MEDICARE LOW INCOME SUBSIDY (LIS): AN EVALUATION OF EXPENDITURE, UTILIZATION AND HEALTH CARE OUTCOMES

A DISSERTATION
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Delford I. Doherty, PharmD, MPH

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Ron Hadsall, PhD

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ABSTRACT

BACKGROUND: This study focuses on the Low Income Subsidy (LIS) component of the Medicare Part D program. LIS is a federal program which provides government subsidized prescription drug coverage for Medicare beneficiaries in order to reduce or eliminate low-income enrollees' out-of-pocket expenses associated with prescription drugs. LIS beneficiaries constitute 38 percent of Medicare Part D enrollees but account for more than half of total Part D spending; in part, because they are sicker, utilize more health services and pay lower out-of-pocket costs compared to other Part D beneficiaries. There are two types of LIS beneficiaries: deemed and non-deemed. The deemed group consists of full-benefit dual eligible Medicare beneficiaries - those who receive full Medicare and Medicaid benefits. Non-deemed beneficiaries are required to apply for and submit written proof of income and assets in order to be considered for premium and other federal cost-sharing subsidies.

A plethora of studies have been conducted on the effect of insurance on health care utilization and the corresponding effect on health and health outcomes. For instance, several studies have concluded that financial incentives such as reducing cost-share, lowering premiums and out-of-pocket (OOP) costs can have positive effects on access and adherence to medications. Contrarily, other studies such as the Rand Health Insurance Experiment, have found that reduced cost sharing is sub-optimal because it causes moral hazard. Within the Medicare Part D population, there has been a myriad of studies across the board have shown conflicting results regarding the effects of subsidized

cost-sharing on expenditure, utilization and outcomes in Part D. Results from studies specifically comparing deemed vs. non-deemed vs. non-LIS beneficiaries' expenditure, utilization and health outcomes have been equivocal.

OBJECTIVE: To evaluate the impact of subsides on expenditures, medication and health care utilization and health outcomes between LIS groups.

METHODS: Using 5% Medicare administrative data sample, interrupted time series econometric models were developed to evaluate the impact of LIS enrollment (subsidy amount) on beneficiaries' prescription and health services utilization and expenditures. Differences-in-differences regression was used to estimate changes in utilization and expenditures between LIS groups and for beneficiaries who switched groups between 2009 and 2010. The analysis included covariates such as age, race, sex, comorbidity, number drug therapy classes and OOP costs, in order to adjust for confounders.

RESULTS: The results from this study showed that non-LIS beneficiaries had significantly higher health services utilization and total expenditure, compared to deemed and non-deemed beneficiaries. For beneficiaries who switched LIS status from deemed to non-deemed or non-LIS and vice versa, there was no difference in total health services expenditures and utilization, except for beneficiaries who switched from deemed to non-LIS. The non-LIS group had a significant reduction in health services utilization.

For prescription drug utilization and expenditure, the results showed a significant

increase in medication utilization with increasing subsidy amount (i.e. deemed > non-deemed > non-LIS). There was no difference in prescription drug expenditures, except for the non-deemed group, which had a significantly lower expenditure. There was no difference in medication adherence, measured as the medication possession ratio (MPR). For beneficiaries who switched LIS status from deemed to non-deemed or deemed to non-LIS, medication utilization and expenditure significantly decreased as beneficiaries switch from full subsidy (deemed) to partial (non-deemed) or no subsidy (non-LIS) but there was no difference in medication adherence (MPR). The results, however, showed no difference in medication utilization for beneficiaries who switched status from partial subsidy (non-deemed) to full (deemed) or no-subsidy (non-LIS). Yet, there was a significant increase in expenditure as subsidy amount increased from non-deemed to deemed, and a corresponding decrease in expenditure as subsidy amount decreased from non-deemed to non-LIS. Despite the effect of switching on utilization and expenditure, LIS had no effect on medication adherence.

CONCLUSION: Overall, the findings from this study suggest that the LIS program, like Part D itself, improves beneficiaries' access to affordable prescription drugs. While there was a positive association between subsidy amount and prescription utilization and expenditure, there was no impact on medication adherence. Further, LIS status had an equivocal relationship with health services utilization and expenditure. Essentially LIS provided no medical spending offsets, consistent with findings in the literature. The impact of this study depends on the perspective of the constituent – beneficiary vs. Medicare plan sponsor vs. taxpayer vs. clinician.

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CHAPTER 1: INTRODUCTION

The Low Income Subsidy (LIS) is a federal program which provides government subsidized prescription drug coverage for Medicare beneficiaries through private stand-alone prescription drug plans (PDPs) and Medicare Advantage prescription drug plans (MA-PDs) (KFF, 2009). The LIS program was initiated with the Medicare Part D prescription drug coverage in January, 2006, and in accordance with Section 1860D-14 of the Social Security Act to reduce or eliminate low-income enrollees' out-of-pocket expenses associated with the drug benefit (O'Sullivan, 2008).

There are two types of LIS beneficiaries: deemed and non-deemed. Beneficiaries who are deemed LIS eligible are automatically registered for the program. The non-deemed beneficiaries must apply through the Supplemental Security Assistance program to get the LIS benefit (Summer et al, 2010). Non-deemed low-income beneficiaries are required to apply for and submit written proof of income and assets to the Social Security Administration (SSA) or their state Medicaid agencies to be considered for premium and other federal cost-sharing subsidies under Part D (O'Sullivan, 2008). Figure 1 is an illustration of the difference between deemed and non-deemed LIS population.

FIGURE 1

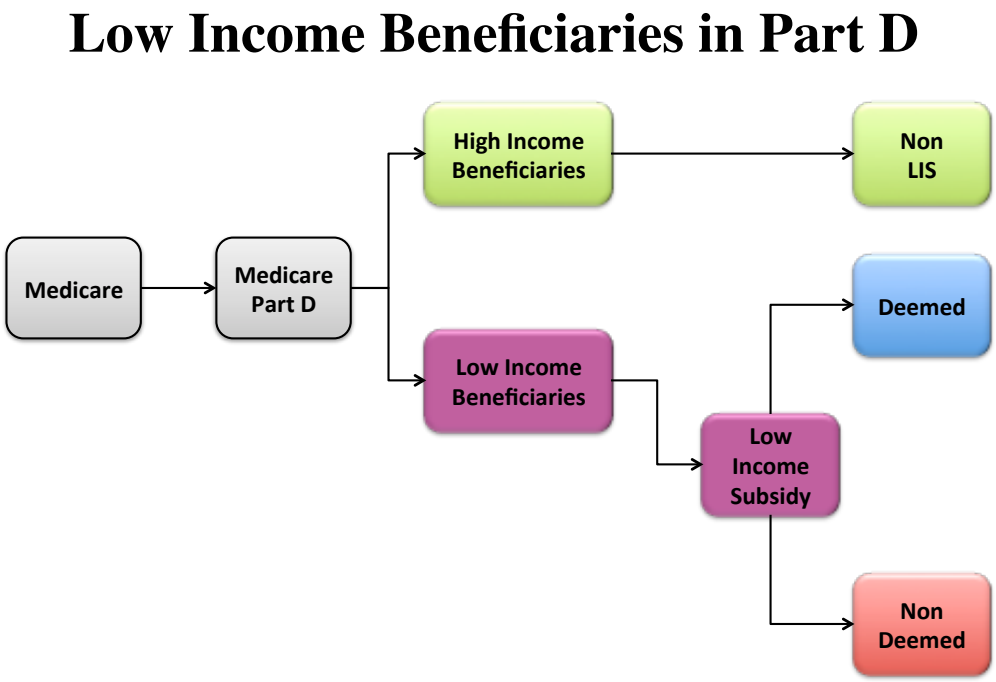


Figure 1: Low-Income Beneficiaries (Benes) in Part D

The deemed group consists of full-benefit dual eligible Medicare beneficiaries – those who receive full Medicare and Medicaid benefits – and partial-benefit dual eligibles – those in the Medicare Savings Program (O'Sullivan 2008). Dual eligibles (full) who are not enrolled in a Medicare Part C (Medicare managed care) plan are automatically enrolled in a Medicare Part D Prescription Drug Plan (PDP) as soon as they become eligible.

Contrarily, partial and non-dual SSI beneficiaries are not automatically enrolled but have their enrollment facilitated by Centers for Medicare and Medicaid Services (CMS) if they do not enroll after a certain time (Liu & Chollet, 2006). These partial-

benefit dual eligibles can opt out of Part D if they have an alternative source of creditable coverage. The non-deemed beneficiaries consist of individuals with incomes below 150% of the federal poverty level (FPL) and assets below $11,990 for individual and $23,970 for a married couple in 2008. The SSA notifies these beneficiaries of their qualification for the benefits after their application has been processed. This is the same process for partial-benefit dual eligibles and non-dual SSI beneficiaries.

Under the LIS benefit design; the federal government pays the plans for the monthly premiums, deductibles and coverage gap expenses of deemed LIS beneficiaries with full subsidies. Meanwhile, non-deemed LIS beneficiaries pay modest copayments for each on formulary prescription and the full cost of any drugs not on their plan's formulary. All LIS beneficiaries are enrolled in plans with premiums at or below the low-income subsidy level for the region. They pay zero premium for such plans (though they may select a plan with a higher premium and pay the difference).

It is estimated that over 3.8 million eligible beneficiaries must apply for non-deemed LIS benefits each year (Summer et al, 2010); however, in 2009, only 40 percent of those thought eligible applied and actually received LIS benefit. The remaining 60 percent, though present in Part D, did not take advantage of the program (Summer et al, 2010). The low participation rate for this group has not changed significantly over the past five years, despite major efforts to inform beneficiaries about the availability of the subsidy.

In 2010, CMS launched a new campaign to inform millions of Americans about a new "twist" in the law which made it easier for beneficiaries to qualify for "*extra help*"

and become registered for LIS (SSA, 2010). Through this campaign CMS was hoping to engage all stakeholders including beneficiaries and their families, health systems and state Medicaid programs financing these beneficiaries. Figure 2 shows Medicare beneficiaries who are eligible for LIS benefits and those who participate in the program.

FIGURE 2

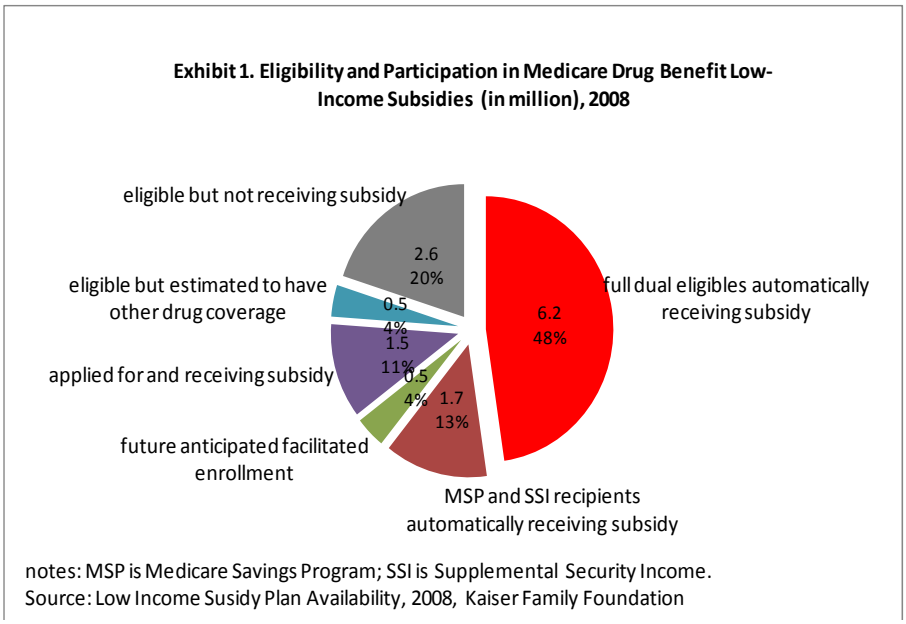


Figure 2: Eligibility and Participation in Medicare Drug Benefit Low-Income Subsidies

Generally LIS beneficiaries (deemed and non-deemed) constitute 38 percent of Medicare Part D enrollees but account for more than half of the total Part D spending; in part because they are sicker, utilize more health services and generally obtain more brand name opposed to generic medications and pay lower out-of-pocket costs when compared to non-LIS Part D beneficiaries (Summer et al, 2010). Studies specifically evaluating and

comparing deemed vs. non-deemed vs. non-LIS Part D beneficiaries' expenditure, utilization and health outcomes are insufficient or have shown equivocal results.

The purpose of this study is to evaluate the impact of LIS enrollment on expenditures, medication and health care service utilization, and health outcomes. This study will elucidate whether the low-income subsidies is effective in providing beneficiaries access to prescription drugs, and highlight the resulting effect of prescription drug utilization on non-drug related health care utilization and expenditure. Additionally, the analysis from this study should provide insightful information that will enhance the quality and efficiency of the LIS program.

BACKGROUND & SIGNIFICANCE

MEDICARE PART D PROGRAM

Medicare is a social health insurance program in the United States (U.S.), which covers people age 65 or older, some younger people with disabilities, and people with End-Stage Renal Disease – permanent kidney failure requiring dialysis or transplant, Amyotrophic lateral sclerosis *(*ALS) and Amyotrophic Myeloid Leukemia (AML*)* (O'Sullivan, 2008).

Medicare came into effect under the Social Security Act (SSA) of 1965 to provide hospital insurance for inpatient hospital stays under Medicare Part A, and medical insurance under Part B (O'Sullivan, 2008). In 2003, the Medicare Prescription Drug Improvement and Modernization Act (MMA) was passed to provide comprehensive prescription drug coverage under Medicare Part D, thus adding a missing component of the Medicare insurance program.

The Part D program, like Medicare itself, was designed to be an entitlement benefit program in which eligible individuals would receive prescription drug benefits regardless of income, health status, or prescription drug usage. In addition, it was designed to meet two fundamental goals: protect beneficiaries against catastrophic prescription drug spending and reduce the underuse of essential medications needed to treat chronic illnesses due to increasing costs (O'Sullivan, 2003). The most fundamental need for Part D was to address the overreliance of the elderly on private and other non-standardized supplemental insurance for prescription drug coverage (O'Sullivan et. al, 2003). Yet, Part D was designed to use private plans to deliver prescription drug benefits

and subsidize premiums for beneficiaries who purchase a plan. A similar design was used in the American Association of Retired Persons *"*AARP" PDPs and other Medigap plans. The privatization of plans, though controversial, was a strategic decision to use existing prescription benefit models present in the private industry in order to increase the efficiency of the prescription drug program. As such, in order to contain the cost of the program, a private market-based mechanism, which exposes enrollees to incremental costs above threshold benefit levels seen in the private market, was adopted. Additionally, privatization was aimed at efficiency by enabling private insurance plans to compete for enrollees through competitive pricing, customer service and clinical programs. By 2009, approximately 60% (26.37 million) of Medicare beneficiaries were enrolled in a Part D plan (17.5 million in stand-alone (PDP) plans and 9.2 million in Medicare Advantage (MA) drug plans (Morgan et. al, 2008).

MEDICARE PART D BENEFIT

At the initiation of the Part D benefit in 2006, there were approximately 1,429 stand-alone PDPs and 1,333 MA-PD plans nationwide (Morgan et al, 2006); however, it was estimated that there were at least 40 PDP plans in each market (Robst et. al, 2007). Nevertheless, there was some uniformity between plans as the MMA required plans to provide "qualified coverage" or "alternate prescription drug coverage" which was, at least, actuarially equivalent to standard drug benefits (Gruber, 2009). It should also be noted that this study will exclusively evaluate Part D beneficiaries who are enrolled in a PDP fee-for-service (FFS) and not MA-PD plans.

Under the PDP benefit design individuals can only enroll in Part D during the initial enrollment period or during the annual open enrollment period. Individuals who fail to enroll during their initial enrollment period are subject to a penalty if they decide to enroll in Part D after the enrollment period. The mandatory enrollment penalty was set in place to increase the pool of beneficiaries and spread the risk. There are special situations in which enrollment may be granted without facing penalty. These situations include moving to a new geographic area, involuntary loss of creditable coverage; inadequate information provided on creditable coverage status, federal error, termination of a PDP contract, and low-income enrollees deemed eligible for a subsidy outside of the initial or annual enrollment periods. These beneficiaries are not subject to the penalty if they have maintained "creditable" drug coverage through another public or private source. Creditable coverage is defined as drug benefits whose actuarial value equals or exceeds that of the standard coverage such as retiree health coverage offered by a former employer or union and military coverage including TRICARE (O'Sullivan, 2008).

CMS allows plans to offer actuarially equivalent coverage if they are able to provide the same actuarial value as the standard benefit, even with different benefit structures such as eliminating the deductible, implementing cost-sharing requirements higher than the 25% amount under basic standard coverage, implementing drug-tier structures with tiered cost-sharing under which generics have the lowest cost-sharing and brands and specialty drugs with higher cost sharing, etc. These actuarially equivalent plans could either be labeled "actuarially equivalent standard" which offer different cost-sharing structures, or "basic alternative standard" which may reduce the deductible, change cost

sharing, and/or change the initial coverage limit. The Medicare PDP penetration was approximately 37.9% and 37.1% in 2009 and 2010 respectively (KFF, 2012). In 2007, over 51% of Medicare Part D beneficiaries were enrolled in actuarially equivalent plans (O'Sullivan, 2008). Of these, 15% were registered in an MA-PD plan.

The Part D benefit structure also allows plans to offer enhanced coverage which exceed the value of the standard coverage by including basic and supplemental benefits such as lower copay and deductible, coverage for beneficiaries in the "coverage gap,[1]" etc. In essence, the enhanced coverage increases the actuarial value of the plan package. In 2008, over 35% of beneficiaries were enrolled in an enhanced coverage plan (O'Sullivan, 2008). It was estimated that 80% of beneficiaries with enhanced coverage were MA-PD enrollees and 20% were PDP enrollees (MEDPAC, 2007).

The Medicare Part D design provides prescription drug coverage from $0 to a maximum threshold, the initial coverage limit (ICL), wherein the beneficiary pays 25% and the plan pays 75% of the cost of the prescription up to the coverage gap where the beneficiary is responsible for the full amount until they reach the catastrophic limit where the beneficiary pays 5%, the plan 15% and Medicare pays 80% of the total cost of the drug. While the percentages remain unchanged, the threshold amounts are adjusted for inflation on a yearly basis. Table 1 is a layout of the standard Part D benefit for 2006 to 2010. Between 2006 and 2010 there was no significant change in the Part D benefit design except for adjustments due to inflation. In 2011, there was a change in the benefit structure following the 2010 health care reform act. For example beneficiary out-of-

[1] A break in coverage in which beneficiary is expected to pay the full amount for their prescription.

pocket cost in the coverage gap was reduced by 50% for branded drugs. These changes are discussed further in a later section under the Affordable Care Act (ACA) and LIS.

TABLE 1:

Medicare Part D Benefit Parameters for Defined Standard Benefit 2006 through 2010 Comparison					
Part D Standard Benefit Design Parameters:	**2006**	**2007**	**2008**	**2009**	**2010**
Deductible - (after the Deductible is met, Beneficiary pays 25% of covered costs up to total prescription costs meeting the Initial Coverage Limit.	$250	$265	$275	$295	$310
Initial Coverage Limit - Coverage Gap (Donut Hole) begins at this point. (The Beneficiary pays 100% of their prescription costs up to the Out-of-Pocket Threshold)	$2,250	$2,400	$2,510	$2,700	$2,830
Total Covered Part D Drug Out-of-Pocket Spending including the Coverage Gap - Catastrophic Coverage starts after this point.	$5,100.00	$5,451.25	$5,726.25	$6,153.75	$6,440.00 plus a $250 rebate
Out-of-Pocket Threshold - The Total Out-of-Pocket Costs including the Donut hole, 2012 Example:	$3,600	$3,850	$4,050	$4,350	$4,550
$320 (Deductible)					
+(($2930-$320)*25%) (Initial Coverage)	$ 250.00	$ 265.00	$ 275.00	$ 295.00	$ 310.00
+(($6657.5-$2930)*100%) (Coverage Gap)	$ 500.00	$ 533.75	$ 558.75	$ 601.25	$ 630.00
= $4,700 (Maximum Out-Of-Pocket Cost prior to Catastrophic Coverage - excluding plan premium)	$2850.00	$3051.25	$3216.25	$3453.75	$3610.00
	$3600.00	$3850.00	$4050.00	$4350.00	$4550.00
Catastrophic Coverage Benefit:					
Generic/Preferred Multi-Source Drug	**$2.00**	**$2.15**	**$2.25**	**$2.40**	**$2.50**
Source: Medicare.com Accessed on June 10, 2012 through http://www.q1medicare.com/PartD-The-2012-Medicare-Part-D-Outlook.php					

Table 1: Part D Benefit Parameters for Defined Standard Benefit 2006 through 2010 Comparison

DUAL ELIGIBLES AND THE LOW INCOME SUBSIDY PROGRAM

Medicare beneficiaries who are also eligible for Medicaid are considered dual-eligible. Prior to Part D, dually eligible Medicare beneficiaries have typically relied on Medicaid for outpatient medications. Medicare pays first for services which both programs cover, and then Medicaid picks up Medicare cost-sharing charges and provides protection against the cost of other services generally not covered by Medicare, such as comprehensive drug coverage (Gruber, 2009). Dual eligibles rely on Medicaid to pay

Medicare premiums and cost-sharing as well as critical benefits Medicare does not cover, such as long term care (Neuman & Cubanski, 2009). These dual beneficiaries also qualify for Supplemental Security Income (SSI) cash assistance – generally 74% of the FPL for "medically needy" individuals who have exhausted their resources paying for health and long-term care (O'Sullivan 2003). Although some protections are provided for spouses, individuals who spend down-define this to receive assistance with nursing home care must apply all of their income toward the costs of their care.

Dual eligibles shift the prescription drug benefit paradigm from Medicaid to Medicare Part D, with significant implications for utilizations, expenditures and health outcomes. Dual eligibles also receive low-income subsidy (LIS), have fully subsidized premiums, do not pay deductibles and are exempted from coverage gaps (Medicare Benefit Manual, 2012). Compared to their earlier coverage under Medicaid; however, dual eligibles face more stringent rules for cost sharing, formularies and utilization. Similarly, these rules and benefits vary based on state generosity and other available programs (SSA, 2010). It is noteworthy that state generosity is less significant in the LIS population as subsidy amounts are standardized according to predetermined requirements for qualification.

Among the dual eligibles are those who are "full subsidy eligible" or "deemed LIS eligible" through qualification for the supplemental security insurance (SSI) and do not need to apply for the benefit. "Full Subsidy Eligible" or "deemed" are individuals who are enrolled in a PDP or MA-PD plan with incomes below 135% of the federal poverty level ($14,040 for an individual and $18,900 for a couple in 2009), and have

resources in 2009 below $6,290 for an individual and $9,440 for a couple. Fully subsidized individuals are entitled to the full range of benefits under their state's Medicaid program with their drug benefits provided through Part D, regardless of whether they meet the other eligibility requirements. Fully subsidized individuals include dual eligibles, recipients of Supplemental Security Income (SSI) benefits, or enrollees in a Medicare Savings Program (MSP) who are qualified Medicare beneficiaries (QMBs), specified low-income Medicare beneficiaries or other qualifying individuals (QIs).

All full subsidy-eligible individuals receive a premium subsidy equal to 100% of the low-income benchmark premium amount for basic coverage under the plan selected by the enrollee. The minimum subsidy offered cannot be less than the premium amount for the lowest cost PDP plan in the region. These beneficiaries also have a premium subsidy for any Part D late enrollment equal to 80% for up to 60 months of delayed enrollment (O'Sullivan 2008).

Other beneficiaries who receive partial benefits are "non-deemed" LIS and must apply for the benefit through the social security administration (SSA) or their state Medicaid programs and qualify for partial subsidies if their income and assets are below specified FPL (SSA, 2010). Non-deemed LIS beneficiaries may enroll in any stand-alone PDP or MA-PD benchmark plan. LIS beneficiaries who enroll in a non-benchmark prescription drug plan are responsible for paying the premium amount that is above the benchmark cost (Summer et al, 2010). The partial subsidy (non-deemed LIS) group includes beneficiaries who are enrolled in a PDP plan or MA-PD plan with incomes below 150% of poverty ($15,600 for an individual and $21,000 for a couple in 2009), and

have resources in 2009 below $10,490 for an individual and $20,970 for a couple (O'Sullivan, 2008). These individuals have a sliding scale premium subsidy ranging from 100% of the premium subsidy amount at 150% of poverty to 0% of such value at 135%. Specifically, individuals with incomes 135% ≤140% FPL receive 75% premium subsidy, those 140%≤145% FPL receive 50% premium subsidy, and 25% premium subsidy for those beneficiaries who are 145%≤150% FPL (O'Sullivan 2008). These benefits will be more clearly defined in Tables 3 and 4 in section G: Cost-Sharing. Table 2 is the table of resource limits used to determine LIS eligibility. Between 2009 and 2010 the resource limits did not change for each subsidy group.

TABLE 2

Table of resource limits used to determine eligibility of Low-Income Subsidy (LIS)			
LIS Level	**Marital Status**	**2009 LIS Resource Limit***	**2010 LIS Resource Limit***
Full Subsidy LIS (Deemed)	Single	$8,100	$8,100
	Married	$12,910	$12,910
All Other LIS (Non-Deemed)	Single	$12,510	$12,510
	Married	$25,010	$25,010
***These resource limits include $1,500 per person for burial expenses** **Source: http://www.kff.org/medicare/upload/8094.pdf**			

Table 2: Table of Resource Limits Used to Determine Eligibility of Low-Income Subsidy (LIS)

LIS ENROLLMENT

According to CMS reports, in 2009, fewer than half of LIS eligible beneficiaries were enrolled in the benefit program. In this year, there were 12.5 million LIS beneficiaries enrolled in the program; 8.1 million deemed eligible and 3.8 million non-deemed (Summer et al, 2010). Because beneficiaries who are deemed-LIS eligible are automatically registered, all eligible deemed-LIS beneficiaries receive the full benefit.

The CMS report showed approximately 500,000 eligible beneficiaries did not receive the benefit because they had other coverage and were not enrolled in Part D, while over 2 million beneficiaries who were eligible for the subsidy and enrolled in Part D but did not apply for the program (Summer et al, 2010). As a result, only 40 percent of eligible non-deemed beneficiaries actually received LIS in 2009. Figure 3 is a depiction of LIS participation in 2009. The figure shows that 19 percent (2.3 million) of eligible non-deemed beneficiaries did not receive the LIS subsidy.

FIGURE 3

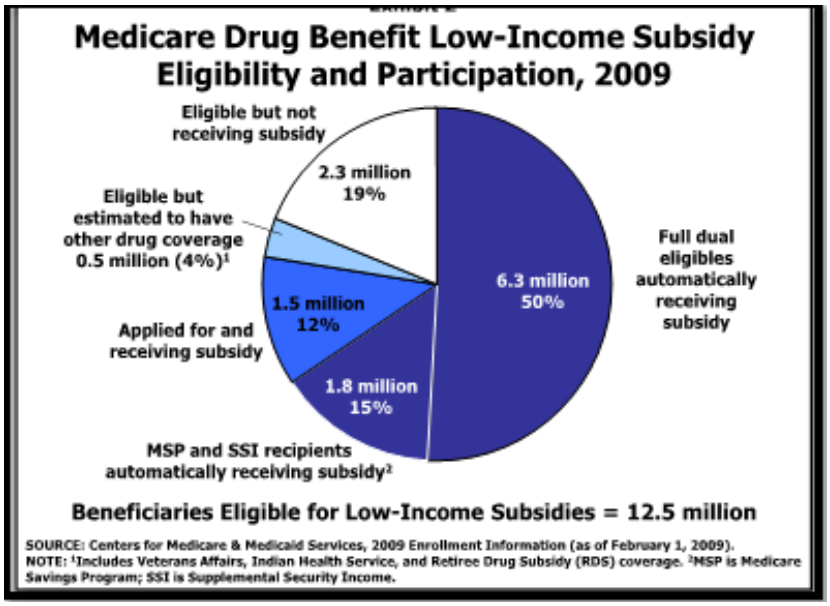


Figure 3: Medicare Drug Benefit Low-Income Subsidy Eligibility and Participation, 2009

Interestingly, this low participation rate is not new. In the last five years the participation rate has not changed, hovering between 34 percent and 41 percent despite major efforts by the CMS to provide assistance with applications (SSA, 2010). The SSA

estimates that as a result of recent policy changes, including the exclusion of the cash value of life insurance policies in evaluating assets and the exclusion of assistance provided by others for household expenses in the income calculation, hundreds of thousands more beneficiaries qualified for the LIS benefit in 2010 (SSA, 2010).

Additionally, the economic downturn, which severely impacted many seniors and left many beneficiaries with less retirement savings and income than anticipated, may have also contributed to an increase in the number of beneficiaries who qualified for the LIS in 2010.

EXTRA HELP CAMPAIGN

According to a national survey of seniors, the most significant factor influencing LIS enrollment is the lack of awareness about LIS benefits, particularly among low-income seniors of color (SSA, 2010). In 2010, CMS launched a new campaign to inform millions of Americans about the new "twist" in the law, which made it easier for beneficiaries to qualify for extra help and get registered for LIS. Through this campaign, CMS engaged all stakeholders including beneficiaries and their families, health systems and state Medicaid programs financing these beneficiaries without LIS benefit (CMS, 2012). This campaign was targeted at state Medicaid directors, large health systems, and non-profit organizations working with seniors, community health centers, leaders and family members, particularly those in predominant minority communities (CMS, 2012). The expectation was that by informing and engaging key stakeholders and

beneficiaries, CMS would raise awareness of the LIS program and, thus, increase the number of people applying for the program. A preliminary report from the CMS showed an increase in both deemed and non-deemed LIS enrollment in 2010 compared to 2009 (CMS, 2012). This increase was attributable to the extra help campaign, recent policy changes designed to expand the base of qualified beneficiaries, and the adverse economic climate.

PRESCRIPTION DRUG UTILIZATION AND SPENDING

Prescription drugs constitute a significant proportion of U.S. health care expenditures accounting for 10% ($216.7 billion) in 2006 (Neuman et. al, 2006). By some accounts, the actual spending on prescription drugs is much higher if one considers the cost of medications wrapped up in diagnosis related groups (DRGs) or used in physicians' offices (Schondelmyer, 2009). Prescription drug expenditures have been increasing on a slower rate (KFF, 2010). The rise of expenditure is attributable to several market factors including increased demand due to prescription drug coverage, new drugs, increased utilization, etc. (Duggan et al, 2008). The introduction of Part D and other benefits such as the LIS significantly increased prescription utilization. For example, in a report by Duggan and Morton, over 60 percent of prescription drugs filled in the U.S. were filled for beneficiaries of Medicare, Medicaid, and other government programs.

Another key factor responsible for the rise in prescription expenditure is the private and public payer dynamic involved in the payment for prescription drugs. In

2006, the private/public payer subsidization of prescription benefit was 44% and 35% respectively, resulting in an out-of-pocket spending of 22% (KFF, 2010). Under this dynamic, public spending on prescription drugs for Medicare Part D and other government prescription programs rose to 53% in 2006 (Summer et al, 2008). Furthermore, as the age of the population increases, the demand for and spending on prescription drugs will increase to meet the demand. This increase will be seen across all sectors of the Medicare program including Part A, B, C and D.

Figure 4 is a presentation of Part D spending on prescription drugs from the inception of the program in 2006 to 2013 projections. The figure also shows a difference between Congressional Budget Office (CBO) projections and actual spending. This figure presents a clear picture of actual spending and how spending is changing over time.

FIGURE 4

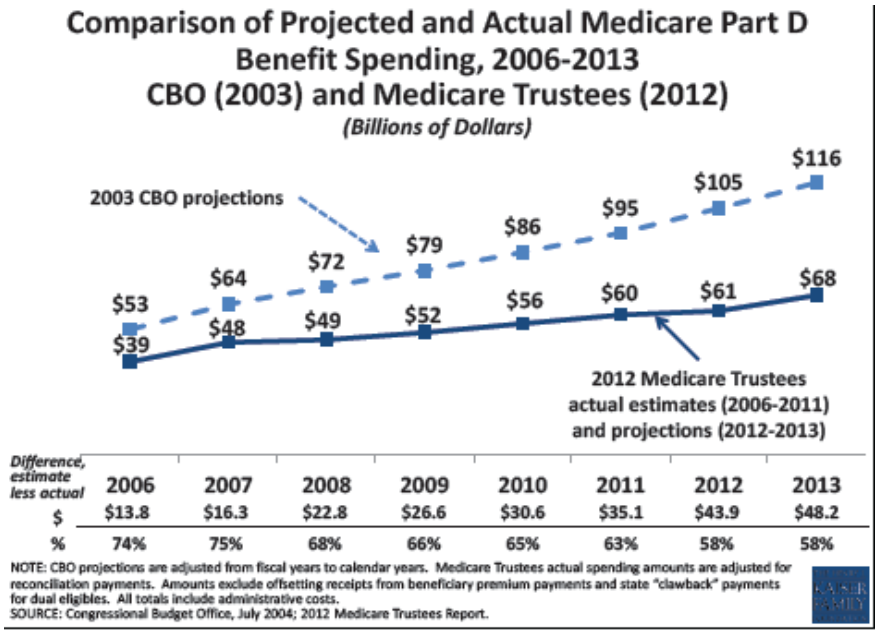


Figure 4: Comparison of Projected and Actual Medicare Part D Benefit Spending, 2006 - 2013

The Medicare Part D program has employed different mechanisms to contain costs in order to stem the rise in prescription drug expenditures. Cost-containing mechanisms such as coinsurance, copayments and deductibles aim to control spending by introducing cost sharing in order to control moral hazard. Additionally, Medicare plans expose beneficiaries to the full incremental costs above benchmark insurance policies in order to motivate enrollees to choose low-costing benchmark plans. Figure 5 shows the actual growth rate of Medicare Part D spending against CBO projections. The CBO used a projected 12 percent growth rate per capita for years before 2006 and 9 percent per capita starting in 2006; actual growth per capita has been 10 percent and 4 percent,

respectively. Spending growth into the future is also expected to be slower than the original projections made in 2003 (actual growth is only available through 2010).

FIGURE 5

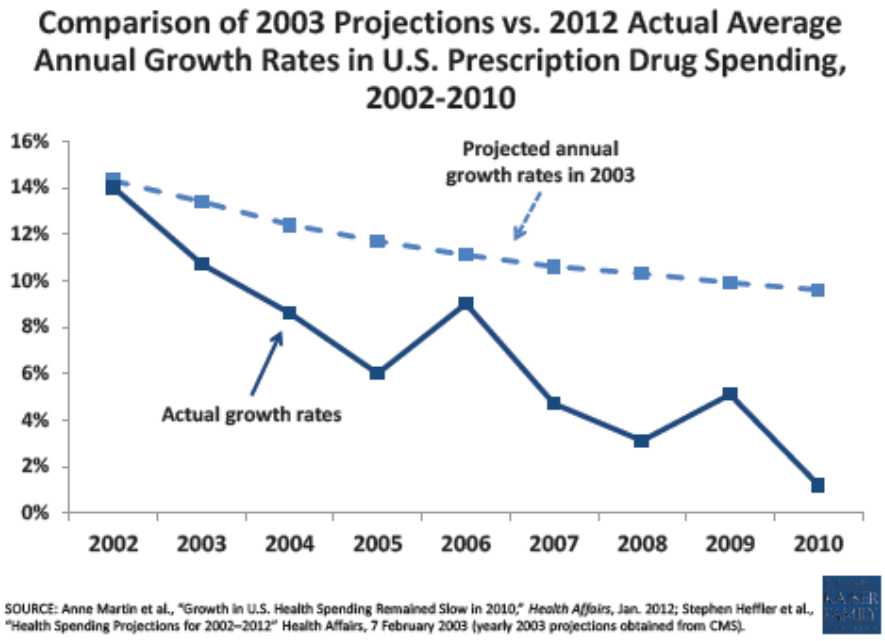


Figure 5: Comparison of 2003 Projections vs. 2012 Actual Average Annual Growth Rates in U.S. Prescription Drug Spending 2002 - 2010

COST-SHARING

The most elaborate cost sharing mechanism in Part D, the doughnut hole, came about due to budget constraints which led to the introduction of the coverage gap in which beneficiaries must pay the full cost of their prescription drug(s) until they hit a catastrophic limit of $5,726 (Hoadley et al, 2008). This controversial coverage gap was introduced by a congressional budget resolution intended to contain the cost of the

program within projected budget estimates through cost sharing (Hoadley, 2005). The CBO estimated cost savings from the coverage gap of approximately $13.3 billion over a 10-year period (Summer et al, 2010). This coverage gap though, did not affect dual eligible and LIS beneficiaries who faced modest costs.

Nonetheless, over the years, dual eligibles have seen an increase in out-of-pocket expenses on prescription drugs with copays ranging from $1 to $5, depending on whether the drug is generic vs. brand or the different cost-sharing schemes implemented by their prescription plan (Summer et al, 2010). Part D plans employ other methods of cost-sharing including formulary management, formulary-tiers, prior authorization, and utilization reviews and management, step therapy and quantity limits in order to manage cost. Beneficiaries are allowed the autonomy to search for and identify plans that are economical and with benefits structures that are appropriate for their medication needs. This affords beneficiaries an opportunity to compare plans and make price-conscious decisions. Unfortunately, that is not always a viable option given the myriad of choices and the complexity of each plan. Figure 6 is a depiction of the standard Part D benefit and the different levels of cost sharing for LIS beneficiaries. Table 3 and Table 4 show the premium subsidy for beneficiaries receiving full and partial LIS subsidy. There was no significant change in benefit between 2009 and 2010, except for adjustment due to inflation.

FIGURE 6

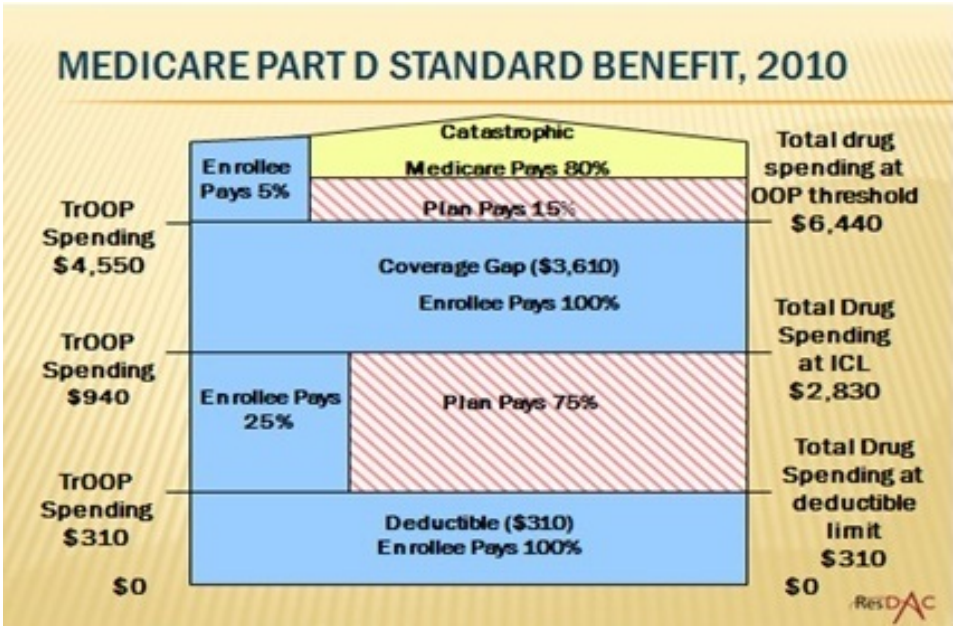


Figure 6: Part D Standard Benefit, 2010

TABLE 3

TABLE 3 **2009 Maximum LIS Beneficiary Cost-Sharing Table**

Low-income Subsidy Category	Deductible	Copayment up to Out-of-Pocket Threshold*	Copayment above Out-of-pocket Threshold*
Institutionalized Full-Benefit Dual Eligible	$0	$0	$0
Full-Benefit Dual Eligible ≤ 100% FPL	$0	$1.10 generic, $3.20 brand	$0
Full-Benefit Dual Eligible > 100% FPL; Medicare Saving Program Participant (QMB-only, SLMB-only, or QI); Supplemental Security Income (but not Medicaid) Recipient; Applicant < 135% FPL with resources ≤ $8,100 ($12,910 if married)**	$0	$2.40 generic, $6.00 brand	$0
Applicant < 150% FPL with resources bet. $8,100-$12,510 ($12,910-$25,010 if married)**	$60	15%	$2.40 generic, $6.00 brand
*Out-of-Pocket Threshold is $4,350 for 2009. ** Resource limits displayed include $1,500 per person for burial expenses.			

ᵇ Resource limits displayed do not include the $1,500 allowance per person for burial expenses.

