	
Coronary Heart Disease	147,362,032		**<0.001**
Yes		49.2%	
No		25.3%	
Angina Diagnosis	147,327,681		**<0.001**
Yes		51.5%	
No		27.2%	
Heart Attack	147,677,771		**<0.001**
Yes		49.6	
No		26.7	
Other Heart Disease Diagnosis	147,441,636		**<0.001**
Yes		42.2%	
No		25.9%	
Stroke	147,779,309		**<0.001**
Yes		45.6%	
No		27.3%	
Arthritis	147,263,520		**<0.001**
Yes		35.3%	
No		22.0%	
Currently Smoke	137,451,298		**<0.001**
Yes		24.6%	
No		**30.1%**	

BMI	**144,604,461**		**<0.001**
Underweight/normal <25%		24.5%	
Overweight 25-29%		27.1%	
Obese >30		39.5%	
Insurance Coverage	149,217,142		**<0.001**
Any private		30.7%	
Public only		28.0%	
Uninsured		2.4%	
Private Insurance	149,217,142		**.0003**
Covered for at least 1 day		30.9%	
Not covered		27.7%	
Tricare/champva Insurance	149,217,142		**.823**
Covered for at least 1 day		29.7%	
Not covered		29.3%	
Medicare	149,217,142		**<0.001**
Covered for at least 1 day		29.6%	
Not covered		10.7%	
Medicaid/Schip	149,217,142		**<0.001**
Covered for at least 1 day		40.7%	
Not covered		28.0%	
Other Public A Insurance	149,217,142		**.459**
Covered for at least 1 day		33.6%	
Not covered		29.3%	
Other Public B Insurance	149,217,142		**.458**
Covered for at least 1 day		31.6%	
Not covered		29.3%	
Uninsured entire year	149,217,142		**<0.001**
Yes		2.4%	
No		29.5	
Living in Urban Area	149,217,142		**.807**
No		29.5%	
Yes		29.3%	
Comfortable Speaking English	46,347,599		**<0.001**
Inapplicable			
Yes		29.8%	
No		26.0%	

Region	149,217,142		**<0.001**
Northeast (1)		19.9%	
Midwest (2)		21.7%	
South (3)		37.4%	
West (4)		20.8%	
Marital Status	149,217,142		**<0.001**
Married		27.8%	
Widowed		32.5%	
Single		28.0%	
Divorced		25.3%	
Separated		30.5%	
Family income % of poverty line	149,217,142		**<0.001**
Less than 1.00 times poverty line		34.7%	
1.01 to 1.24 times poverty line		34.6%	
1.25 to 1.99 times poverty line		30.8%	
2.0 to 3.99 times poverty line		29.3%	
4.00 or more times poverty line		26.0%	
Income	149,074,064		**<0.001**
0-20,000		32.9%	
20,000-35,000		28.6%	
35,000-300,000		24.9%	
Overall Health (Self Reported)	149,084,581		**<0.001**
Excellent		13.1%	
Very Good		21.9%	
Good		31.5%	
Fair		44.6%	
Poor		53.0%	
Mental Health	149,123,508		**<0.001**
Excellent		21.9%	
Very Good		26.2%	
Good		34.7%	
Fair		40.4%	
Poor		**43.5%**	

For Table 5: During 2006-2008 N=14,258, the estimated population size is 149217142, where 29.4% entered the gap and 70.6% didn't enter the gap. The percentages are of those that entered the gap.

Table 6:

Logit Regression Analysis Table

(Adjusted Odds Ratio for likelihood of reaching the coverage gap)

Characteristic	Odds Ratio	95% CI	P Value
Sex	1.24	1.12-1.37	<.001
Race	1.25	1.16-1.34	<.001
Diabetes	.455	.374-.554	<.001
Asthma	.633	.493-.814	<.001
High Blood Pressure	.745	.640-.868	<.001
High Cholesterol	.897	.834-.964	0.003
Coronary Heart Disease	.924	.849-1.00	0.066
Angina	1.04	.962-1.13	0.300
Heart Attack	.757	.670-.856	<.001
Other Heart Disease	.989	.910-1.07	0.795
Stroke	1.07	.948-1.21	0.262
Arthritis	.996	.927-1.07	0.912
Currently Smoke	1.03	1.00-1.06	0.045
Private Insurance	.701	.528-.932	0.015
Medicare	.400	.176-.909	0.029
Medicaid	.657	.566-.762	<.001
Uninsured	3.77	1.04-13.67	0.043
Age (2)	1.20	1.06-1.36	0.002
Age (3)	1.36	1.18-1.56	<.001
Repd Mental Health(1)	.924	.820-1.04	0.195
Repd Mental Health (2)	1.07	.904-1.27	0.462
Repd Health (1)	.612	.537-.698	<.001
Repd Health (2)	1.59	1.39-1.81	0.000
Income Group (1)	1.02	.876-1.18	0.808
Income Group (2)	1.17	1.01-1.34	0.030
Insurance Cov (2)	.866	.648-1.16	0.329
BMI (2)	1.13	1.00-1.28	0.044
BMI (3)	1.54	1.33-1.77	<.001