Table 3: 2009 Maximum LIS Beneficiary Cost-Sharing Table

TABLE 4

2010 Maximum LIS Beneficiary Cost-Sharing Table

Low-income Subsidy Category	Deductible	Copayment up to Out-of-Pocket Threshold*	Copayment above Out-of-pocket Threshold*
Institutionalized Full-Benefit Dual Eligible	$0	$0	$0
Full-Benefit Dual Eligible ≤ 100% FPL	$0	$1.10 generic, $3.30 brand	$0
Full-Benefit Dual Eligible > 100% FPL; Medicare Saving Program Participant (QMB-only, SLMB-only, or QI); Supplemental Security Income (but not Medicaid) Recipient; Applicant < 135% FPL with resources ≤ $8,100 ($12,910 if married)**	$0	$2.50 generic, $6.30 brand	$0
Applicant < 150% FPL with resources bet. $8,100-$12,510 ($12,910-$25,010 if married)**	$63	15%	$2.50 generic, $6.30 brand
*Out-of-Pocket Threshold is $4,550 for 2010. ** Resource limits displayed include $1,500 per person for burial expenses.			

Accessed through CMS http://www.dea.ri.gov/documents/2010%20LIS%20Resource%20Limits.pdf?Counter=3534&IntNumPerPage=10&checkDate=1&checkKey=&srchType=1&numDays=14&srchOpt=0&srchData=&keywordType=All&chkNewsType=6&IntPage=&showAll=1&pYear=&year=0&desc=&cboOrder=date

Table 4: 2010 Maximum LIS Beneficiary Cost-Sharing Table

UTILIZATION MANAGEMENT (UMT) PROGRAMS

In addition to establishing different cost-sharing tiers and formulary management programs, Part D plan sponsors have several options available to contain drug spending. These UMT programs include step therapy (ST), prior authorization (PA), quantity limits (QL), medication therapy management (MTM) and Drug Utilization Review (DUR). Plan sponsors typically rely on pharmacy benefits managers (PBMs) to administer UMTs. Plans may place UMT requirements on the use of certain drugs on their formulary, such as requiring beneficiaries to obtain prior authorization prior to fulfilling expensive prescriptions such as brands and specialty drugs. Plans may also require beneficiaries to first try a preferred drug in the formulary before being able to obtain an alternate (usually

a more expensive) drug for the same medical conditions. Plans may implement quantity limits on certain drugs in order to limit the use of expensive drugs. Quantity limits are also set in place to avoid waste by limiting the amount of expensive medications dispensed. Additionally, since Medicare Part D plans and plan sponsors are privately owned, they are incentivized to implement UMTs in order to maximize drug rebates from manufacturers, control cost by directing prescribers to less costly options, thereby reducing drug spending. Figure 7 is a sample of utilization management programs offered by CMS plan sponsors.

FIGURE 7

Utilization Management Practices under Medicare Part D

Prior authorization	Step therapy	Quantity limits
Prior authorization means that a beneficiary will need prior approval from his or her plan before being able to fill a prescription. If a drug has a prior authorization requirement, a beneficiary will need to work with his or her plan and physician to obtain an authorization. Many prior authorization requirements can be resolved at the point of sale and do not require any additional information from the physician.	In some cases, plans require a beneficiary to first try one drug to treat his or her medical condition before they will cover another drug for that condition. For example, if Drug A and Drug B both treat a medical condition, a plan may require doctors to prescribe Drug A first. If Drug A does not work for a beneficiary, then the plan will cover Drug B.	For safety and cost reasons, plans may limit the quantity of drugs that they cover over a certain period of time. For example, if a beneficiary currently takes 2 pills per day and the quantity limit is 30 pills per month, he or she would need to work with the plan to get authorization for the higher quantity.

Figure 7: Utilization Management Practices Under Medicare Part D

Some plans also offer UMT programs such as MTM and DURs which are offered to patients with multiple chronic conditions, who are taking many prescription drugs, or who have high drug costs – annual costs exceeding $3,100 for 2012. The goal of these

programs is to evaluate patients' medication regimen for drug-disease and drug-drug interactions, patients' understanding of their medication regimens and knowledge about how to manage their conditions. MTM and DUR, like PA, QL and ST are administered by the PBM under a negotiated administration fee paid by the plan sponsor. The sponsors are required to target beneficiaries for enrollment, at least, quarterly during the year to allow more Medicare beneficiaries to have access to the MTM program earlier in the year (Medicare Part D Manual, 2012).

UMTs are not required under Medicare Part D but are required under the MA-PD STAR ratings. While UMTs may be effective in reducing spending, they present another barrier for dual eligibles in obtaining prescription drugs, which could be disruptive, and with potentially negative health outcomes. Plan sponsors are required to establish a reasonable and appropriate drug utilization management program with policies and systems to assist in preventing over-utilization and under-utilization of prescribed medications and provide incentives to reduce costs when medically appropriate. Part D sponsors are required to submit their utilization management tools to CMS for approval as a component of the sponsor's formulary (Medicare Part D Manual, 2012).

THE AFFORDABLE CARE ACT AND THE LOW INCOME SUBSIDY

On March 23, 2010, President Obama signed comprehensive health reform, the Patient Protection and Affordable Care Act (PPACA), into law. This law focuses on provisions to expand coverage, control health care costs, and improve the health care delivery system. Under PPACA, a state-based American Health Benefit Exchange

program would be created through which individuals can purchase coverage, with premium and cost-sharing credits available to individuals/families with income between 133-400% of the federal poverty level (the poverty level is $18,310 for a family of three in 2009) (KFF, 2011). This should expand prescription drug coverage to most, if not all, Americans, including seniors.

Included in the PPACA law were other bold provisions to expand coverage and access to Medicare beneficiaries, especially those with low-income status. For example, a provision stipulates a gradual phasing down of beneficiary coinsurance rate in the Medicare Part D coverage gap from 100% to 25% by 2020, for brand-name drugs, and 75% of the generic drug cost by 2020 for prescriptions filled in the Medicare Part D coverage gap (phased in beginning in 2011) (KFF, 2011). Furthermore, the out-of-pocket cost that qualifies an enrollee for catastrophic coverage will be reduced significantly between 2014 and 2019 (KFF 2011).

This legislation also brought significant changes to the Retiree Drug Subsidy (RDS) and the Employer Group Waiver Plan (EGWP), two major prescription drug programs typically used by private employers and unions to provide competitive prescription coverage for Medicare eligible retirees. On January 1, 2013, the RDS, which has been the mainstay of coverage for employers providing prescription drug coverage for Medicare eligible retirees, became taxable. Employers with Medicare Part D-eligible beneficiaries now face higher costs due to a loss of the 28% subsidy (net average of 20%) for drug costs between $295 and $6,000. The EGWP supports drug costs under plans where membership is restricted solely to employer or union-sponsored group plan

members. The EGWP, by all indications, provides greater savings in most cases over the RDS, due to a pre-tax federal subsidy, which allows 100% of expenses associated with prescription drug coverage to be tax deductible. The total subsidy varies by the type of EGWP plan but is estimated to be up to 35%. Unlike the RDS, EGWP subsidy payments are risk-adjusted for health status using the CMS Hierarchical Condition Categories (CMS-HCC) model, implemented in 2004, to adjust Medicare capitation payments for the health expenditure risk of enrollees (KFF, 2011).

All of these provisions aggregate to expand coverage to senior beneficiaries and increase their access to medications and other services. Evidence of the effects of the intended and unintended consequences of this massive expansion to current and future markets is tenuous, nor are there models that have been rigorously tested for the effect of this change on expenditure, utilization and outcomes, especially among seniors who will see a dramatic drop in their out-of-pocket costs. Therefore, understanding beneficiary utilization patterns after gaining expanded access through the LIS program should tell a realistic story about utilization patterns and changes in expenditure and health outcomes that can be applicable to the changes occurring on the national stage. Events in the LIS population can serve as a microcosm in order to study the change happening on the national stage.

BACKGROUND SUMMARY

In summary, the low income subsidy is a federal program which provides government subsidized prescription drug coverage for Medicare beneficiaries through private stand-alone prescription drug plans and Medicare Advantage prescription drug plans in order to reduce or eliminate low-income enrollees' out-of-pocket expenses associated with the drug benefit. There are two types of LIS beneficiaries: deemed and non-deemed. The deemed group consists of full-benefit dual eligible Medicare beneficiaries – those who receive full Medicare and Medicaid benefits. Non-deemed beneficiaries are required to apply for and submit written proof of income and assets in order to be considered for premium and other federal cost-sharing subsidies under Part D. In 2009, only 40 percent of the 3.8 million eligible beneficiaries applied and received LIS benefits. In response to this, CMS launched the extra help campaign with the ultimate goal of increasing enrollment. LIS beneficiaries constitute 38 percent of Medicare Part D enrollees but account for more than half of the total Part D spending; in part, because they are sicker, utilize more health services and generally obtain more brand name than generic medications as compared with non-LIS Part D beneficiaries. LIS beneficiaries, therefore, pay lower out-of-pocket costs compared to other Part D beneficiaries. In an effort to contain expenditures, Medicare plan sponsors are required to provide utilization management programs that are geared toward containing drug expenditures and utilization. As will be discussed in Chapter 2, studies across the board have shown conflicting results regarding the effects of subsidies on expenditure, utilization and outcomes in Part D. Most of these studies are limited to generalization.

OBJECTIVES AND SPECIFIC AIMS

The overall goal of this study is to evaluate the impact of the LIS enrollment on expenditures, medication and health care services utilization, and health outcomes. There is a large body of literature on the effect of insurance on utilization, expenditure and outcomes; however, the literature on the effects of LIS on expenditures and outcomes is still limited. The approach used in this study was to develop a model that builds on existing research in order to contribute new ideas to the field. Due to the wealth of information available through the different Medicare files used in this project, it was possible to design econometric models using a multitude of variables in order to conduct the analysis needed to answer the research questions specified in this study. At the conclusion of this study, the findings will contribute to the growing literature on the impact of the LIS program on medication utilization and adherence.

OBJECTIVE 1:

Compare health services utilization (emergency department visits, outpatient visits and inpatient hospitalization) and total health services expenditures across Medicare Part D low-income cost-share status (deemed vs. non-deemed vs. non-LIS) in 2009 and 2010.

AIM 1:

Compare health services utilization (ED visits, outpatient visits and inpatient hospitalization) and total health services expenditures between deemed vs. non-deemed vs. non-LIS beneficiaries in 2009 and 2010.

Hypothesis 1A:

Health services utilization (ED visits, outpatient visits and inpatient hospitalization) will be lower for beneficiaries in the lowest cost-share group.

Hypothesis 1B:

Total health expenditures will be lower for beneficiaries in the lowest cost-share group.

AIM 2:

Compare health services utilization and total health services expenditures among beneficiaries who switched status: i.e. deemed to non-deemed/non-LIS, non-deemed to deemed/non-LIS, or non-LIS to deemed/non-deemed between 2009 and 2010.

Hypothesis 2A:

Health services utilization (ED visits, outpatient visits and inpatient hospitalization) will be the same between all of the groups.

Hypothesis 2B:

Total health expenditures will be the same between all groups.

Rational: The effect of access and adherence to prescription drugs has been captured by several studies. Overall, studies across the board have shown inconsistent results regarding the effects of prescription access and adherence on non-drug related medical spending. In the recent past, Stuart et. al, 2007 and Gilman et al 2007 specifically evaluated the effect of drug expenditures on medical spending and concluded that expenditures on prescription drugs do not offset medical spending. Ingber et al, 2010 used panel data to evaluate the effect of prescription drug spending on non-drug related medical expenditures and found equivocal results. Zhang et al, 2009 used Medicare Part D claims data to evaluate the effect of Part D expenditures on medical spending, and found minimal effects at best. The central hypothesis for this objective is that gaining LIS status reduces cost sharing which increases access to medications, improves adherence, and ultimately decreases non-drug related health utilization and spending; however, for beneficiaries who switched status, utilization and expenditures would be the same because 12 months is not enough time to see the full effect of switching on health services utilization and health services expenditure.

The approach is to evaluate variables such as emergency department (ED) visits, outpatient and inpatient visits, etc. This will allow for the evaluation of how access and adherence to prescription drugs can influence non-drug related medical expenditures among beneficiaries.

OBJECTIVE 2:

Compare prescription drug utilization and total drug expenditure across Medicare Part D low-income cost-share status (deemed vs. non-deemed vs. non-LIS) in 2009 and 2010.

AIM 3:

Compare total drug expenditures and prescription drug utilization between deemed vs. non-deemed vs. non-LIS beneficiaries in 2009 and 2010.

Hypothesis 3A:

Total prescription drug utilization will be higher for beneficiaries in the lowest cost-share group.

Hypothesis 3B:

Total prescription drug expenditures will be higher for beneficiaries in the lowest cost-share group.

AIM 4:

Compare total drug expenditures and prescription drug utilization among beneficiaries who switched status: i.e. deemed to non-deemed/non-LIS, non-deemed to deemed/non-LIS, or non-LIS to deemed/non-deemed between 2009 and 2010.

Hypothesis 4A:

Total prescription drug utilization will be higher for beneficiaries who switch to a lower cost-share group (i.e. deemed > non-deemed > non-LIS).

Hypothesis 4B:

Total prescription drug expenditures will be higher for beneficiaries who switch to a lower cost-share group (i.e. deemed > non-deemed > non-LIS).

Rational: Prescription drugs constitute a significant proportion of U.S. health care expenditures, accounting for 10% ($216.7 billion) in 2006. The level of cost-share beneficiaries' pay affects adherence to prescription drugs. Some studies have concluded an inverse relationship between cost and adherence. Similarly, the effect of insurance status on prescription drug use and spending has been well documented by several studies indicating insurance status increases prescription utilization and expenditures. The overarching hypothesis is that gaining LIS status increases access to prescription drugs, especially brand-name medications, which increases total spending on medications. The expectation is that beneficiaries with LIS will have higher utilization and expenditure. This will also be true for beneficiaries who switched status from no (or low) subsidy to moderate or high subsidy. In this case, the full effect of switching on prescription drug utilization and expenditure can be observed immediately.

The approach was to evaluate measures such as medication possession ratio (MPR), out-of-pocket expenditures and total expenditure. Drug expenditures were examined before and after beneficiaries gained LIS status. The out-of-pocket cost paid by beneficiaries and the total amount paid by the Medicare plan for prescription drugs were computed. This allowed for the evaluation of how cost sharing affects drug utilization and adherence among beneficiaries.

CHAPTER 2: LITERATURE REVIEW

CHAPTER OUTLINE

There is a growing body of literature on the effect of cost sharing on health behavior and the resulting implication on medication adherence and medical expenditures. There is also a multitude of published studies on the effect insurance has on health care utilization and the corresponding effect on health and health outcomes. For instance, several studies have concluded that financial incentives such as reducing cost-share, lowering premiums and out-of-pocket (OOP) costs can have positive effects on access and adherence to medications. Contrarily, other studies such as the Rand Health Insurance Experiment, has found that reduced cost sharing is sub-optimal because it causes moral hazard. Within the Medicare Part D population there have been a myriad of studies with varying conclusions. In the non-deemed LIS population; however, the body of literature is still growing. This literature review focuses on prescription utilization and expenditures, the corresponding impact on medical utilization and spending, and the clinical and economic implications of beneficiary cost sharing.

The first section of this chapter discusses how the LIS program is operationalized as part of a beneficiary's pharmacy benefit. The second section is a discussion of the conceptual framework used in this project. The final section of this chapter is an appraisal of the literature surrounding prescription utilization and spending, cost-sharing, utilization management programs, and will conclude with a summation with highlighted gaps and conclusions from this review.

OPERATIONALIZATION OF LOW INCOME SUBSIDY

LIS benefits are incorporated into a beneficiary's pharmacy benefits by the pharmacy benefits manager (PBM). The PBM is contracted by the PDP sponsor to manage all aspects of the benefit structure without disruptions at the point of sale.

A beneficiary with LIS benefits receives Low-Income Premium Subsidy (LIPS), Low-Income Cost Share Subsidy (LICS), Coverage Gap Discount Program (CGDP) benefits, etc. Figure 8 is a simplified diagram of how PBMs operationalize the complex relationships and processes involved in providing LIS benefits with a standard PDP.

In order to offer a standard PDP benefit to a low-income beneficiary, the plan sponsor contracts a PBM to manage the pharmacy benefits. The PBM collects LIPS and LICS amounts from CMS, CGDP amounts from pharmaceutical manufacturers[2] and cost-share amounts from beneficiaries at the point of sale (POS). After administering the benefits, the PBM will pass-through LIPS, CGDP, LICS and drug rebates collected from manufacturers to the PDP sponsor based on contractual guarantees. The plan sponsor pays the PBM a fixed amount per member per month (PMPM) for managing the entire pharmacy benefits. This includes adjudicating drug costs for each prescription dispensed and administering clinical and utilization management programs. This is the complex web of processes managed by the PBM in the background in order to ensure no disruptions to the beneficiary at the point of sale.

[2] Note: CGDP was not available in 2009 and 2010; it came into effect under the ACA in 2010. Additionally, CGDP is prorated at 50% and 90% discount off branded and generic prescriptions respectively.

In spite of the complexity of processes and procedures PBMs have developed platforms to effectively manage and administer PDPs and compete for business on the capability of their platforms to manage drug purchasing, inventory and prescription fulfillment.

FIGURE 8

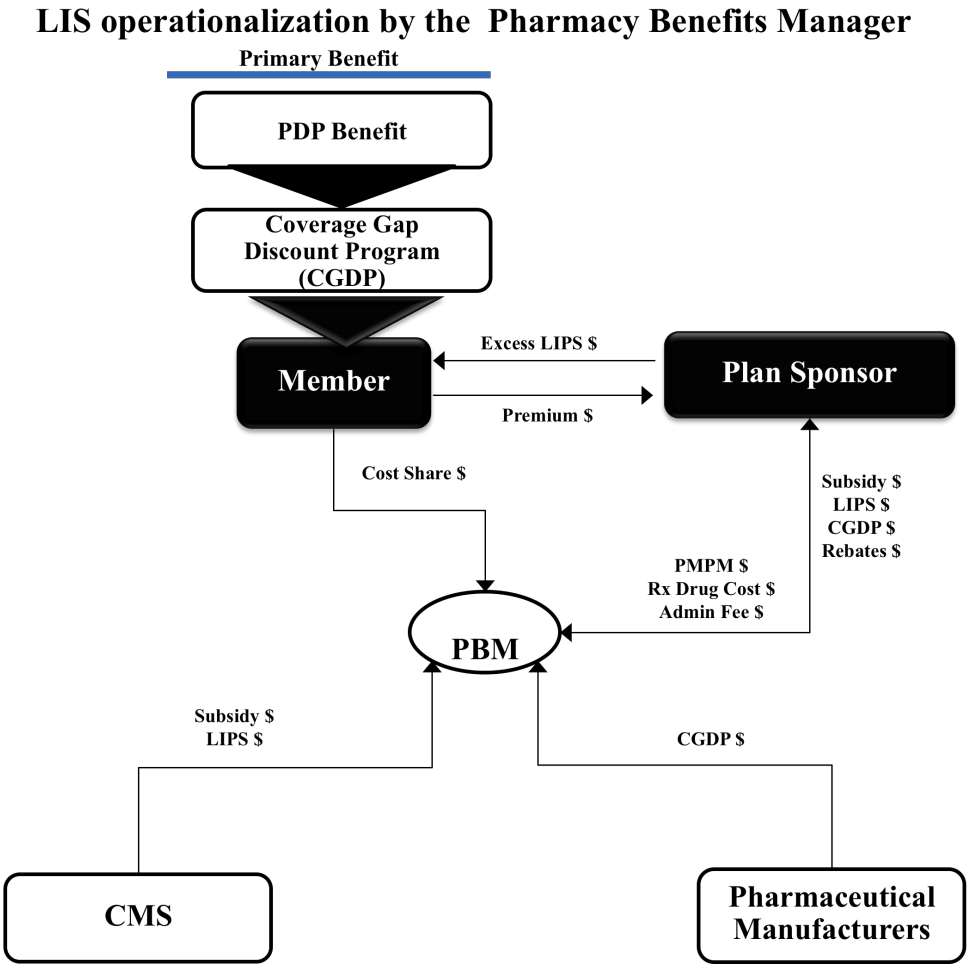


Figure 8: LIS Operationalization by the Pharmacy Benefits Manager

CONCEPTUAL FRAMEWORK

The conceptual model for this study is based on Grossman's theory of the demand for health care. The Grossman model encompasses the "economic theory" and the "human capital theory." In Grossman's human capital framework, individuals demand health care for the consumption benefits as well as production benefits that good health provides. By investing time and consuming healthcare goods and services, which produce good health, individuals maximize their utility (Gordis, 2009).

Grossman's model provides a conceptual framework for interpretation of the demand for health and medical care in relation to an individual's resource constraints, preferences and consumption needs over their life cycle. Health is determined by many factors among which are medical care, socioeconomics, employment status, income, housing conditions, diet and lifestyle (Grossman, 1972a). The question is how individuals allocate their resources to produce health. The model assumes that consumers are continuously building up their individual health capita to produce health. Grossman considers the individual as both a producer and a consumer of health, thereby removing the artificial separation of consumption and production in the model. As a result, the demand for health can be seen under two elements: the consumption effects through which individuals yield direct utility when individuals consume health care during sickness and feel better as they get healthier and the investment effects in which an individual's health stock increases as he invests in health care.

In Grossman's framework, individuals inherit an initial stock of health, which depreciates over time (age) and improves by investment. When individuals perceive their

health stock below some desirable level, they will seek to increase their health status by combining inputs of medical services and goods, other non-medical goods and their own time. In this sense, the demand for health care is considered derived, meaning that people are in demand for the utility of good health but must purchase health care in order to get good health. As a result, the demand for prescription drugs, one type of medical good, is viewed as a derived demand for good health. Further, individuals are not passive consumers of health but are rather active producers who spend time and money on the production of health. Grossman also highlighted the fact that although individuals value their health, they do not value it above all else. This means that, if they did, they would only embark on habits and activities that maximize their health and avoid unhealthy habits such as smoking, drinking, speeding or stress.

The economic theory states that when a consumer is assessed the full price of a prescription drug (commodity) and has enough information about the drug's benefits and adverse effects, he will consume an optimal amount of the drug given his preferences and income constraints (Grossman, 1972). If the economic theory is correct, rational patients will weigh the costs and benefits of drugs against other methods of producing health before purchasing an optimal combination of prescription drugs and other goods and services that maximize their health outcome, subject to the individual's income constraints. Since the price of prescription drugs is also in itself a function of one's insurance status and pharmacy benefit generosity, the insurance status for prescription drugs and/or the pharmacy benefit design can induce patients to behave differently than they would if they did not have the insurance. Insured patients tend to consume more

drugs than uninsured patients. One plausible explanation for this is that insured patients are normally exposed to lower prices than the full prices of drugs. The effect of insurance status on prescription drug use and spending has been well documented by Manning et al, 1985; Leibowitz et al, 1985; Poisal & Murray, 2001.

Moral hazard in the context of health care has focused on the fact that beneficiaries under full or partial insurance coverage (or LIS) status, who pay $0 for services, leads to excess in utilization because they are not exposed to the full cost of their prescriptions (Trottmann et al, 2011). As such, having the right incentives through cost-based pricing mechanisms could reduce this inefficiency induced by moral hazard through the imposition of appropriate "cost-sharing." This will imply that raising out-of-pocket cost on LIS beneficiaries to an optimal amount will be efficient. This implication is one of the key questions yet to be answered by our current national discourse. From our ongoing debate using the economic theory argument, one might be inclined to suggest that having incentives through cost-based pricing could be optimal. Opponents to this standpoint will argue that cost-sharing, at some level, will convey too much risk, especially to low-income beneficiaries (Goldman & Phillipson, 2007). Therefore, the right economic argument calls for a suitable trade-off between cost-sharing and appropriate subsidy to improve utilization (Pauly, 2004). In this context, the level of cost sharing or subsidies awarded could be adjusted based on the elasticity of services. For example, the price of prescription drugs could be adjusted to cost more for prescription drugs that are generally inelastic since it has been shown that inelastic prescription drugs are less prone to moral hazard (Zhang et al, 2009). An analysis from RAND found using

reported data to calculate the own-price elasticity of demand for prescription drugs to be between –0.05 and –0.08, indicating an inelastic demand (Ringel et al, 2007). Smith (1993) analyzed the effect of an increase in prescription drug copayments from $2 to $5 on prescription drugs for a set of employer groups covered by one national managed care plan and calculated a price elasticity of demand for pharmaceuticals equal to be –0.10. A Mathematica study report estimates the price elasticity of demand for prescription drugs is usually in the range of –0.1 to –0.6 (Liu & Chollet, 2006). This study also reported that the introduction of multi-tier formularies shows the demand for some drugs (e.g., those treating symptomatic conditions) may be more price-elastic than the demand for other drugs.

Alternatively, the subsidies could be adjusted to modest amounts on a means-tested out-of-pocket scale which forces those with higher means (high income) to pay more than those with lower income. The premise for this already exists in Medicare Part B and in the determination of LIS eligibility in its current state. Similarly, a value based insurance design, which reduces copays for maintenance therapies used in the treatment of chronic conditions could be implemented as an alternative to the subsidy.

There are limitations to this theory. The key assumption of the economic theory is that consumers are knowledgeable about the type of health care goods and services in order to make rational choices that will maximize their health. This assumption is also built on the expectation of a perfect market in which there are many options with competitors, an abundance of information and time to make decisions. The contrary to this assertion is true. Further, the health care market is uniquely different in that patients

are not ultimately able to make the decision, as is the case with traditional markets. Patients are told what medications to use, which physicians to see, and are expected to comply. This does not leave any room for shopping around or applying one's rational compass. A final and very important assumption is that patients are able to apply opportunity costs in order to rationally forgo some prescription drugs in preference of others. This may not always be true if the patient has multiple chronic illnesses that are of equal importance. Even if they try, patients may not have the necessary resources to be able to shop around and evaluate available choices and make rationally informed decision.

Grossman's theory provides the theoretical framework explaining the implementation of the Medicare Part D Low Income Subsidy and its effects on utilizations and expenditure on prescription drugs for beneficiaries after LIS enrollment. There are several economic implications of this theory.

First, increased cost sharing across several levels may decrease utilization of prescription drugs for non-LIS beneficiaries who are more price-sensitive due to limited income. Not coincidentally, this can reduce adherence to ongoing drug therapy possibly due to discontinuation of therapy, less refill of prescription, skipping doses or switching to less expensive drugs. The economic theory, however, will contend that given the right economic incentives, applied appropriately, the impact of cost-sharing will lead to an optimal utilization of prescription drugs.

This conceptual model explains the basis for the implementation of the LIS program in Medicare Part D and how it influences the utilization and expenditure of

prescription drugs among LIS beneficiaries. From this conceptual model it can be inferred that individuals who are vested in their health will invest the human capital necessary to apply for the LIS program. Furthermore, the reduce cost sharing resulting from LIS enrollment may increase utilization and expenditure of prescription drugs. As a result, reduced cost sharing will lead to better adherence to ongoing drug therapy for chronic conditions. This position is consistent with the hypotheses covered under OBJECTIVE 2: To compare prescription drug utilization and total drug expenditure across Medicare Part D low-income cost-share status (deemed vs. non-deemed vs. non-LIS) in 2009 and 2010.

The substitution effect of drug therapy to other medical goods and services has been shown in several studies to be consistent across age and income groups (Grossman, 1972b; Goldman et al, 2007). These results imply that adherence to drug therapy leads to a reduction in the utilization of other medical services. Based on this conceptual model, reduced cost sharing for LIS beneficiaries should increase adherence, which should in turn reduce the utilization of other medical services because of the substitution effect of prescription drugs. This is consistent with the hypothesis covered under OBJECTIVE 1: To compare health services utilization (ED visits, outpatient visits and inpatient hospitalization) and total health services expenditure between deemed vs. non-deemed vs. non-LIS beneficiaries in 2009 and 2010.

ECONOMIC MODELS ILLUSTRATING THE IMPACT OF LIS BENEFITS

The impact of LIS benefits on utilization, expenditure and health care outcomes can be construed in two scenarios. Scenario 1 is a representation of the direct impact of LIS status. After registration for LIS benefits, beneficiaries qualify for and receive low incomes premium subsidy (LIPS) and low-income cost-share (LICS) for every prescription they fill. As a result of the LIPS and LICS, LIS beneficiaries pay less in deductible and premiums, and face lower OOP cost (lower copayment and coinsurance) at the point of sale. Reducing cost-share increases beneficiary access and adherence to medications, with the ultimate result being better health outcomes and a corresponding reduction in non-drug related expenditures, as well as total health expenditures. This is attributable to the substitution effects of prescription drugs on medical utilization.

The second scenario is concerned with moral hazard. In this model, reducing OOP cost and beneficiary cost-share is sub-optimal and inefficient. It causes beneficiaries to change their prescription purchasing behavior and over-utilize and/or misuse health care products and services because they are not exposed to the full cost. As a result, in this model, LIS subsidies cause a distortion in prices, causing a market failure that is ultimately unsustainable.

Figure 9 is an illustration of both scenarios discussed above. Figure 10 is a depiction of the income effect of LIS benefits on the prescription demand curve. It shows how lowering OOP costs and other beneficiary cost-share contribution (due to LIS) reduce the price of prescription drugs from P_1 (non-LIS price) to P_0 (non-deemed LIS

price) at the point of sale. This price reduction shifts the demand curve outward, showing an increase in quantity demanded from Q_0 to Q^e.

FIGURE 9

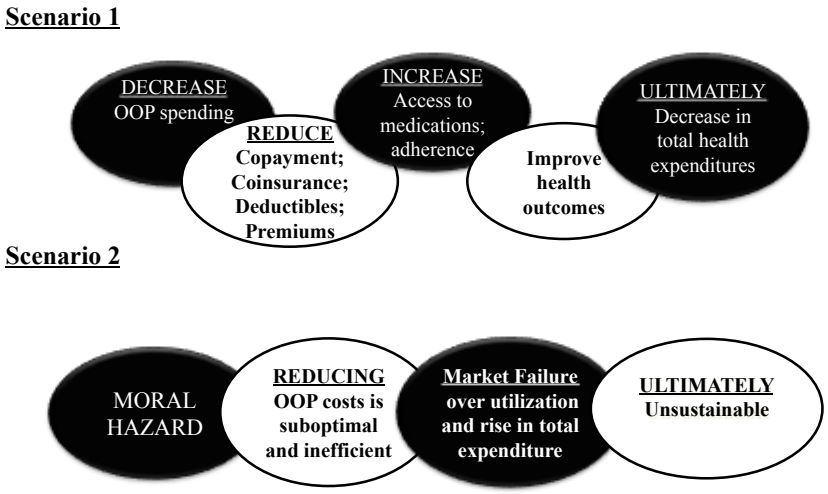


Figure 9: Economic Implications of LIS Status

FIGURE 10

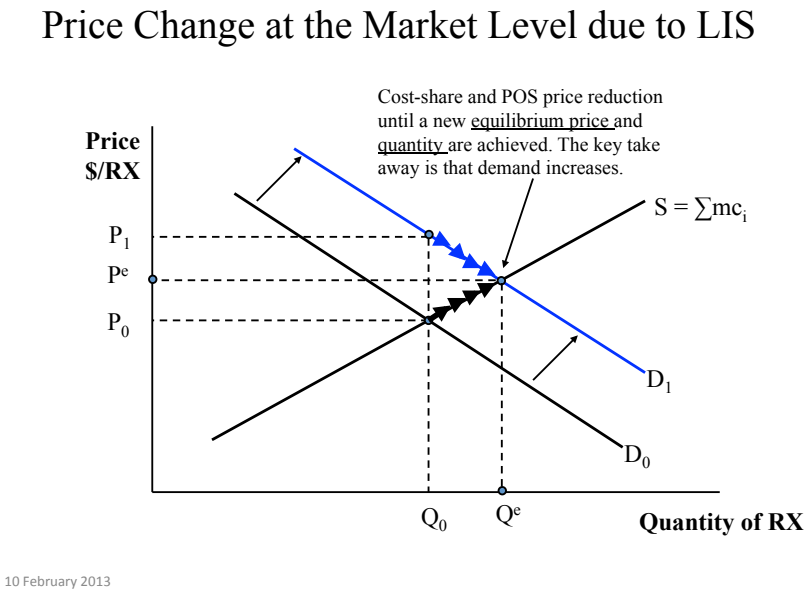


Figure 10: Price Change at the Market Level Due to LIS

Figure 11 is an illustration of the substitution and income effects of LIS. The Y-axis represents RX (prescription) utilization and the X-axis medical utilization. In this figure, prescription utilization is a substitute for medical utilization (i.e. inpatient visits, outpatient visits, ED visits, etc.). For example, prior to gaining LIS status, an individual utilizes **X** prescriptions with a corresponding **Y** medical services based on a budget constraint of $\mathbf{I_1}$ with an indifference curve of $\mathbf{U_1}$**.** The optimal consumption for a non-LIS beneficiary is ($\mathbf{Y_{Non\text{-}LIS,}}\mathbf{X_{Non\text{-}LIS}}$)**.** Based on the substitution effect of prescription drugs and medical services, these beneficiaries consume less prescription drugs but utilize more medical services. After gaining LIS status and the application of subsidies, the non-deemed beneficiary consumes **X** prescriptions with a corresponding **Y** medical utilization

based on an outward shift of the budget constraint $\mathbf{I_0}$ and an indifference curve $\mathbf{U_0}$. In this case, the beneficiary consumes more prescriptions (X) because they face less OOP and other cost-share amounts. Similarly, due to the substitution effects of prescriptions for medical services non-deemed LIS beneficiaries utilize less medical services (Y). The optimal consumption bundle for the non-deemed beneficiary is ($\mathbf{X_{Non\text{-}Deemed\ LIS,}}$ $\mathbf{Y_{Non\text{-}Deemed\ LIS}}$), at which point the beneficiary buys more prescription drugs. As a result, the impact of LIS subsidies (OOP and beneficiary cost-share) is an increase in prescription drug utilization and a corresponding reduction in the utilization of medical services.

Additionally, if the reduction in prescription drug utilization is decomposed further, two separate effects are identified: the substitution and income effects. The substitution effect is captured as a total reduction in medical utilization that is directly attributable to the increase in prescription drug utilization due to gaining LIS status. This is captured as ($\mathbf{X_{Non\text{-}Deemed\ LIS} - X_Z}$). The income effect is captured as an increase in purchasing power resulting from a reduction in the price paid by a beneficiary at the point of sale. This effect is shown by a higher indifference curve, $\mathbf{U_1}$, and is captured by ($\mathbf{X_Z - X_{Non\text{-}LIS}}$). Ultimately, the combination of both the income and substitution effects results in a total reduction in medical service utilization.

FIGURE 11

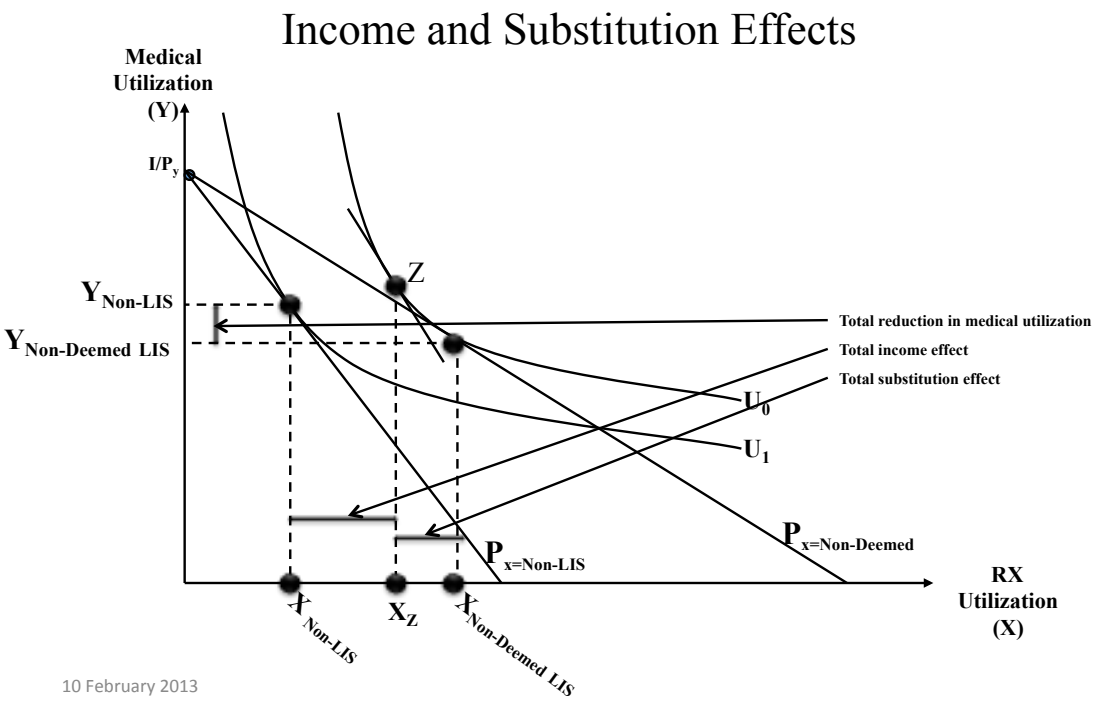


Figure 11: Income and Substitution Effects of LIS

LITERATURE EVALUATION

COST SHARING

Cost sharing is one of the mechanisms used to control the utilization of prescription drugs through premiums, copayment and coinsurance. Copayment is a flat fee assessed per prescription while coinsurance is a fixed fraction of the final price of the prescription drug (Opdyck et al, 2006). Fixed copayments do not sensitize patients to drug prices, or expose them to the cost differential between different drugs, for example, brand vs. generic (Opdyck et al, 2006). Contrarily, coinsurance, because it is based on a percentage of the cost exposes patients to price differences, which can affect behavior of price-sensitive patients (Opdyck et al, 2006). Coinsurance, though an effective cost-sharing tool, can impose a financial burden on beneficiaries with expensive drugs, which can cause serious health consequences.

Although most private and public insurers have adopted this cost-sharing model in an attempt to control the rising cost of health care, evidence from the literature suggests that increased cost sharing is associated with lower drug utilization and spending (Huskamp et al, 2003; Joyce et al, 2002; Lebowitz et al, 1985; Johnson et al, 1977; Motheral & Fairman, 2001; Goldman et al, 2004). The key issue is whether increasing cost sharing reduces the utilization of essential drugs.

Understanding the relationship between cost and adherence is critical, especially for beneficiaries with chronic conditions. Some studies looking at this relationship have concluded an inverse relationship exists between out-of-pocket cost and adherence (Piette

et al, 2004; Tseng et al, 2004). For example, Harris et. al. found patients with diabetes reduced their use of anti-diabetic drugs by 23 percent under high cost-sharing structures (Harris et al, 1990). Patients facing increasing costs have reported several mechanisms to adapt to cost increases. These include skipping doses, stretching out or stopping doses, selectively refilling prescriptions based on perceived importance, etc. (Harris et al, 1990). Goldman et al. (2006) found an inverse relationship between copayment and compliance. His study revealed that each $10 increase in copayment decreases average compliance by 5 percentage points in a plan year. Additionally, several studies have shown that large changes in drug benefits were associated with substantial morbidity and mortality in certain high-risk populations, especially among vulnerable populations such as the elderly and the poor (Tamblyn, et al, 2001; Heisler et al, 2004; Kennedy & Erb, 2002). Although rates of underuse varied substantially across treatments, out-of pocket-costs were a strong determinant of underuse across medication types. Further, the negative effects of cost sharing are significantly higher (42%) on coinsurance than in copayment regimen (31%). This effect is more prominent in out-of-pocket costs created under coinsurance.

If the assumptions of the economic theory do not hold, an increase in cost sharing significantly decreases utilization, and patients will face adverse health consequences due to reduced drug utilization because of cost sharing. As a result, these patients will seek out more costly medical services due to increased morbidity caused by changes in drug utilizations, which will either offset or exceed the savings from prescription cost sharing in the long run.

Several studies reported adverse health consequences from cost sharing, particularly among vulnerable population such as elderly and poor patients. Tamblyn et al. (2001) investigated how cost sharing affects essential drug utilization, and evaluated the corresponding health outcomes. This study concluded that cost sharing reduced the use of essential drugs in the elderly and among welfare recipients. The level of reduction was higher in less essential drugs than in essential drugs. However, there was a corresponding rise in the likelihood of serious adverse events, hospitalization, emergency department visits and death. Interestingly, the reduction of less essential drug utilization had no effect on adverse events or emergency department visits.

Contrarily, Johnson et al. (1997) studying members of a large health maintenance organization (HMO) whose copayments increased ranging from $ 1 to $5 during a three-year period found reduced utilization and annual drug spending but with no observed changes in the utilization of medical services including physician office visits, hospitalizations and emergency department visits.

Overall, studies across the board have shown conflicting results regarding the effects of cost sharing. In the recent past, Stuart et. al., 2007 and Gilman et. al. 2007 specifically evaluated the effect of drug expenditures on medical spending and concluded that expenditures on prescription drugs do not offset medical spending. Ingber et. al., 2010 used panel data to evaluate the effect of prescription drug spending on non-drug related medical expenditures and found equivocal results; however, Zhang et. al., 2009 used Medicare Part D data to evaluate the effect of Part D expenditures on Medical spending

and found minimal effects at best.

UTILIZATION MANAGEMENT PROGRAMS

In an attempt to control moral hazard, plans use utilization management tools to incentivize beneficiaries and prescribers to only use prescription drugs and medical services where the marginal benefit exceeds the marginal costs. Some of the utilization management tools used by plans include prior authorization, quantity limits, step therapy, closed formularies, and preferred drug list.. UMTs have been used widely by managed care organizations to control costs. Several studies have evaluated the intended and unintended consequences of UMTs. In 1988, Feldstein, Wickizer and Wheeler showed that utilization review programs conducted by private insurance companies were effective in controlling medical utilization and costs (Feldstein & Wickizer, 1988).

Quantity limits are payment caps imposed by Part D plan sponsors to limit the quantity of medications dispensed per prescription or over a specific time frame. For example, Goldfarb et al. (1999) showed that the implementation of a monthly limit of sumatriptan to four doses (tablets or injections) significantly decreased pharmacy costs.

Prior authorization is a requirement by health plans to verify with a prescriber that a given medication or medical service is indicated for the patient in the frequency and dosage requested. MacKinnon et. al. (2001) conducted a critical review of prior authorization programs and found PA programs to be effective in controlling drug costs.

A closed formulary is an exclusive list of drugs for which a health plan will pay. Closed formularies are similar to a preferred drug list with a key difference being a PA requirement set in place to permit prescribing drugs that are not in the preferred drug list.

Step therapy is a form of Prior Authorization whereby one or more prerequisite medications, which may or may not be in the same drug class, must be tried first before a Step Therapy medication will be approved. Motheral conducted a critical review of ST program evaluations and demonstrated that ST programs for certain therapy classes can provide significant drug savings through the greater use of lower-cost alternatives and, to a lesser extent, reduced drug utilization. Specifically, the drug savings and clinical impact of ST programs for NSAIDs and PPIs can provide significant drug savings without increasing use of other medical services (Motheral et al, 2001 & Motheral, 2011). Similarly, Yokoyama et al. (2007) demonstrated that a step-therapy intervention for angiotensin receptor blockers (ARBs) that required prior use of an angiotensin converting enzyme inhibitors (ACEI) or an ARB was associated with lower drug cost compared with health plans with no step-therapy intervention.

These are all examples of UMT programs used by PDPs in varying degrees and frequency to contain cost. While these tools have been successful, there is also evidence showing that these programs can cause disruption with negative health consequences. For example, Panzer (2005) showed that implementing a generic step therapy formulary for selective serotonin reuptake inhibitors (SSRIs) in patients with anxiety disorders may be associated with an increase in therapy change and premature treatment discontinuation, resulting in an overall increase in cost to Medicare plans. Furthermore, a Robert Wood

Johnson Foundation (RWJF) study evaluating how utilization management programs can negatively impact health care quality and access showed that utilization management programs may have an adverse effect on the quality of care provided to some patients who may face a higher risk of early re-admission as a result of restrictions due to utilization management programs (RWJF, 1999).

SUMMARY OF LITERATURE EVALUATION

This literature evaluation concentrated on evaluating the intended and unintended consequences of cost-sharing and utilization management tools used by plan sponsors. Specifically, this review looked at the effect of cost sharing and UMTs inthe Part D population. The review found that several studies have been conducted to measure the relationship between cost sharing, UMTs and prescription utilization, adherence, and medical expenditure.

Despite the abundance of studies on cost sharing and UMTs, an evaluation of the literature found a significant gap in the literature regarding their impact on LIS beneficiaries. This is a key limitation of the current literature. While there has been an explosion of articles on the effect of LIS on Part D spending and the corresponding impact on beneficiary health outcomes, there have been very few studies comparing deemed vs. non-deemed vs. non-LIS, and beneficiaries who switched LIS status. This is also a significant gap in the literature.

This study draws conclusions based on a holistic view of each LIS beneficiary in order to understand how and why utilization patterns change. The key gap in the

literature that this study seeks to fill is to provide some insights into whether LIS beneficiaries are sensitive to price and other UMTs in the PDP market. The argument is this: since LIS beneficiaries are subsidized across a spectrum depending on their income level, they are not completely price-insensitive because they face modest costs in premiums and other out-of-pocket costs. As such, health economic concepts such as moral hazard, efficiency, price-sensitivity, and other UMTs can be evaluated in this population despite the fact that they are subsidized. At the conclusion of this study, the findings will contribute to the growing literature on impact of the LIS program on beneficiaries' access and adherence to prescription, and will provide information that adds value to our ongoing national discourse on health care subsidies. This study will contribute to the general understanding of the effects of LIS and other subsidies on different clinical and research outcomes.

CHAPTER 3: RESEARCH METHODS

CHAPTER OUTLINE

This chapter describes the research methodology used in this study. It presents an overview of the study design and research methodology, the selection of treatments and controls, an overview of the data sources, the inclusion/exclusion criteria used for cohort selection and discusses how key variables are operationalized in order to answer key research questions. Additionally, Chapter 3 illustrates the econometric models developed for the analyses and will conclude by discussing difference-in-difference the econometric model used for estimating treatment effects and outcomes.

STUDY DESIGN AND RESEARCH METHODOLOGY OVERVIEW

This study focuses on Medicare Part D beneficiaries under fee for service who are eligible and/or enrolled in the LIS program. The overall goal of this study is to investigate how LIS enrollment affects drug related and health services utilization patterns.

In this study drug compliance was determined using the Medication Possession Ratio (MPR) of drug therapy. Drug expenditures were examined for beneficiaries with and without LIS, before and after beneficiaries gain LIS status, and for beneficiaries who switched LIS status (i.e. full subsidy to no subsidy or partial subsidy, and vice versa). The out-of-pocket cost paid by beneficiaries and the total amount paid by the plan for prescription drugs were computed. This allowed for the evaluation of how cost sharing affected drug utilization and adherence among deemed and non-deemed beneficiaries, before and after LIS enrollment. Since this study looked at utilization from 2009 to 2010,

a longitudinal study design was employed to follow each beneficiary in the study sample in order to capture his or her utilization and expenditures for the entire duration of the study. This analysis provided additional information on how LIS enrollment affected utilization, expenditure, and health outcome for each beneficiary.

This study was conducted using administrative claims data from the CMS, which afforded a wealth of information to be available to support the study design and develop econometric models using multiple variables. The different datasets used in this study include the 5% random sample of the Medicare Part D Prescription Drug Event (PDE) file and 5% random sample of the Beneficiary Annual Summary File. Other data files used include 5% random sample of Medicare Part A (MedPAR) which contains inpatient hospital and skilled nursing facility (SNF) final action stay records; 5% Outpatient Standard Analytic File, which contains final action claims data submitted by institutional and outpatient providers; 5% Carrier claim file contains final action claims data submitted by non-institutional providers; and the Part D Plan Characteristics File which contains information about plan benefit design including supplemental and enhanced alternative benefits offered by MA-PDs or PDPs in each calendar year. By linking all of these files together, a final dataset consisting of a complete record of the prescription drug events, diagnoses, outpatient and inpatient visits, and emergency department visits was created for each beneficiary in the study population.

DATA SOURCE

Medicare Part D Prescription Drug Event (PDE) File

This study used a **5% random sample** of the Medicare Part D Prescription Drug Event (PDE) data to investigate changes in the utilization and spending on prescription drugs for beneficiaries before and after LIS enrollment. The PDE includes information on drug utilizations such as NDC codes, days' supply, quantity dispensed, out-of-pocket amount, and gross drug cost paid by plans.

Beneficiary Summary File (BSF)

The 5**% Beneficiary Summary File (BSF)** which contains information on demographic characteristics such as date of birth, zip code, age, and race, was used as the primary source for beneficiary demographic data, including the identification of cost-share groups and LIS status.

Medicare Part A (MedPAR) File

This study used the **5% random sample of Medicare Part A (MedPAR)** dataset, which contains inpatient hospital and skilled nursing facility (SNF) final action stay records. Each MedPAR record represents a stay in an inpatient hospital or SNF. An inpatient "stay" record summarizes all services rendered to a beneficiary from the time of admission to a facility through discharge.

Outpatient Standard Analytic File

The **5% Outpatient Standard Analytic File** contains final action claims data submitted by institutional outpatient providers. This file includes diagnosis and procedure

(ICD-9 diagnosis, ICD-9 procedure code, and CMS Common Procedure Coding System (HCPCS) codes), dates of service, reimbursement amount, outpatient provider number, revenue center codes and beneficiary demographic information.

Carrier Claim File

The **5% Carrier claim file** contains final action claims data submitted by non-institutional providers such as physicians, physician assistants, clinical social workers, nurse practitioners, independent clinical laboratories, ambulance providers, and freestanding ambulatory surgical centers. This file also includes diagnosis and procedure (ICD-9 diagnosis, CMS Common Procedure Coding System (HCPCS) codes), dates of service, reimbursement amount, non-institutional provider numbers (e.g., UPIN, PIN, NPI), and beneficiary demographic information. Each observation in this file is at the claim level.

Medicare Part D Plan Characteristics File

The **Plan Characteristics File** which contains information about plan benefit design including supplemental and enhanced alternative benefits offered by MA-PDs or PDPs in each calendar year. Since organizations offering drug plans have flexibility in the design of the prescription drug benefit packages, including the establishment of formularies, benefits offered by plans may change each year; therefore, multiple years of this file are needed in order to create cross-sectional files for the same contract and plan IDs. This can be achieved using the encrypted plan contract ID (in the PDE) to link to the CONTRACT_ID in the plan characteristic file.

TREATMENT AND CONTROLS

Specifically, this study looked at the following populations:

I. **Deemed LIS beneficiaries (non-institutionalized)** – these beneficiaries are naturally eligible for LIS and do not have to apply in order to get the benefit. They are also not enrolled in an MAPD plan. This is the first experimental group.

II. **Non-Deemed LIS beneficiaries** – these beneficiaries must apply in order to get LIS. They are also not enrolled in an MAPD plan. This is the second experimental group.

III. **Non-LIS beneficiaries** – these beneficiaries are neither deemed nor non-deemed but are present in Part D. These beneficiaries could be eligible for non-LIS program. They are also not enrolled in an MAPD plan. This is the control group.

Eligibility is based on federal poverty line (FPL). Because of this there are no state variations in eligibility criteria. Although there are different levels of subsidy given to LIS beneficiaries based on income level, the LIS groups (deemed and non-deemed) were condensed to single individual groups in order to increase sample size and allow for better evaluation.

LIS beneficiaries were identified initially from the Beneficiary Summary File using the Part D enrollment variable and the "cost share group" variable. The cost share variable is also used to distinguish between deemed vs. non-deemed vs. non-LIS beneficiaries (see Table 5).

TABLE 5

TABLE 5: VALUES FOR COST SHARE GROUP VARIABLE	COHORT
00 = Not Medicare enrolled for the month	Excluded
XX = Enrolled in Medicare A and/or B, but no MIIR record for the month	Excluded
01 = Bene. is deemed with 100% premium-subsidy and no copayment	Deemed – Excluded (institutionalized)
02 = Bene is deemed with 100% premium-subsidy and low copayment	Deemed – Included
03 = Bene is deemed with 100% premium-subsidy and high copayment	Deemed – Included
04 = Bene with LIS, 100% premium-subsidy and high copayment	Non-Deemed – Included
05 = Bene with LIS, 100% premium-subsidy and 15% copayment	Non-Deemed – Included
06 = Bene with LIS, 75% premium-subsidy and 15% copayment	Non-Deemed – Included
07 = Bene with LIS, 50% premium-subsidy and 15% copayment	Non-Deemed – Included
08 = Bene with LIS, 25% premium-subsidy and 15% copayment	Non-Deemed – Included
09 = No premium subsidy nor cost sharing = not LIS	Non-LIS – Included
10 -13 = not in Part D	Excluded

Table 5: Values For Cost-Share Group Variable

After extracting beneficiaries from the BSF, these members were linked to the PDE, MedPAR and Carrier files using the beneficiary ID (bene_id) variable. The Part D Plan Characteristics file was linked to the PDP using the encrypted plan contract ID. By linking all of these files together, a final dataset consisting of a complete record of the prescription drug events, diagnoses, outpatient and inpatient visits and emergency department visit for each beneficiary in the study population was created. The linkage of all data is shown in Figure 12.

FIGURE 12

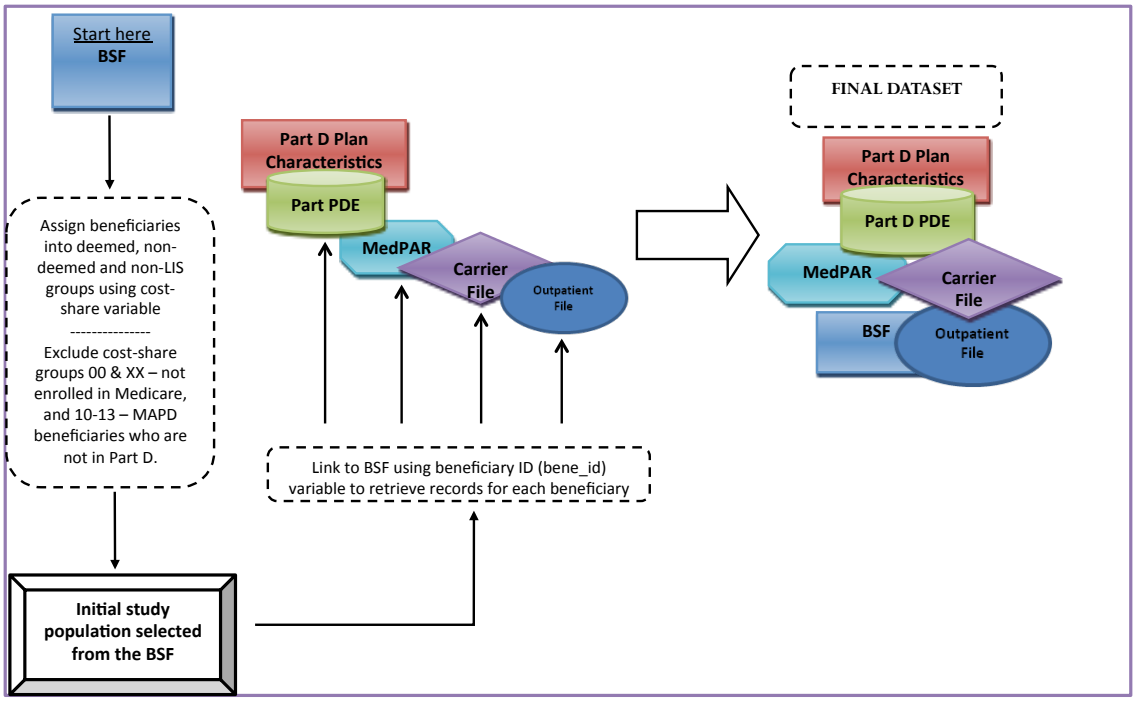


Figure 12: Linking of the Dataset

COHORT INCLUSION CRITERIA

- **Deemed (non-institutionalized)***:* Must be age 65 and older, enrolled in a Medicare Part D fee for service plan in 2009 and 2010 and should have maintained deemed status for, at least, 12 months (2009).

- **Non-Deemed LIS:** Must be age 65 and older, enrolled in a Medicare Part D fee for service plan in 2009 and 2010 and should have maintained non-deemed status for, at least, 12 months (2009).

- **Non-LIS**: Must be age 65 and older, enrolled in a Medicare Part D fee for service plan in 2009 and 2010 and should not be receiving LIS for, at least, 12 months (2009).

SELECTING THE APPROPRAITE NON-LIS GROUP:

FIGURE 13.

According to CMS reports only 40 percent of eligible non-deemed beneficiaries actually received the LIS benefit in 2009. Approximately 19 percent (2.3 million) of Part D beneficiaries who are eligible for non-deemed LIS status did not receive the subsidy in 2009. As a result, the non-LIS group includes beneficiaries who are eligible for non-deemed LIS status but are not receiving the subsidy either because of a lack of knowledge, lack of resources and other factors that affect a beneficiary's ability to register for non-deemed LIS status. During cohort selection the goal was to select the most appropriate group of beneficiaries who are truly representative of the non-LIS group. Ideally, this group should include beneficiaries who are very close to the eligibility threshold and are very similar to the non-deemed group. The approach was to select non-LIS beneficiaries who live in the

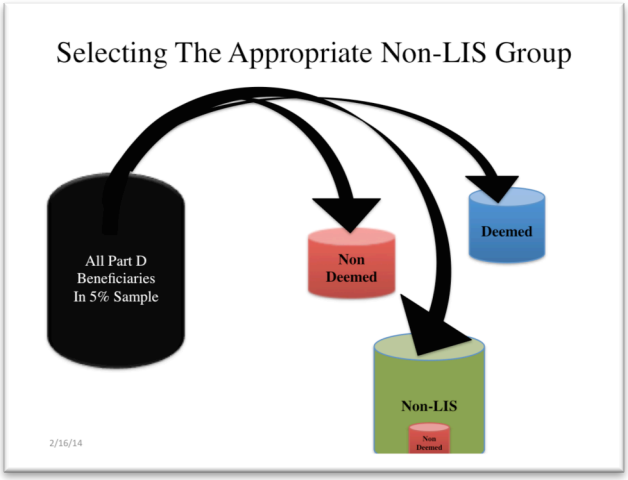


Figure 13: Selecting the Appropriate Non-LIS Group

same zip codes as deemed and non-deemed beneficiaries. For a zip code to be selected, at least, ten LIS (deemed and/or non-deemed) beneficiaries must reside in the zip code. A total of 325 zip codes across the U.S. were identified, accounting for over 15 percent of all the LIS beneficiaries in the 5% sample. The intuition is that these non-LIS beneficiaries are in similar socioeconomic status as the deemed and non-deemed beneficiaries they live by. Therefore, by selecting them, not coincidentally, beneficiaries who are potentially eligible for non-deemed LIS status but are not registered for the program are also selected. This, then, allows for a comparison of beneficiaries who are just above and just below the eligibility threshold. As a result, the non-LIS beneficiaries in this study are presumed to be very similar to the non-deemed beneficiaries.

COHORT EXCLUSION CRITERIA

If any eligible member meets one or more of the following exclusion criteria he was excluded from the analysis:

- Dropping out of Part D between 2009 and 2010.
- Enrolling in an MAPD plan between 2009 and 2010.
- For LIS beneficiaries (experimental groups), losing LIS status any time in 2009.
- Switching from deemed to non-deemed status or vice versa between 2009 and 2010, after the switching exception period.
- Institutionalization – beneficiaries who are in nursing homes or long-term care facilities. These facilities have pharmacies and clinical staff responsible to ensure

beneficiaries get all of their drug doses (MPR = 1.00) These beneficiaries also have significant comorbidities that may skew the analysis.

- Beneficiaries with a flag for End-Stage Renal Disease (ESRD).

VARIABLE OPERATIONALIZATION

There are several variables used in this study. These variables are divided into dependent (outcome) and independent (explanatory) variables.

DEPENDENT (OUTCOME) VARIABLES

Health Services Utilization

Heath services utilization includes inpatient hospitalizations, Emergency Department (ED) visits and outpatient visits.

a. **Hospitalization** – an estimate of the total number of inpatient hospitalizations, including number of diagnosis and length of stay and Medicare and beneficiary cost information.
b. **Outpatient Visits** – an estimate of the total number of outpatient visits, including number of diagnosis, Medicare and beneficiary cost information.
c. **Emergency Department Visits** – an estimate of the total number of emergency department visits, including number of diagnosis, Medicare and beneficiary cost information. ED visits are identified in the MedPAR

and Outpatient files. Beneficiaries who visited the ED and were subsequently admitted inpatient are identified in the MedPAR files. The ED records of those beneficiaries who visited the ED but are not admitted inpatient are captured in the outpatient claims.

Health Services Expenditures

Health services expenditures are captured as an aggregate of cost information from the inpatient, outpatient and physician services. The average expenditure is aggregated for each beneficiary across all health services used by the beneficiary throughout the study period.

Prescription Drug Utilization

An estimate of prescription drug utilization was assessed using variables from the Part D Prescription Drug Event (PDE). Information such as number of prescriptions, number of drug therapy classes, utilization management programs including drug tier levels, prior authorization, quantity limits and step therapy programs were estimated.

Prescription Drug Expenditures

Total prescription drug expenditure was computed using reimbursement amounts paid by Medicare, LIS amounts and out-of-pocket amounts paid by beneficiaries.

INDEPENDENT (EXPLANATORY) VARIABLES

Patient demographic characteristics were obtained from the Beneficiary Summary File (BSF), which contains information about age, gender, race/ethnicity, ZIP code, etc. The BSF is also used to identify LIS enrollment and the beneficiary cost-share group. Table 6 is a list of explanatory variables, their definitions and applications to the study.

TABLE 6

TABLE 6. EXPLANATORY VARIABLES

VARIABLE	DEFINITION	OPERATIONALIZATION	TYPE
Age	Age is defined as the number of years from the patient date of birth to the index prescription date	Index_Age is calculated as: service_dt – dob	Continuous
Sex	Sex is defined as male or female and reported to Medicare	Sex is identified by the variable SEXCODE in BSF file	Dichotomous
Race	RTI Race Code is an enhanced classification algorithm, which includes beneficiaries who either have an SSA race code which = Hispanic or a first/last name, which RTI has determined, is likely to be of Hispanic origin.	Race is identified by the variable RTI_RACE_CD	Categorical
Zip Code	Zip code in which a beneficiary live	BENE_ZIP	Polychotomous
Charlson Index (Comorbidity Risk Score)	A diagnosis-based multi-item predictive comorbidity index, which stratifies patients into groups with similar risk of comorbidity	One Medicare A or B claim identified by ICD-9-CM codes specific for each comorbidity	Polychotomous (for each comorbidity classification)
Medication adherence (medication possession ratio-MPR)	Rate of adherence to prescription drugs. Adherence to medication has been shown to have an effect on expenditure and outcomes. MPR was calculated by drug class and for classes with at least 3 months exposure.	Calculated from the PDE file using variables such as days supply, date of service, etc.	Dichotomous
Low Income Subsidy Status/Group	Patients receiving prescription benefits due to low income status	Identified by variable in the BSF files using the cost share variable	Polychotomous
Deductible Amount	Dollar amount of Part D deductible charged by plan.	DED_AMT	Polychotomous

TABLE 6. EXPLANATORY VARIABLES			
OOP Amount	Dollar amount of the Medicare-defined Part D Annual Out-of-Pocket Cost Threshold. This field is blank for Fixed Capitated Reinsurance Demos.	OOPT_AMT	Polychotomous

Table 6: Explanatory Variables

Comorbidity Measure: Charlson Comorbidity Index ICD-9 Coding

Risk adjustment tools have far reaching importance in the health care and health services research. They are used to assess the performance of health care systems and health plans, and are also used to control for health status, one of the most important confounders in health care outcomes research (Iezzoni LI, 2003). In the past, comorbidities were used as exclusions in designing clinical trials so as to avoid the confounding influence on the outcome. With risk adjustment tools, this practice is no longer necessary.

Most comorbidity risk adjustments are based on patient diagnoses, recorded as ICD-9 diagnosis codes. While there are many diagnosis-based risk adjustment tools used in health services research, the Charlson and Elixhauser indices are the most notable (Charlson ME. et. al. , 1987; Elixhauser A, et al, 1998). Several studies have compared the prognostic predictive value of the Charlson and Elixhauser indices in health services and have concluded with results showing similar predictive performance in comorbidity measures (Lieffers, J. R, et.al, 2011; Southern, DA, 2004; Gabriel SE, et al 1999; Stukenborg GJ, et al., 2001). Only a minority of studies showed that the Elixhauser

model outperformed the Charlson/Deyo model in predicting mortality (Lieffers, J. R, et.al, 2011; Southern, DA, 2004; Gabriel SE, et al 1999; Stukenborg GJ, et al., 2001).

In this study, the Charlson score was used as the diagnosis-based risk adjustment tool. Charlson is a multi-item predictive comorbidity index, which stratifies patients into groups with similar risk of comorbidity (Charlson et al., 1987). The Charlson index, which was originally based on ICD-9-CM diagnoses and procedure codes and their associated weights, contains 19 categories of comorbidity that provide an overall comorbidity score to reflect the cumulative increased likelihood of one-year mortality (Charlson et al., 1987). A higher Charlson score corresponds to a more severe burden of comorbidity and a higher risk of mortality.

Table 7 is the list of Charlson comorbidity categories. The cumulative Charlson index (CI) was computed for each beneficiary in 2009 and 2010 by analyzing Medicare Part A or B inpatient and outpatient claims for diagnosis and procedure codes matching the comorbidity categories. A polychotomous logistic regression was used for the CI computation in order to account for non-linearities in comorbidity measure.

Table 7: Charlson Comorbidity Categories and Weights

Charlson Comorbidities	ICD-9 Code	Score
Myocardial Infarction	410 – 410.9	1
Congestive Heart Failure	428 – 428.9	1
Peripheral Vascular Disease	433.9, 441 – 441.9, 785.4, V43.4	1
Cerebrovascular Disease	430 – 438	1
Dementia	290 – 290.9	1
Chronic Pulmonary Disease	490 – 496, 500 – 505, 506.4	1
Rheumatologic Disease	710.0, 710.1, 710.4, 714.0 – 714.2, 714.81, 725	1
Peptic Ulcer Disease	531 – 534.9	1
Mild Liver Disease	571.2, 571.5, 571.6, 571.4 – 571.49	1
Diabetes	250 – 250.3, 250.7	1

Table 7: Charlson Comorbidity Categories and Weights		
Diabetes with Chronic Complications	250.4 – 250.6	2
Hemiplegia or Paraplegia	344.1, 342 – 342.9	2
Renal Disease	582 – 582.9, 583 – 583.7, 585, 586, 588 – 588.9	2
Moderate or Severe Liver Disease	572.2 – 572.8	3
AIDS	042 – 044.9	6

Table 7: Charlson Comorbidity Categories and Weights

Medication Adherence Measure: Medication Possession Ratio (MPR) Coding

Like comorbidity risk calculations, there are several methods used to estimate patients' adherence to prescription drugs. The two most commonly used medication adherence measures in the literature are the Medication Possession Ratio (MPR) (Peterson et. al, 2007) and the Proportion of Days Covered (PDC) (Choudhry NK, et al., 2009). In this study the MPR is the method used for computing beneficiary adherence to their treatment regimen.

The MPR is a claims-based medication adherence measurement. Beneficiary adherence was computed for both 2009 and 2010 through the summation of the total "days' supply" of medication refills across each year, for each beneficiary, divided by the time interval between the first fill and last fill of each medication. The limitation of this approach is that it focuses only on the time period that the patient was persistent with the medication, and does not account for any discontinuation of the medication. This approach also includes the days for the final fill while capping the ratio at 1.0 for each prescription drug. This approach can overstate the medication adherence measure because capping tends to skew the MPR upward (Martin et al., 2009).

In order to address the issue of overestimation of the MPR in this study, a few steps were taken. First, the MPR was calculated for each beneficiary, for each drug therapy class rather than for each drug the beneficiary takes, and the total MPR was capped at 1.0 for that class. This limits the overall inflation resulting from the potential treatment overlap associated with switching between medications in the same class during the year. Second, in order for a class of drugs to be included in the MPR computation, a beneficiary must have a minimum of 3 months' supply of prescription drugs from that class in his record. This eliminates drugs that are taken for short courses in an emergency or ambulatory setting such as antibiotics, short-term pain killers, inhalers for asthma or COPD exacerbation, which can potentially inflate the MPR. The 3 month minimum forces the MPR calculation to capture only drugs that are used chronically and represent the true adherence measure.

Table 8. is the list of drug therapy classes used in the MPR calculation. It was adapted for this population from the VA Rx-Risk (Rx-Risk-V), a VA-adapted pharmacy-based case-mix instrument, which was developed by Solan et.al in 2003. After developing therapy classes, the Medispan Master Drug Database was used to identify drug names, using NDCs, and map them into the respective classes.

In this study compliance was defined as a MPR ratio of 0.8, the industry standard. A polychotomous logistic regression analysis was used for the MPR computation in order to account for non-linearities in compliance measure.

Table 8: Medication Possession Ratio (MPR) Standard Therapy Class Coding

Standard Therapy Classes	
ADRENALS	ANXIETY & INSOMNIA
ALCOHOL DEPENDENCE	BIOLOGIC RESPONSE MODIFIERS
ALLERGY	BENEIGN PROSTATE HYPERPLASIA
ALZHEIMER'S	CARDIOVASCULAR AGENTS
ANDROGENS	CONGESTIVE HEART FAILURE
ANESTHETICS & SEDATIVE HYPNOTICS	CHOLELITHOLYTIC AGENTS
ANTBIOTICS	CNS STIMULANTS
ANTI-OBESTITY DRUGS	CONTRACEPTIVES
ANTIARRHYTHMIC AGENTS	COUGH & COLD
ANTIARTHRITICS	DIABETIC THERAPY
ANTIBIOTICS	ERECTILE DYSFUNCTION
ANTICOAGULANTS	END STAGE RENAL DISEASE
ANTICONVULSANTS	GERD & GI AGENTS
ANTIDEPRESSANTS	HEMATOPOIETIC AGENTS
ANTIDOTES	HEMOSTATICS
ANTIFUNGALS	HORMONE REPLACEMENT THERAPY
ANTIGOUT AGENTS	IRRITABLE BOWEL SYNDROME
ANTIHISTAMINE DRUGS	IMMUNE SUPPRESSION
ANTIHYPERTENSIVES	LIPOTROPICS
ANTIHYPERTENSIVES/CHF	MULTIPLE SCLEROSIS
ANTIHYPERTENSIVES/IHD	MYASTHENIA GRAVIS
ANTIMYCOBACTERIALS (TB AGENTS)	OPHTHALMIC PREPS (ANTIBIOTICS, ANESTHETICS, MIOTICS & MYDRIATICS)
ANTINEOPLASTIC AGENTS	OSTEOPOROSIS
ANTIPARASITICS	PAIN & INFLAMMATION
ANTIPARKINSON'S DRUGS	RESPIRATORY TRACT AGENTS (ASTHMA & COPD)
ANTIPLATELET	SEPSIS
ANTIPSYCHOTIC AGENTS	SMOKING CESSATION
ANTISEIZURE	STEROIDS
ANTISPASMODICS	THROMBOLYTIC AGENTS
ANTIVIRAL & ANTIRETROVIRAL AGENTS	THYROID AGENTS

Notes –

- Most drug classes are consistent with Medispan's standard therapeutic classes.
- Some of the classes were consolidated. For example, the ophthalmic preparations were collapsed into one therapy class, which encompasses glaucoma and other ophthalmic conditions.
- Products such as needles, syringes, OTC products, etc. were excluded and were, therefore, not included in the number of therapy classes' count for each beneficiary.
- All NDCs (Product Service ID's) that could not be matched after removing exclusions were grouped as miscellaneous. These products were not included in the MPR calculation.

Table 8: Standard Drug Therapy Classes

STATISTICAL ANALYSIS

Baseline Analysis

Prior to developing the econometric model, descriptive data was analyzed using Kruskal Wallis (KW) and chi-squared (χ^2) tests for continuous and categorical data, respectively, in order to create baseline comparisons of the deemed vs. non-deemed vs. non-LIS groups. Preliminary cohort descriptions were conducted to identify and compare the different cohorts for distribution of demographic characteristics. Hypothesis testing used χ^2 and KW tests with 95% confidence intervals. From this, covariates were evaluated for potential confounding and effect modification. Improvement of fit criteria was evaluated using logistic regressions and covariates were appropriately selected for the model based on clinical relevance and statistical significance.

Kruskal–Wallis Test

The KW test is a non-parametric test used when the measurement variable does not meet the normality assumption of an ANOVA test. The KW test is preferential in this case because the one-way ANOVA test may yield inaccurate estimates of the P-value because the data is not normally distributed. In this study several beneficiary exclusions were made. As a result, the normality assumption may not be accurate. The KW test does not make assumptions about normality, thus making it appropriate in this case.

The KW test, like most non-parametric tests, is performed on ranked data, which allows the measurement observations to be converted to their ranks in the overall data set.

Some information is lost though during the substitution of ranks for the original values. This information loss can make this a less powerful test than an ANOVA.

HYPOTHESIS TESTING

Difference-in-Difference (DID) Regression Analysis

The simplest DID setup is one where outcomes are observed for two or more groups over two time periods. The first is for static group comparisons where different units are exposed to different values of a causal variable and responses are compared at a single point in time (Halaby, 2004). The second is for the pretest-posttest group where the same units are exposed to different values of the causal variable and their responses are compared at different times (Halaby, 2004). Meaning, one group is exposed to a treatment in the second period but not in the first (the experimental group), while the second (control) group is not exposed to the treatment in either period. In the estimation, the average gain in the control group is subtracted from the average gain in the treatment group. This removes biases from permanent differences between those groups, as well as biases from comparisons over time that could be the result of trends.

DID estimates are determined using ordinary least squares procedures for panel data on beneficiaries in the treatment and control groups across time-specific interventions (health services utilization, prescription utilization and expenditures). In this study, treatment includes beneficiaries with LIS and those beneficiaries who switched groups between 2009 and 2010.

This standard approach assumes that uncertainty is caused by sampling error in estimating the means of each group/time period combinations. Similarly, autocorrelation is addressed by reducing the time-series component of the data, i.e. averaging the sum of a beneficiaries experience in the pre (2009) and post (2010) treatment phase.

An important limitation of this estimation approach is ecological fallacy, a bias of assigning results from macro level design to the individual. The implication of ecological fallacy in this estimation is discussed further in the discussion section.

The OLS regression was used to conduct a DID regression for each outcome variable (health services utilization, prescription utilization and expenditures) for each individual in the pre and post treatment phases. This gives an approximation of the covariates effects on the outcome variables evaluated in this study. The generalized regression model for this DID analysis is shown in Equation 1 below. The difference-in-difference coefficients (β_5 and β_6) are the key relationships of interest.

Equation 1: Difference in Difference Regression

$$\mathbf{Y = \beta_0 + \beta_1 X + \beta_2\ YEAR2010 + \beta_3\ SWITCHER\text{-}ND + \beta_4\ SWITCHER\text{-}NLIS + \beta_5 YEAR2010\ x\ SWITCHER\text{-}ND + \beta_6 YEAR2010\ x\ SWITCHER\text{-}NLIS + u}$$

Where:

- X is a vector of explanatory variables.
- YEAR
    - Coded 1 if the year is 2010 and 0 if it is 2009
- If evaluating the deemed group:

- SWITCHER-ND = 1 if the person switched to non-deemed.
- SWITCHER –NLIS = 1 if the person switched to non-LIS.
- β_5 tells us whether the change from 2009 to 2010 is different for switchers to non-deemed than for continuing deemed people.
- β_6 tell us whether the change from 2009 to 2010 is different for switchers to non-LIS than for continuing deemed people.

A potential problem with this analysis is autocorrelation (non-randomness) in the data. While this is highly unlikely in the dataset used in this study, auto-correlation was addressed in the DID analysis by ignoring the time-series component of the data, through aggregation of the data as a sum of a beneficiary's experience in the pre and post treatment periods. This is acceptable because this study is focused on the impact of LIS eligibility/enrollment and not trends.

In order to check for other violations to the OLS model, a series of estimations were conducted in several steps. First, an unadjusted OLS DID regression was performed for each outcome with the goal of approximating the effects of non-covariate controlled variables on outcomes in order to identify potential confounders.

After running the unadjusted OLS DID, generalized estimating equations (GEE) were run to examine the effects of other covariates, and estimate outcomes variables (health services and prescription drug utilization and expenditure) while adjusting for clustering. The advantage of the GEE in relation to OLS is to address three potential violations, which can potentially bias coefficient estimate: assumption of normality, left

censoring (a situation in which a significant number of beneficiaries have 0 utilization vs. positive skew – a situation in which a few outliers have very high utilization) and heteroskedasticity. These violations are implicit in the data. For example, out of the 186,768 beneficiaries included in this study, only 19 percent to 23 percent had any inpatient record, while a number of beneficiaries had no outpatient or prescription record. This could potentially increase left censoring of the data, thereby biasing the DID coefficient estimates downward. Similarly, the distribution of prescription drug and health services utilization and expenditure may be disproportionate among beneficiaries and beneficiary groups; these outliers can bias the coefficient upward. Additionally, a kernel distribution was plotted for each outcome in order to identify any skew, heteroscedasticity and kurtosis in the data.

If the GEE identified non-normality in the data, a One Part Generalized Estimating Equations (GEE) was conducted to correct or adjust for non-normality. The One Part GEE allows for the estimation of both the mean and variance functions in the original scale. It works by estimating specific mean and variance for each beneficiary.

In order to estimate count and cost variables (outcomes), generalized linear models (GLM) were used. These models are extensions of familiar regression models such as the linear models with the following assumptions: independence, homogeneity of variance, normality of error terms, and linearity (Breslow et. al., 1990); however, a convenient property of GLM distributions is that the conditional variance of the distribution is a function of its mean (Breslow et. al., 1990). Additionally, the GLM distribution can take on several families for modeling positive count and cost data, where

the conditional variance of Y increases with its expectation, including Poisson Gaussian, gamma and negative binomial regressions (Breslow et. al., 1990). GLMs are fit to the data by maximum likelihood, providing estimates of the regression coefficients and the asymptotic standard errors of the coefficients (Breslow et. al., 1990).

In this study, the response variables for prescription utilization (count) and expenditure's (cost based), conditional variance increased more rapidly than the mean, resulting in over-dispersion. This invalidated the use of the Poisson distribution. As a result, the negative-binomial distribution was deemed appropriate. The negative-binomial GLM's maximum likelihood ratio's alpha value for Prob≥Chibar^2 was evaluated for significance. If Prob≥Chibar^2 was statistically significant then the assumption that the mean is equal to the variance is rejected and the negative binomial regression was confirmed.

Hausman Test

The Hausman test was conducted to determine whether a fixed or random effects model should be used for the DID analysis. Fixed effects (FE) models control for effects of time-invariant variables with time-invariant effects, and assume the derived intercepts are distributed within finite variance (Greene, 2008, 208-209). Random effects (RE) models assuming the unobserved variables are uncorrelated with the observed variables. The RE models intercepts if they are generated from a distribution with a finite and estimable variance (Greene, 2008, 208-209). Overall, the fixed effects model produces unbiased estimates of β, but with high sample-to-sample variability, while the random

effects model produces biased estimates of β, but with constraint on the estimates of the variance (Greene, 2008, 208-209).

The Hausman test detects violations of the random effects modeling assumption and identifies correlation between the independent variable(s) and differences between the β estimates of the fixed effects model (βFE) and the β estimates of the random effects model (βRE). The Hausman test statistic H is shown below:

Equation 2: Hausman Test

$$\mathbf{H = (\beta RE - \beta FE)' [Var (\beta FE) - Var (\beta RE)]^{-1} (\beta RE - \beta FE).}$$

In this study the Hausman test was conducted to determine if there was a statistically significant difference in the Hausman test statistic (H). If $p < 0.05$, then H was significant, meaning the two models were different enough to reject the null hypothesis. As a result, the random effects estimator was rejected in favor of the fixed effects estimator. Conversely, if $p > 0.05$, then the random effects estimator was preferred over the fixed effects estimator. Both RE and FE models are estimated using Generalized Least Squares (GLS).

Estimating Skewed Data

Due to the different inclusion and exclusion criteria used in this study, the distribution of variables is not normal. Before conducting the different estimations, a plot of the distribution of each outcome variable (utilization, expenditure, MPR,

comorbidity score) was obtained. The kernel density estimate is similar in skew for the utilization, expenditure and other measures. Appendix Q is a sample distribution of prescription drug utilization and Appendix R is a sample distribution of prescription drug expenditure.

Goodness-of-fit Tests

The model was estimated for overall goodness of fit using the OLS regression. The overarching principle of the goodness-of-fit analysis is to compare the predicted values from the regression model to the observed values from the data. Ideally, the fit of a proposed regression model should be better than the fit of the mean model. From the OLS regression output, the R-squared, the overall F-test, and the Root Mean Square Error (RMSE) were used to determine how the predicted values from the regression model differed from the observed values. The R-squared measures the proportion of total variance that is explained by the model and ranges from 0 to 1, with 0 indicating that the proposed model does not improve prediction over the mean and 1 indicating perfect prediction. An important consideration for the R-squared is that it increases as predictors are added to the regression model (Minitab, 2013). Since there are many predictors used in this regression model, the R-squared would be artificially inflated. Since the Adjusted R-squared incorporates the model's degrees of freedom, it is considered a more reliable predictor of fitness because it decreases as predictors are added if the increase in model fit does not make up for the loss of degrees of freedom (McCullagh and Nelder, 1989).

As a result, Adjusted R-squared was used in this study since it is recommended in models with more than one predictor variable (Rao, 1973).

The F-test was used to determine whether the proposed relationship between the dependent and independent variable are statistically significant. It also evaluates the null hypothesis that all regression coefficients are equal to zero. A significant F-test indicates that the observed R-squared is reliable and is not spurious. The RMSE was evaluated in order to determine the absolute fit of the model to the data by analyzing how close the observed data points were to the model's predicted values.

The goodness of fit test for GLM models indicates both the probability distribution family (Poisson, negative binomial, etc.) and the appropriate link function, in this case the log link (McCullagh and Nelder, 1989). The large value of the chi-square in the goodness of fit test is another indicator that the Poisson distribution is not a good choice. The residual deviance is the difference between the deviance of the current model and the maximum deviance of the ideal model. If the residual difference is small enough, the goodness of fit test will not be significant, indicating that the model fits the data. The conclusion is that the model fits reasonably well because the goodness-of-fit chi-squared test is not statistically significant (Rao, 1973). If the test were statistically significant, it would indicate that the data does not fit the model well. As a result, a different estimation method would be used after checking for violations such as omitted variables, co-linearity, skew, kurtosis, etc.