Table 7:

Marginal Effects of Logit Regression

Characteristic	Dy/Dx	95% CI	P value
Sex	.042	.022-.062	<.001
Race	.044	.030-.058	<.001
Diabetes	-.156	(-.195)-(-.117)	<.001
Asthma	-.090	(-.140)-(-.040)	<.001
High Blood Pressure	-.058	(-.089)-(-.028)	<.001
High Cholesterol	-.022	(-.036)-(-.007)	0.003
Coronary Heart Disease	-.016	-.034-.002	0.067
Angina	.009	-.008-.025	0.300
Heart Attack	-.055	-.07-(-.030)	0.000
Other Heart Disease	-.002	-.019-.014	0.795
Stroke	.014	-.011-.039	0.262
Arthritis	-.001	-.015-.013	0.912
Currently Smoke	.005	.001-.011	0.045
Private Insurance	-.070	-.127-(-.014)	0.015
Medicare	-.182	-.344-(-.019)	0.028
Medicaid	-.083	-.112-(-.054)	<.001
Uninsured	.263	.008-.518	0.043
Age (2)	.037	.013-.060	0.002
Age (3)	.061	.034-.088	<.001
Repd Mental Health(1)	-.016	-.039-.008	0.195
Repd Mental Health (2)	.014	-.019-.046	0.426
Repd Health (1)	-.097	-.123-(-.071)	<.001
Repd Health (2)	.091	.065-.118	<.001
Income Group (1)	.003	-.026-.033	0.808
Income Group (2)	.030	.002-.058	0.030
Insc	-.028	-.085-.028	0.327
BMI (2)	.024	.000-.048	0.044
BMI (3)	.085	.057-.113	<.001

Table 8:

Probit Regression Analysis Table

Characteristic	Coef	95% CI	P Value
Sex	.133	.073-.192	<.001
Race	.132	.090-.175	<.001
Diabetes	-.299	-.393-(-.206)	<.001
Asthma	-.061	-.165-.042	0.246
High Blood Pressure	-.134	-.197-(-.070)	<.001
High Cholesterol	-.050	-.089-(-.012)	0.010
Coronary Heart Disease	-.038	-.087-.010	0.117
Angina	.023	-.027-.073	0.361
Heart Attack	-.132	-.195-(-.068)	<.001
Other Heart Disease	-.001	-.050-.046	0.940
Stroke	.079	.009-.150	0.027
Arthritis	.016	-.025-.056	0.448
Currently Smoke	.017	.000-.033	0.048
Private Insurance	-.200	-.364-(-.036)	0.017
Medicare	-.685	-1.19-(-.179)	0.008
Medicaid	-.266	-.353-(-.178)	<.001
Uninsured	.500	-.199-1.19	0.161
Age (2)	.110	.040-.179	0.002
Age (3)	.186	.106-.265	<.001
Repd Mental Health(1)	-.042	-.113-.029	0.249
Repd Mental Health (2)	.044	-.057-.144	0.396
Repd Health (1)	-.308	-.384-(-.232)	<.001
Repd Health (2)	.325	.244-.405	<.001
Income Group (1)	.020	-.066-.107	0.649
Income Group (2)	.099	.017-.181	0.018
Insc	-.088	-.255-.080	0.305
BMI (2)	.103	.034-.172	0.003
BMI (3)	.324	.244-.404	<.001
cons	.137	-1.76-2.03	0.887

Table 9:

Marginal Effects for Probit Regression

Characteristic	Dy/Dx	95% CI	P value
Sex	.044	.025-.064	<.001
Race	.044	.030-.058	<.001
Diabetes	-.099	-.131-(-.069)	<.001
Asthma	-.020	-.055-.014	0.246
High Blood Pressure	-.045	-.066-(-.024)	<.001
High Cholesterol	-.016	-.029-(-.003)	0.010
Coronary Heart Disease	-.013	-.289-.003	0.117
Angina	.007	-.010-.024	0.361
Heart Attack	-.044	-.065-(-.023)	<.001
Other Heart Disease	-.001	-.017-.015	0.940
Stroke	.027	.003-.050	0.027
Arthritis	.005	-.008-.019	0.448
Currently Smoke	.006	.000-.011	0.048
Private Insurance	-.067	-.122(-.012)	0.017
Medicare	-.228	-.397-(-.059)	0.008
Medicaid	-.088	-.118-(-.059)	<.001
Uninsured	.167	-.066-.399	0.161
Age (2)	.037	.014-.060	0.002
Age (3)	.062	.035-.089	<.001
Repd Mental Health(1)	-.013	-.038-.010	0.249
Repd Mental Health (2)	.015	-.019-.048	0.396
Repd Health (1)	-.102	-.128-(-.077)	<.001
Repd Health (2)	.108	.081-.135	<.001
Income Group (1)	.007	-.002-.036	0.650
Income Group (2)	.033	.005-.060	0.017
Insc	-.029	-.085-.026	0.303
BMI (2)	.034	.011-.057	0.003
BMI (3)	.108	.081-.135	<.001