CHAPTER 4: RESULTS

COHORT SELECTION PROCEDURE

The cohort selection was based on the inclusion/exclusion criteria of this study. First, beneficiaries who were under 65 year old were excluded. These beneficiaries are mostly disabled individuals, and this study focuses primarily on beneficiaries over age 65. Then, beneficiaries who reside outside of the U.S. and its territories were excluded because there is no credible way to capture information on their utilization of health care services outside the U.S. Next, beneficiaries who were institutionalized were excluded because they are primarily deemed, are complex patients and do not have complete control over health care choices or decision to apply for LIS. Similarly, beneficiaries with end stage renal disease (ESRD) were excluded because of their complexity. Beneficiaries with less than 12-month continuous enrollment in each group were excluded. The analysis was limited to beneficiaries with 12-month exposure to a respective group. Therefore, beneficiaries who switched groups or died at any point in 2009 were excluded. Finally, some non-LIS beneficiaries were excluded because of the zip code manipulation in order select the appropriate cohort. This was discussed in Chapter 3. It is noteworthy that there are overlaps between the exclusions, meaning that beneficiaries may fall under multiple exclusion categories.

FIGURE 14

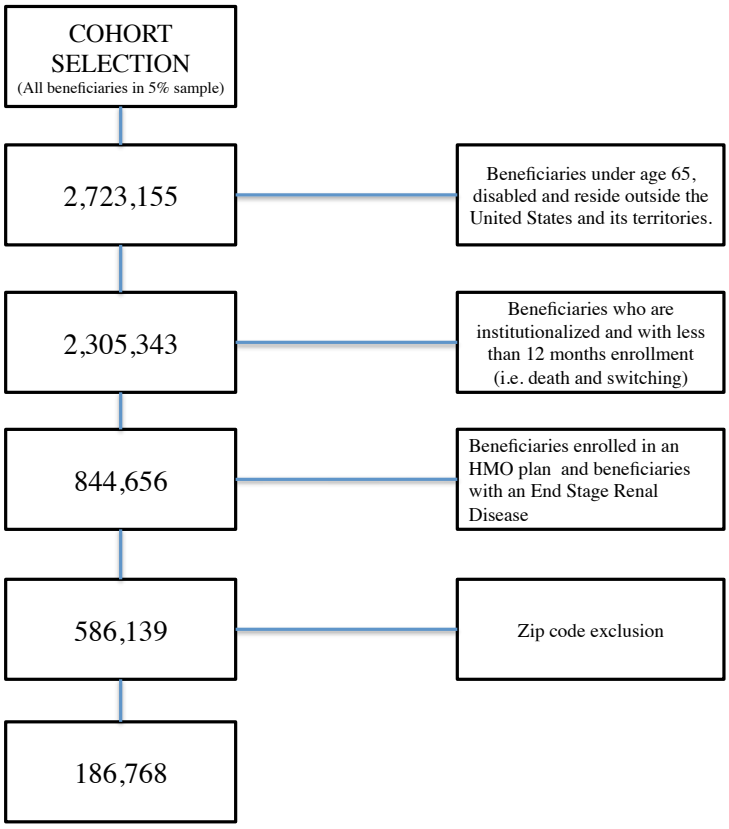


Figure 14: Cohort Selection Procedure

BASELINE COHORT POPULATION DESCRIPTIVE STATISTICS

In order to examine the differences between groups and explore the cohorts for potential confounders, descriptive statistics were performed. Table 9 shows the demographic information for each group. The population size is similar between the non-LIS and non-deemed groups. The deemed group is significantly larger than the other two

groups. There are more females in each group than males. The average age for non-deemed and non-LIS groups is approximately 77 years, a year older than the deemed group. The racial differences between the three groups show there are more Caucasian than Hispanics, and more Hispanics than African Americans (Black). The Kruskal–Wallis (KW) test shows that all of these differences are statistically significant.

TABLE 9: DEMOGRAPHICS

Variable	Deemed		Non-Deemed		Non-LIS		Test
Total Count of Beneficiaries	171,727 (91.9%)		6,756 (3.6%)		8,285 (4.4%)		*KW*
Gender							
Female	121,478 (70.7%)		4,917 (72.8%)		5,463 (65.9%)		$X^2 = 103.8$ Pr = 0.0001
Male	50,249 (29.3%)		1,839 (27.2%)		2,822 (34.1%)		
	Count (Mean)	**SD**	**Count (Mean)**	**SD**	**Count (Mean)**	**SD**	
Age	76.34	7.70	77.28	7.63	77.29	7.88	$X^2 = 217.9$ Pr = 0.0001
Race							
Asian/Pacific Islander	16,782(9.8%)	19.56	62 (0.92%)	34.4	623 (7.5%)	23.9	$X^2 = 2.4$ Pr = 0.0001
Black	28,955(16.9)		796 (11.8%)		1,116 (13.5%)		
Hispanic	30,525(17.8)		359 (5.3%)		1,278 (15.4%)		
White	91,367(53.2)		5,478 (81.1%)		5,113 (61.7%)		
Other/Unknown	4,098 (2.4%)		61 (0.92%)		155 (1.9%)		

Table 9: Beneficiary Demographics

PRESCRIPTION DRUG UTILIZATION

Table 10 examines the cohort populations for baseline statistics on prescription drug utilization in order to identify potential confounders. The KW estimate also shows a statistically significant difference in the total number of prescription claims and average number of prescriptions per year for deemed beneficiaries compared to non-deemed and non-LIS beneficiaries. The analysis also shows that deemed beneficiaries pay

significantly less out of pocket ($2.13) per prescription compared to $8.82 and $28.51 for non-deemed and non-LIS beneficiaries respectively. Offsetting this out-of-pocket amount paid is the low-income subsidy amount received by each beneficiary, which is significantly higher ($30.48) for the deemed compared to the non-deemed ($20.53) and the non-LIS ($0) beneficiaries. The baseline analyses also show the non-LIS beneficiaries with a higher average expenditure per prescription dispensed ($68.4) compared to the deemed and non-deemed beneficiaries ($64.6 and $59.4, respectively). This is a statistically significant difference.

The average day supply per prescription dispensed is 34.6 for the deemed and 36.8 for the non-deemed and 42.1 for the non-LIS group. This translates to an adherence measure (medication possession ratio (MPR)) of 0.85, 0.86 and 0.88 for the deemed, non-deemed and non-LIS groups respectively. The differences in day supply and MPR are statistically significant.

There was also evidence of differences in the number of unique therapeutic drug classes between the groups. The deemed group use more drugs from different therapy classes compared to the non-deemed and non-LIS groups. This is a surrogate indicator for the number of diagnoses a beneficiary has, and also an indicator of health status.

Finally, three utilization management programs (UMP), prior authorizations (PA), quantity limits (QL) and step therapy (ST), were evaluated for each group. The deemed and non-deemed groups had more PAs, QLs and STs than the non-LIS beneficiaries. This is a consequence of the plan design. Non-LIS programs are less restrictive and more

similar to commercial plans. The differences in PAs, QLs and STs were not statistically significant.

In the industry, pharmacy benefit managers are typically evaluated by how effectively they can manage brand/generic utilization. The brand/generic utilization is similar between the deemed and non-LIS groups. The non-deemed beneficiaries, however, had a higher generic utilization and lower brand utilization.

Specialty medications are a fast growing segment of prescription drug utilization trend and are projected to account for 50% of all drug cost by 2018 (Johnson, et. al., 2013). Specialty medications are defined as injectable and non-injectable drugs that are typically used to treat complex conditions and meet one or more of the following criteria: are biotech-derived or biologic in nature; are significantly higher cost than traditional medications; are used in complex treatment regimens; require special delivery, storage, and handling; require special medication-administration training for patients; require on-going monitoring of medication adherence, side effects, and dosage changes; are available through limited-distribution channels; and may require additional support and coordinated case management.[3] Examples of specialty medications include growth hormones, blood factors, interferons, and some cancer therapies.

At the baseline specialty utilization was 0.98% for the deemed, 0.97% for the non-deemed and 1.5% for the non-LIS group, accounting for $1,255,725 (12.3% of total drug cost), $44,670 (11.8% of total drug cost) and $99,756 (19.5% of total drug cost) respectively.

[3] The Burchfield Group's Definition of Specialty Medication. The Burchfield Group is a consulting and auditing firm with a focus on pharmacy benefit consulting, regulatory and Medicare compliance, auditing and data validation. http://www.burchfieldgroup.com/about/

TABLE 10: PRESCRIPTION DRUGS

Variable	Deemed		Non-Deemed		Non-LIS		Test
Total Number of Utilizing Beneficiaries	158,055		6,381		7,485		
Total Prescription Expenditure	$10,211,933		$378,903		$512,273		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Average # of Prescriptions per Year	55.13	41.00	51.12	34.00	33.16	26.00	$X^2 = 2521.75$ Pr = 0.0001
Average Days Supply	34.60	14.57	36.81	16.19	42.10	20.36	$X^2 = 1237.44$ Pr = 0.0001
Average Patient Pay Amount (Including TrOOP amount)	$2.13	1.72	$8.82	7.04	$28.51	28.85	$X^2 = 30081.4$ Pr = 0.0001
Low Income Subsidy Amount	$30.48	28.96	$20.53	21.20	$0.007	0.47	$X^2 = 22033.2$ Pr = 0.0001
Average Medicare Payment Amount	$32.00	55.88	$30.03	50.13	$36.52	146.53	$X^2 = 254.58$ Pr = 0.0001
Average Prescription Expenditure	$64.61	76.00	$59.38	67.17	$68.44	107.41	$X^2 = 90.28$ Pr = 0.0001
Average # of Therapy Classes	7.5	3.6	7.2	3.2	5.9	3.0	$X^2 = 1400$ Pr = 0.0001
MPR	0.85	0.32	0.86	0.29	0.88	0.32	$X^2 = 99.01$ Pr = 0.0001
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Prior Authorization[4]	0.45	2.1	0.32	1.7	0.27	1.6	$X^2 = 26.6$ Pr = 0.0001
Quantity Limits[5]	15.8	19.1	13.8	15.9	8.4	10.7	$X^2 = 835$ Pr = 0.0001
Step Therapy[6]	1.24	3.85	1.23	3.58	1.02	3.11	$X^2 = 0.765$ Pr = 0.6822
Generic Utilization	67.4%	-	70.7%	-	67.8%	-	-
Brand Utilization	32.6%	-	29.3%	-	32.3%	-	-
Specialty Utilization	0.98%	-	0.97%	-	1.5%	-	-

Table 10: Baseline Prescription Drug Utilization

HEALTH SERVICES UTILIZATION AND TOTAL HEALTH EXPENDITURES

INPATIENT (IP) UTILIZATION AND EXPENDITURE

Out of the 171, 727 deemed, 6,756 non-deemed and 8,285 non-LIS beneficiaries in this study, 35,402 (20.6%), 1,551 (23.0%) and 1,435 (17.3%) respectively utilized inpatient services. This translated to a hospitalization rate of 206 per 1000 deemed

[4] Average number of claims adjudicated with a PA
[5] Average number of claims adjudicated with a QL restriction
[6] Average number of claims adjudicated with a ST requirement

beneficiaries, 230 per 1000 non-deemed and 173 per 1000 non-LIS beneficiaries. Upon admission to the hospital, the deemed group had the shortest length of stay (inpatient days), two inpatient days and four inpatient days less than the non-deemed and non-LIS beneficiaries respectively. The differences in length of stay were not statistically significant.

The average number of diagnoses reported per visit is similar between the groups but are statistically significantly different. Similarly, the average comorbidity score identified by the Charlson index was 3.38, 3.26 and 2.87 for the deemed, non-deemed and non-LIS groups respectively. The difference in comorbidity score between the three groups is statistically significant. The Charlson index follows the opposite trend of the MPR scores. The importance of this relationship is explored further in discussion.

The rate of emergency department (ED) visits is significantly different between the groups with more ED visits among the deemed compared to the non-deemed and non-LIS groups. The ED visits identified in the MedPAR inpatient file represents visits for those beneficiaries who visited the ED and were subsequently admitted inpatient. The ED records of those beneficiaries who visited the ED but are not admitted inpatient are captured in the outpatient claims.

The LIS subsidy does not apply toward beneficiaries' inpatient costs. The average beneficiary out-of-pocket (OOP) cost is inclusive of inpatient deductible amount, Part A Coinsurance and Blood Deductible Liability amount. The beneficiary OOP cost is lowest for the deemed ($1,699) compared to non-deemed ($1,791) and non-LIS ($1,925). This difference is not statistically significant. The average expenditure (inclusive of total

beneficiary OOP and total plan payment amount is $19,196 for the deemed, $18,313 non-deemed and $24,860 for the non-LIS groups. This difference was statistically significant. The baseline inpatient information is shown in Table 11.

TABLE 11: Inpatient Utilization and Expenditure

Inpatient Health Services Utilization	Deemed LIS		Non-Deemed LIS		Non-LIS		Test
Hospitalization Rate per 1000 beneficiaries	206		230		173		$X^2 = 2.37$ Pr =0001
Rate of Emergency Department (ED) Visits per 1000 (Total ED Visits)	148 (25,438)		153 (1,037)		117 (973)		$X^2 = 28.3$ Pr = 0001
Total Inpatient Expenditure	$679,573,340		$28,403,092		$35,673,638		$X^2 = 114.676$ Pr = 0.0001
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Test**
Diagnoses	15.36	13.11	15.17	12.27	14.67	12.53	$X^2 = 12.198$ Pr = 0.0022
Inpatient Days	14.8	25.95	16.23	28.50	18.27	28.59	$X^2 = 3.84$ Pr = 0.1464
[7]Beneficiary Payment Amount	$1,699	2014	$1,791	2190	$1,925	2301	$X^2 = 2.890$ Pr = 0.2358
[8]Medicare Payment Amount	$17,496	21600	$16,521	18105	$22,935	$17,496	$X^2 = 119.654$ Pr = 0.0001
Average Expenditure	$19,196	22786	$18,313	19501	$24,860	11140	$X^2 = 114.676$ Pr = 0.0001
Average IP Pharmacy Charge Amount (% of Total IP Expenditure)	$7,231 (37.7%)	15656	$6,685 (36.5%)	12631	$7,205 (29.0%)	14986	$X^2 = 7.937$ Pr = 0.0189
Charlson (Comorbidity) Index	3.38	2.14	3.26	2.20	2.87	1.98	$X^2 = 449$ Pr = 0.0001

Table 11: Baseline Inpatient Utilization

OUTPATIENT UTILIZATION AND EXPENDITURE

The rate of outpatient visits was highest for the non-deemed group 1,113 visits per 1000 beneficiaries, followed by the deemed with 1,079 visits per 1000, and the non-LIS group with 930 visits per 1000 beneficiaries. The ED visits for those beneficiaries who were admitted to the ED and were discharged with no subsequent inpatient

[7] Beneficiary pay amount = Inpatient Deductible + Part A Coinsurance + Blood Deductible Liability Amount
[8] Plan Pay Amount = Medicare Payment Amount + Primary Payer Amount (where applicable)

hospitalizations were captured in the outpatient file. The ED visits for the deemed group (377 per 1000 beneficiaries) compared to the non-deemed (300 per 1000) and non-LIS (149 per 1000). This difference was statistically significant.

The average beneficiary out-of-pocket (OOP) cost is highest for the deemed ($328) compared to non-deemed ($324) and non-LIS ($265). This difference is statistically significant. The average expenditure (inclusive of total beneficiary OOP and total Medicare payment amount is $1,986 for the deemed, $1,862 non-deemed and $1,618 for the non-LIS groups. This difference was also statistically significant.

Table 12. Outpatient Utilization and Expenditure

Outpatient Health Services Utilization	Deemed LIS		Non-Deemed LIS		Non-LIS		Test
Rate of Outpatient Visits/1000 (Total number of visits)	1,079 (185,224)		1,113 (7,518)		930 (7,704)		$X^2 = 119$ Pr = 0.0001
Rate of ED Visits/1000 (Total number of ED Visits)	377 (64,675)		300 (2,029)		149 (1,233)		$X^2 = 227.18$ Pr = 0.0001
Total Outpatient Expenditure	$367,854,864		$13,998,516		$12,465,072		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Outpatient Visits	6.58	7.43	6.61	7.0	4.7	5.2	$X^2 = 689.8$ Pr = 0.001
Beneficiary Payment Amount	$328	885.8	$324	777.5	$265	673.8	$X^2 = 101.0$ Pr = 0.0001
Medicare Payment Amount	$1,658	3746.5	$1,538	3306.1	$1,354	3105	$X^2 = 323.0$ Pr = 0.0001
Outpatient Expenditure	$1,986	4391.5	$1,862	3874.9	$1,618	3651.6	$X^2 = 253.1$ Pr = 0.0001

Table 12: Baseline Outpatient Utilization

PHYSICIAN SERVICES (Expenditures only)

Physician services includes claims by non-institutional providers such as physicians, physician assistants, clinical social workers, nurse practitioners, independent clinical laboratories, ambulance providers, and free-standing ambulatory surgical centers. Physician services claims are generated for each inpatient or outpatient visit made by the beneficiary. These services include other ancillary services that are not necessarily provided by the physician. As a result, only expenditures used from physician services in order to capture all expenses used to estimate total health expenditures.

The average beneficiary out-of-pocket (OOP) cost is highest for the non-LIS group ($848) compared to deemed ($699) and non-deemed ($692). This difference is statistically significant. The average expenditure (inclusive of total beneficiary OOP and total Medicare payment amount is $3,888 for the non-LIS, $3,268 for the deemed, and $3,183 for non-deemed group. This difference was statistically significant.

Table 13. Physician Services Expenditures

Physician Services Expenditures	Deemed LIS		Non-Deemed LIS		Non-LIS		Test
Total Expenditure	$521,703,520		$20,613,108		$29,925,936		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Test**
Beneficiary Payment Amount	$699	966.2	$692	1086.7	$848	1044.3	$X^2 = 435$ Pr = 0.0001
Medicare Payment Amount	$2,568	3956	$2,491	4387	$3,040	4017	$X^2 = 278.4$ Pr = 0.0001
Expenditure	$3,268	4919	$3,183	5470	$3,888	5022	$X^2 = 316.9$ Pr = 0.0001

Table 13: Baseline Physician Services Expenditures

TOTAL HEALTH EXPENDITURES

The total health service expenditure table is an aggregate of the total inpatient, outpatient and physician services expenditures. The average beneficiary out-of-pocket (OOP) cost is highest for the non-deemed group ($1,436) compared to non-LIS ($1,367) and deemed ($1,355). This difference is statistically significant. The average expenditure (inclusive of total beneficiary OOP and total Medicare payment amount is $9,432 for the non-LIS, $9,328 for the non-deemed, and $9,137 for the deemed group. This difference was statistically significant. This combined health services utilization results are showing in Table 14.

Table 14. Total Health Expenditures

Total Health Expenditures	Deemed LIS		Non-Deemed LIS		Non-LIS		Test
Total Count of Beneficiaries	171,727 (91.9%)		6,756 (3.6%)		8,285 (4.4%)		-
Total Expenditure	$1,569,060,036		$63,019,430		$78,068,532		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Test**
Beneficiary Payment Amount	$1,355	1131	$1,436	1201	$1,367	1175	$X^2 = 62.2$ Pr = 0.0001
Medicare Payment Amount	$7,784	8780	$7,892	8074	$8,055	9978	$X^2 = 9.75$ Pr = 0.0126
Expenditure	$9,137	9569	$9,328	8976	$9,432	10795	$X^2 = 9.74$ Pr = 0.0077

Table 14: Total Health Expenditure (Baseline)

GROUP SWITCHING

A given beneficiary in 2009 can switch to a different group or maintain the same group in 2010. As a result, there are three possibilities for each beneficiary moving from 2009 to 2010. Switching makes it possible to evaluate how beneficiaries' expenditure, health services and prescription drug utilization changes between 2009 and 2010 as they switch between groups. See Figure 15.

FIGURE 15: BENEFICIARY SWITCHING BETWEEN 2009 AND 2010

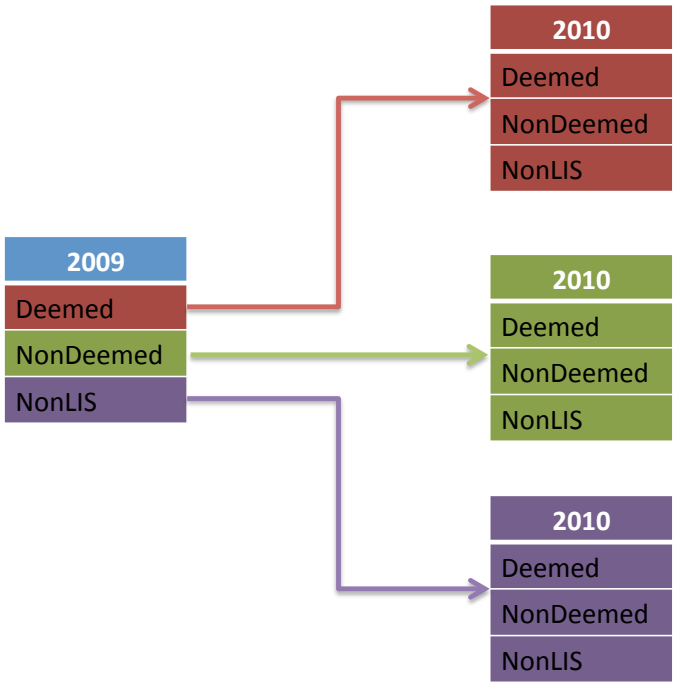
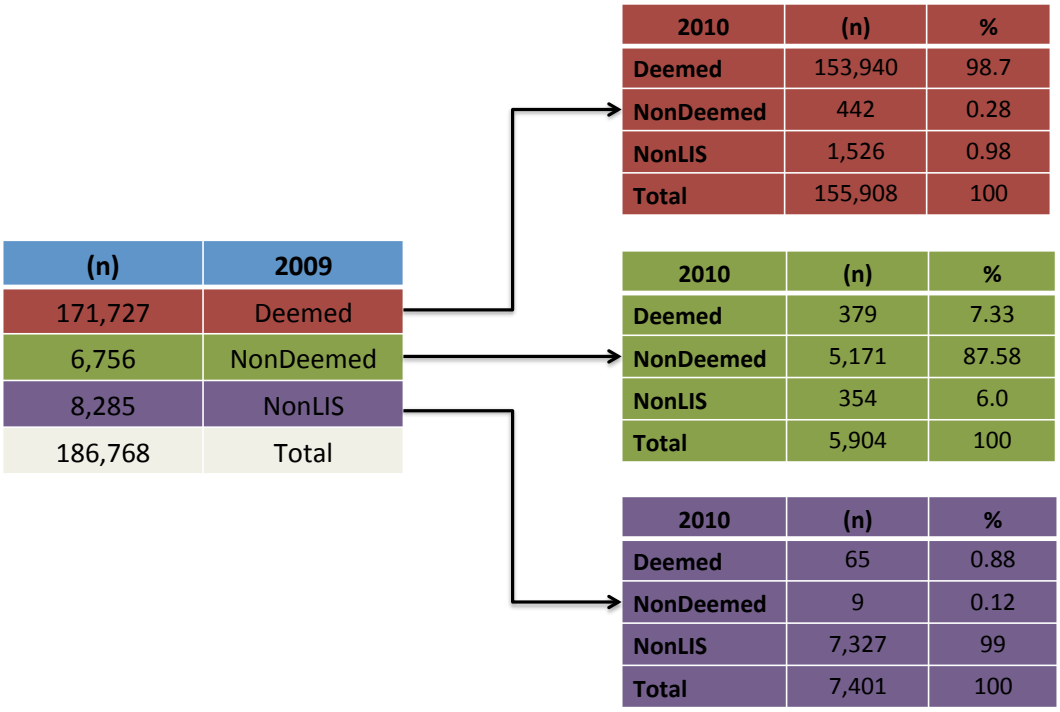


Figure 15: Beneficiary Switching Between LIS Status, 2009 and 2010

After a beneficiary switched groups in 2010 individuals are restricted and locked into that group. Additionally, beneficiaries were required to maintain the status of this group throughout 2010 or face exclusion. Similarly, beneficiaries who died in 2010 were naturally excluded because they had less than 9 months enrollment in 2010. Figure 16 is an illustration of beneficiary switching between 2009 and 2010 after restrictions and corresponding exclusions have been applied.

FIGURE 16: BENEFICIARY SWITCHING BETWEEN 2009 AND 2010



(n)	2009
171,727	Deemed
6,756	NonDeemed
8,285	NonLIS
186,768	Total

2010	(n)	%
Deemed	153,940	98.7
NonDeemed	442	0.28
NonLIS	1,526	0.98
Total	155,908	100

2010	(n)	%
Deemed	379	7.33
NonDeemed	5,171	87.58
NonLIS	354	6.0
Total	5,904	100

2010	(n)	%
Deemed	65	0.88
NonDeemed	9	0.12
NonLIS	7,327	99
Total	7,401	100

Figure 16: Beneficiary Switching Between 2009 and 2010

Beneficiaries were allowed three months (January 1 – March 31) to settle into a given group. Beneficiaries were locked into a group on April 1, 2010. Any beneficiary who switched status after April 1 was excluded. After applying all exclusions due to switching and death, a total of 17,533 (9.39%) of the initial 186,768 beneficiaries included in the study were excluded. Among the 17,533 beneficiaries excluded, 8,065 (46%) were excluded because they passed away in 2010 and the remaining 9,468 (54%) were excluded because they switched groups and did not maintain the same group status throughout 2010. Table 15 shows all exclusion for each group.

It is important to note that no further analysis was conducted on beneficiaries who switched from the non-LIS group in 2009 to either the deemed or non-deemed group in 2010 because the number of beneficiaries switching too low and did not provide a sample size with enough power to detect any statistical difference.

TABLE 15: APRIL 1ST EXCLUSIONS

April 1st Group Name	Exclusions	Percent Excluded Due to Death	Final 2010 Count	Total Percent Exclusion	Baseline (2009) Count
Deemed	15,797 (9.2%)	8,846 (56%)	155,908	9.39%	171,705
Non-Deemed	852 (12.6%)	366 (43%)	5,904		6,756
Non-LIS	884 (10.7%)	356 (38%)	7,401		8,285
Total	17,533	9,568 (5.1%)	169,213		186,746

Table 15: April 1st Exclusions

HYPOTHSIS TESTING: SUMMARY RESULTS

The summary results show a brief highlight of the results achieved from the hypothesis tested under each stated objective. The table shows the coefficient for each outcome variable, its standard error, p-value, confidence interval and the conclusion. The complete results are shown in the next section.

OBJECTIVE 1:

Compare health services utilization (emergency department visits, outpatient visits and inpatient hospitalization) and total health services expenditures across Medicare Part D low-income cost-share status (deemed vs. non-deemed vs. non-LIS) in 2009 and 2010.

Summary Results for Health Services Utilization and Total Health Services Expenditures (Non-switchers: Deemed vs. Non-Deemed vs. Non-LIS)

Table 16: Summary Results for Health Services Utilization and Total Health Expenditures (Non-switchers Deemed vs. Non-Deemed vs. Non-LIS)

- Hypothesis 1A – Health services utilization will be lower for beneficiaries in the lowest cost-share group (i.e. deemed < non-deemed < non-LIS)
- Hypothesis 1B – Total health services expenditures will be lower for beneficiaries in the lowest cost-share group (i.e. deemed < non-deemed < non-LIS)

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Outpatient Visits**					
Deemed	-	-	-	-	-	
Non-Deemed	0.0142	0.01833	0.438	-0.0217	0.5016	Rejected
Non-LIS	-0.278	0.01611	0.000	-0.2996	-0.2365	Rejected*

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Outpatient Expenditure**					
Deemed	-					
Non-Deemed	-0.0589	0.0256	0.022	-0.10916	-0.00865	Fail to Reject*
Non-LIS	-0.1132	0.0236	0.000	-0.15943	-0.06700	Fail to Reject*
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Emergency Department Visits**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.1844	0.03227	0.000	-0.2477	-0.1212	Fail to Reject*
Non-LIS	-0.4651	0.03126	0.000	-0.5263	-0.4038	Fail to Reject*
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Inpatient Visits**					
Deemed	-	-	-	-	-	
Non-Deemed	0.0356	0.03200	0.266	-0.02714	0.09832	Rejected
Non-LIS	-0.0373	0.02962	0.208	-0.0954	0.02072	Rejected
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Inpatient Expenditure**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.0468	0.03665	0.201	-0.11867	0.02498	Rejected
Non-LIS	-0.0515	0.04435	0.246	-0.13840	0.03545	Rejected
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Total Health Expenditures**					
Deemed	-	-	-	-	-	
Non-Deemed	0.0169	0.0123	0.170	-0.0072	0.04091	Rejected
Non-LIS	0.1076	0.0094	0.000	0.08915	0.12615	Fail to Reject*
***Statistically significant**						

Table 16: Summary Results for Health Services Utilization and Total Health Expenditures (Non-switchers: Deemed vs. Non-Deemed vs. Non-LIS)

Table 16 is a summary of the results from testing hypotheses 1A and 1B (health services utilization and total health services expenditures) for beneficiaries who did not switch groups between 2009 and 2010 (Objective 1). The table includes the strength of the effect (coefficient), the standard error, the p-value, the 95% confidence interval and a conclusion indicating whether the hypothesis was accepted or rejected in each case.

Summary Results for Health Services Utilization and Total Health Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

Table 17: Summary Results for Health Services Utilization and Total Health Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

- Hypothesis 2A – Health services utilization will be the same between all groups (i.e. deemed = non-deemed = non-LIS)
- Hypothesis 2B – Total health expenditures will be the same between all groups (i.e. deemed = non-deemed = non-LIS)

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Outpatient Visits**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.099	0.08715	0.258	-0.269	0.0721	Fail to Reject
Non-LIS	-0.100	0.0478	0.035	-0.1698	-0.0069	Rejected*
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Outpatient Expenditure**					
Deemed	-					
Non-Deemed	0.293	0.1035	0.005	0.0905	0.4963	Rejected*
Non-LIS	0.032	0.0592	0.584	-0.0836	0.1486	Fail to Reject
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Emergency Department Visits**					
Deemed	-	-	-	-	-	
Non-Deemed	0.0338	0.13717	0.807	-0.2293	0.30441	Fail to Reject
Non-LIS	0.0099	0.07702	0.897	-0.1409	0.16078	Fail to Reject
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Inpatient Visits**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.239	0.1512	0.114	-0.5351	0.0563	Fail to Reject
Non-LIS	0.0875	0.0867	0.314	-0.0827	0.2576	Fail to Reject
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Inpatient Expenditure**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.39116	0.23387	0.094	-0.84955	0.06723	Fail to Reject
Non-LIS	-0.11796	0.13953	0.398	-0.39144	0.15555	Fail to Reject
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Total Health Expenditures**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.0344	0.05721	0.548	-0.14652	0.07777	Fail to Reject

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Non-LIS	-0.0715	0.03885	0.066	-0.14766	0.00465	Fail to Reject
***Statistically significant**						

Table 17: Summary Results for Health Services Utilization and Total Health Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS).

Table 17 is a summary of the results from testing hypotheses 2A and 2B (health services utilization and expenditure) for beneficiaries who switched groups from deemed to non-deemed or deemed to non-LIS between 2009 and 2010 (Objective 1). The table includes the strength of the effect (coefficient), the standard error, the p-value, the 95% confidence interval and a conclusion indicating whether the hypothesis was accepted or rejected in each case.

Summary Results for Health Services Utilization and Total Health Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

Table 18: Summary Results for Health Services Utilization and Total Health Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

- Hypothesis 2A – Health services utilization will be the same between all groups (i.e. deemed = non-deemed = non-LIS)
- Hypothesis 2B – Total health expenditures will be the same between all groups (i.e. deemed = non-deemed = non-LIS)

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Outpatient Visits**					
Non-Deemed	-	-	-	-	-	
Deemed	0.0594	0.0629	0.504	-0.1148	0.2337	Fail to Reject
Non-LIS	0.0464	0.0651	0.615	-0.1342	0.2269	Fail to Reject
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Outpatient Expenditure**					

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Non-Deemed	-					
Deemed	0.027	0.11316	0.813	-0.19504	0.24855	Fail to Reject
Non-LIS	-0.0008	0.11344	0.994	-0.22316	0.22155	Fail to Reject
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Emergency Department Visits**					
Non-Deemed	-	-	-	-	-	
Deemed	-0.0109	0.1469	0.941	-0.3008	0.2789	Fail to Reject
Non-LIS	-0.0291	0.1551	0.852	-0.3330	0.2749	Fail to Reject
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Inpatient Visits**					
Non-Deemed	-	-	-	-	-	
Deemed	0.1134	0.1563	0.468	-0.1929	0.4198	Fail to Reject
Non-LIS	0.0278	0.1635	0.865	-0.2929	0.3484	Fail to Reject
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Inpatient Expenditure**					
Non-Deemed	-	-	-	-	-	
Deemed	0.1474	0.3576	0.680	-0.5536	0.8484	Fail to Reject
Non-LIS	0.1424	0.2016	0.480	-0.2526	0.5375	Fail to Reject
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Total Health Expenditure**					
Non-Deemed	-	-	-	-	-	
Deemed	0.01767	0.0586	0.763	-0.0972	0.1325	Fail to Reject
Non-LIS	-0.00133	0.0627	0.983	-0.1246	0.1216	Fail to Reject
***Statistically Significant**						

Table 18: Health Services Utilization and Total Health Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS).

Table 18 is a summary of the results from testing hypotheses 2A and 2B (health services utilization and expenditure) for beneficiaries who switched groups from non-deemed to deemed or non-deemed to non-LIS between 2009 and 2010 (Objective 1). The table includes the strength of the effect (coefficient), the standard error, the p-value, the

95% confidence interval and a conclusion indicating whether the hypothesis was accepted or rejected in each case.

OBJECTIVE 2:

Compare prescription drug utilization and total drug expenditure across Medicare Part D low-income cost-share status (deemed vs. non-deemed vs. non-LIS) in 2009 and 2010.

Summary Results for Prescription Drug Utilization and Expenditures (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

Table 19: Summary Results for Prescription Drug Utilization and Expenditures (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

- Hypothesis 3A – Prescription drug utilization will be higher for beneficiaries in the lowest cost-share group (i.e. deemed > non-deemed > non-LIS)
- Hypothesis 3B – Total prescription drug expenditures will be higher for beneficiaries in the lowest cost-share group (i.e. deemed > non-deemed > non-LIS)

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Prescription Utilization**					
Deemed	-					
Non-Deemed	-0.0497	0.0121	0.000	-0.0734	-0.0261	Fail to Reject*
Non-LIS	-0.3434	0.0111	0.000	-0.3651	-0.3218	Fail to Reject *
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**Prescription Expenditure**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.0415	0.0162	0.010	-0.0732	-0.0097	Fail to Reject*
Non-LIS	-0.0283	0.0222	0.203	-0.0719	0.0153	Rejected
Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS	**MPR**					
Deemed	-	-	-	-	-	
Non-Deemed	0.0816	0.07554	0.280	-0.0665	0.2296	No difference in adherence
Non-LIS	0.1096	0.06188	0.077	-0.0117	0.2309	No difference in adherence

Group	Effect (Coefficient)	SE	P>|Z|	95% CI	Conclusion
*Statistically Significant					

Table 19: Summary Results for Prescription Drug Utilization and Expenditures (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS).

Table 19 is a summary of the results from testing hypotheses 3A and 3B (prescription drug utilization and expenditure) for beneficiaries who did not switch groups between 2009 and 2010 (Objective 2). The table includes the strength of the effect (coefficient), the standard error, the p-value, the 95% confidence interval and a conclusion indicating whether the hypothesis was accepted or rejected in each case.

Summary Results for Prescription Drug Utilization and Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

Table 20: Summary Results for Prescription Drug Utilization and Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

- Hypothesis 4A – Prescription drug utilization will be higher for beneficiaries who switch to a lower cost-share group (i.e. deemed > non-deemed > non-LIS)
- Hypothesis 4B – Total prescription drug expenditures will be higher for beneficiaries who switch to a lower cost-share group (i.e. deemed > non-deemed > non-LIS)

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Prescription Utilization**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.3634	0.05144	0.000	-0.4643	-0.2627	Fail to Reject*
Non-LIS	-0.7696	0.03500	0.000	-0.8383	-0.7011	Fail to Reject*
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**Prescription Expenditure**					
Deemed	-					
Non-Deemed	-0.4002	0.0660	0.000	-0.5295	-0.2708	Fail to Reject*
Non-LIS	-0.7664	0.0591	0.000	-0.8821	-0.6506	Fail to Reject*

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS	**MPR**					
Deemed	-	-	-	-	-	
Non-Deemed	-0.2400	0.3215	0.455	-0.8703	0.3902	No difference in adherence
Non-LIS	-0.1821	0.2021	0.367	-0.5781	0.2139	No difference in adherence
***Statistically Significant**						

Table 20: Summary Results for Prescription Drug Utilization and Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS).

Table 20 is a summary of the results from testing hypotheses 4A and 4B (prescription drug utilization and expenditure) for beneficiaries who switched groups from deemed to non-deemed or deemed to non-LIS between 2009 and 2010 (Objective 2). The table includes the strength of the effect (coefficient), the standard error, the p-value, the 95% confidence interval and a conclusion indicating whether the hypothesis was accepted or rejected in each case.

Summary Results for Prescription Drug Utilization and Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

Table 21: Summary Results for Prescription Drug Utilization and Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

- Hypothesis 4A – Prescription drug utilization will be higher for beneficiaries who switch to a lower cost-share group (i.e. deemed > non-deemed > non-LIS)
- Hypothesis 4B – Total prescription drug expenditures will be higher for beneficiaries who switch to a lower cost-share group (i.e. deemed > non-deemed > non-LIS)

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Prescription Utilization**					
Non-Deemed	-	-	-	-	-	
Deemed	0.0438	0.0642	0.495	-0.0820	0.1697	Reject
Non-LIS	-0.0478	0.0658	0.468	-0.1688	0.0812	Reject

Group	Effect (Coefficient)	SE	P>|Z|	95% CI		Conclusion
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**Prescription Expenditure**					
Non-Deemed	-					
Deemed	0.2815	0.0859	0.001	0.1129	0.45000	Fail to Reject*
Non-LIS	-0.2411	0.1003	0.015	-0.4396	-0.04662	Fail to Reject*
Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS	**MPR**					
Non-Deemed	-	-	-	-	-	
Deemed	0.1171	0.4314	0.786	-0.7283	0.9625	No difference in adherence
Non-LIS	-0.2658	0.4014	0.508	-1.0534	0.5209	No difference in adherence
***Statistically Significant**						

Table 21: Summary Results for Prescription Drug Utilization and Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS).

Table 21 is a summary of the results from testing hypotheses 4A and 4B (prescription drug utilization and expenditure) for beneficiaries who switched groups from non-deemed to deemed or non-deemed to non-LIS between 2009 and 2010 (Objective 2). The table includes the strength of the effect (coefficient), the standard error, the p-value, the 95% confidence interval and a conclusion indicating whether the hypothesis was accepted or rejected in each case.

HYPOTHESIS TESTING: COMPLETE RESULTS

This section shows the complete slate of results from the hypothesis tested under each stated objective including all explanatory variables. The table shows the coefficient for each outcome variable, interaction terms, standard error, p-value and confidence interval.

PART 1: Hypothesis Testing on Health Services Utilization and Expenditures

Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS

AIM 1: Compare health services utilization (ED visits, outpatient visits and inpatient hospitalization) and total health services expenditure between deemed vs. non-deemed vs. non-LIS beneficiaries in 2009 and 2010.

Hypothesis 1A: Health services utilization (ED visits, outpatient visits and inpatient hospitalization) will be lower for beneficiaries in the lowest cost-share group.

The following regression models are for the estimation of health services utilization (ED visits, outpatient visits and inpatient hospitalization) between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. This analysis utilized two estimation methods. First, a poisson regression was conducted and the mean was compared to the variance. Since the mean ≠ variance, the negative binomial regression (NBR) was estimated. The R^2 values were evaluated for both the poisson and NBR. Since the NBR's likelihood-ratio's alpha value for the Prob≥Chibar^2 = 0.000, then we reject the assumption that the mean ≠ variance and use the negative binomial regression for estimating utilization.

Table 22: Outpatient Services Utilization (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Negative binomial regression                    Number of obs   = 332876
                                                LR chi2 (13)    = 55178.47
Dispersion     = mean                           Prob > chi2     = 0.0000
Log likelihood = -825514.77                     Pseudo R2       = 0.0323

------------------------------------------------------------------------------
       outpatient visits |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
                  Deemed | (base)
              Non-Deemed |   .0142246   .0183358     0.78   0.438    -.0217129     .050162
                 Non-LIS |  -.2680776   .0161168   -16.63   0.000     -.299666   -.2364892
                         |
             year (2010) |  -.1610923   .0047845   -33.67   0.000    -.1704698   -.1517149
                         |
  Group_Year_Interaction |
              Non-Deemed |   .0027026   .0258977     0.10   0.917    -.0480559    .0534612
                 Non-LIS |   .0702751   .0227643     3.09   0.002      .025658    .1148923
                         |
        beneficiary_race |
                   black |  -.1139094   .0063532   -17.93   0.000    -.1263613   -.1014574
                hispanic |  -.2271868   .0062563   -36.31   0.000    -.2394489   -.2149248
  asian/pacific islander |  -.6790458   .0083391   -81.43   0.000    -.6953901   -.6627014
                   other |  -.0227216   .0149942    -1.52   0.130    -.0521096    .0066665
                         |
           gender (male) |   .2074826   .0051034    40.66   0.000       .19748    .2174851
                     age |   .0187818   .0003558    52.79   0.000     .0180845    .0194791
              ED_visits |   .1665468   .0017118    97.30   0.000     .1631919    .1699018
       comorbidity_score |   .1989324   .0012823   155.14   0.000     .1964192    .2014456
                   _cons |  -.7901092   .0298647   -26.46   0.000    -.8486429   -.7315755
-------------------------+----------------------------------------------------------------
                /lnalpha |   .3601983   .0032371                      .3538536     .366543
-------------------------+----------------------------------------------------------------
                   alpha |   1.433614   .0046408                      1.424547    1.442738
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 1.1e+06 Prob>=chibar2 = 0.000
```

As shown by the coefficients in Table 22, outpatient utilization was 1.4% higher for the non-deemed, but 26.8% lower for the non-LIS group, compared to the beneficiaries who are deemed. This was only significant non-LIS group (95% CI: -0.299666, -0.2364892).

The combined interaction of group status and time (Group_Year_Interaction) shows that non-deemed beneficiaries had a 2.7% increase in outpatient utilization between 2009 and 2010 compared to the deemed beneficiaries, while the non-LIS group had a 70.3% increase in outpatient utilization between 2009 and 2010 compared to the

deemed. The Group_Year_Interaction was only significant for the non-LIS group (95% CI: 0.025658, 0.1148923).

Table 23: Emergency Room Visits (Non:-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Negative binomial regression                    Number of obs   =  332876
                                                LR chi2(19)     =  70062.17
Dispersion     = mean                           Prob > chi2     =  0.0000
Log likelihood = -305378.09                     Pseudo R2       =  0.1029

------------------------------------------------------------------------------
             ED_visits |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
                Deemed | (base)
            Non-Deemed |  -.1844351   .0322736    -5.71   0.000    -.2476902   -.1211799
               Non-LIS |  -.4650658   .0312615   -14.88   0.000    -.5263373   -.4037944
                       |
           year (2010) |   .4731147   .0074932    63.14   0.000     .4584282    .4878011
                       |
  Group_Year_Interaction |
            Non-Deemed |   .0620049   .0420888     1.47   0.141    -.0204877    .1444975
               Non-LIS |  -.0039313   .0406907    -0.10   0.923    -.0836837     .075821
                       |
        beneficiary_race |
                 black |   .1726899    .009602    17.98   0.000     .1538704    .1915095
              hispanic |   .0402642   .0097746     4.12   0.000     .0211064     .059422
  asian/pacific islander |  -.3655576   .0143314   -25.51   0.000    -.3936467   -.3374686
                 other |  -.0741674   .0239703    -3.09   0.002    -.1211484   -.0271865
                       |
        gender (male) |   .0909898   .0080818    11.26   0.000     .0751497    .1068299
                   age |   .0167684   .0005631    29.78   0.000     .0156646    .0178721
     outpatient visits |   .0397562   .0006486    61.29   0.000     .0384849    .0410275
  outpatient_expenditure |   .0001449   2.41e-06    60.22   0.000     .0001402    .0001496
        inpatient_visits |   .6939157   .0167462    41.44   0.000     .6610938    .7267376
inpatient_length_of_stay |  -.0044035   .0004441    -9.91   0.000    -.0052739    -.003533
    inpatient_diagnoses |  -.0264683   .0019882   -13.31   0.000     -.030365   -.0225715
   inpatient_expenditure |  -9.23e-06   5.31e-07   -17.39   0.000    -.0000103   -8.19e-06
physician_services_expenditure |   .0000385   1.23e-06    31.23   0.000     .0000361    .0000409
        comorbidity_score |    .071666   .0020891    34.30   0.000     .0675714    .0757606
                    _cons |  -3.200566   .0470647   -68.00   0.000    -3.292811   -3.108321
-----------------------+------------------------------------------------------------------
                /lnalpha |   .5867596   .0064682                      .5740822     .599437
-----------------------+------------------------------------------------------------------
                   alpha |   1.798152   .0116308                        1.7755    1.821093
------------------------------------------------------------------------------
```

Table 23 shows results for emergency department visits. ED_visits were 18.4% and 46.5% lower for the non-deemed and non-LIS beneficiaries respectively. These effects were significant [95% CI: -0.2476902, -0.1211799 (non-deemed) and 95% CI: -0.5263373, -0.4037944).

The combined interaction of group status and time (Group_Year_Interaction) shows that non-deemed beneficiaries had a 6.2% increase in ED_visits between 2009 and 2010 compared to the deemed beneficiaries, while the non-LIS group had a 0.4% decrease in ED_visits between 2009 and 2010 compared to the deemed. The Group_Year_Interaction was not statistically significant for either group.

Table 24: Inpatient Visits (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Negative binomial regression                    Number of obs   =     332876
                                                LR chi2(16)     =     177973.73
Dispersion     = mean                           Prob > chi2     =     0.0000
Log likelihood = -160258.58                     Pseudo R2       =     0.3570

------------------------------------------------------------------------------
       inpatient_visits |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------------------+-----------------------------------------------------------------
                Deemed | (base)
            Non-Deemed |   .0355911   .0320089     1.11   0.266    -.0271451    .0983274
               Non-LIS |  -.0373421   .0296262    -1.26   0.208    -.0954085    .0207243
                       |
           year (2010) |  -.0752209   .0086191    -8.73   0.000     -.092114   -.0583277
                       |
 Group_Year_Interaction |
            Non-Deemed |   .0014887   .0443042     0.03   0.973    -.0853459    .0883234
               Non-LIS |   .0234968   .0415453     0.57   0.572    -.0579304    .1049241
                       |
      beneficiary_race |
                 black |  -.0150708   .0111433    -1.35   0.176    -.0369113    .0067698
              hispanic |  -.0885026   .0116665    -7.59   0.000    -.1113685   -.0656367
 asian/pacific islander |   -.326372   .0178318   -18.30   0.000    -.3613217   -.2914223
                 other |  -.0913906   .0286794    -3.19   0.001    -.1476013   -.0351799
                       |
         gender (male) |    .027643   .0093523     2.96   0.003     .0093127    .0459732
                   age |   .0201049     .00064    31.41   0.000     .0188505    .0213592
  inpatient_claim_count |   1.004752   .0104685    95.98   0.000     .9842338    1.025269
inpatient_length_of_stay |  -.0325513   .0004307   -75.58   0.000    -.0333954   -.0317072
    inpatient_diagnoses |   .0207548   .0010984    18.90   0.000      .018602    .0229076
             ED_visits |   .0480743   .0019063    25.22   0.000      .044338    .0518105
      comorbidity_score |   .0798386   .0021314    37.46   0.000     .0756612     .084016
                  _cons |  -4.060252   .0532197   -76.29   0.000    -4.164561   -3.955943
------------------------+-----------------------------------------------------------------
              /lnalpha |  -.5318027   .0100231                     -.5514475   -.5121578
------------------------+-----------------------------------------------------------------
                 alpha |   .5875449    .005889                      .5761153    .5992012
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 6.5e+04 Prob>=chibar2 = 0.000
```

As shown by the coefficients in Table 24, inpatient utilization was 3.6% higher for the non-deemed, but 3.7% lower for the non-LIS group, compared to the deemed group.

The combined interaction of group status and time (Group_Year_Interaction) shows that non-deemed beneficiaries had a 0.1% increase in inpatient utilization in between 2009 and 2010 compared to the deemed beneficiaries, while the non-LIS group had a 2.3% increase in inpatient utilization between 2009 and 2010 compared to the deemed. These effects were not statistically significant.

Hypothesis 1B: Health services expenditures will be lower for beneficiaries in the lowest cost-share group.

The following regression models are for the estimation of total health expenditures for ED visits, outpatient visits, inpatient hospitalization and physician services between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. This analysis utilized a negative binomial regression. The GLM estimator addresses skewness by the choice of a distribution family (in this case the negative binomial distribution), and tackles the non-linearity by the choice of its link function (in this case the log function).

Table 25: Outpatient Expenditure (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Generalized linear models                         No. of obs      = 332876
outpatienttimization     : ML                     Residual df     = 332857
                                                  Scale parameter = 1
Deviance         = 1687488.24                     (1/df) Deviance  = 5.069709
Pearson          = 687872.1367                    (1/df) Pearson   = 2.06657

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function: g(u) = ln(u)                       [Log]

                                                  AIC             = 12.86092
Log pseudolikelihood = -2140527.142               BIC             = -2544963
```

outpatient_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Deemed	(base)					
Non-Deemed	-.0589028	.0256406	-2.30	0.022	-.1091574	-.0086481
Non-LIS	-.1132184	.0235781	-4.80	0.000	-.1594306	-.0670062
year (2010)	.6462871	.0052261	123.67	0.000	.6360442	.65653
Group_Year_Interaction						
Non-Deemed	.1429219	.0290167	4.93	0.000	.0860502	.1997937
Non-LIS	.1265466	.0270992	4.67	0.000	.0734332	.17966
beneficiary_race						
black	.0247436	.006872	3.60	0.000	.0112747	.0382124
hispanic	.1494601	.0067271	22.22	0.000	.1362753	.1626449
asian/pacific islander	.0147784	.0097745	1.51	0.131	-.0043792	.0339361
other	.2605123	.0154438	16.87	0.000	.2302429	.2907816
gender (male)	.1343347	.0058514	22.96	0.000	.1228663	.1458032
age	.0041438	.0004151	9.98	0.000	.0033303	.0049574
outpatient_benepay_beneficiary_amount	.0060239	.0014655	4.11	0.000	.0031515	.0088962
outpatient_medicare_pay_amount	.0009097	9.44e-06	96.38	0.000	.0008912	.0009282
outpatient visits	.0752595	.000964	78.07	0.000	.0733701	.0771488
physician_services_expenditure	6.93e-06	9.95e-07	6.96	0.000	4.98e-06	8.88e-06
ED_visits	.2335925	.002913	80.19	0.000	.2278831	.2393019
ED_charge	-.0000321	5.09e-06	-6.31	0.000	-.0000421	-.0000222
comorbidity_score	.0559707	.0015523	36.06	0.000	.0529284	.0590131
_cons	3.181106	.0352593	90.22	0.000	3.111999	3.250213

As shown by the coefficients in Table 25, outpatient expenditure was 5.9% lower for the non-deemed and 11.3% lower for the non-LIS group, compared to the deemed group. These effects were significant [95% CI: -0.1091574, -0.0086481 (non-deemed) and 95% CI: -0.1594306, -.0670062 (non-LIS group)].

The combined interaction of group status and time (Group_Year_Interaction) shows that non-deemed beneficiaries had a 14.3% increase in outpatient expenditure between 2009 and 2010 compared to the deemed beneficiaries, while the non-LIS group had a

12.7% increase in outpatient expenditure between 2009 and 2010 compared to the deemed. The Group_Year_Interaction was statistically significant for both groups [95% CI: 0.0860502, 0.1997937 (non-deemed) and 95% CI: 0.0734332, 0.17966 (non-LIS)].

Table 26: Inpatient Expenditures (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Generalized linear models                         No. of obs      =    332876
outpatienttimization     : ML                     Residual df     =    332854
                                                  Scale parameter =    1
Deviance = 976033.2023                            (1/df) Deviance =    2.932316
Pearson  = 1575294.962                            (1/df) Pearson  =    4.73269

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function: g(u) = ln(u)                       [Log]

                                                  AIC             =   6.98465
Log pseudolikelihood = -1162489.226               BIC             =  -3256380
```

inpatient_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Deemed	(base)					
Non-Deemed	-.0468521	.0366487	-1.28	0.201	-.1186822	.0249781
Non-LIS	-.0514786	.0443509	-1.16	0.246	-.1384048	.0354476
year (2010)	-.0863845	.0141279	-6.11	0.000	-.1140747	-.0586943
Group_Year_Interaction						
Non-Deemed	.0199716	.0630139	0.32	0.751	-.1035334	.1434765
Non-LIS	.0770514	.0739136	1.04	0.297	-.0678165	.2219194
beneficiary_race						
black	.02	.0184698	1.08	0.279	-.0162003	.0562002
hispanic	-.070648	.0188765	-3.74	0.000	-.1076453	-.0336507
asian/pacific islander	-.2135418	.023821	-8.96	0.000	-.2602301	-.1668534
other	-.03164	.0421993	-0.75	0.453	-.1143491	.0510692
gender (male)	-.0416821	.0161074	-2.59	0.010	-.073252	-.0101122
age	.0149507	.0011345	13.18	0.000	.012727	.0171743
inpatient_visits	7.580657	.1226518	61.81	0.000	7.340264	7.82105
inpatient_claim_count	-1.253054	.1082985	-11.57	0.000	-1.465316	-1.040793
inpatient_length_of_stay	.00907	.0012801	7.09	0.000	.0065611	.0115789
inpatient_diagnoses	-.0516021	.0054725	-9.43	0.000	-.062328	-.0408762
ED_visits	.0649268	.0050398	12.88	0.000	.0550489	.0748047
beneficiary_payment	.0023993	.0000461	52.03	0.000	.0023089	.0024897
medicare_payment	.0000511	1.56e-06	32.84	0.000	.0000481	.0000542
physician_services_expenditure	.0000269	1.87e-06	14.38	0.000	.0000232	.0000305
ED_charge	.0000639	7.87e-06	8.13	0.000	.0000485	.0000793
comorbidity_score	.0737553	.0040018	18.43	0.000	.0659119	.0815988
_cons	-2.664159	.0939558	-28.36	0.000	-2.848309	-2.480009

As shown by the coefficients in Table 26, inpatient expenditure was 4.7% lower for the non-deemed and 5.1% lower for the non-LIS group, compared to the deemed group. These effects were not statistically significant.

The combined interaction of group status and time (Group_Year_Interaction) shows that non-deemed beneficiaries had a 2% increase in inpatient expenditure between 2009 and 2010 compared to the deemed beneficiaries, while the non-LIS group had a 7.7% increase in inpatient expenditure between 2009 and 2010 compared to the deemed group. The Group_Year_Interaction was not statistically significant for either group.

Table 27: Total Health Expenditures (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Generalized linear models                         No. of obs      =    332876
outpatienttimization     : ML                     Residual df     =    332858
                                                  Scale parameter =  .7102151
Deviance         =  242743.0482                   (1/df) Deviance =  .7292691
Pearson          =  236400.7691                   (1/df) Pearson  =  .7102151

Variance function: V(u) = u^2                     [Gamma]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  17.74208
Log pseudolikelihood = -2952937.999               BIC             =  -3989721
```

health_services_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Deemed	(base)					
Non-Deemed	.0168566	.0122745	1.37	0.170	-.007201	.0409143
Non-LIS	.1076474	.0094401	11.40	0.000	.0891451	.1261498
year (2010)	.0710762	.0031372	22.66	0.000	.0649274	.077225
Group_Year_Interaction						
Non-Deemed	-.0039677	.0167845	-0.24	0.813	-.0368646	.0289293
Non-LIS	-.0393499	.0131771	-2.99	0.003	-.0651765	-.0135233
beneficiary_race						
black	-.0191513	.0042123	-4.55	0.000	-.0274072	-.0108954
hispanic	.0437723	.0040753	10.74	0.000	.0357848	.0517597
asian/pacific islander	.0782681	.0049346	15.86	0.000	.0685965	.0879396
other	.0914599	.009696	9.43	0.000	.072456	.1104638
gender (male)	.0444681	.003476	12.79	0.000	.0376554	.0512809
age	.0085782	.0002485	34.52	0.000	.0080912	.0090653
ED_visits	.067043	.0016294	41.15	0.000	.0638494	.0702366
ED_charge	-1.17e-06	3.12e-06	-0.38	0.707	-7.28e-06	4.94e-06
comorbidity_score	.0348511	.0008999	38.73	0.000	.0330872	.0366149
health_services _beneficiary_payment	.0003453	7.95e-06	43.44	0.000	.0003297	.0003609
health_services_tot_medicare_paymentamount	.000048	5.02e-07	95.67	0.000	.0000471	.000049
health_services_utilization	.0298504	.0001473	202.63	0.000	.0295617	.0301391
_cons	5.665609	.0210102	269.66	0.000	5.62443	5.706788

The results for total health services expenditure are shown in Table 27. The total health expenditure is 1.7% higher for non-deemed beneficiaries and 10.8% higher for non-LIS beneficiaries compared to the deemed group. This effect was only significant for the non-LIS group (95% CI: 0.0891451, 0.1261498).

The combined interaction of group status and time (Group_Year_Interaction) shows that non-deemed beneficiaries had a 0.4% decrease in total health services expenditure between 2009 and 2010 compared to the deemed beneficiaries, while the non-LIS group had a 3.9% reduction in total health services expenditure between 2009 and 2010 compared to the deemed. The Group_Year_Interaction effect was only significant for the non-LIS group (95% CI: -0.0651765, -0.0135233).

Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS

AIM 2: Compare health services utilization and health services expenditures among beneficiaries who switched status: i.e. non-deemed to non-LIS, or non-deemed to deemed, or non-LIS to non-deemed between 2009 and 2010.

Hypothesis 2A: Health services utilization (ED visits, outpatient visits and inpatient hospitalization) will be the same between all of the groups.

The following regression models are for the estimation of health services utilization (ED visits, outpatient visits and inpatient hospitalization) between

beneficiaries who switched status from deemed to non-deemed and deemed to non-LIS. This analysis utilized two estimation methods. First, a poisson regression was conducted and mean was compared to the variance. Since the mean ≠ variance, the negative binomial regression (NBR) was estimated. The R^2 values were evaluated for both the poisson and NBR. Since the NBR's likelihood-ratio's alpha value for the Prob≥Chibar^2 = 0.000, then we reject the assumption that the mean ≠ variance and use the negative binomial regression for estimating utilization.

Table 28: Outpatient Services Utilization (Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Negative binomial regression                    Number of obs   =    311816
                                                LR chi2(13)     =    52181.10
Dispersion     = mean                           Prob > chi2     =    0.0000
Log likelihood = -776116.22                     Pseudo R2       =    0.0325

------------------------------------------------------------------------------
       outpatient visits |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
                 Deemed | (base)
             Non-Deemed |   .0826992   .0612002     1.35   0.177    -.0372509    .2026493
                Non-LIS |  -.0800398   .0336459    -2.38   0.017    -.1459846    -.014095
                        |
            year (2010) |   -.160434   .0047934   -33.47   0.000    -.1698289    -.151039
                        |
                    DID |
  switcher_to_Non-Deemed |  -.0985659   .0871006    -1.13   0.258      -.26928    .0721481
     switcher_to_Non-LIS |  -.1006274   .0478351    -2.10   0.035    -.1943825   -.0068723
                        |
       beneficiary_race |
                   black |  -.1263179   .0065188   -19.38   0.000    -.1390944   -.1135413
                hispanic |  -.2356063   .0064004   -36.81   0.000    -.2481508   -.2230618
  asian/pacific islander |  -.6955904   .0085002   -81.83   0.000    -.7122504   -.6789304
                   other |  -.0177342   .0152929    -1.16   0.246    -.0477079    .0122394
                        |
           gender (male)|   .2129838   .0052798    40.34   0.000     .2026355     .223332
                     age |   .0180835   .0003666    49.32   0.000     .0173649    .0188021
              ED_visits |   .1657663   .0017432    95.09   0.000     .1623498    .1691829
      comorbidity_score |   .2002161   .0013223   151.41   0.000     .1976244    .2028079
                   _cons |  -.7400852   .0307527   -24.07   0.000    -.8003595    -.679811
-------------------------+----------------------------------------------------------------
                /lnalpha |    .362182   .0033383                      .355639     .368725
-------------------------+----------------------------------------------------------------
                   alpha |    1.43646   .0047954                      1.427092     1.44589
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 1.1e+06 Prob>=chibar2 = 0.000
```

As shown by the coefficients in Table 28, outpatient utilization was 8.2% higher for the non-deemed, but 8.0% lower for the non-LIS group, compared to the deemed group. This was only significant non-LIS group (95% CI: -0.1459846, -0.014095).

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had a 9.9% lower outpatient

utilization compared to the deemed beneficiaries who did not switch. This was not statistically significant. Similarly, beneficiaries who switched from deemed to non-LIS group had 10.1% lower in outpatient utilization compared to the deemed beneficiaries who did not switch. This was statistically significant (95% CI: -0.1943825, -0.0068723).

Table 29: Emergency Department Visits (Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

Negative binomial regression	**Number of obs**	**=**	**311816**
	LR chi2(19)	**=**	**65504.92**
Dispersion = mean	**Prob > chi2**	**=**	**0.0000**
Log likelihood = -290035.09	**Pseudo R2**	**=**	**0.1015**

ED_visits	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Deemed	(base)					
Non-Deemed	-.0835198	.1046056	-0.80	0.425	-.288543	.1215034
Non-LIS	-.0600087	.0583816	-1.03	0.304	-.1744345	.0544171
year (2010)	.472998	.0075056	63.02	0.000	.4582872	.4877088
DID						
switcher_to_Non-Deemed	.0337946	.138049	0.24	0.807	-.2367764	.3043656
switcher_to_Non-LIS	.0099367	.0769629	0.13	0.897	-.1409078	.1607812
beneficiary_race						
black	.1739289	.0097964	17.75	0.000	.1547283	.1931295
hispanic	.0352629	.0099602	3.54	0.000	.0157412	.0547845
asian/pacific islander	-.372634	.014556	-25.60	0.000	-.4011631	-.3441048
other	-.0848796	.0243907	-3.48	0.001	-.1326844	-.0370747
gender (male)	.0904569	.0083056	10.89	0.000	.0741783	.1067355
age	.016153	.000577	28.00	0.000	.0150222	.0172839
outpatient visits	.0398935	.0006645	60.04	0.000	.0385912	.0411958
outpatient_expenditure	.0001463	2.49e-06	58.76	0.000	.0001414	.0001512
inpatient_visits	.6877205	.0172946	39.76	0.000	.6538236	.7216173
inpatient_length_of_stay	-.0044798	.0004742	-9.45	0.000	-.0054091	-.0035504
inpatient_diagnoses	-.0262492	.0020549	-12.77	0.000	-.0302768	-.0222216
inpatient_expenditure	-9.55e-06	5.56e-07	-17.17	0.000	-.0000106	-8.46e-06
physician_services_expenditure	.0000394	1.28e-06	30.82	0.000	.0000369	.0000419
comorbidity_score	.0717508	.0021454	33.44	0.000	.0675459	.0759557
_cons	-3.152666	.0481844	-65.43	0.000	-3.247105	-3.058226
/lnalpha	.5903452	.0066066			.5773965	.6032939
alpha	1.804611	.0119223			1.781395	1.828131

Likelihood-ratio test of alpha=0: chibar2(01) = 1.4e+05 Prob>=chibar2 = 0.000

Table 29 shows results for emergency department visits. ED_visits were 8.4% and 6.0% lower for the non-deemed and non-LIS beneficiaries respectively. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had 3.4% higher ED_visits compared to the deemed beneficiaries who did not switch. This was not statistically significant. Beneficiaries who switched from deemed to non-LIS group had 1.0% higher ED_visits compared to the deemed beneficiaries who did not switch. This also was not statistically significant.

Table 30: Inpatient Visits (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

```
Negative binomial regression                    Number of obs   =  311816
                                                LR chi2(16)     =  166713.31
Dispersion     = mean                           Prob > chi2     =  0.0000
Log likelihood = -150419.26                     Pseudo R2       =  0.3566

------------------------------------------------------------------------------
      inpatient_visits |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
                Deemed | (base)
           Non-Deemed |   .1463528   .1026278     1.43   0.154    -.0547939    .3474995
              Non-LIS |  -.0502231   .0630743    -0.80   0.426    -.1738464    .0734002
                      |
          year (2010) |  -.0738106   .0086159    -8.57   0.000    -.0906976   -.0569237
                      |
                  DID |
switcher_to_Non-Deemed |  -.2387544   .1512212    -1.58   0.114    -.5351426    .0576338
   switcher_to_Non-LIS |   .0874619   .0867974     1.01   0.314    -.0826579    .2575816
                      |
      beneficiary_race |
                black |  -.0141541   .0113831    -1.24   0.214    -.0364646    .0081563
             hispanic |  -.0916057    .011904    -7.70   0.000    -.1149371   -.0682743
asian/pacific islander |   -.334302   .0181705   -18.40   0.000    -.3699155   -.2986884
                other |  -.0973945   .0292703    -3.33   0.001    -.1547633   -.0400258
                      |
         gender (male) |   .0317508   .0096678     3.28   0.001     .0128022    .0506994
                  age |   .0197222   .0006583    29.96   0.000     .0184318    .0210125
 inpatient_claim_count |   1.001619   .0108468    92.34   0.000       .98036    1.022879
inpatient_length_of_stay |  -.0324096   .0004481   -72.33   0.000    -.0332878   -.0315314
    inpatient_diagnoses |   .0205126   .0011379    18.03   0.000     .0182823    .0227429
            ED_visits |   .0471284   .0019371    24.33   0.000     .0433317     .050925
     comorbidity_score |   .0808542   .0021951    36.83   0.000     .0765518    .0851565
                 _cons |  -4.031143   .0546878   -73.71   0.000    -4.138329   -3.923957
-----------------------+------------------------------------------------------------------
              /lnalpha |   -.532178   .0103389                     -.5524418   -.5119141
-----------------------+------------------------------------------------------------------
                 alpha |   .5873244   .0060723                      .5755427    .5993473
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 6.2e+04 Prob>=chibar2 = 0.000
```

As shown by the coefficients in Table 30, inpatient utilization was 14.6% higher for the non-deemed beneficiaries and 5.2% higher for the non-LIS group, compared to the deemed group. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had a 23.9% higher inpatient utilization compared to the deemed beneficiaries who did not switch. This was not statistically significant. Beneficiaries who switched from deemed to non-LIS group had 8.7% higher inpatient utilization compared to the deemed beneficiaries who did not switch. This also was not statistically significant.

Hypothesis 2B: Total health services expenditures will be the same between all of the groups.

The following regression models are for the estimation of total health expenditures for ED visits, outpatient visits, inpatient hospitalization and physician services for beneficiaries who switched status from deemed to non-deemed and deemed to non-LIS beneficiaries between 2009 and 2010. This analysis utilized a negative binomial regression. The GLM estimator addresses skewness by the choice of a distribution family (in this case the negative binomial distribution), and tackles the non-linearity by the choice of its link function (in this case the log function).

Table 31: Outpatient Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =    311816
Optimization     : ML                             Residual df     =    311797
                                                  Scale parameter =         1
Deviance         =  1579444.253                   (1/df) Deviance =  5.065617
Pearson          =  638522.5032                   (1/df) Pearson  =  2.047879

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  12.89408
Log pseudolikelihood = -2010270.676               BIC             =  -2364840
```

outpatient_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Deemed	(base)					
Non-Deemed	-.23245	.0933053	-2.49	0.013	-.415325	-.0495749
Non-LIS	-.1951523	.0505539	-3.86	0.000	-.2942361	-.0960685
year (2010)	.6458262	.005227	123.56	0.000	.6355814	.656071
DID						
switcher_to_Non-Deemed	.2934445	.1035432	2.83	0.005	.0905036	.4963854
switcher_to_Non-LIS	.0324685	.0592416	0.55	0.584	-.0836428	.1485799
beneficiary_race						
black	.0236926	.0070104	3.38	0.001	.0099525	.0374328
hispanic	.14937	.0068564	21.79	0.000	.1359316	.1628083
asian/pacific islander	.001507	.0099738	0.15	0.880	-.0180413	.0210552
other	.2672303	.0156692	17.05	0.000	.2365193	.2979413
gender (male)	.1349974	.0060242	22.41	0.000	.1231903	.1468046
age	.0044083	.0004264	10.34	0.000	.0035726	.005244
outpatient_beneficiary_payment	.0064223	.0014731	4.36	0.000	.0035351	.0093095
outpatient_medicare_pay_amount	.0008987	9.69e-06	92.77	0.000	.0008798	.0009177
outpatient visits	.0743612	.0009845	75.54	0.000	.0724317	.0762907
physician_services_expenditure	6.83e-06	1.04e-06	6.54	0.000	4.78e-06	8.88e-06
ED_visits	.2314876	.0029612	78.17	0.000	.2256838	.2372915
ED_charge	-.0000328	5.48e-06	-5.98	0.000	-.0000435	-.000022
comorbidity_score	.0572663	.0016048	35.69	0.000	.054121	.0604116
_cons	3.172984	.0362284	87.58	0.000	3.101977	3.24399

As shown by the coefficients in Table 31, outpatient expenditure was 9.3% lower for the non-deemed and 5.1% lower for the non-LIS group, compared to the deemed group. These effects were significant [95% CI: -0.415325, -0.0495749 (non-deemed) and 95% CI: -0.2942361, -0.0960685 (non-LIS group)].

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had a 23.2% higher outpatient expenditure compared to the deemed beneficiaries who did not switch. This was statistically significant (95% CI: 0.0905036, 0.4963854). Beneficiaries who switched from deemed to non-LIS group had 3.2% higher outpatient expenditure compared to the deemed beneficiaries who did not switch. This was not statistically significant.

Table 32: Inpatient Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =    311816
Optimization     : ML                             Residual df     =    311794
                                                  Scale parameter =         1
Deviance         =   913002.797                   (1/df) Deviance =  2.928224
Pearson          =   1493291.85                   (1/df) Pearson  =  4.789354

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  6.984769
Log pseudolikelihood = -1088959.347               BIC             =  -3031244
```

inpatient_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Deemed	(base)					
Non-Deemed	.3205987	.1780934	1.80	0.072	-.0284579	.6696553
Non-LIS	.0077556	.1044155	0.07	0.941	-.196895	.2124061
year (2010)	-.084778	.014376	-5.90	0.000	-.1129545	-.0566015
DID						
switcher_to_Non-Deemed	-.3911617	.2338785	-1.67	0.094	-.849555	.0672317
switcher_to_Non-LIS	-.117963	.1395303	-0.85	0.398	-.3914374	.1555115
beneficiary_race						
black	.0224164	.0194033	1.16	0.248	-.0156134	.0604461
hispanic	-.0736017	.0196715	-3.74	0.000	-.1121572	-.0350463
asian/pacific islander	-.2192997	.0243185	-9.02	0.000	-.266963	-.1716363
other	-.0231407	.0443336	-0.52	0.602	-.1100329	.0637515
gender (male)	-.0288639	.0169565	-1.70	0.089	-.062098	.0043702
age	.0142164	.0011926	11.92	0.000	.011879	.0165538
inpatient_visits	7.527761	.1256981	59.89	0.000	7.281397	7.774125
inpatient_claim_count	-1.238743	.1105354	-11.21	0.000	-1.455389	-1.022098
inpatient_length_of_stay	.0089911	.0012992	6.92	0.000	.0064447	.0115374
inpatient_diagnoses	-.0524178	.0056905	-9.21	0.000	-.063571	-.0412646
ED_visits	.0634803	.0051813	12.25	0.000	.0533252	.0736355
beneficiary_payment	.0024373	.0000469	51.96	0.000	.0023454	.0025293
medicare_payment	.0000526	1.63e-06	32.28	0.000	.0000494	.0000558
physician_services_expenditure	.0000261	1.92e-06	13.59	0.000	.0000224	.0000299
ED_charge	.000061	8.20e-06	7.44	0.000	.0000449	.000077
comorbidity_score	.0717022	.0041371	17.33	0.000	.0635936	.0798107
_cons	-2.605956	.0984942	-26.46	0.000	-2.799001	-2.412911

As shown by the coefficients in Table 32, inpatient expenditure was 32.1% higher for the non-deemed and 0.7% higher for the non-LIS group, compared to the deemed group. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had a 39.1% lower inpatient expenditure compared to the deemed beneficiaries who did not switch. Similarly, beneficiaries who switched from deemed to non-LIS group had 11.8% lower inpatient expenditure compared to the deemed beneficiaries who did not switch. This DID was not statistically significant for either groups.

Table 33: Total Health Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =    311816
Optimization     : ML                             Residual df     =    311798
                                                  Scale parameter =  .7161888
Deviance         =  228512.6162                   (1/df) Deviance =  .7328867
Pearson          =  223306.2283                   (1/df) Pearson  =  .7161888

Variance function: V(u) = u^2                     [Gamma]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =   17.7199
Log pseudolikelihood = -2762655.532               BIC             =  -3715785
```

health_services_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Deemed	(base)					
Non-Deemed	.0124557	.0407306	0.31	0.760	-.0673748	.0922861
Non-LIS	-.1043044	.0275746	-3.78	0.000	-.1583496	-.0502592
year (2010)	.0716037	.0031345	22.84	0.000	.0654603	.0777472
DID						
switcher_to_Non-Deemed	-.0343735	.0572174	-0.60	0.548	-.1465176	.0777705
switcher_to_Non-LIS	-.0715069	.0388563	-1.84	0.066	-.1476638	.00465
beneficiary_race						
black	-.0144252	.0043218	-3.34	0.001	-.0228958	-.0059545
hispanic	.0500949	.0041755	12.00	0.000	.041911	.0582787
asian/pacific islander	.0864098	.0050428	17.14	0.000	.0765261	.0962936
other	.0989929	.0099222	9.98	0.000	.0795458	.11844
gender (male)	.0506336	.0036176	14.00	0.000	.0435433	.057724
age	.0085535	.0002566	33.34	0.000	.0080506	.0090564
ED_visits	.0661204	.0016393	40.33	0.000	.0629074	.0693333
ED_charge	-4.85e-06	3.27e-06	-1.48	0.138	-.0000113	1.56e-06
comorbidity_score	.0353018	.0009305	37.94	0.000	.033478	.0371255
health_services_beneficiary_payment	.0003625	8.34e-06	43.45	0.000	.0003462	.0003789
health_services_tot_medicare_paymentamount	.0000483	5.24e-07	92.07	0.000	.0000472	.0000493
health_services_utilization	.0299281	.0001535	195.03	0.000	.0296273	.0302288
_cons	5.650693	.0216819	260.62	0.000	5.608197	5.693189

The results for total health expenditures are shown in Table 33. The total health services expenditure is 1.2% higher for non-deemed beneficiaries and 10.4% lower for

non-LIS beneficiaries compared to the deemed group. This effect was only significant for the non-LIS group (95% CI: -0.1583496, -.0502592).

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had a 3.4% lower inpatient expenditure compared to the deemed beneficiaries who did not switch. Similarly, beneficiaries who switched from deemed to non-LIS group had 3.9% lower inpatient expenditure compared to the deemed beneficiaries who did not switch. This DID was not statistically significant for either groups.

Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS

AIM 2: Compare health services utilization and health services expenditures among beneficiaries who switched status: i.e. non-deemed to non-LIS, or non-deemed to deemed, or non-LIS to non-deemed between 2009 and 2010.

Hypothesis 2A: Health services utilization (ED visits, outpatient visits and inpatient hospitalization) will be the same between all of the groups.

The following regression models are for the estimation of health services utilization (ED visits, outpatient visits and inpatient hospitalization) between beneficiaries who switched status from non-deemed to deemed and non-deemed to non-LIS. This analysis utilized two estimation methods. First, a poisson regression was

conducted and mean was compared to the variance. Since the mean ≠ variance, the negative binomial regression (NBR) was estimated. The R^2 values were evaluated for both the poisson and NBR. Since the NBR's likelihood-ratio's alpha value for the Prob≥Chibar^2 = 0.000, then we reject the assumption that the mean ≠ variance and use the negative binomial regression for estimating utilization.

Table 34: Outpatient Services Utilizations (Switchers: Non-Deemed to Deemed vs. Deemed to Non-LIS)

```
Negative binomial regression                    Number of obs   =      11808
                                                LR chi2(13)     =    1864.73
Dispersion     = mean                           Prob > chi2     =     0.0000
Log likelihood = -30772.955                     Pseudo R2       =     0.0294

------------------------------------------------------------------------------
        outpatient visits|      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
              Non-Deemed | (base)
                  Deemed |    .039653   .0629567     0.63   0.529    -.0837399    .1630459
                 Non-LIS |   .0419676   .0651644     0.64   0.520    -.0857523    .1696875
                         |
             year (2010) |  -.1684688   .0238132    -7.07   0.000    -.2151419   -.1217957
                         |
                     DID |
      switcher_to_Deemed |    .059443   .0889311     0.67   0.504    -.1148586    .2337447
     switcher_to_Non-LIS |   .0463693   .0921102     0.50   0.615    -.1341634     .226902
                         |
       beneficiary_race |
                   black |  -.1996875   .0344592    -5.79   0.000    -.2672263   -.1321487
                hispanic |  -.2034336   .0495353    -4.11   0.000     -.300521   -.1063462
  asian/pacific islander |  -.8596305   .1248626    -6.88   0.000    -1.104357   -.6149042
                   other |    .026052   .1143453     0.23   0.820    -.1980606    .2501646
                         |
            gender (male)|   .1854757    .025225     7.35   0.000     .1360356    .2349157
                     age |   .0291374   .0017661    16.50   0.000     .0256758    .0325989
               ED_visits |   .1711366   .0089588    19.10   0.000     .1535778    .1886955
      comorbidity_score |   .1903252    .005974    31.86   0.000     .1786164     .202034
                   _cons |  -1.522793   .1486418   -10.24   0.000    -1.814125    -1.23146
-------------------------+----------------------------------------------------------------
                /lnalpha |   .1585192   .0168957                     .1254042    .1916341
-------------------------+----------------------------------------------------------------
                   alpha |   1.171774   .0197979                     1.133607    1.211227
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 3.8e+04 Prob>=chibar2 = 0.000
```

As shown by the coefficients in Table 34, outpatient utilization was 4.0% higher for the deemed and 4.2% higher for the non-LIS group, compared to the non-deemed group. This was not statistically significant either group.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had a 5.9% higher outpatient utilization compared to the deemed beneficiaries who did not switch. This was not statistically significant. Similarly, beneficiaries who switched from non-deemed to non-LIS group had 4.6% higher outpatient utilization compared to the non-deemed beneficiaries who did not switch. This was also not significant.