Table 10:

Gap Entry by Gap Group and Gender

Gender Label	Gap 1:	Gap 2	Gap 3
Male=1	70.6%	20.9%	8.5%
Female=2	66.1%	24.7%	9.2%

Table 11:

Adherence by Condition and Gap Entry Group 1

	Gap Group 1			
Condition Variable Name	**Mean**	**95% CI (low)**	**95% CI (High)**	**Number of Obs**
hptnz_sc: Hypertension	-0.072	-0.083	-0.032	3299
diabz_sc: Diabetes	-0.075	-0.102	-0.049	852
hlpz-sc: High Cholesterol	-0.104	-0.119	-0.088	2103
arthz_sc: Arthritis	-0.094	-0.164	-0.025	270
deprz_sc: Depression	-0.144	-0.196	-0.091	441
copdz_sc: Asthma	-0.077	-0.132	-0.022	575

Table 12:

Adherence by Condition and Gap Entry Group 2

	Gap Group 2			
Condition Variable Name	**Mean**	**95% CI (low)**	**95% CI (High)**	**Number of Obs**
hptnz_sc: Hypertension	-0.002	-0.014	0.009	1501
diabz_sc: Diabetes	0.012	-0.007	0.032	596
hlpz-sc: High Cholesterol	-0.011	-0.027	0.006	1183
arthz_sc: Arthritis	0.009	-0.041	0.059	115
deprz_sc: Depression	0.017	-0.025	0.059	262
copdz_sc: Asthma	-0.005	-0.043	0.034	368

Table 13:

Adherence by Condition and Gap Entry Group 3

	Gap Group 3			
Condition Variable Name	**Mean**	**95% CI (low)**	**95% CI (High)**	**Number of Obs**
hptnz_sc: Hypertension	0.042	0.016	0.068	588
diabz_sc: Diabetes	0.019	-0.001	0.039	332
hlpz-sc: High Cholesterol	0.026	-0.001	0.052	491
arthz_sc: Arthritis	-0.018	-0.092	0.057	62
deprz_sc: Depression	0.013	-0.029	0.056	133
copdz_sc: Asthma	0.056	0.019	0.092	217

Table 14:

Analysis of Variance by Hypertension

Hypertension: Number of Obs: 4626	
Variable Name:	**P Value**
Model	<.001
Gap	<.001
Sex	0.203
Age by Group	0.167
Education by year	0.508
Income Group	0.028
BMI	0.037
Reported Health	0.324
Region	0.233
Mental Health	0.651
Race	0.915

Table 15:

Analysis of Variance by Diabetes

Diabetes Number of Obs: 1383	
Variable Name:	**P Value**
Model	<.001
Gap	<.001
Sex	0.601
Age by Group	0.079
Education by year	<.001
Income Group	0.035
BMI	0.088
Reported Health	0.581
Region	0.439
Mental Health	0.609
Race	0.460

Table 16:

Analysis of Variance by High Cholesterol

High Cholesterol Number of Obs: 3181	
Variable Name:	**P Value**
Model	<.001
Gap	<.001
Sex	0.213
Age by Group	0.622
Education by year	0.069
Income Group	0.003
BMI	0.001
Reported Health	0.078
Region	0.507
Mental Health	0.195
Race	0.636

Table 17:

Analysis of Variance by Arthritis

Arthritis Number of Obs: 246	
Variable Name:	**P Value**
Model	0.201
Gap	0.071
Sex	0.852
Age by Group	0.879
Education by year	0.426
Income Group	0.533
BMI	0.032
Reported Health	0.318
Region	0.705
Mental Health	0.025
Race	0.217

Table 18:

Analysis of Variance by Depression

Depression Number of Obs: 600	
Variable Name:	**P Value**
Model	0.001
Gap	<.001
Sex	0.409
Age by Group	0.551
Education by year	0.465
Income Group	0.249
BMI	0.036
Reported Health	0.510
Region	0.690
Mental Health	0.153
Race	0.587

Table 19:

Analysis of Variance by Asthma

Asthma Number of Obs: 884	
Variable Name:	**P Value**
Model	0.001
Gap	0.001
Sex	0.563
Age by Group	0.019
Education by year	0.797
Income Group	0.023
BMI	0.355
Reported Health	0.154
Region	0.058
Mental Health	0.276
Race	0.213

Table 20:

Number of Prescriptions for Males by Gap Group

Males				Number of Obs
Gap By Group	**Mean**	**95% CI (low)**	**95% CI (High)**	
Gap 1	25.36	24.76	25.98	7836
Gap 2	35.23	34.36	36.11	5548
Gap 3	36.72	35.5	37.92	4654

Table 21:

Number of Prescriptions for Females by Gap Group

Females				Number of Obs
Gap By Group	**Mean**	**95% CI (low)**	**95% CI (High)**	
Gap 1	29.39	28.68	30.09	8625
Gap 2	36.65	35.53	37.53	6613
Gap 3	37.54	36.54	38.54	6099

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