Table 35: Emergency Department Visits (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Negative binomial regression                    Number of obs   =      11808
                                                LR chi2(19)     =    2548.64
Dispersion     = mean                           Prob > chi2     =     0.0000
Log likelihood = -10598.484                     Pseudo R2       =     0.1073

------------------------------------------------------------------------------
             ED_visits |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
          Non-Deemed | (base)
              Deemed |   .0849293   .1120736     0.76   0.449    -.1347309    .3045894
             Non-LIS |   .0733246   .1179505     0.62   0.534    -.1578541    .3045034
                     |
           year (2010) |   .5402336   .0407362    13.26   0.000     .4603921    .6200751
                     |
                 DID |
      switcher_to_Deemed |  -.0109533   .1479098    -0.07   0.941    -.3008511    .2789445
     switcher_to_Non-LIS |  -.0290257      .1551    -0.19   0.852    -.3330162    .2749648
                     |
        beneficiary_race |
                  black |   .0602951   .0574179     1.05   0.294    -.0522419     .172832
               hispanic |    .057565   .0828265     0.70   0.487     -.104772     .219902
  asian/pacific islander |   .0896413   .1930467     0.46   0.642    -.2887232    .4680058
                  other |   .1215703   .1875838     0.65   0.517    -.2460871    .4892277
                     |
          gender (male)|   .1206248   .0432608     2.79   0.005     .0358352    .2054143
                   age |   .0150514   .0030632     4.91   0.000     .0090477    .0210551
       outpatient visits |   .0313531   .0030734    10.20   0.000     .0253294    .0373768
    outpatient_expenditure |   .0001385   .0000114    12.14   0.000     .0001161    .0001608
         inpatient_visits |   .6560519   .0780798     8.40   0.000     .5030183    .8090854
  inpatient_length_of_stay |  -.0049948   .0021604    -2.31   0.021    -.0092291   -.0007606
      inpatient_diagnoses |  -.0156891    .008959    -1.75   0.080    -.0332483    .0018702
     inpatient_expenditure |  -.0000118   3.33e-06    -3.53   0.000    -.0000183   -5.25e-06
physician_services_expenditure |   .0000457   6.82e-06     6.69   0.000     .0000323     .000059
         comorbidity_score |    .051755   .0103937     4.98   0.000     .0313837    .0721262
                   _cons |  -3.167231   .2562585   -12.36   0.000    -3.669489   -2.664974
-----------------------+------------------------------------------------------------------
                /lnalpha |   .4402911   .0364188                      .3689116    .5116707
-----------------------+------------------------------------------------------------------
                   alpha |   1.553159   .0565642                      1.44616    1.668076
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 3739.60 Prob>=chibar2 = 0.000
```

Table 35 shows results for emergency department visits. Compared to the non-deemed beneficiaries, ED_visits were 8.5% and 7.3% higher for the deemed and non-LIS beneficiaries respectively. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 1.1% lower ED_visits compared to the non-deemed beneficiaries who did not switch. This was not statistically significant. Similarly, beneficiaries who switched from non-deemed to non-LIS group had 2.9% lower ED_visits compared to the non-deemed beneficiaries who did not switch. This was also not significant.

Table 36: Inpatient Visits (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Negative binomial regression                    Number of obs   =     11808
                                                LR chi2(16)     =   6990.97
Dispersion     = mean                           Prob > chi2     =    0.0000
Log likelihood = -6236.7657                     Pseudo R2       =    0.3592

------------------------------------------------------------------------------
      inpatient_visits |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
           Non-Deemed | (base)
               Deemed |  -.0789528   .1159579    -0.68   0.496     -.306226    .1483204
              Non-LIS |   .0315073   .1184044     0.27   0.790    -.2005611    .2635757
                      |
          year (2010) |  -.0605668   .0425824    -1.42   0.155    -.1440268    .0228932
                      |
                  DID |
    switcher_to_Deemed |   .1134144   .1563063     0.73   0.468    -.1929404    .4197691
   switcher_to_Non-LIS |   .0277595   .1635814     0.17   0.865    -.2928541    .3483731
                      |
     beneficiary_race |
                black |   -.036962   .0647948    -0.57   0.568    -.1639575    .0900334
             hispanic |  -.0134058   .0939474    -0.14   0.887    -.1975394    .1707278
asian/pacific islander |  -.3404299   .2672851    -1.27   0.203     -.864299    .1834392
                other |   .0062471   .2093204     0.03   0.976    -.4040132    .4165075
                      |
        gender (male) |   .0511394   .0458743     1.11   0.265    -.0387726    .1410514
                  age |   .0192153   .0032801     5.86   0.000     .0127865    .0256441
 inpatient_claim_count |   .8310342   .0487354    17.05   0.000     .7355146    .9265537
inpatient_length_of_stay |  -.0324904    .001993   -16.30   0.000    -.0363965   -.0285842
   inpatient_diagnoses |   .0401032   .0050906     7.88   0.000     .0301258    .0500806
            ED_visits |   .0431197    .009618     4.48   0.000     .0242688    .0619707
     comorbidity_score |   .0631833   .0099991     6.32   0.000     .0435854    .0827813
                 _cons |  -3.860774   .2743859   -14.07   0.000     -4.39856   -3.322988
-----------------------+------------------------------------------------------------------
              /lnalpha |  -.7608453    .053778                     -.8662483   -.6554422
-----------------------+------------------------------------------------------------------
                 alpha |   .4672713   .0251289                      .4205263    .5192124
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 1751.54 Prob>=chibar2 = 0.000
```

As shown by the coefficients in Table 36, inpatient utilization was 8.0% lower for the deemed beneficiaries and 3.2% higher for the non-LIS group, compared to the deemed group. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 11.3% higher inpatient utilization compared to the non-deemed beneficiaries who did not switch. This was not statistically significant. Beneficiaries who switched from non-deemed to non-LIS group had 2.8% higher inpatient utilization compared to the non-deemed beneficiaries who did not switch. This was also not significant.

Hypothesis 2B: Health services expenditures will be the same between all of the groups.

The following regression models are for the estimation of total health expenditures for ED visits, outpatient visits, inpatient hospitalization and physician services for beneficiaries who switched status from non-deemed to deemed and non-deemed to non-LIS beneficiaries between 2009 and 2010. This analysis utilized a negative binomial regression. The GLM estimator addresses skewness by the choice of a distribution family (in this case the negative binomial distribution), and tackles the non-linearity by the choice of its link function (in this case the log function).

Table 37: Outpatient Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =     11808
Optimization     : ML                             Residual df     =     11790
                                                  Scale parameter =         1
Deviance         =  57749.92295                   (1/df) Deviance =  4.898212
Pearson          =  24498.48266                   (1/df) Pearson  =  2.077904

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  12.91247
Log pseudolikelihood = -76217.24522               BIC             =  -52799.4
```

outpatient_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Non-Deemed	(base)					
Deemed	-.0742521	.1013924	-0.73	0.464	-.2729775	.1244733
Non-LIS	-.0463814	.10137	-0.46	0.647	-.245063	.1523002
year (2010)	.8038893	.0289252	27.79	0.000	.747197	.8605816
DID						
switcher_to_Deemed	.0267562	.1131644	0.24	0.813	-.195042	.2485544
switcher_to_Non-LIS	-.0008057	.1134485	-0.01	0.994	-.2231607	.2215494
beneficiary_race						
black	-.0526361	.0422348	-1.25	0.213	-.1354147	.0301425
hispanic	.1920468	.0549864	3.49	0.000	.0842754	.2998183
asian/pacific islander	.1313421	.1534035	0.86	0.392	-.1693233	.4320075
other	.0073563	.1474486	0.05	0.960	-.2816376	.2963502
gender (male)	.1532323	.0318187	4.82	0.000	.0908689	.2155958
age	-.0026213	.0022121	-1.18	0.236	-.0069569	.0017144
outpatient_medicare_pay_amount	.0009157	.0000467	19.62	0.000	.0008242	.0010072
outpatient visits	.0620017	.0046719	13.27	0.000	.052845	.0711584
physician_services_expenditure	4.81e-07	4.85e-06	0.10	0.921	-9.02e-06	9.98e-06
ED_visits	.2481618	.0173674	14.29	0.000	.2141223	.2822012
ED_charge	-.0000355	.0000122	-2.92	0.004	-.0000594	-.0000117
comorbidity_score	.0453374	.007516	6.03	0.000	.0306062	.0600685
_cons	3.734365	.1848334	20.20	0.000	3.372098	4.096631

As shown by the coefficients in Table 37, outpatient expenditure was 7.4% lower for the deemed and 4.6% lower for the non-LIS group, compared to the non-deemed group. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 2.7% higher outpatient expenditure compared to the non-deemed beneficiaries who did not switch, and beneficiaries who switched from non-deemed to non-LIS group had a 0.08% lower outpatient expenditure compared to the non-deemed beneficiaries who did not switch. These effects were also not significant.

Table 38: Inpatient Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =     11808
Optimization     : ML                             Residual df     =     11786
                                                  Scale parameter =         1
Deviance         =  33894.96665                   (1/df) Deviance =  2.875867
Pearson          =  71365.26726                   (1/df) Pearson  =  6.055088

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  7.498031
Log pseudolikelihood = -44246.37436               BIC             = -76616.85
```

inpatient_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Non-Deemed	(base)					
Deemed	.1005667	.208564	0.48	0.630	-.3082112	.5093447
Non-LIS	-.0162204	.1218903	-0.13	0.894	-.255121	.2226801
year (2010)	-.0528915	.0790726	-0.67	0.504	-.207871	.102088
DID						
switcher_to_Deemed	.1474342	.3576587	0.41	0.680	-.5535639	.8484323
switcher_to_Non-LIS	.1424822	.201581	0.71	0.480	-.2526094	.5375737
beneficiary_race						
black	-.1427975	.0990812	-1.44	0.150	-.3369931	.051398
hispanic	-.0070428	.1396547	-0.05	0.960	-.2807609	.2666753
asian/pacific islander	-.6085542	.1943819	-3.13	0.002	-.9895356	-.2275727
other	-.2244224	.2391942	-0.94	0.348	-.6932345	.2443896
gender (male)	-.1417276	.0890147	-1.59	0.111	-.3161931	.0327379
age	.0257654	.0053105	4.85	0.000	.015357	.0361739
inpatient_visits	8.289424	.5268536	15.73	0.000	7.25681	9.322038
inpatient_claim_count	-2.820697	.4236218	-6.66	0.000	-3.650981	-1.990414
inpatient_length_of_stay	-.0644352	.0148418	-4.34	0.000	-.0935245	-.0353459
inpatient_diagnoses	.010724	.0276885	0.39	0.699	-.0435446	.0649925
ED_visits	.1704019	.0435534	3.91	0.000	.0850387	.255765
beneficiary_payment	.0028028	.0001868	15.00	0.000	.0024367	.003169
medicare_payment	.0000631	9.82e-06	6.43	0.000	.0000439	.0000824
physician_services_expenditure	.0000404	.0000154	2.63	0.009	.0000103	.0000705
ED_charge	.0000373	.0000498	0.75	0.454	-.0000603	.0001349
comorbidity_score	.1066048	.0203773	5.23	0.000	.066666	.1465435
_cons	-3.507325	.4278835	-8.20	0.000	-4.345962	-2.668689

As shown by the coefficients in Table 38, inpatient expenditure was 10.1% higher for the deemed and 1.6% lower for the non-LIS group, compared to the non-deemed group. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 14.7% higher inpatient expenditure compared to the non-deemed beneficiaries who did not switch, and beneficiaries who switched from non-deemed to non-LIS group had 14.2% higher inpatient expenditure compared to the non-deemed beneficiaries who did not switch. These effects were also not significant.

Table 39: Total Health Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =     11808
Optimization     : ML                             Residual df     =     11790
                                                  Scale parameter =  .6786334
Deviance         =  8558.814768                   (1/df) Deviance =  .7259385
Pearson          =   8001.08732                   (1/df) Pearson  =  .6786334

Variance function: V(u) = u^2                     [Gamma]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  17.82232
Log pseudolikelihood = -105204.9605               BIC             = -101990.5
```

health_services_expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Non-Deemed	(base)					
Deemed	-.0194101	.041837	-0.46	0.643	-.101409	.0625889
Non-LIS	-.0542917	.0423613	-1.28	0.200	-.1373184	.028735
year (2010)	.0547155	.016946	3.23	0.001	.0215019	.087929
DID						
switcher_to_Deemed	.0176792	.0586084	0.30	0.763	-.0971911	.1325495
switcher_to_Non-LIS	-.0013275	.0627257	-0.02	0.983	-.1242677	.1216126
beneficiary_race						
black	-.0281073	.024073	-1.17	0.243	-.0752895	.0190748
hispanic	-.0044049	.0354748	-0.12	0.901	-.0739342	.0651244
asian/pacific islander	-.2014488	.0775377	-2.60	0.009	-.3534198	-.0494778
other	-.0205929	.092933	-0.22	0.825	-.2027381	.1615524
gender (male)	.0092322	.0187935	0.49	0.623	-.0276023	.0460668
age	.0098685	.0013333	7.40	0.000	.0072552	.0124817
ED_visits	.0824049	.0122826	6.71	0.000	.0583314	.1064784
ED_charge	.0000263	.0000137	1.93	0.054	-4.74e-07	.0000531
comorbidity_score	.0328501	.0043812	7.50	0.000	.024263	.0414372
health_services_beneficiary_payment	.0002158	.0000309	6.97	0.000	.0001551	.0002764
health_services_tot_medicare_paymentamount	.0000566	2.33e-06	24.31	0.000	.000052	.0000611
health_services_utilization	.0285571	.0007187	39.74	0.000	.0271486	.0299656
_cons	5.639656	.1136083	49.64	0.000	5.416988	5.862324

The results for total health expenditure are shown in Table 39. The total health expenditure is 1.9% lower for deemed beneficiaries and 5.4% lower for non-LIS beneficiaries compared to the non-deemed group. These effects were not significant.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 1.8% higher total health services expenditure compared to the non-deemed beneficiaries who did not switch. Beneficiaries who switched from non-deemed to non-LIS group had a 0.1% lower total health services expenditure compared to the non-deemed beneficiaries who did not switch. These effects were not statistically significant.

PART 2: Hypothesis Testing on Prescription Utilization and Expenditures

Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS

AIM 3: Compare total drug expenditures and prescription drug utilization between deemed vs. non-deemed vs. non-LIS beneficiaries in 2009 and 2010

Hypothesis 3A: Total prescription drug utilization will be higher for beneficiaries in the lowest cost-share group.

The following regression models are for the estimation of prescription drug utilization between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. This analysis utilized two estimation methods. First, a poisson regression was conducted and mean was compared to the variance. Since the mean ≠ variance, the negative binomial regression (NBR) was estimated. The R^2 values were evaluated for both the poisson and NBR. Since the NBR's likelihood-ratio's alpha value for the Prob≥Chibar^2 = 0.000, then we reject the assumption that the mean ≠ variance and use the negative binomial regression for estimating utilization.

Table 40: Prescription Drug Utilization (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Negative binomial regression                    Number of obs   =     81156
                                                LR chi2(19)     =    114653.57
Dispersion     = mean                           Prob > chi2     =    0.0000
Log likelihood = -340500.64                     Pseudo R2       =    0.1441

------------------------------------------------------------------------------
        prescription count |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------------------+--------------------------------------------------------------------
                   Deemed  | (base outcome)
               Non-Deemed  |  -.0497479   .0120782    -4.12   0.000    -.0734209    -.026075
                  Non-LIS  |  -.3434564   .0110634   -31.04   0.000    -.3651402   -.3217726
                           |
     Group_Year_Interaction |
          Non-Deemed (2010) |   .0103637   .0168006     0.62   0.537    -.0225648    .0432922
             Non-LIS (2010) |   .0308592   .0133949     2.30   0.021     .0046056    .0571129
                           |
                time (2010)|   -.022671   .0030168    -7.51   0.000    -.0285839   -.0167581
                           |
          beneficiary_race |
                     black |   .0755562   .0044625    16.93   0.000     .0668099    .0843025
                  hispanic |  -.0123791    .003867    -3.20   0.001    -.0199583   -.0047999
     asian/pacific islander |  -.0572382   .0044794   -12.78   0.000    -.0660176   -.0484587
                     other |  -.0266361   .0091438    -2.91   0.004    -.0445577   -.0087145
                           |
                       age |    .000033   .0002148     0.15   0.878    -.0003881    .0004541
             total_quantity |    .000011   7.18e-07    15.29   0.000     9.57e-06    .0000124
       total_days_of_supply |   .0004565   2.42e-06   188.45   0.000     .0004518    .0004613
 beneficiary_patient_amount |   .0002231   8.48e-06    26.29   0.000     .0002064    .0002397
       total_subsidy_amount |   .0000227   5.44e-06     4.16   0.000      .000012    .0000333
    medicare_payment_amount |  -.000014   5.36e-06    -2.61   0.009    -.0000245   -3.50e-06
   prescription expenditure |   3.60e-06   5.32e-06     0.68   0.498    -6.83e-06     .000014
                        mpr |   .7734331   .0084788    91.22   0.000     .7568149    .7900513
             quantity_limit |    .004597   .0000985    46.68   0.000      .004404      .00479
         prior_authorization |   .0067097   .0007779     8.63   0.000     .0051851    .0082343
                      _cons |   2.144481   .0173072   123.91   0.000      2.11056    2.178403
---------------------------+--------------------------------------------------------------------
                  /lnalpha |  -1.967735   .0062378                     -1.979961   -1.955509
---------------------------+--------------------------------------------------------------------
                     alpha |   .1397731   .0008719                      .1380747    .1414925
------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 3.4e+05 Prob>=chibar2 = 0.000
```

Table 40 shows the estimation of prescription drug utilization between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. Prescription drug utilization was 5.0% lower for non-deemed beneficiaries and 34.4% lower for the non-LIS beneficiaries. These effects were statistically significant [95% CI: -0.0734209, -0.026075 (non-deemed) and -0.3651402, -0.3217726 (non-LIS)].

The combined interaction of group status and time (Group_Year_Interaction) shows that non-deemed beneficiaries had a 1.0% higher prescription drug utilization between 2009 and 2010 compared to the deemed beneficiaries, while the non-LIS group

had a 3.1% higher prescription drug utilization between 2009 and 2010 compared to the deemed. The Group_Year_Interaction was only significant for the non-LIS group (95% CI: 0.0046056, 0.0571129).

Hypothesis 3B: Total prescription drug expenditures will be higher for beneficiaries in the lowest cost-share group.

The following regression models are for the estimation of prescription drug expenditures between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. This analysis utilized a negative binomial regression. This analysis utilized a negative binomial regression. The GLM estimator addresses skewness by the choice of a distribution family (in this case the negative binomial distribution), and tackles the non-linearity by the choice of its link function (in this case the log function).

Table 41: Prescription Drug Expenditures (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Generalized linear models                         No. of obs      =     81156
Optimization     : ML                             Residual df     =     81136
                                                  Scale parameter =         1
Deviance         =  33625.45734                   (1/df) Deviance =  .4144333
Pearson          =  23522.32893                   (1/df) Pearson  =  .2899124

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  17.36543
Log pseudolikelihood = -704634.3449               BIC             = -883546.3

------------------------------------------------------------------------------
                             |               Robust
   prescription expenditure |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------------+------------------------------------------------------------------
                     Deemed | (base outcome)
                 Non-Deemed |   -.041469   .0162028    -2.56   0.010    -.0732259   -.0097121
                    Non-LIS |  -.0282789   .0222332    -1.27   0.203    -.0718551    .0152972
                            |
     Group_Year_Interaction |
          Non-Deemed (2010) |   .0032485   .0211906     0.15   0.878    -.0382843    .0447813
             Non-LIS (2010) |   .0006122   .0237358     0.03   0.979    -.0459092    .0471336
                            |
                time (2010) |  -.0195495   .0038671    -5.06   0.000    -.0271288   -.0119702
                            |
           beneficiary_race |
                      black |   .0099764    .005875     1.70   0.089    -.0015383    .0214912
                   hispanic |   .0274959   .0052368     5.25   0.000      .017232    .0377598
    asian/pacific islander  |   .0530074   .0057855     9.16   0.000      .041668    .0643468
                      other |  -.0135928   .0125088    -1.09   0.277    -.0381096    .0109241
                            |
                        age |   .0019356   .0002878     6.72   0.000     .0013714    .0024997
         prescription count |   .0015176   .0001152    13.17   0.000     .0012917    .0017435
              total_quantity |   1.70e-06   9.07e-07     1.88   0.060    -7.45e-08    3.48e-06
       total_days_of_supply |   .0000705   4.14e-06    17.01   0.000     .0000624    .0000786
 beneficiary_patient_amount |   .0006582   .0000184    35.68   0.000      .000622    .0006943
       total_subsidy_amount |   .0003937   2.30e-06   170.96   0.000     .0003892    .0003982
    medicare_payment_amount |   .0000531   2.23e-06    23.77   0.000     .0000487    .0000575
                       mpr |   1.323408   .0175657    75.34   0.000      1.28898    1.357836
            quantity_limit |   .0019285   .0001193    16.17   0.000     .0016947    .0021622
        prior_authorization |  -.0009652   .0011345    -0.85   0.395    -.0031888    .0012585
                      _cons |   5.393173   .0258277   208.81   0.000     5.342552    5.443795
------------------------------------------------------------------------------
```

Table 41 shows the estimation of prescription drug expenditure between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. Prescription drug expenditure was 4.1% lower for non-deemed beneficiaries and 2.8% lower for the non-LIS beneficiaries.

This effect was only statistically significant for the non-deemed group (95% CI: -0.0732259, -0.0097121). The combined interaction of group status and time (Group_Year_Interaction) was not statistically significant for either group.

MEDICATION ADHERENCE (Medication Possession Ratio – MPR)

The following regression models are for the estimation of prescription drug adherence between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. The prescription adherence measure (mpr) was coded as a binary variable 0/1 (non-compliant/compliant). The 0/1 indicator for mpr was determined using the average MPR calculated for each beneficiary inclusive of all the different classes of drugs used by the beneficiary. An mpr = 1 means a beneficiary is generally compliant with an actual average MPR ≥ 0.8, and mpr = 0 means the beneficiary is non-compliant with an average MPR <0.8. The binary adherence measure (mpr) was not normally distributed. A binary logistic regression (logit) was used to estimate the binary response. This model is a generalization of the binary logit model.

Table 42: Medication Possession Ratio (Non-Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Multinomial logistic regression                 Number of obs   =     81156
                                                LR chi2(15)     =     19435.25
                                                Prob > chi2     =     0.0000
Log likelihood = -38170.209                     Pseudo R2       =     0.2029

------------------------------------------------------------------------------
         mpr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
0 (mpr<0.8)  |  (base outcome)
-------------+----------------------------------------------------------------
1 (mpr ≥ 0.8)|
      Deemed |   (base)
  Non-Deemed |   .0815755   .0755376     1.08   0.280    -.0664755    .2296265
     Non-LIS |   .1095892   .0618797     1.77   0.077    -.0116928    .2308712
             |
Group_Year_Interaction |
Non-Deemed (2010) |  -.1381488   .1059229    -1.30   0.192    -.3457539    .0694563
             |
Non-LIS (2010) |  -.0718441   .0786401    -0.91   0.361    -.2259759    .0822878
             |
    time (2010) |  -.0443755   .0185734    -2.39   0.017    -.0807788   -.0079723
             |
beneficiary_race |
         black |  -.2046097   .0264478    -7.74   0.000    -.2564464   -.1527731
      hispanic |   -.305267   .0231383   -13.19   0.000    -.3506173   -.2599167
asian/pacific islander |  -.3136146   .0273921   -11.45   0.000     -.367302   -.2599271
         other |  -.1440403    .055844    -2.58   0.010    -.2534925   -.0345881
             |
           age |   .0027821   .0013216     2.11   0.035     .0001919    .0053723
prescription count |  -.0599472   .0011209   -53.48   0.000    -.0621441   -.0577504
  total_quantity |  -.0000169   4.61e-06    -3.66   0.000    -.0000259   -7.83e-06
total_days_of_supply |    .003116   .0000399    78.11   0.000     .0030378    .0031942
totalpatientpayamount |  -.0000746   .0000431    -1.73   0.083    -.0001591    9.83e-06
prescription expenditure |  -.0000213   2.70e-06    -7.88   0.000    -.0000265    -.000016
           _cons |  -.6217054   .0993941    -6.25   0.000    -.8165142   -.4268965
------------------------------------------------------------------------------
```

Table 42 shows the estimation of prescription drug adherence between deemed vs. non-deemed vs. non-LIS beneficiaries who did not switch groups between 2009 and 2010. Prescription drug adherence was 8.1% higher for non-deemed beneficiaries and 11.0% higher for the non-LIS beneficiaries. These effects were not statistically significant. The combined interaction of group status and time (Group_Year_Interaction) was not significant for either group.

Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS

AIM 4: Compare total drug expenditures and prescription drug utilization among beneficiaries who switched status: i.e. non-deemed to non-LIS, or non-deemed to deemed, or non-LIS to non-deemed, etc. between 2009 and 2010.

Hypothesis 4A: Total prescription drug utilization will be the same between all groups.

The following regression models are for the estimation of prescription drug utilization between beneficiaries who switched groups from deemed to non-deemed vs. deemed to non-LIS between 2009 and 2010. This analysis utilized two estimation methods. First, a poisson regression was conducted and mean was compared to the variance. Since the mean ≠ variance, the negative binomial regression (NBR) was estimated. The R^2 values were evaluated for both the poisson and NBR. Since the NBR's likelihood-ratio's alpha value for the Prob≥Chibar^2 = 0.000, then we reject the assumption that the mean ≠ variance and use the negative binomial regression for estimating utilization.

Table 43: Prescription Drug Utilization (Switchers: Deemed vs. Non-Deemed vs. Non-LIS)

```
Negative binomial regression                      Number of obs   =      75298
                                                  LR chi2(19)     =     111612.82
Dispersion     = mean                             Prob > chi2     =     0.0000
Log likelihood = -314817.24                       Pseudo R2       =     0.1506

-------------------------------------------------------------------------------------------
           prescription count |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------------------------+------------------------------------------------------------
                       Deemed |   (base)
                   Non-Deemed |  -.0452719   .0357542    -1.27   0.205    -.1153488     .024805
                      Non-LIS |   -.078284    .023079    -3.39   0.001     -.123518   -.0330499
                              |
                  time (2010) |  -.0259143   .0029156    -8.89   0.000    -.0316288   -.0201998
                              |
                          DID |
       switcher_to_Non-Deemed |  -.3634716   .0514401    -7.07   0.000    -.4642923   -.2626508
          switcher_to_Non-LIS |  -.7696586   .0350033   -21.99   0.000    -.8382637   -.7010535
                              |
             beneficiary_race |
                        black |  .0746327   .0044466    16.78   0.000     .0659176    .0833478
                     hispanic |   .008742   .0038658     2.26   0.024     .0011651    .0163189
       asian/pacific islander | -.0191531   .0044422    -4.31   0.000    -.0278597   -.0104466
                        other |  .0094645   .0090186     1.05   0.294    -.0082116    .0271405
                              |
                          age |  -.0000902   .0002163    -0.42   0.677     -.000514    .0003337
               total_quantity |   .0000124   7.32e-07    16.90   0.000     .0000109    .0000138
         total_days_of_supply |   .0004073   2.49e-06   163.72   0.000     .0004024    .0004121
   beneficiary_patient_amount |   .0016032    .000024    66.89   0.000     .0015562    .0016502
         total_subsidy_amount |   9.24e-06   9.61e-06     0.96   0.336    -9.59e-06    .0000281
totalcovereddplanpaidamount   |   1.27e-06   9.54e-06     0.13   0.894    -.0000174      .00002
      prescription expenditure|  -3.48e-06   9.52e-06    -0.36   0.715    -.0000221    .0000152
                          mpr |   .7794157   .0085017    91.68   0.000     .7627528    .7960787
               quantity_limit |   .0039397   .0000965    40.82   0.000     .0037506    .0041289
          prior_authorization |   .0063701   .0007626     8.35   0.000     .0048753    .0078648
                        _cons |   2.106854   .0174121   121.00   0.000     2.072727    2.140982
------------------------------+------------------------------------------------------------
                     /lnalpha |  -2.052464    .006568                      -2.065337   -2.039591
------------------------------+------------------------------------------------------------
                        alpha |    .128418   .0008434                       .1267755    .1300819
-------------------------------------------------------------------------------------------
Likelihood-ratio test of alpha=0:  chibar2(01) = 3.0e+05 Prob>=chibar2 = 0.000
```

Table 43 shows the estimation of prescription drug utilization between beneficiaries who switched from deemed to non-deemed vs. deemed to non-LIS between 2009 and 2010. Prescription drug utilization was 4.5% lower for non-deemed beneficiaries and 7.8% lower for the non-LIS beneficiaries. This effect was only statistically significant for the non-LIS group (95% CI: -0.123518, -0.0330499).

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had 36.3% lower prescription drug utilization compared to the deemed beneficiaries who did not switch. Beneficiaries who

switched from deemed to non-LIS group (switcher_to_Non-LIS) had 77% lower prescription drug utilization compared to the deemed beneficiaries who did not switch. These effects were both significant [95% CI: -0.4642923, -0.2626508 (non-deemed) and -0.8382637, -.7010535 (non-LIS)].

Hypothesis 4B: There will be no difference in total drug expenditures between the groups.

The following regression models are for the estimation of prescription drug expenditures between beneficiaries who switched groups from deemed to non-deemed vs. deemed to non-LIS between 2009 and 2010. This analysis utilized a negative binomial regression. This analysis utilized a negative binomial regression. The GLM estimator addresses skewness by the choice of a distribution family (in this case the negative binomial distribution), and tackles the non-linearity by the choice of its link function (in this case the log function).

Table 44: Prescription Drug Expenditures (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =     75298
Optimization     : ML                             Residual df     =     75278
                                                  Scale parameter =         1
Deviance         =  30398.30674                   (1/df) Deviance =   .403814
Pearson          =  20617.29482                   (1/df) Pearson  =  .2738821

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  17.38794
Log pseudolikelihood = -654618.5149               BIC             = -814914.1

------------------------------------------------------------------------------
                             |               Robust
   prescription expenditure |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------------+------------------------------------------------------------------
                     Deemed | (base outcome)
                 Non-Deemed |   .0406616   .0392558     1.04   0.300    -.0362782    .1176015
                    Non-LIS |  -.0526395   .0329693    -1.60   0.110    -.1172582    .0119792
                            |
                time (2010) |  -.0230376   .0038663    -5.96   0.000    -.0306154   -.0154598
                            |
                        DID |
     switcher_to_Non-Deemed |  -.4001823   .0660243    -6.06   0.000    -.5295876    -.270777
        switcher_to_Non-LIS |  -.7663967   .0590621   -12.98   0.000    -.8821564    -.650637
                            |
          beneficiary_race |
                      black |   .0178016   .0060157     2.96   0.003     .006011    .0295922
                   hispanic |   .0541055   .0053681    10.08   0.000     .0435843    .0646267
     asian/pacific islander |   .0833234   .0057952    14.38   0.000     .0719651    .0946817
                      other |    .007635   .0125594     0.61   0.543    -.0169808    .0322509
                            |
                        age |    .001448   .0002904     4.99   0.000     .0008789    .0020171
          prescription count |   .0000986   .0001403     0.70   0.482    -.0001765    .0003737
              total_quantity |   3.06e-06   1.36e-06     2.26   0.024     4.02e-07    5.72e-06
       total_days_of_supply |   .0000683   4.24e-06    16.10   0.000        .00006    .0000766
 beneficiary_patient_amount |   .0018095   .0000581    31.13   0.000     .0016956    .0019234
       total_subsidy_amount |   .0003833   2.45e-06   156.55   0.000     .0003785    .0003881
totalcovereddplanpaidamount |    .000058   2.21e-06    26.26   0.000     .0000537    .0000623
                        mpr |    1.32584   .0180619    73.41   0.000     1.290439     1.36124
             quantity_limit |   .0016907   .0001174    14.41   0.000     .0014607    .0019207
         prior_authorization |  -.0014351   .0010188    -1.41   0.159     -.003432    .0005617
                       _cons |   5.386284    .026379   204.19   0.000     5.334582    5.437986
------------------------------------------------------------------------------
```

Table 44 shows the estimation of prescription drug expenditure between beneficiaries who switched from deemed to non-deemed vs. deemed to non-LIS between 2009 and 2010. Prescription drug expenditure was 4.1% lower for non-deemed beneficiaries and 5.3% lower for the non-LIS beneficiaries. These effects were not statistically significant for either group.

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had 40.0% lower prescription drug expenditure compared to the deemed beneficiaries who did not switch. Beneficiaries who switched from deemed to non-LIS group (switcher_to_Non-LIS) had 76.6% lower prescription drug expenditure compared to the deemed beneficiaries who did not switch. These effects were both statistically significant [95% CI: -0.5295876, -0.270777 (non-deemed) and -0.8821564, -0.650637 (non-LIS)].

MEDICATION ADHERENCE (Medication Possession Ratio – MPR)

The following regression models are for the estimation of prescription drug adherence between beneficiaries who switched groups from deemed to non-deemed vs. deemed to non-LIS between 2009 and 2010. The prescription adherence measure (mpr) was coded as a binary variable 0/1 (non-compliant/compliant). The 0/1 indicator for mpr was determined using the average MPR calculated for each beneficiary inclusive of all the different classes of drugs used by the beneficiary. An mpr = 1 means a beneficiary is generally compliant with an actual average MPR ≥ 0.8, and mpr = 0 means the beneficiary is non-compliant with an average MPR <0.8. The binary adherence measure (mpr) was not normally distributed. A binary logistic regression (logit) was used to estimate the binary response. This model is a generalization of the binary logit model.

Table 45: Medication Possession Ratio (Switchers: Deemed to Non-Deemed vs. Deemed to Non-LIS)

```
Multinomial logistic regression                 Number of obs   =     75298
                                                LR chi2(15)     =  18130.28
                                                Prob > chi2     =    0.0000
Log likelihood = -35480.255                     Pseudo R2       =    0.2035

------------------------------------------------------------------------------
         mpr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
0 (mpr<0.8)  |  (base)
-------------+----------------------------------------------------------------
1 (mpr ≥ 0.8)|
             |
    Deemed |
  Non-Deemed |  -.0876381    .234695    -0.37   0.709    -.5476318    .3723557
     Non-LIS |  -.0021974     .13887    -0.02   0.987    -.2743776    .2699827
             |
    time (2010) |  -.0440737   .0185745    -2.37   0.018     -.080479   -.0076684
             |
         DID |
switcher_to_Non-Deemed|  -.2400324   .3215764    -0.75   0.455    -.8703106    .3902457
   switcher_to_Non-LIS|  -.1821632   .2020536    -0.90   0.367    -.5781809    .2138545
             |
 beneficiary_race |
       black |  -.2307762   .0272467    -8.47   0.000    -.2841788   -.1773737
    hispanic |  -.3344952   .0239501   -13.97   0.000    -.3814365   -.2875539
asian/pacific islander |  -.3289269   .0280814   -11.71   0.000    -.3839654   -.2738883
       other |  -.1464746   .0572394    -2.56   0.010    -.2586616   -.0342875
             |
         age |   .0027071    .001377     1.97   0.049     8.25e-06     .005406
prescription count |  -.0593878    .001184   -50.16   0.000    -.0617085   -.0570672
  total_quantity |  -.0000181   4.94e-06    -3.66   0.000    -.0000278   -8.41e-06
total_days_of_supply |   .0030854   .0000416    74.21   0.000     .0030039    .0031669
totalpatientpayamount |   .0001289   .0001395     0.92   0.356    -.0001445    .0004022
prescription expenditure |  -.0000225   2.79e-06    -8.07   0.000     -.000028   -.0000171
         _cons |  -.5997215   .1033763    -5.80   0.000    -.8023353   -.3971077
------------------------------------------------------------------------------
```

Table 45 shows the estimation of prescription drug adherence between beneficiaries who switched from deemed to non-deemed vs. deemed to non-LIS between 2009 and 2010. Prescription drug adherence was 8.7% lower for non-deemed beneficiaries and 0.2% lower for the non-LIS beneficiaries. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from deemed to non-deemed (switcher_to_Non-Deemed) had 24.0% lower prescription drug adherence compared to the deemed beneficiaries who did not switch. Beneficiaries who switched from deemed to non-LIS group (switcher_to_Non-LIS) had 18.2% lower

prescription drug adherence compared to the deemed beneficiaries who did not switch. These effects were both not statistically significant.

Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS

AIM 4: Compare total drug expenditures and prescription drug utilization among beneficiaries who switched status: i.e. non-deemed to non-LIS, or non-deemed to deemed, or non-LIS to non-deemed, etc. between 2009 and 2010.

Hypothesis 4A: Total prescription drug utilization will be the same between all groups.

The following regression models are for the estimation of prescription drug utilization between beneficiaries who switched groups from non-deemed to deemed vs. non-deemed to non-LIS between 2009 and 2010. This analysis utilized two estimation methods. First, a poisson regression was conducted and mean was compared to the variance. Since the mean ≠ variance, the negative binomial regression (NBR) was estimated. The R^2 values were evaluated for both the poisson and NBR. Since the NBR's likelihood-ratio's alpha value for the Prob≥Chibar^2 = 0.000, then we reject the assumption that the mean ≠ variance and use the negative binomial regression for estimating utilization.

Table 46: Prescription Drug Utilization (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Negative binomial regression                    Number of obs   =     2786
                                                LR chi2(19)     =     3483.64
Dispersion     = mean                           Prob > chi2     =     0.0000
Log likelihood = -11557.457                     Pseudo R2       =     0.1310

------------------------------------------------------------------------------
         prescription count |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------------------+-------------------------------------------------------------------
                 Non-Deemed | (base outcome)
                     Deemed |  -.0121791   .0448631    -0.27   0.786    -.1001092     .075751
                    Non-LIS |   -.093925   .0436948    -2.15   0.032    -.1795652   -.0082848
                            |
                time (2010) |  -.0238611   .0160232    -1.49   0.136    -.0552659    .0075438
                            |
                        DID |
          switcher_to_Deemed |   .0438087   .0642094     0.68   0.495    -.0820394    .1696568
        switcher_to_Non-LIS  |  -.0478292   .0658451    -0.73   0.468    -.1768833    .0812248
                            |
           beneficiary_race |
                      black |   .0413542   .0226877     1.82   0.068    -.0031129    .0858213
                   hispanic |  -.0437925     .02944    -1.49   0.137    -.1014939    .0139088
      asian/pacific islander |  -.0330944   .0797449    -0.42   0.678    -.1893915    .1232027
                      other |  -.1166843   .0690166    -1.69   0.091    -.2519543    .0185857
                            |
                        age |  -.0007424   .0010843    -0.68   0.494    -.0028675    .0013828
             total_quantity |   5.79e-06   2.63e-06     2.20   0.028     6.33e-07     .000011
       total_days_of_supply |   .0005438    .000012    45.23   0.000     .0005202    .0005674
 beneficiary_patient_amount |   .0001926   .0000431     4.47   0.000     .0001082    .0002771
       total_subsidy_amount |  -.0000451   .0000291    -1.55   0.122    -.0001022    .0000121
totalcovereddplanpaidamount |   .0000214   .0000262     0.82   0.414      -.00003    .0000728
   prescription expenditure |  -.0000187   .0000257    -0.73   0.465     -.000069    .0000316
                        mpr |   .4958454   .0491467    10.09   0.000     .3995195    .5921712
             quantity_limit |   .0072421   .0005834    12.41   0.000     .0060987    .0083855
        prior_authorization |   .0155163   .0049451     3.14   0.002      .005824    .0252086
                      _cons |   2.320129     .09187    25.25   0.000     2.140067    2.500191
----------------------------+-------------------------------------------------------------------
                   /lnalpha |  -2.061602   .0339823                     -2.128206   -1.994998
----------------------------+-------------------------------------------------------------------
                      alpha |     .12725   .0043242                      .1190507     .136014
------------------------------------------------------------------------------
```

Table 46 shows the estimation of prescription drug utilization between beneficiaries who switched from non-deemed to deemed vs. non-deemed to non-LIS between 2009 and 2010. Prescription drug utilization was 1.2% lower for non-deemed beneficiaries and 9.4% lower for the non-LIS beneficiaries. This effect was only statistically significant for the non-LIS group (95% CI: -0.1795652, -0.0082848).

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 4.4% higher prescription drug utilization compared to the non-deemed beneficiaries who did not switch. Beneficiaries who switched from non-deemed to non-LIS group (switcher_to_Non-LIS) had 4.8% lower prescription drug utilization compared to the non-deemed beneficiaries who did not switch. These effects were both not statistically significant.

Hypothesis 4B: There will be no difference in total drug expenditures between the groups.

The following regression models are for the estimation of prescription drug expenditures between beneficiaries who switched groups from non-deemed to deemed vs. non-deemed to non-LIS between 2009 and 2010. This analysis utilized a negative binomial regression. This analysis utilized a negative binomial regression. The GLM estimator addresses skewness by the choice of a distribution family (in this case the negative binomial distribution), and tackles the non-linearity by the choice of its link function (in this case the log function).

Table 47: Prescription Drug Expenditures (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Generalized linear models                         No. of obs      =      2786
Optimization     : ML                             Residual df     =      2766
                                                  Scale parameter =         1
Deviance         =   1015.86495                   (1/df) Deviance =  .3672686
Pearson          =  693.3298119                   (1/df) Pearson  =  .2506615

Variance function: V(u) = u+(1)u^2                [Neg. Binomial]
Link function    : g(u) = ln(u)                   [Log]

                                                  AIC             =  17.07593
Log pseudolikelihood = -23766.77071               BIC             = -20925.05
```

prescription expenditure	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Non-Deemed	(base outcome)					
Deemed	-.0499424	.0539	-0.93	0.354	-.1555845	.0556998
Non-LIS	-.0351371	.0577102	-0.61	0.543	-.148247	.0779727
time (2010)	-.0291772	.0199939	-1.46	0.144	-.0683645	.0100101
DID						
switcher_to_Deemed	.2814948	.0859777	3.27	0.001	.1129816	.4500079
switcher_to_Non-LIS	-.2431132	.1002624	-2.42	0.015	-.4396239	-.0466026
beneficiary_race						
black	.0153466	.0296325	0.52	0.605	-.0427321	.0734253
hispanic	-.0738913	.0422072	-1.75	0.080	-.1566158	.0088333
asian/pacific islander	-.0710292	.0880736	-0.81	0.420	-.2436503	.1015918
other	.2311401	.0828138	2.79	0.005	.0688281	.3934521
age	.0047727	.0014123	3.38	0.001	.0020047	.0075408
prescription count	.0013327	.0006338	2.10	0.036	.0000904	.0025749
total_quantity	9.87e-07	1.46e-06	0.68	0.498	-1.87e-06	3.84e-06
total_days_of_supply	.0001182	.0000235	5.02	0.000	.0000721	.0001644
beneficiary_patient_amount	.001377	.0001142	12.06	0.000	.0011532	.0016007
total_subsidy_amount	.0002003	.0000244	8.21	0.000	.0001525	.0002481
totalcovereddplanpaidamount	.0000842	.0000251	3.35	0.001	.0000349	.0001334
mpr	1.030757	.1058874	9.73	0.000	.8232219	1.238293
quantity_limit	.0042185	.0007639	5.52	0.000	.0027213	.0057158
prior_authorization	-.0008625	.0070549	-0.12	0.903	-.0146898	.0129647
_cons	5.170484	.1484131	34.84	0.000	4.879599	5.461368

Table 47 shows the estimation of prescription drug expenditure between beneficiaries who switched from non-deemed to deemed vs. non-deemed to non-LIS between 2009 and 2010. Prescription drug expenditure was 5.0% lower for deemed beneficiaries and 3.5% lower for the non-LIS beneficiaries. These effects were not statistically significant for either group.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 28.1% higher prescription drug expenditure compared to the non-deemed beneficiaries who did not switch. Beneficiaries who switched from non-deemed to non-LIS group (switcher_to_Non-LIS) had 24.3% lower prescription drug expenditure compared to the non-deemed beneficiaries who did not switch. These effects were both significant [95% CI: 0.1129816, 0.4500079 (deemed) and -0.4396239, -0.0466026 (non-LIS)].

MEDICATION ADHERENCE (Medication Possession Ratio – MPR)

The following regression models are for the estimation of prescription drug adherence between beneficiaries who switched groups from non-deemed to deemed vs. non-deemed to non-LIS between 2009 and 2010. The prescription adherence measure (mpr) was coded as a binary variable 0/1 (non-compliant/compliant). The 0/1 indicator for mpr was determined using the average MPR calculated for each beneficiary inclusive of all the different classes of drugs used by the beneficiary. An mpr = 1 means a beneficiary is generally compliant with an actual average MPR ≥ 0.8, and mpr = 0 means the beneficiary is non-compliant with an average MPR <0.8. The binary adherence measure (mpr) was not normally distributed. A binary logistic regression (logit) was used to estimate the binary response. This model is a generalization of the binary logit model.

Table 48: Medication Possession Ratio (Switchers: Non-Deemed to Deemed vs. Non-Deemed to Non-LIS)

```
Multinomial logistic regression                 Number of obs   =       2786
                                                LR chi2(15)     =     608.89
                                                Prob > chi2     =     0.0000
Log likelihood = -1255.0407                     Pseudo R2       =     0.1952

------------------------------------------------------------------------------
         mpr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
0 (mpr<0.8)  |  (base outcome)
-------------+----------------------------------------------------------------
1 (mpr ≥ 0.8)|   (base)
  Non-Deemed |
      Deemed |   .1014089   .2979565     0.34   0.734    -.4825751    .6853929
     Non-LIS |   .1545848   .2878012     0.54   0.591    -.4094951    .7186648
             |
   time (2010) |  -.1880785   .1055883    -1.78   0.075    -.3950277    .0188707
             |
         DID |
switcher_to_Deemed |   .1170512   .4313547     0.27   0.786    -.7283885    .9624909
switcher_to_Non-LIS |  -.2658489   .4013932    -0.66   0.508    -1.052565    .5208672
             |
beneficiary_race |
       black |  .0384887   .1450794     0.27   0.791    -.2458618    .3228392
    hispanic |  .0700176   .1797773     0.39   0.697    -.2823394    .4223746
asian/pacific islander |  1.332719   .6485073     2.06   0.040     .0616682     2.60377
       other |  -.420653   .4017073    -1.05   0.295    -1.207985    .3666788
             |
         age |  -.0007026   .0071085    -0.10   0.921    -.0146351    .0132298
prescription count |  -.0660348   .0060368   -10.94   0.000    -.0778667   -.0542028
    total_quantity |  -2.73e-06   .0000123    -0.22   0.824    -.0000267    .0000213
total_days_of_supply |   .0033347   .0002178    15.31   0.000     .0029077    .0037616
totalpatientpayamount |  -.0001174   .0002276    -0.52   0.606    -.0005634    .0003286
prescription expenditure |  -.0000298    .000015    -1.99   0.047    -.0000591   -4.37e-07
       _cons |  -.3628668    .547641    -0.66   0.508    -1.436223    .7104898
------------------------------------------------------------------------------
```

Table 48 shows the estimation of prescription drug adherence between beneficiaries who switched from non-deemed to deemed vs. non-deemed to non-LIS between 2009 and 2010. Prescription drug adherence was 10.1% higher for deemed beneficiaries and 15.5% higher for the non-LIS beneficiaries. These effects were not statistically significant.

The differences in differences (DID) shows that beneficiaries who switched from non-deemed to deemed (switcher_to_Deemed) had 11.7% higher prescription drug adherence compared to the non-deemed beneficiaries who did not switch. Beneficiaries

who switched from non-deemed to non-LIS group (switcher_to_Non-LIS) had 26.6% lower prescription drug adherence compared to the non-deemed beneficiaries who did not switch. These effects were also not statistically significant.

POWER ANALYSES

Power is the probability of detecting an outcome effect, given that the effect is really present. Power analyses are appropriate when there is concern about the correct rejection, or not, of the null hypothesis. In this study, this concern arises from the result estimates for beneficiaries who switched LIS status between 2009 and 2010, primarily because of the low sample size of beneficiaries who switched LIS groups and the consistent "non-significant" findings for the outcomes estimated in these groups. As a result, power analyses were conducted for beneficiaries who switched from deemed (2009) to non-deemed or non-LIS (2010) and for those who switched from non-deemed (2009) to deemed or non-LIS (2010). No analysis was conducted for beneficiaries switching from non-LIS (2009) to deemed or non-deemed (2010) because of the relatively low number of switching (page 93). In this context, the power analyses were conducted in order to obtain a more refined estimate of the population size effect, using the sample size of each switching group and the comparator group, an alpha = 0.05 and two-tailed. The results showed that, in some cases, a much larger sample size would be needed in order to detect the smallest difference in the outcome variable. In other instances, especially in situations where there was a large difference in the outcome

effect, the study did not have enough power to detect a statistically significant difference. This is explored further under the Limitations of this study.

Table 49: Power Analyses for Beneficiaries who Switched LIS status

	Sample size	OP Utilization	OP Expenditure	IP Utilization	IP Expenditure	Total Health Expenditure	RX Utilization	RX Expenditure	MPR
Deemed to Deemed (comparator)	153,940	-	-	-	-	-	-	-	-
Deemed to non-deemed	442	0.0509	0.1031	0.1837	0.1581	0.0732	0.6966	0.3724	0.1118
Deemed to non-LIS	1,526	0.96	0.9744	0.9971	0.992	0.1862	0.9936	0.2846	0.2678
Non-deemed to non-deemed (comparator)	5,171	-	-	-	-	-	-	-	-
Non-deemed to deemed	379	0.0507	0.0837	0.1792	0.2947	0.0666	0.4628	0.2583	0.0913
Non-deemed to non-LIS	354	1.00	0.2303	0.98	1.00	0.0536	1.00	0.3485	0.2099

Table 49 shows the power calculation for beneficiaries who switched groups. No distinct pattern or correlation was identified between the power and the statistical significance for each outcome. For example, the power for detecting a difference in the MPR outcome is very low across the board, primarily because the difference is very small and would require a very large sample size to detect. The overall take away from this analysis is that, in quite a few of these cases, the analysis did not have the statistical power and/or sample size needed to detect a difference in the outcome. Even so, the findings from this study can still be instructive, especially if the outcomes are biologically significant (for example, MPR).

CHAPTER 5: DISCUSSION

CHAPTER OUTLINE:

Based on the complexity of the Medicare program and the different constituencies affected by outcome of this evaluation, the discussion is framed under different perspectives including Taxpayer, Health Care Reform, Medicare (Health Plan), Beneficiary/Patient and Clinical. First, the results are explored and interpreted through the lens of Grossman's theory of the demand for health insurance, the conceptual framework used in this study. Finally, this discussion will look into future opportunities and areas for research and will end with major conclusions.

GROSSMAN'S THEORY

This study focuses on the Low Income Subsidy (LIS) component of the Medicare Part D program. A plethora of studies have been conducted on the effect of insurance on health care utilization and the corresponding effect on health and health outcomes (Leibowitz et. al., 1985; Manning et. al., 1987; Poisal, et. al., 2001; Pauly M.V., 2004).

Prior work from several studies suggests that financial incentives such as subsidies targeted at reducing cost-share, lowering premiums and out-of-pocket (OOP) costs can have positive effects on access and adherence to medications (Pauly M.V., 2004; Trottmann et. al., 2011). Contrarily, other studies such as the Rand Health Insurance Experiment, have found that reduced cost sharing is sub-optimal because it can lead to moral hazard (Johnson et.al., 1997; Ringel et. al., 2007).

Within the Medicare Part D population, a myriad of studies across the board have shown conflicting results regarding the effects of subsidized cost-sharing on expenditure, utilization and outcomes (Goldman et. al., 2007; Stuart et. al., 2007; Zhang et. al., 2009); however, results from studies specifically comparing deemed vs. non-deemed vs. non-LIS beneficiaries' medication and health services utilization and expenditure have been equivocal. This study builds logically on prior work in this area by specifically evaluating the impact of low income subsides on the medication and health services utilization and expenditures of non-institutionalized Medicare beneficiaries enrolled in fee for service Medicare Part D plans.

The first objective was to compare health services utilization (emergency department visits, outpatient visits and inpatient hospitalization) across Medicare Part D low-income cost-share status (deemed vs. non-deemed vs. non-LIS) in 2009 and 2010, while the second objective was to compare prescription drug utilization and total drug expenditure across Medicare Part D low-income cost-share status (deemed vs. non-deemed vs. non-LIS) in 2009 and 2010.

A key AIM of this analysis was to specifically evaluate prescription drug utilization, total drug expenditure and health services utilization between beneficiaries who switched status from a full subsidy group with $0 cost-share on prescription drugs (deemed), to a partial subsidy group with moderate cost-share (non-deemed), or to a no subsidy group with highest cost-share (non-LIS), and vice versa, between 2009 and 2010.

This fits nicely with Grossman's theory of the demand for health care, the conceptual framework used in this study. Grossman's theory, which encompasses the

"economic theory" and the "human capital theory," provides the conceptual framework for interpretation of the demand for prescription drugs and other health care services in relation to a beneficiary's resource constraints, preferences and consumption needs over their life cycle. Specifically, Grossman's model was used to interpret the individual's demand for prescription drugs based on his cost-share status (deemed vs. non-deemed vs. non-LIS), and the potential offsets in utilization and expenditure on health care services.

Results from this study showed that 1.3percent (1,968) deemed (fully subsidy) beneficiaries moved to a partial subsidy (non-deemed) or lost their LIS status – moved to no subsidy (non-LIS) between 2009 and 2010. Similarly, 12.42 percent (733) of partial subsidy (non-deemed) beneficiaries lost their LIS status by moving to no subsidy (non-LIS) status or switched status to full subsidy (deemed) between 2009 and 2010. Perhaps a more striking result is the fact that only1 percent (74) of non-LIS beneficiaries switched group status. Because this group supposedly includes LIS eligible members (see Chapter 3), the expectation was that this group will have the most movement since the financial gains non-LIS members stand to receive from switching status to a lower cost-share group was substantial.

Notwithstanding, the findings from this study are consistent with reports from CMS, which showed that only 40 percent of eligible non-deemed beneficiaries actually received the LIS in 2009 (see Figure 3). A simple interpretation of this finding is that exogenous to income status, there are other factors influencing a beneficiary's decision to apply for the program or navigate the process to maintain or switch his or her current cost-share status to a more favorable one. Some of these factors that have been found

include but are not limited to patient health status, knowledge of the program, access to application materials, family support and savvy, but these were not the focus of this study. At the core of this question is how individuals allocate their resources to produce health? How do those beneficiaries who do, make the decision to apply?

The human capital theory assumes that beneficiaries are continuously building up their individual health capita to produce health. In Grossman's framework, individuals inherit an initial stock of health, which depreciates over time (with age) and improves by investment. When individuals perceive their health stock below some desirable level, they will seek to increase their health status by combining inputs of medical goods and services, and other non-medical goods and their own time to improve their health stock. Since the demand for prescription drugs, which is a type of medical good, is a derived demand for good health, one would expect beneficiaries who perceive their health stock to be low, would pursue or purchase prescription drugs in order to improve their health stock; however, to what extent does this apply? Is an individual who is unaware of the LIS program or does not have access to the necessary resources to apply, or lacks the savvy to navigate the process negligent? Does it mean that these beneficiaries' perceived health stock is not low enough to motivate them to find the means to apply? An alternative argument is that patients dislike taking medications as it suggests they are not well and remind them of their poor health status. It is relevant to note though that this study did not evaluate patients' perceptions.

The human capital theory argues that individuals who are vested in their health will invest the human capital necessary to optimize their cost-share status favorably in

order to increase their health stock. The theory also posits that although individuals value their health, they do not value it above all else. This means that, if they did, they would only embark on habits and activities, which maximize their health in the first place. Therefore, beneficiaries will avoid unhealthy habits such as smoking, alcohol consumption, speeding or stress and, along those lines, do all they can to optimize their LIS status and improve their health status.

There is a limitation on how the human capital theory can be interpreted in this study. For example, it cannot be claimed, asserted or verified that every instance of a beneficiary's failure to enroll for, or maintain, LIS status is attributable to human capital or the lack thereof. The presumption that every beneficiary's failure to enroll is related to human capital is problematic in that there are many notable confounding factors such as health status, age, access to application materials, support system, location, etc. that can influence enrollment. The true difference in human capital focuses on a beneficiary's innate ability which can be influenced by beneficiary heterogeneity even when individuals are in similar situations, have similar opportunities and face similar economic constraints. It is also important to note that the human capital theory only applies to non-deemed and non-LIS beneficiaries who have to apply to get LIS benefits. Since the deemed beneficiaries are automatically enrolled into the LIS program, the human capital theory doesn't apply.

The next dimension of the LIS program and the switching dynamic focuses on how beneficiaries behave before and after switching LIS status. For instance, one may question whether a beneficiary changes his or her prescription buying behavior after

switching from full subsidy (deemed) to partial (non-deemed) or no subsidy (non-LIS) status and vice versa. Suppose switching groups changes a beneficiary's prescription buying behavior, is there a corresponding change in health services utilization?

The impetus for these questions is based on results from prior studies showing that beneficiaries with LIS benefits obtain more brands than generic medications compared to non-LIS beneficiaries. This has traditionally been attributable to moral hazard; caused by the fact LIS beneficiaries pay lower out-of-pocket costs compared to other Part D beneficiaries.

Moral hazard is the centerpiece of the economic theory, which states that when a beneficiary (consumer) is assessed the full price of a prescription drug (commodity) and has enough information about the drug's benefits and adverse effects, he or she will consume an optimal amount of the drug given his preferences and income constraints (Grossman, 1972).

Results from this study (Table 19) show that beneficiaries who switched from deemed (full subsidy) to non-deemed (partial subsidy) or non-LIS (no subsidy) status had statistically significantly lower prescription drug utilization [5.0% (non-deemed) and 34.3% (non-LIS)]. Similarly, expenditures on prescription drugs were lower by 40% (non-deemed) and 76.6% for non-LIS beneficiaries. Both were statistically significant as well.

These results imply that as beneficiaries move from full subsidy (lowest cost-share) to partial subsidy (modest cost-share) and to no subsidy (highest cost-share), they utilize less prescription drugs and have a corresponding reduction in expenditure. Yet,

results from the prescription adherence measure, medication possession ratio (MPR), remained high but unchanged. Since MPR is unchanged, then the results imply that as beneficiaries are exposed to the true cost of the drugs (high cost-share), they adjusted their behavior to utilize an optimal amount of prescriptions. As such, the amount of reduction in prescription drug utilization and expenditure after switching from full subsidy to partial or no subsidy is the magnitude (unit) and cost of moral hazard respectively.

By this logic one would expect that as beneficiaries switch from partial subsidy (non-deemed) to full subsidy (deemed) status there would be an increase in their prescription drug utilization and expenditures; while beneficiaries who switch from partial subsidy (non-deemed) to no subsidy (non-LIS) would decrease their prescription drug utilization and expenditures. The results from this study (Table 20) are somewhat consistent with this expectation since there was no statistically significant difference in prescription drug utilization between beneficiaries who switched from partial to full subsidy or from partial to no subsidy. However, there was a marked increase (28.2%) in expenditure for beneficiaries who switched from partial to full subsidy, and a 24.1% decrease in expenditure for beneficiaries who switched from partial to no subsidy. Meanwhile, the prescription adherence measure, medication possession ratio (MPR), still remained high but unchanged. The difference in expenditures can be explained by the fact that beneficiaries switched from taking generic medications to more expensive brands as they switched from partial subsidy (moderate cost-share) to full subsidy (no cost-share) status. Another explanation for the observed change in expenditure is shown

in Table 10; beneficiaries in the full subsidy (deemed) group had more claims processed with prior authorization edits, an indication they were accessing drugs that are typically more expensive and in a higher tier. Contrarily, as beneficiaries switched from partial subsidy (moderate cost-share) to no subsidy (high cost-share) status and were exposed to the full cost of the drugs, they adjusted their prescription buying behaviors to purchasing cheaper generic alternatives rather than branded products (Appendices I and J).

These results supported the arguments in the economic theory by showing that beneficiaries were rational – when exposed to higher prescription drug prices, they evaluated the costs and benefits of drugs against other methods of producing health before purchasing an optimal combination of prescription drugs and other goods and services that maximized their health outcome, subject to the individual's income constraints.

Overall, while the effects of switching led to a quantifiable amount of moral hazard in terms of both prescription drug utilization and/or expenditures, the result showed a net zero effect on medication adherence. As a result, after adjusting for different confounders such as comorbidity risk, age, gender, one would expect switching to have a net zero effect on health services utilization due to net zero change in medication adherence. This linkage is important because it is the primary tenet of justification for most prescription-based health care subsidies such as the low-income subsidy, 340B drug pricing for disproportionate share hospitals and clinics, retiree drug subsidy for employers and unions, employer group waiver plans for employers, etc.

These programs subsidize drug costs, thereby making prescription drugs less costly and more accessible to qualified beneficiaries and ultimately improve medication adherence.

Poor or non-adherence had negative health effects with an estimated annual economic burden upward of 290 billion dollars to U.S. employers and taxpayers (NEHI, 2009). A demonstration of the impact of the LIS program on beneficiary access and adherence to their medication regimen has been the primary justification for funding these types of prescription-based subsidy programs. This was not the case in this study as medication adherence remained unchanged.

Proponents of the LIS program argued that a typical downstream effect of subsidized prescription drug programs are the direct medical spending offsets in addition to potential offsets on other costs of poor or non-adherence such as emergency department visits, absenteeism, productivity, etc. The results from this study found the effect of LIS status (Table 15) and switching between groups (Table 16) on health services utilization to be equivocal. As beneficiaries switch from full subsidy (deemed) to partial subsidy (non-deemed) or no subsidy (non-LIS) status, the change in health services utilization and expenditures were inconsistent. For example, outpatient visits decreased by 9.9 percent and, 10.0 percent for both the partial subsidy (non-deemed) and no subsidy (non-LIS) respectively; however, this was only significant for beneficiaries who switched from full to no subsidy. Similarly, outpatient expenditure increased by 29.3 percent (partial subsidy) and 3.2 percent (no subsidy); however, this was only significant for the partial subsidy (non-deemed) group. This was also the case for health services utilization. Not surprisingly, the comorbidity (Charlson) score remained unchanged.

For the beneficiaries switching from full subsidy (deemed) to partial (non-deemed) or no subsidy (non-LIS) status, the downstream effect of subsidized prescription drug programs on medical utilization and spending offsets also showed mixed results. Health services utilization, which combines utilization across the board, declined by 10.2 percent and 9.1 percent for beneficiaries switching from full to partial and no subsidy status respectively. This was only significant for beneficiaries who switched from full subsidy to no subsidy. Total health services expenditure also declined by 3.4 percent and 7.2 percent for beneficiaries switching from full to partial and full to no subsidy status respectively. Neither of these declines was significant.

The results for beneficiaries switching from partial (non-deemed) to full subsidy (deemed) or no subsidy (non-LIS) status (Table 17), showed no difference in the downstream effect of subsidized prescription drug programs directly offsetting medical utilization and spending. Again, comorbidity (Charlson) score remained unchanged, indicating no change in health status.

As with the human capital theory, there are limitations with the interpretation of the implications of the economic theory, as well. The key assumption of the economic theory is that beneficiaries are rational and are knowledgeable about the combination of health care goods and services, which they then choose to purchase in order to maximize their health. The primary challenge with this assertion is that the health care market is uniquely different from the market for other goods and services. This was addressed in Pauly's 1978 influential paper on whether health care is different from other goods and services produced in the economy (Pauly M.V., 1978). Pauly posited that health care is

different because of government intervention, uncertainty, asymmetric information, externalities, equity considerations and the lack of meaningful prices. If health care were really different, then normal economic principles and the economic theory would not apply to the Medicare population. For example, there is significant government involvement in health care, which restricts competition through regulations and barriers to entry (Santerre and Neun, 2009). With a limited number of health care suppliers, there are fewer competitors for beneficiaries to shop from for the best prices. Additionally, the government can also set price controls and offer subsidies, which distorts market prices (Santerre and Neun, 2009). For example, in a competitive economy, prices are viewed as meaningful signals. As a result, rising prices indicate an increase in demand or a decrease in supply. Moreover, in a competitive economy, the price of a commodity represents the marginal cost of the resources used to provide the commodity (Pauly M.V., 1978). Therefore, prices have normative meanings in a competitive economy. In the health care sector these meanings are inconsistent; however, because many prices exist for the same health care service or prescription drugs in the same market, even from the same supplier (Pauly M.V., 1978). As such, there is simply a lack of competitive prices in the health care market. Therefore, with no consistently competitive market prices beneficiaries are unable to shop for competitive prices for health care services and prescription drugs.

Furthermore, uncertainty pervades the healthcare sector and the health care product is ill defined, making it difficult for the beneficiary to understand what he or she is actually buying (Santerre and Neun, 2009). Along those same lines, asymmetric information is implicit between beneficiaries and medical providers (Pauly M.V., 1978).

Even if beneficiaries have general information about treatment course or prescribed medicine, there is always uncertainty about whether the treatment course or medication will work or whether there will be complications or adverse events. This uncertainty or asymmetric information can influence a beneficiary's decision to buy or not to buy a product and can cause inefficiencies in the market, if a provider or prescriber uses this information asymmetry to sell beneficiaries services they don't need.

Similarly, the health care market is uniquely different in the sense that patients are not able to make the ultimate decision about their care, as is the case with traditional markets. With key players such as third-party insurers and pharmacy benefits managers, physician and pharmacy networks, formularies, and clinical edits, patients are told what medications to use, which physicians to see, and are expected to comply. This does not leave any room for shopping around or applying one's rational compass.

A final and very important limitation of the economic theory is that patients are unable to apply opportunity costs in order to rationally forgo some health care services and prescription drugs in preference of others. This may not always be true, especially if the patient has multiple chronic illnesses that are of equal importance. Even if they try, patients may not have the necessary resources or knowledge to be able to shop around and evaluate available choices and make a rationally informed decision.

These factors are present in other industries as well, but in no other industry are they all present. As a result, there is some limitation to applying the economic theory to this study population.

MEDICARE (HEALTH PLAN) PERSPECTIVE

Medicare health plans receive a substantial portion of their revenue from federal subsidies. Nearly 90 percent of plans' revenues come from various Medicare subsidies (Decarolis, 2012). Therefore, the way these subsidies are set and managed is a crucial component of understanding plan prices, the cost of the program and the efficiency of the system. In 2010, the low-income subsidy accounted for 19.9 billion of the 57.3 billion dollars paid to Medicare health plans; making the LIS the single most important source of revenue to Medicare plans (Decarolis, 2012).

Under the traditional fee for service (FFS) model, Medicare plans have typically complained about Medicare's lower average payment rates to providers compared with private payers' rates (MedPAC, 2011). This FFS arrangement has one critical desirable characteristic not present under a capitated arrangement, in that it removes the provider's incentive to aggressively pursue and set in place stringent utilization management programs (MedPAC, 2011). Therefore, under FFS, beneficiary health outcomes have no direct budgetary constraints for plans. As such, Medicare FFS plans are only concerned about other regulatory requirements such as "non-payment for never events" (AHRQ 2012), "Star Ratings program" (CMS 2013), "Medication Therapy Program" (CMS, 2013), etc., which can influence reimbursement under the FFS arrangement.

This study included only beneficiaries who are enrolled in a FFS plan. The study starts by comparing health services and prescription drug utilization and expenditures between beneficiaries with full subsidy (deemed) vs. partial subsidy (non-deemed) vs. no subsidy (non-LIS). The results show that beneficiaries with the highest subsidies (lowest

cost-share) tend to have the highest prescription drug utilization and expenditures. This is expected under an FFS model since beneficiaries are not exposed to the full effect of the cost. For example, in 2010, beneficiaries with full subsidies pay $0 deductible, $0 co-pay, $1.10 for a generic and $3.20 for a brand drug at the point-of-sale, while beneficiaries with partial subsidy pay $0 copay/deductible, and $2.40 for a generic and $6.0 for a brand drug at the point-of-sale. Beneficiaries with no subsidy, however, pay the standard Part D benefit, $60 deductible, 15 percent coinsurance, and $2.40 for a generic and $6.0 for a brand drug at the point-of-sale. Results show partial subsidy beneficiaries used 5 percent less prescriptions, while no subsidy individuals had 34.4% fewer prescriptions compared to full subsidy individuals.

Similarly, expenditures for partial subsidy beneficiaries was 4.2 percent lower than the full subsidy individuals, while no subsidy individuals had 28.3 percent lower expenditures compared to full subsidy individuals. Interestingly, despite the change in prescription drug utilization and expenditures, there was no change in medication adherence, indicating this may not be the most appropriate use of those resources.

The association between the level of subsidies a beneficiary received and the health services utilization and expenditures, however, is mixed. For example, health services utilization was lower for the partial subsidy (non-deemed) group, but higher for the group with no subsidy (non-LIS). The total health services expenditure was significantly higher (10.8 percent) only for the non-LIS group. Regardless, there was no change in comorbidity risk between the groups.

The hypothesis was that there would be a difference in prescription drug

utilization and expenditures primarily because of the income effects of subsidies on prescription drugs. Conversely, the hypothesis on health services utilization and expenditures was that there will be no difference, and this is primarily because 12 months is not enough exposure to prescriptions in order to improve medication adherence and make a significant impact on beneficiaries' health status, leading to medical utilization and spending offsets. Since the results from this study showed no change in medication adherence or comorbidity risk, it is no surprise that there were no offsets on health services utilization and expenditures.

The second objective of this study was directed at evaluating beneficiary behavior after switching subsidy groups, i.e. full subsidy in 2009 to partial or no subsidy in 2010, or, from partial subsidy in 2009 to full or no subsidy in 2010. The target of this analysis was moral hazard. The hypothesis for this analysis, focused on the income effect of the subsidy and its price distortions. It was hypothesized that beneficiaries with full subsidies will use more drugs and have higher expenditures than beneficiaries with partial or no subsidy. Results showed that beneficiaries who switched from full subsidy to partial subsidy, and from full subsidy to no subsidy had a 36.3 percent and 77 percent reduction in prescription drug utilization respectively, with a corresponding 40 percent and 76.6 percent reduction in expenditures respectively. Beneficiaries who switched from partial subsidy to full or no subsidy had no significant change in utilization. However, expenditures increased by 28 percent as beneficiaries switched from partial to full subsidy and decreased by 24 percent as they switched from partial to no subsidy. Notwithstanding, medication adherence and comorbidity risk remained unchanged and

there was no medical utilization and spending offset.

Moral hazard, up to this point has been discussed in the context of the beneficiaries. Yet, beneficiaries are not always the cause. Within the context of the Medicare plan, moral hazard can be evaluated by how judiciously the health plan administers Medicare benefits under the guidance of the Medicare law. Although Medicare plans do not determine which subsidies beneficiaries are eligible for, or how much subsidy is too much, they are required to establish reasonable and appropriate processes and utilization management programs to prevent overutilization (42 C.F.R §423.153 et seq.) (AMCP, 2013). Plans have an inherent responsibility to utilize the best plan management strategies to optimize the level of care beneficiaries receive in order to provide value for taxpayers.

In the fee for service context, the definition of moral hazard also applies to the failure of plans to set in place appropriate steps to incentivize the use of services and procedures that are supported by clinical evidence, a failure to ascertain medical necessity, a failure to provide high quality care, or a lack of the proper processes and procedures to reduce fraud, waste and abuse at the provider level. Moral hazard can also be applied to how plans select formulary products and the clinical edits they set in place to appropriately manage the utilization of specialty and expensive brand medications.

Moral hazard calls for plans to be judicious with taxpayer dollars in order to ensure the sustainability of the Medicare program. It goes to the very essence of our national debate on health care. When health plans fail at this responsibility, the consequences is far-reaching, affecting beneficiaries, taxpayers, and the fabric of the

health care system.

BENEFICIARY (PATIENT) PERSPECTIVE

Prescription drug expenditures are affected by prescription volume and the fulfillment of more-expensive drugs (CBO, 2011). Consistent with the result of this study, non-LIS (no subsidy) beneficiaries account for a much smaller share of Medicare spending on prescription drugs because they spend less on average than do LIS (full and partial subsidy) beneficiaries (GAO, 2010). One explanation for this is that non-LIS beneficiaries only have the standard Part D benefit, and generally cover a larger share of prescription drug spending through their own premiums and out-of-pocket payments. The share of drug spending paid by non-LIS beneficiaries varies considerably across enrollees, depending on their total drug expenditures and the plans in which they enroll (CBO, 2011). As a result, non-LIS beneficiaries are expected to be more sensitive to drug prices, are disincentivized from moral hazard and probably more adherent to their medications. Again, these patients may have other incentives to avoid taking their medications but those incentives were not the focus of this study. LIS beneficiaries, though, do not experience the same financial stress or variation in their out-of-pocket spending. Their out-of- pocket share is much is much lower and is typically flat across all generic, brand or specialty drugs, regardless of the price or formulary status. Beneficiaries with the low-income subsidy are truly insensitive to drug costs.

The second objective of this study sets the stage for understanding the impact of cost-share and price sensitivity on prescription drug utilization and expenditures by first

comparing prescription drug utilization and expenditures between beneficiaries with full or partial or no-subsidy, then utilization and expenditures of those beneficiaries who switch status from full to partial or no subsidy, and vice versa between 2009 and 2010.

The similarities in medication utilization among Part D enrollees with and without LIS coverage supports the Part D program's objective of providing enhanced access to needed medications for diverse groups of Medicare beneficiaries (CBO, 2011). The results from this study suggest that beneficiaries with LIS benefits had higher expenditures because of increased utilization. The use of expensive brands and specialty medications was very similar between the full/partial subsidy beneficiaries compared to beneficiaries with no subsidy. The results also showed that beneficiaries with subsidy had significantly more prescriptions processed with prior authorizations and step therapy edits than beneficiaries with no subsidy. This could be an indication of access to more expensive brands and specialty drugs.

Yet, the overall impact of out-of-pocket limits on beneficiary prescription buying behavior is not innocuous. The combined savings on out-of-pocket spending for beneficiaries with low-income subsidy in 2009 was approximately $4,275,336 ($2 per beneficiary per month). Overall, non-LIS beneficiaries pay approximately $20 to $26 more per prescription than beneficiaries with subsidy. This amount can significantly impact some non-LIS beneficiaries ability to access prescription drugs.

As a result, one would expect non-LIS beneficiaries who face the highest cost-share to switch status from no subsidy to partial or full subsidy in order to avoid paying

$20 to $26 per prescription. Because beneficiaries who are eligible for full subsidy are automatically registered for the program, this only applies to those beneficiaries who are eligible for partial subsidies and must apply to get the benefit. To the extent that it applies, enrolling in the LIS program would be in a beneficiary's economic and health care interest. It has long been speculated that some savvy non-LIS beneficiaries with incomes exceeding thresholds for LIS eligibility and may qualify under state medically needy programs achieve this by "spending down" excess income (Coutler B. et. al, 2007). In this case one would expect non-LIS beneficiaries to be the most incentivized to spend down in order to meet the minimum requirements necessary to be eligible to switch status from no subsidy (non-LIS) to partial (non-deemed) or full subsidy (deemed); however, there was no evidence of that in this study.

Interestingly, this study found the opposite effect. Results from switching analysis show the non-LIS group was the most stable group with the lowest number of beneficiaries switching from non-LIS to partial or full subsidy groups between 2009 and 2010. The makeup of this group is quite interesting. The non-LIS beneficiaries live in "poor" zip codes based on FPL where beneficiaries with full and partial subsidies live. By this account, the non-LIS beneficiaries are in a similar socioeconomic situation as the deemed and non-deemed, meaning they are potentially eligible to receive partial subsidies. Even so, the non-LIS was the most stable group with the least movement to other groups. It is baffling that these beneficiaries did not take advantage of this opportunity.

A deeper review of the data in order to understand this non-LIS group reveals that

in 2009 they were slightly older, used fewer prescriptions, had significantly less prescription drugs from different drug therapy classes, had a slightly better medication adherence record and a significantly lower comorbidity risk. In essence, the non-LIS group was stable because beneficiaries were healthier, used fewer prescriptions and were adhered more closely to their medicines. This removes the typical incentives for beneficiaries get extra help from the LIS program.

Conversely, the deemed (full subsidy) beneficiaries who are on the extreme opposite of the non-LIS beneficiaries, were the youngest of all three groups and used the highest number of prescription drugs from multiple drug therapy classes. Deemed beneficiaries were the least adherent of the three groups and but also had the highest comorbidity risk. This group constitutes the non-institutionalized (community-living) poor and is typically construed, in the context of LIS eligibility and enrollment, as risk averse because they are automatically registered for the LIS program to receive the highest subsidy amount. The assumption is that automatic enrollment removes the incentive for deemed beneficiaries to be more vested in the program. For example, Rudolph and Montgomery, in a study designed to understand how much beneficiaries knew about the Medicare prescription drug benefit and low-income subsidy programs, found that communication efforts to the LIS population, particularly for beneficiaries deemed automatically eligible for the LIS, is needed to continually make them aware of their benefits and protections in Part D (Rudolph NV and Montgomery MA, 2010). While deemed beneficiaries may not be aware of the LIS benefits, this study showed that losing subsidies can be quite devastating, as beneficiaries out of pocket costs increased by

an average of $10 to $30 per medication, depending on whether beneficiaries lose all or some of their subsidies (i.e. switched status from full to partial or no subsidy). Therefore, deemed beneficiaries, contrary to logical assumptions, are not completely risk averse.

Partial beneficiaries are in the middle of the spectrum in terms of age, prescription drug utilization, medication adherence and comorbidity risk. They face uncertain terms in the sense that they must apply to get the benefit. Like the deemed beneficiaries, the loss of subsidy increases beneficiaries out of pocket cost by an average $20 per medication.

Overall, all Part D beneficiaries have an incentive to take advantage of the low-income subsidy if they are eligible. Those beneficiaries who are savvy will manipulate their income status by spending down so they meet the minimum thresholds for LIS eligibility. Undoubtedly, the vast majority of beneficiaries are unaware of their eligibility for subsidies. Even among those beneficiaries who are currently receiving subsidy, as Rudolph and Montgomery highlighted, knowledge of how the program works is lacking. As a result, the low-income subsidy for most beneficiaries is piece of the overall Part D benefit that provides access to affordable medications. From the beneficiary standpoint, the LIS program is seamless to their medication utilization and overall health care experience.

CLINICAL PERSPECTIVE

The clinical argument for the LIS program is perhaps the most defensible justification, especially when the program is successful in providing beneficiaries access to affordable medications. The premise is even greater considering that LIS beneficiaries

have a higher prevalence of chronic conditions and comorbidities than non-LIS beneficiaries, meaning they are clinically needy. Therefore, providing access to affordable prescription drugs is both a clinically and economically sound investment, especially if there are medical spending offsets.

The challenge, of course, is moral hazard, inefficient and inappropriate prescribing and medication use, as costs continue to rise at unsustainable rates. As with moral hazard, there is a cost associated with inappropriate medication use, which is common in older adults. A report by the Department of Health and Human Services and the Office of Inspector General revealed questionable and potentially harmful prescriptions for Medicare beneficiaries cost taxpayers over $352 million a year (DHS & OIG, 2013). The report also red-flagged the records of over 2,200 doctors for fraud, waste and abuse resulting from either overprescribing, promoting brand-name drugs over generics, excessive prescribing of narcotics and other addictive drugs, or using an alarmingly high number of pharmacies to dispense drugs.

Inappropriate use is not only a prescribing issue; it could be the result of the Medicare plan's benefit design as well. Donohue and colleagues examined the impact of Medicare Part D benefit on inappropriate medication use among Medicare beneficiaries and found that inappropriate use may be responsive to lower out-of-pocket costs (Donohue et al, 2012). This raises the question of whether beneficiaries in the LIS program are more likely to engage in inappropriate use of prescription drugs.

Notwithstanding moral hazard, inappropriate prescribing and all the challenges that can be used to indict Part D and the LIS program, it is difficult to understate the

clinical value of the LIS program. The similarities in medication utilization among Part D enrollees with and without LIS coverage supports the program's objective of providing enhanced access to needed medications for diverse groups of Medicare beneficiaries (Stuart B. et. al., 2012). Achieving equity in access to prescription drugs is a vital piece of the ultimate goal of improvement in beneficiaries' clinical outcome.

Results from this study revealed a positive relationship between subsidy amount and beneficiaries utilization of prescription drugs. However, the results fall short at consistently identifying improvements in clinical outcomes. Specifically, whether subsidy amount (LIS group status) had any effect on health services (ER, outpatient and inpatient) utilization and expenditures. The intuition being that as medication use increased, adherence improved and outcomes should improve, as well. For example, Baik et. al. identified that since the implementation of the Medicare Part D prescription drug benefit in 2006, adherence and health outcomes improved among Medicare beneficiaries (Baik et. al., 2012).

In this study the effect of subsidy amount on clinical outcomes is mixed. For example, beneficiaries with no subsidy (non-LIS) had 28 percent lower outpatient visits compared to beneficiaries with subsidy. Indicating the subsidy had no positive effect on outpatient utilization. Emergency department visits were approximately 18 percent lower for beneficiaries with partial subsidy (non-deemed) but 47 percent lower for beneficiaries with no subsidy, compared to full subsidy (deemed) beneficiaries. Since ED visits are considered a very good barometer in measuring the impact of access and adherence to

prescription drugs on health outcomes, one would expect an inverse relationship between subsidy amount and ED visits, i.e. non-LIS (no subsidy) beneficiaries would have a higher number ED visits compared LIS (deemed or non-deemed) beneficiaries. In this study the association between subsidy amount and ED visits is irrelevant. This was also the case for inpatient utilization.

For beneficiaries who switched groups from full subsidy to partial or no subsidy between 2009 and 2010, the results showed no association between subsidy amount and inpatient and ED visits. Outpatient visits declined by 10 percent for beneficiaries who switched from full subsidy to no subsidy. For beneficiaries who switched from partial subsidy to full or no subsidy there was no statistically significant association between subsidy amount and outpatient, ER and/or inpatient visits. These associations do not support the clinical arguments for the LIS program.

The expectation is that increased subsidy increases access and adherence to medications, with a subsequent reduction in ER, outpatient and inpatient visits. For example, Shang and Goldman (2007) found a $1 increase in prescription drug spending was associated with a $2.06 reduction in Medicare spending on health services. In this study the hypothesis was that subsidy amount would have no net effect on beneficiaries' clinical outcome or expenditure. This is, in part, due to the very short duration of the study. It is also due to the fact that because beneficiaries were already in Medicare, most had access to medications and health care services. In addition, clinical benefit was predicated on access and adherence going hand in hand in order for beneficiaries to

realize the full clinical benefits of the drugs. It is also possible that the effects of subsidy amount would be more apparent in specific cohorts of the population where there is increased utilization of expensive brands and specialty drugs, where cost and adherence can have significant clinical implications.

Therefore, it would seem that the primary target for improving clinical outcomes is adherence. While the Part D program and the low income subsidy has succeeded, to large extent, in providing beneficiaries equitable access to affordable medicines, the next step in the chain is harnessing the necessary tools available to improve adherence. The results from this study showed there was no difference in medication adherence (defined as the medication possession ratio) between beneficiaries with full, partial or no subsidy. Further, even after beneficiaries switched from partial to full subsidy (and vice versa) their adherence measure remained unchanged. These results are contrary to the stated hypothesis.

There are several approaches that can be used to improve adherence and clinical outcomes. A combination of prescriber and member education, in addition to benefit design, would provide the best opportunities for success. For example, a recent study found a high prevalence of poorer cognition and numeracy among Medicare beneficiaries likely eligible for the Part D LIS (Kuye, 2013). These beneficiaries would undoubtedly have serious difficulty being compliant with their medication regimen, even with access to the appropriate medications. Therefore, promoting programs such as medication therapy management and other disease management programs directed at improving

patient adherence would be most valuable. These programs offer interventions encompassing direct phone outreach, medication utilization reviews, refill reminders, drug/food interaction screenings, lifestyle modification suggestions, etc. These are incentives that go beyond reducing copayments or coinsurance amounts and other subsidy based incentives, especially when they are strategically targeted and are provided by a pharmacist (Branham et al., 2012; Barnett, et al., 2009; McGivney et al., 2007*)*.

Pharmacist-provided MTM have been shown to effectively reduce costs associated with patient medication use, especially in areas of cardiovascular, gastroesophageal reflux disease, pulmonary, and diabetes groups (Branham et al., 2012). Further, a recent study by Soliman et. al. (2013) evaluating patient characteristics predicting the frequency of medication therapy management visits for patients with diabetes showed that patients with diabetic complications and using regimens that include insulin, received more frequent MTM visits; and the MTM services delivered had a positive impact on optimal diabetes care (Soliman et. al., 2013).

Adherence could also be improved through optimal benefit design (Dor and Encinosa, 2010). This has typically been done by including MTM services under the standard Part D benefit and including quality measures such as customer service, member complaints, problems getting services, member experience with drug plan drug pricing, patient safety, etc., which are pertinent to, but do not directly influence, adherence (PQA, 2013). These approaches, while necessary, fall short at achieving the level of success observed by programs implemented by commercial health plans.

For example, some large employers have considered value based benefit design

(VBBD) models whereby beneficiaries' financial incentives are aligned with clinical outcome (NBCH, 2013). VBBD is not only applicable to copay and coinsurance programs,it can be much more than cost-sharing reductions and could be used as the basis for disease management programs, pharmaceutical care or MTM programs, or for prescription drug benefit packages designed to specifically reward better adherence. Value based designs are also applicable in other inpatient or outpatient clinical programs because it supports and rewards the use of services when the clinical benefits exceed the cost and likewise discourages the use of services when the benefits do not justify the cost (Chernew et. al., 2007). In 2009, the Medicare Payment Advisory Commission (MedPAC) recommended to Congress that Medicare explore the use of VBBD in the Part D program (MedPAC, 2009). Later that year, U.S. Senate bill (S. 1040) entitled the "Seniors' Medication Copayment Reduction Act of 2009", was introduced by Sen. Kay Hutchison [R-TX] to establish a Medicare Part D demonstration to test whether VBBD increases adherence to prescribed drug regimens, improves outcomes, and reduces costs for fifteen conditions. This bill met a swift and unfortunate (this indicates your opinion-consider revising, consider costly as you show this cost in your next sentence) death in the U.S. Senate Finance Committee (Govtrack.US, 2013). As a result, the Medicare Part D program was left in limbo, with a persistent misalignment between financial incentives and clinical goals, a disenfranchisement of beneficiaries, as taxpayers continue to pay these unsustainable costs.

It is noteworthy that this study, like the others referenced above, did not actually measure the direct effect of drug adherence on outcomes such as averted hospitalizations,

ER and outpatient visits. It is also important to note that it is not unreasonable to argue that in spite of the subsidies provided to Part D beneficiaries, and the subsequent equity in access to affordable medicines observed, it is a failure on the part of this LIS program, based on its clinical goals, that medication adherence remained unchanged and with no impact on health services utilization. This also reveals the notion that reducing cost sharing is only one factor among many that might improve adherence. Therefore, programs must be created to help beneficiaries meet and stay complaint with their pharmacotherapy in order to realize the full impact of the LIS program.

TAX PAYER PERSPECTIVE

The taxpayer perspective on the LIS program is a small piece on the larger conversation on subsidized health care. The taxpayer perspective specifically focuses on the economic arguments for and insights into the impact of the low-income subsidy program in Medicare Part D.

The taxpayer funded low-income subsidy program was set in place to subsidize prescription drug costs for low-income seniors. The subsidy distorts Medicare Part D premiums and lowers the copays and coinsurance amounts paid by Medicare beneficiaries who are enrolled in the program. In 2010, the LIS accounted for $19.9 billion of the $57.3 billion paid to Part D plans, making the LIS the single most important source of plans revenues (Decarolis, 2012). The key question is whether taxpayers are getting the biggest bang for their buck, and whatthe net gain is or loss to the overall economy.

Under the condition of a perfectly competitive market, no case can be made for the low-income subsidy. Since health care is a unique market, the perfect market assumption is relaxed, and one would expect that introducing the low-income subsidy or some other government intervention within this imperfect market framework will be efficient and welfare increasing. This is the best scenario for the taxpayer, an investment that increases the welfare of all.

Results from this study, however, show evidence of increasing moral hazard on prescription drug utilization and expenditures as beneficiaries receive more subsidies. Further complicating the matter is the fact that there was no change in prescription adherence, nor were there any medical utilization and/or spending offsets.

In the context of the overall economy, there are many inputs taxpayers can choose from to produce good health. The health production function can include a combination of healthcare, environment, nutrition, hygiene, public health programs, income, lifestyle, drug subsidies, etc. (Santerre and Neun, Ch. 2, 2009). Therefore, prescription drug subsidies are an example of but one of a myriad of alternatives that can be used in the health production function to produce good health. As such, the best use of taxpayer resources will include only technically efficient input-output combinations in the health production function, in order to achieve optimization (where marginal benefit = marginal cost) and allocative efficiency (where the net benefit exceeds the cost) (Santerre and Neun, Ch. 2, 2009).

Needless to say, the results from this study showed that the LIS program does not meet the minimum threshold for optimization or allocative efficiency. This is not to say

that the low-income subsidy program is not essential. Nor is it an indictment of how the program is managed. Rather, it is an evaluation of the opportunity cost of the LIS program within the larger context of the economy and the desire to achieve efficiency in the allocation of scarce resources in the economy's overall production function (i.e. health, jobs, public safety, defense, etc.).

Ideally, taxpayers would prefer Pareto efficiency, which has to do with the distribution of commodities across consumers. Pareto efficiency is achieved when an allocation is conducted such that an individual or a group is better off and no other individual or group is made worse. Only a perfectly competitive market achieves Pareto efficiency. Since the health care market is not perfectly competitive, Pareto efficiency cannot be achieved. This is a market failure. Therefore, it is justifiable for the government to intervene in the health care (Medicare Part D) market with subsidies to promote market efficiency and equity, which cannot be achieved by the competitive equilibrium in perfect markets. This is one of the central tenets of the low-income subsidy program.

This conundrum is the challenge for taxpayers who prefer a Pareto efficient market that achieves allocative efficiency but may also want an equitable distribution of resources. Based on the results from this study it can be inferred that the LIS program is not allocatively efficient, nor does it achieve Pareto efficiency. Yet, since one of its primary goals is to address equity for millions of low-income seniors by providing low-cost medications, taxpayers can consider this program to be largely successful.

HEALTH CARE REFORM

Our political discourse has been inundated by health care reform, with a growing emphasis on cost of care, value, outcomes and the necessity and scope of entitlement programs such as Medicare, Medicaid, LIS. Various provisions under the ACA have an impact on the Part D benefit for both LIS and non-LIS beneficiaries (CBO, 2011). The law closes the doughnut hole for non-LIS beneficiaries, and introduces income-based premiums (means testing), which are also used in Medicare Part B, for individuals with income above $85,000 and couples with a joint income above $170,000, beginning 2011 (CBO, 2011). All of these subsidies have been effective in providing beneficiaries access to prescription drugs. Results from this study showed the effectiveness of the low-income subsidies in providing beneficiaries access to prescription drugs but stopped short at identifying the resulting effect of prescription drug utilization on health services utilization.

Within the context of health care reform, this study can be insightful as one considers the centerpiece of the ACA, which is to significantly reduce the number of uninsured by providing a continuum of affordable coverage options through the Medicaid expansion and new Health Insurance Exchanges, using federal subsidies (KFF, 2012).

Effective January 1, 2014, under the Affordable Care Act, Medicaid was expanded to include individuals between the ages of 19 up to 65 with incomes up to 138 percent FPL or 133 percent FPL for a family of four based on modified adjusted gross income (KFF, 2012). The CBO predicts that 11 million Americans will gain coverage by 2022 through this provision (CBO, 2012). The Medicaid expansion and other provisions

of the ACA would lead state Medicaid spending to increase by $76 billion over 2013-2022, while federal Medicaid spending would increase by $952 billion over the same period (Holahan et. al., 2012).

Pundits across the political spectrum argue about the economic consequences, policy and political implications and even clinical intricacies of the health care reform bill. From the standpoint of this study, the Medicaid expansion is evaluated on its merit as subsidy. Therefore, evidence gleaned from the LIS program is used to develop ideas and formulate theories that add value to our ongoing national debate on health care subsidies.

Results from the LIS show that subsidies increase moral hazard. Subsidies such as low-income subsidy or Medicaid expansion subsidies that are targeted at only those beneficiaries with low-income are considered demand-side subsidies. Demand side subsidies, unlike excise subsidies (e.g. cash for clunkers), which are used to pay beneficiaries a certain amount per unit for purchasing a commodity, cause less price distortion. Conventional insurance theory holds that moral hazard is caused by a price distortion, which creates an incentive to consume health care inefficiently. Therefore, programs such as the low-income subsidy program in Part D and the Medicaid expansion under health care reform are inefficient because of their net income effect. The additional health care consumed when beneficiaries receive subsidy is, thus, moral hazard.

This concept of income effects and redistribution has been one of the most controversial arguments against health care reform and the Medicaid expansion. Like

other government interventions such as Medigap, 340B drug pricing, premium assistance subsidies, out-of-pocket spending limits, etc., the Medicaid expansion is a government intervention to redistribute income through health insurance. This income redistribution is more apparent in the onslaught of tax mandates used to pay into the insurance pool. For example, increasing Medicare tax rate by 0.9 percent and an added tax of 3.8 percent on unearned income for high-income taxpayers, annual fee on health insurers, 40 percent excise tax on so-called Cadillac plans with rich benefits, just to name a few (IRS, 2013). These are all targeted at redistributing income vertically to achieve equity. As a result, the Medicaid expansion will by no means achieve allocative or Pareto efficiency. Rather, it is a government intervention engineered to redistribute income through insurance in order to achieve vertical equity in the system.

Supporters of subsidy-based programs typically argue for equity and the overall benefit to the economy. Proponents of this position typically do not consider moral hazard as inefficient. This was described in Nyman's theory of health insurance, which suggests that much of the moral hazard is actually efficient, especially when the care that was deemed to be welfare decreasing is reclassified as welfare-increasing (Nynam, 2004). As such, the excess utilization and expenditure directly related to the low-income subsidy, originally considered inefficient is actually welfare increasing. Similarly, any moral hazard resulting from the Medicaid expansion is efficient. Based on this view the Medicaid expansion subsidies, much like the low-income subsidies, become much more valuable to consumers and taxpayers than initially considered.

Subsidies are typically a government intervention used to achieve equity rather than efficiency. Like the low-income subsidy program in Part D, the Medicaid expansion subsidy has a net income effect that can distort prices and cause moral hazard. Opponents to the use of subsidies typically follow the conventional insurance theory model, which holds that moral hazard, in this context, is inefficient. Supporters of these subsidy programs, who subscribe to the new (Nyman's) insurance theory model, consider moral hazard efficient and welfare increasing.

IMPLICATIONS

The objective of this study was to evaluate the impact of low-income subsides on medication and health care utilization and expenditures. The results from the study have clear implications for Medicare beneficiaries, Medicare plans and taxpayers.

Results from this study have elucidated the effectiveness of the low-income subsidies in providing beneficiaries equitable access to affordable prescription drugs. This is consistent with previous studies with results showing that reducing drug copayments increases drug adherence (Gibson et al, 2005; Goldman et al, 2007), but stop short at identifying improvements in some clinical outcomes as identified by Hsu et al, 2006; Rice and Matsuoka, 2004; Goldman et al, 2007, which reduces overall health care costs (Gaynor et al, 2007; Chandra et al, 2007; Shang and Goldman, 2007; Zhang et al 2009; and Deb et al 2009).

Yet, there was very little evidence to show that subsidies had an impact on medication adherence and subsequently on a beneficiary's clinical outcome. This is a

disappointment for beneficiaries and more so for taxpayers who subsidize the estimated annual $290 billion associated with poor or non-adherence each year (NEHI, 2009).

From the Medicare health plan perspective, the LIS program has serious implications for health plans since the low-income subsidy accounted for $19.9 billion of the $57.3 billion paid to Medicare health plans in 2010 (Decarolis, 2012). The results from this study demonstrating the success of the LIS program in expanding beneficiary access to medications, solidifies the value and necessity of the program, which is good for health plans bottom-line.

The results also identified one serious unintended consequence (moral hazard) and failed to show any evidence of improvement in beneficiaries' adherence to their medication regimen. These results suggests serious implications for health plans who rely on the LIS for 25 percent of their revenue, yet fail to demonstrate an increase in medication adherence, clinical outcomes or show medical spending offsets. While plans have used the LIS to increase beneficiaries' access to medications, this is only one facet of the multifactorial reasons for non-adherence. Medicare plans have many opportunities to lobby Congress to change or repeal some of the restrictive laws that prevent plans from using innovative schemes and programs such as value based benefit design, formulary management, negotiating for better drug prices, etc. Medicare plans could also utilize some of the effective programs and policies used by private employer plans to align financial incentives with clinical outcomes, thereby improving adherence and actualizing medical spending offsets that can only be achieved through an overall improvement in clinical outcomes.

The taxpayers' perspective hinges on three things: the value derived from investing scarce health care dollars in the LIS program, the opportunity costs of such an investment, and how the information gleaned from this program can provide insightful information that will add value to policy development in other areas where taxpayer funded subsidies are used.

The most significant implication of this study to taxpayers is that the results showed evidence of moral hazard, which was identified as overutilization of medications with no corresponding improvement in medication adherence. Moral hazard can be identified on the prescribing side, as well, with the prescription of expensive brands and specialty drugs, and the overprescribing of products such as narcotics with no consideration of fraud, waste and abuse. This study did not evaluate prescriber moral hazard.

The results showed that a clear pattern of a statistically significant increase in medication utilization as beneficiaries' out-of-pocket cost declined with increased subsidy amounts. This was distinct in the case of switching. As beneficiaries switch to a lower subsidy amount (increased out-of-pocket cost) from a higher subsidy group medication utilization decreased and vice versa.

These findings can be manipulated and interpreted in a multitude of ways to fit one argument or the other, but they can still be insightful for policy makers. The results from evaluation of the LIS program have provided additional information on beneficiaries medication utilization under no, partial and full subsidy, and how behaviors change as beneficiaries switch from no subsidy to partial or full subsidy and vice versa. If

the results from this study herald a trend, then the Medicaid expansion would represent an unprecedented magnitude of injudicious spending of taxpayer dollars, and the opportunity cost would be significant. The opportunity cost of the Medicaid expansion can be can be captured through cost-effectiveness studies. Since this study was not designed to conduct a cost-effectiveness analysis, the opportunity cost of the Medicaid expansion cannot be directly estimated; however, the cost to the U.S. health system can be quantified based on the most recent report from the Organization for Economic Cooperation and Development (OECD). According to OECD, U.S. health care costs account for 17.6 percent of GDP (Whitehouse, 2013). This is a significant economic burden for U.S. taxpayers and is projected to rise sharply to reach 34 percent by 2040 (Whitehouse, 2013). Therefore, the most important implication for taxpayers and policymakers who are entrusted with the responsibility of appropriating scarce taxpayer dollars is that health care appropriations must be strategically invested, while being mindful of the opportunity costs of such investments.

LIMITATIONS

Observational secondary data have several limitations that should be addressed. CMS data is collected specifically for administrative purposes rather than for research; therefore, the information in the dataset may not be presenting the overall picture of the clinical and environmental state of each beneficiary in order to allow for a holistic testing of my hypotheses. There are also potential limitations with using administrative datasets

for research (Gardner et. al., 2008). The extent to which the limitations by Gardner et. al. apply to my study is unknown. These limitations were catalogued by, A. (1998).

Specific to CMS data there are several limitations. For example, the age distribution of Medicare beneficiaries may be a concern. While the majority of LIS eligible patients are elderly, there is a considerable percentage of young dually eligible beneficiaries in Medicare. Younger patients typically are diagnosed with ESRD, ALS or are disabled. In effect, the results of this study may not be generalizable to all ages of LIS beneficiaries.

Further, any previous medication coverage prior to the implementation of Part D in the private market is unavailable prior to January 1, 2006. As such, these patient's prescription histories cannot be obtained and the progression of treatment for comorbidities prior to January 1, 2006 cannot be identified.

In addition, medication consumption cannot be conducted directly from administrative data. The medication possession or acquisition variable can be used as a viable proxy for medication adherence. The key assumption in this case is that patients who process a claim for a medication actually consumed the medication. This is not necessarily true in every case; however, filling a prescription is a predictor of medication consumption, but this cannot be validated with the available data. This assumption may result in a misclassification of exposure leading to bias, which is assumed to be approximately equal between deemed and non-deemed beneficiaries. Several other methods are typically used to estimate medication persistency. In this study MPR was used because it is the most commonly used method and is calculated using the day's

supply over a specified period of time. The MPR is typically used as a dichotomous variable with a break point at 0.8. Patients with an MPR greater than 0.8 would be classified as "adherent" and patients with an MPR less than 0.8 would be classified as "non-adherent." The 0.8 break point is an arbitrary number and may not have any clinical significance (Chan et al, 2010).

A noteworthy limitation is the power of the statistical models to detect a difference in the outcome effect, given that the effect is really present. This is especially true for beneficiaries who switched LIS status from deemed (2009) to non-deemed or non-LIS (2010) and from non-deemed (2009) to deemed or non-LIS (2010). The results from this study showed consistent "non-significant" findings for outcomes estimated among switching groups.

The power analyses, which was conducted to address concerns about the correct rejection, or not, of the null hypothesis showed that, consistent with significantly smaller sample sizes in these groups, this study (in most cases) did not have the statistical power to detect a difference in the outcome among switching groups (see Table 49). Even so, the findings from this study can still be instructive. Regardless of the small sample size, the study had enough power to detect a difference in medication utilization for beneficiaries switching from deemed to non-deemed or non-LIS because the difference was large (36% and 76%, respectively). For beneficiaries switching from non-deemed to non-LIS, while power to detect a difference was estimated at 100%, the difference in utilization was so small that it was not statistically significant.

These effects call for a contextual interpretation of the results and its implication on policy decisions. While statistical difference may or may not be apparent, it is crucial to evaluate both the biological and economic importance of each outcome within the contexts of specific policy decisions. For example, the power to detect a difference in MPR was very low (between 9% and 26%). This is not surprising, given the minute differences between MPRs at baseline (i.e. deemed=0.85, non-deemed=0.86 and non-LIS=0.88) yet, the biological and economic importance of such seemingly insignificant differences cannot be understated. Ho, Bryson and Rumsfeld (2009) estimated that a 25% increase in adherence measure (proportion of days covered) for statins is associated with a 3.8mg/dl reduction in LDL cholesterol. The authors also posit that non-adherence to cardioprotective medications increased the risk of cardiovascular hospitalization up to 40% and mortality up to 80%. From an economic standpoint, the *direct* cost of non-adherence has a *direct* financial impact of $100 billion to $289 billion annually, approximately $2,000 per patient in physician visit a year (Levine et. al., 2013). Additionally, it is estimated that patients with improved self-management of chronic disease can see a direct cost-to-savings ratio of approximately 1:10 (Levine et. al., 2013).

While the interpretation of the impact of this study is significantly limited by a lack of power to determine a difference in the refined estimate of the population size effect for beneficiaries switching LIS groups, the results should not be taken for granted because the biological and economic implications of such findings can be instructive.

Selection of the appropriate risk adjustment tool can be considered a potential limitation to this study, as well as a point of contention, as questions can be raised about

the validity of one risk adjustment tool versus the other. There are many diagnosis-based and prescription-based risk adjustment tools used in health services research. Three different tools were considered for this study: the Charlson and Elixhauser indices, and the VA Rx-Risk (Rx-Risk-V), a VA-adapted pharmacy-based case-mix instrument.

The VA Rx-Risk adjustment tool was not used because it is based on prescription drug utilization (Solan et. al., 2003), an obvious limitation of its application, since it is treatment-based rather than diagnosis- based, and is susceptible to gaming (AAA, 2010). Also, prescription-based risk-adjustment tools cannot distinguish the severity among patients who are prescribed drugs in the same therapy class, but have been shown to be good predictors of future medical costs (AAA, 2010). While the prescription-based risk adjustment tool was not used in this study, the number of drug therapy classes (based on the drug therapy classes identified in the VA Rx-Risk study) was used as a covariate in this study.

The Charlson and Elixhauser indices were both evaluated for this study. Several studies have compared the prognostic predictive value of the Charlson and Elixhauser indices and have concluded with similar predictive performance in comorbidity measures (Lieffers, J. R, et.al, 2011; Southern, DA, 2004; Gabriel SE, et al 1999; Stukenborg GJ, et al., 2001). Only a few studies have shown that the Elixhauser model outperformed the Charlson model in predicting mortality (Lieffers, J. R, et.al, 2011; Southern, DA, 2004; Gabriel SE, et al 1999; Stukenborg GJ, et al., 2001). Since the Charlson index was used in this study rather than the Elixhauser, it can be considered a limitation.

Another limitation in this study is related to the issue of selecting the appropriate non-LIS cohort. The non-LIS cohort was selected from a sample of beneficiaries who live in low-income zip codes based on the federal poverty line. This limits the generalizability of the study findings. Another implication of this is that the effect of the coefficients estimated could be under or overestimated for the non-LIS group.

The study also excludes beneficiaries who did not consistently maintain the same LIS group during the first twelve months (2009) and the first quarter of 2010. Beneficiaries who violated the switching requirement were excluded. These exclusions also limit the generalizability of the study since switching could have been motivated by health care status (need), socio economic status, awareness of the benefits, etc. Therefore, the implication of the switching exclusion could run the gamut, depending on the cause or motivation. Therefore, generalizability is limited to only those beneficiaries who maintain LIS group status for at least a year. Additional sensitivity analyses may need to be conducted in order to determine changes in patient behavior after patients who were excluded for violating the switch status comply after switching.

The final limitation of this study relates to the study period. This study was conducted over a 2-year period. For beneficiaries who continuously maintained the same LIS status, the 2-year period may be adequate for the analysis; however, for beneficiaries who switched LIS status between 2009 and 2010, a year exposure to the pre and post group may not be adequate to capture the positive impact and/or unintended consequences of switching group status.

FUTURE RESEARCH

Future studies may want to concentrate more on the direct effect of changing subsidy amounts (switching between LIS groups) on medication adherence and health outcomes. These studies may also want to explore how to optimize the subsidy provided to beneficiaries in order to achieve the best outcomes for beneficiaries without the consequence of inefficient moral hazard.

Additionally, future studies may want to explore different methodological approaches to achieve and address issues such as switching and consider new and improved approaches to limit excessive beneficiary exclusions in order to conserve the beneficiary pool and increase the sample size.

Future studies may also focus on replicating the findings of this study in specific disease cohorts using other quasi-experimental methodologies such as Non-Equivalent Groups Design, proxy pretest design, partial observability models, propensity score matching, regression discontinuity design, instrumental variables, etc.

While the differences-in-differences analysis is a very good research design because the data provided the luxury of observing the same beneficiary before and after the treatment is applied (i.e. for switchers, the beneficiary is seen while deemed in 2009, and non-deemed in 2010), future studies may use these methods and other econometric tools to validate these findings, and evaluate the effects of subsidies on medication utilization and the resulting effect on prescription adherence, with the ultimate goal of identifying improvements in healthcare outcomes and any potential offsets in medical spending.

CONCLUSION

The objective of this study was to evaluate the impact of low-income subsides on medication and health care utilization and expenditures. After conducting the analysis in this study there are several conclusions that can be drawn from the results of this study. These conclusions include:

1. The LIS program, like the Part D program itself, is meeting its primary goal of providing beneficiaries access to affordable prescription drugs. However, there is no evidence that it is meeting its intended goal of improving medication adherence (MPR) or reducing health services utilization. Though not specifically evaluated in this study, there was also no evidence to support the argument that the low-income subsidy improved health outcomes (ED visits) and health status (comorbidity – Charlson score).

2. There is a direct positive association between subsidy amount (or LIS group status) and medication utilization. Beneficiaries with no subsidy (non-LIS) had the lowest medication utilization while beneficiaries with highest subsidy amount (deemed) had the highest medication utilization. Similarly, there was a significant increase in medication utilization among beneficiaries who switched from no subsidy to partial or full subsidy, and a significant decline in medication utilization as subsidy amount dropped from full to partial or no subsidy. Yet, in all of these cases, medication adherence and comorbidity risk remained unchanged,

while the effect on health services utilization was mixed. There was no evidence, however, of any medical spending offset.

3. Moral hazard was apparent in this study based on prescription utilization. However, depending on whether one subscribes to Pauly's traditional theory of health insurance, or Nyman's theory of health insurance, moral hazard can be seen as a negative, welfare-decreasing under Pauly, or as a positive, welfare-increasing under Nyman. The overall impact of moral hazard depends on the perspective.

4. For beneficiaries, the LIS program is an absolute success in that it provides them with the medicines they need for treatment of chronic illnesses. However, there was no improvement in beneficiaries' medication adherence, indicating that reducing cost sharing through subsidies is only one factor among many that might affects adherence.

5. Health plans have an incredible opportunity to create programs needed to effectively manage beneficiaries' health and reduce cost. However, under the current fee-for-service model, there is a clear misalignment between Medicare plans' financial incentives and beneficiaries' outcomes. As discussed in the health care reform section of the discussion, several components of ACO model prescribed under the Accountable Care Act and other preexisting Medicare

policies such as ‘non-payment for never events,’ Star Ratings, Medication Therapy Management, etc., are quality measures designed to correct the misalignment between Medicare plans financial bottom-line and beneficiary outcomes.

6. Taxpayers would prefer the LIS program, in addition to being means tested, to be a value-based system that is targeted at reducing moral hazard, in order to produce a net value increase to taxpayers. As a result, having the right economic incentives through cost-based pricing could reduce potential inefficiencies and achieve allocative efficiency.

7. The conceptual framework used in this study, Grossman's theory of the demand for health insurance, features both the human capital theory which was illustrative in providing the appropriate framework to evaluate why and how beneficiaries make the decision to apply for LIS subsidy, and the economic theory which was instructive in providing the economic arguments for why and how beneficiaries purchase medicines after receiving subsidies. Grossman's theory was successful in conflating the economic, social and behavioral influences LIS beneficiaries face.

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APPENDICES

Appendix A: Master Beneficiary Summary File (Data Dictionary)

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
BENE_ID	**Encrypted 723 Beneficiary ID (Unique Key)**	CHAR	15	A unique CCW beneficiary identifier field (BENE_ID) that is specific to the Chronic Condition Warehouse. Condition Warehouse. This field is encrypted prior to delivery to researchers. The BENE_ID field is used to cross-reference data for each beneficiary across all claim and assessment data files.	SOURCE: CCW
BENE_ENROLLMT_REF_YR	Beneficiary Enrollment Reference Year	NUM	4	This field indicates the reference year of enrollment of the Beneficiary.	EDIT-RULES: YYYY
FIVE_PERCENT_FLAG	Strict 5% Flag	CHAR	1	A FLAG INDICATING WHETHER THE BENEFICIARY WAS INCLUDED IN a 5% SAMPLE FOR THE REFERENCE YEAR.	CODES: Y = Yes Null = Not Included
ENHANCED_FIVE_PERCENT_FLAG	Enhanced 5% Flag	CHAR	1	A FLAG INDICATING WHETHER THE BENEFICIARY WAS INCLUDED IN THE ENHANCED CCW 5% SAMPLE (I.E., ONCE IN, ALWAYS IN). THIS FLAG DISTINGUISHES BETWEEN THE BENEFICIARIES THAT ARE PART OF THE CMS ANNUAL 5% AND THOSE THAT ARE INCLUDED AS PART OF THE EVER-ENROLLED CHRONIC CONDITION WAREHOUSE.	CODES: Y = INCLUDED IN ENHANCED 5% SAMPLE NULL = NOT INCLUDED IN ENHANCED 5% SAMPLE

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
COVSTART	Medicare Coverage Start Date	DATE	8	This field identifies the date the beneficiary began Medicare coverage (Part A or B).	EDIT-RULES: YYYMMDD
CRNT_BIC_CD	Unequated Beneficiary Identification Code	CHAR	2	This code specifies the type of beneficiary for cash payment programs and identifies the type of relationship between the individual and primary beneficiary when the individual is qualified under another's account.	
STATE_CODE	State Code	CHAR	2	THIS FIELD SPECIFIES THE STATE OF RESIDENCE OF THE BENEFICIARY AND IS BASED ON THE MAILING ADDRESS USED FOR CASH BENEFITS OR THE MAILING ADDRESS USED FOR OTHER PURPOSES (FOR EXAMPLE, PREMIUM BILLING). THIS INFORMATION IS MAINTAINED FROM CHANGE OF ADDRESS NOTICES SENT IN BY THE BENEFICIARIES, AND IS APPENDED TO THE RECORD AT TIME OF PROCESSING IN CENTRAL OFFICE. THE CODING SYSTEM IS THE SSA SYSTEM, NOT THE FEDERAL INFORMATION PROCESSING STANDARD (FIPS).	SOURCE: SSA AND RRB BENEFICIARY RECORD SYSTEMS. FOR RRB BENEFICIARIES, THE STATE IS CODED IN SSA BASED ON MAILING ADDRESS. LIMITATIONS: IN SOME CASES, THE CODE MAY NOT BE THE ACTUAL STATE OF RESIDENCE. (FOR EXAMPLE, IF THE BENEFICIARY HAS A REPRESENTATIVE PAYEE).

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
BENE_COUNTY_CD	County Code	CHAR	3	THIS CODE SPECIFIES THE SSA CODE FOR THE COUNTY OF RESIDENCE OF THE BENEFICIARY. EACH STATE HAS A SERIES OF CODES BEGINNING WITH '000' FOR EACH COUNTY WITHIN THAT STATE. CERTAIN CITIES WITHIN THAT STATE HAVE THEIR OWN CODE. COUNTY CODES MUST BE COMBINED WITH STATE CODES IN ORDER TO LOCATE THE SPECIFIC COUNTY. THE CODING SYSTEM IS THE SSA SYSTEM, NOT THE FEDERAL INFORMATION PROCESSING STANDARD (FIPS).	EDIT-RULES: NUMERIC SOURCE: 'GEOGRAPHIC CODE MANUAL FOR STATE AND COUNTY OF RESIDENCE' PRODUCED BY THE SSA. LIMITATIONS: SOME CODES MAY BE INVALID, UNKNOWN, OR '999'. (DIFFERENT FROM FIPS)
BENE_ZIP_CD	Zip Code of Residence	CHAR	9	THIS FIELD SPECIFIES THE ZIP CODE AND IS BASED UPON THE MAILING ADDRESS USED FOR CASH BENEFITS TO THE BENEFICIARY OR FOR OTHER PURPOSES (E.G., PREMIUM BILLING).	EDIT-RULES: 9-DIGIT ZIP 5-DIGIT ZIP - ZERO BACK FILLED 3-DIGIT ZIP - ALL NINES NO ZIP - ALL ZEROS SOURCE: ENROLLMENT DATA BASE (EDB) LIMITATIONS: ZIP CODE MAY NOT CORRESPOND WITH STATE OF RESIDENCE. COMMENT: CODES IDENTIFY POSTAL SERVICE AREAS WITHIN THE U.S.A. BUT DO NOT NECESSARILY ADHERE TO BOUNDARIES OF CITIES, COUNTIES, STATES, OR OTHER JURISDICTIONS. THE CODE IS APPENDED TO THE RECORD AT TIME OF PROCESSING IN CENTRAL OFFICE. THE FIRST THREE POSITIONS OF THE ZIP CODE REPRESENT A PARTICULAR SECTIONAL POSTAL CENTER OR A METROPOLITAN CITY. THE FOLLOWING TWO DIGITS REPRESENT THE ASSOCIATED POST OFFICE SERVED BY THE POSTAL CENTER OR THE DELIVERY AREA SERVED BY THE POSTAL STATION.
BENE_AGE_AT_END_REF_YR	Age at End of Reference Year	NUM	3	BENEFICIARY'S AGE AT END OF REFERENCE YEAR.	CODES: MAXIMUM AGE IS 115

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
BENE_BIRTH_DT	Date of Birth	DATE	8	THIS DATE SPECIFIES THE BENEFICIARY'S DATE OF BIRTH.	EDIT-RULES: YYYYMMDD SOURCE: SSA AND RRB BENEFICIARY RECORD SYSTEMS
BENE_VALID_DEATH_DT_SW	Valid Date of Death Switch	CHAR	1	INDICATES THAT A BENEFICIARY'S DAY OF DEATH HAS BEEN VERIFIED (BY SSA OR THE RRB) AS THE EXACT DAY OF THE BENEFICIARY BECOMING DECEASED.	
BENE_DEATH_DT	Date of Death	DATE	8	THIS FIELD INDICATES THE DATE OF DEATH OF THE BENEFICIARY.	EDIT-RULES: YYYYMMDD
NDI_DEATH_DT	NDI Date of Death	DATE	8	INDICATES THAT A BENEFICIARY'S DAY OF DEATH HAS BEEN VERIFIED BY A PARTICULAR STATE'S DEATH CERTIFICATE AS THE EXACT DAY OF THE BENEFICIARY BECOMING DECEASED.	EDIT-RULES: MMDDYYYY
BENE_SEX_IDENT_CD	Sex	CHAR	1	THIS FIELD INDICATES THE SEX OF THE BENEFICIARY.	CODES: 0=UNKNOWN 1=MALE 2=FEMALE
BENE_RACE_CD	Beneficiary Race Code	CHAR	1	THE RACE OF A BENEFICIARY.	CODES: 0=UNKNOWN 1=WHITE 2=BLACK 3=OTHER 4=ASIAN 5=HISPANIC 6=NORTH AMERICAN NATIVE
RTI_RACE_CD	Research Triangle Institute (RTI) Race Code	CHAR	1	ENHANCED RACE/ETHNICITY DESIGNATION BASED ON FIRST AND LAST NAME ALGORITHMS.	CODES: 0 = UNKNOWN 1 = NON-HISPANIC WHITE 2 = BLACK (OR AFRICAN-AMERICAN) 3 = OTHER 4 = ASIAN/PACIFIC ISLANDER 5 = HISPANIC 6 = AMERICAN INDIAN / ALASKA NATIVE

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
BENE_ENTLMT_RSN_ORIG	Original Reason for Entitlement Code	CHAR	1	THIS FIELD INDICATES THE REASON FOR THE BENEFICIARY'S ORIGINAL ENTITLEMENT TO MEDICARE BENEFITS.	CODES: 0=OLD AGE AND SURVIVORS INSURANCE (OASI) 1=DISABILITY INSURANCE BENEFITS (DIB) 2=ESRD 3=BOTH DIB AND ESRD SOURCE: SSA AND RRB BENEFICIARY RECORD SYSTEMS
BENE_ENTLMT_RSN_CURR	Current Reason for Entitlement Code	CHAR	1	THIS FIELD INDICATES THE REASON FOR THE BENEFICIARY'S CURRENT ENTITLEMENT TO MEDICARE BENEFITS.	CODES: 0=OLD AGE AND SURVIVORS INSURANCE (OASI) 1=DISABILITY INSURANCE BENEFITS (DIB) 2=ESRD 3=BOTH DIB AND ESRD SOURCE: ENROLLMENT DATA BASE (EDB)
BENE_ESRD_IND	ESRD Indicator	CHAR	1	THIS FIELD SPECIFIES THAT A BENEFICIARY IS AFFLICTED WITH END STAGE RENAL DISEASE (ESRD).	CODES: Y = THE BENEFICIARY HAS ESRD 0 = THE BENEFICIARY DOES NOT HAVE ESRD
BENE_MDCR_STATUS_CD	Medicare Status Code	CHAR	2	THIS FIELD SPECIFIES THE REASON FOR THE BENEFICIARY'S ENTITLEMENT.	CODES: 10 = AGED WITHOUT ESRD 11 = AGED WITH ESRD 20 = DISABLED WITHOUT ESRD 21 = DISABLED WITH ESRD 31 = ESRD ONLY SOURCE: THIS FIELD IS CODED FROM AGE, ORIGINAL REASON FOR ENTITLEMENT, CURRENT REASON FOR ENTITLEMENT AND ESRD INDICATOR CONTAINED IN THE ENROLLMENT DATA BASE AT THE CENTRAL OFFICE AT THE DATE OF PROCESSING.
BENE_PTA_TRMNTN_CD	Part A Termination Code	CHAR	1	THIS CODE SPECIFIES THE REASON PART A ENTITLEMENT WAS TERMINATED.	CODES: 0= NOT TERMINATED 1 = DEAD 2 = NON-PAYMENT OF PREMIUM 3 = VOLUNTARY WITHDRAWAL 9 = OTHER TERMINATION SOURCE: ENROLLMENT DATA BASE (EDB)

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
BENE_PTB_TRMNTN_CD	Part B Termination Code	CHAR	1	THIS CODE SPECIFIES THE REASON PART B ENTITLEMENT WAS TERMINATED.	CODES: 0= NOT TERMINATED 1 = DEAD 2 = NON-PAYMENT OF PREMIUM 3 = VOLUNTARY WITHDRAWAL 9 = OTHER TERMINATION SOURCE: ENROLLMENT DATA BASE (EDB)
BENE_HI_CVRAGE_TOT_MONS	HI Coverage Count	NUM	3	TOTAL NUMBER OF MONTHS OF PART A COVERAGE	
BENE_SMI_CVRAGE_TOT_MONS	SMI Coverage Count	NUM	3	TOTAL NUMBER OF MONTHS OF PART B COVERAGE	
BENE_STATE_BUYIN_TOT_MONS	State Buy-In Coverage Count	NUM	3	TOTAL NUMBER OF MONTHS OF STATE BUY-IN.	
BENE_HMO_CVRAGE_TOT_MONS	HMO Coverage Count	NUM	3	TOTAL NUMBER OF MONTHS OF HMO COVERAGE	
BENE_MDCR_ENTLMT_BUYIN_IND_01 (THROUGH BENE_MDCR_ENTLMT_BUYIN_IND_12)	Medicare Entitlement/Buy-In Indicator	CHAR	1	INDICATES FOR EACH MONTH OF THE DENOMINATOR REFERENCE YEAR, THE ENTITLEMENT OF THE BENEFICIARY TO MEDICARE PART A, MEDICARE PART B, OR MEDICARE PARTS A AND B BOTH, AS WELL AS WHETHER OR NOT THE BENEFICIARY'S STATE OF RESIDENCE WAS LIABLE AND PAID FOR THE BENEFICIARY'S MEDICARE PART B MONTHLY PREMIUMS.	CODES: 0 = NOT ENTITLED 1 = PART A ONLY 2 = PART B ONLY 3 = PART A AND PART B A = PART A, STATE BUY-IN B = PART B, STATE BUY-IN C = PARTS A AND B, STATE BUY-IN

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
BENE_HMO_IND_01 (THROUGH BENE_HMO_IND_12)	HMO Indicator	CHAR	1	CODE INDICATING BENEFICIARY HAS MEMBERSHIP IN HEALTH MAINTENANCE ORGANIZATION.	CODES: 0 = NOT A MEMBER OF HMO 1 = NON LOCK-IN, HCFA TO PROCESS PROVIDER CLAIMS 2 = NON LOCK-IN, GHO TO PROCESS IN-PLAN PART A AND IN-AREA PART B CLAIMS 4 = FEE FOR SERVICE PARTICIPANT IN CASE OR DISEASE MANAGEMENT DEMONSTRATION PROJECT (EFFECTIVE 2005 FORWARD) A = LOCK-IN, HCFA TO PROCESS PROVIDER CLAIMS B = LOCK-IN, GHO TO PROCESS IN-PLAN PART A AND IN-AREA PART B CLAIMS C = LOCK-IN, GHO TO PROCESS ALL PROVIDER CLAIMS CCW FIELD SOURCE AND DERIVATION: RIC-H; Field Name: BENE_GHO_ENRLMT_STRT_DT, BENE_GHO_DISENRLMT_DT, and BENE_GHO_LKIN_PMT_OPTN_CD EACH BYTE OF THIS FIELD REPRESENTS A MONTH OF THE BENEFICIARY SUMMARY REFERENCE YEAR. FOR EXAMPLE, THE FIRST BYTE REPRESENTS BENEFICIARY SUMMARY REFERENCE YEAR MONTH JANUARY, THE SECOND BYTE REPRESENTS BENEFICIARY SUMMARY REFERENCE YEAR MONTH FEBRUARY, AND SO ON UNTIL THE TWELFTH BYTE, WHICH REPRESENTS BENEFICIARY SUMMARY REFERENCE YEAR MONTH DECEMBER. EACH MONTHLY INDICATOR TAKES THE VALUE OF ONE OF THE CODE SET LISTED IN THE BENEFICIARY SUMMARY FILE DATA DICTIONARY. IF THE BENEFICIARY DID NOT HAVE RECORDED COVERAGE DURING A GIVEN MONTH OF THE BENEFICIARY SUMMARY REFERENCE YEAR, THEN THAT MONTH IS CODED '0'.
BENE_ID	**Encrypted 723 Beneficiary ID (Unique Key)**	CHAR	15	A unique CCW beneficiary identifier field (BENE_ID) that is specific to the Chronic Condition Warehouse. This field is encrypted prior to delivery to researchers. The BENE_ID field is used to cross-reference data for each beneficiary across all claim and assessment data files	SOURCE: CCW
BENE_ENROLLMT_REF_YR	Beneficiary Enrollment Reference Year	NUM	4	This field indicates the reference year of enrollment of the beneficiary.	EDIT-RULES: YYYY

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
CRDTBL_CVRG_SW	Creditable Coverage Switch	CHAR	1	Indicates for the Denominator reference year, the presence or absence of creditable coverage status.	* = Enrolled in Medicare A and/or B, but no Part D enrollment data for the beneficiary. *(This status was indicated as 'X' for 2006-2009)* 0 = No instances of any creditable coverage status switch being "ON" at any point during the year 1 = For at least 1 month during the year, 1 out of 5 creditable coverage switches was "ON". Therefore, the beneficiary was enrolled in at least 1 of 5 creditable coverage categories (i.e., FEHB, Tricare, VA, SPAP, or working aged).
PLAN_CVRG_MOS_NUM	Plan Coverage Months Number	CHAR	2	Contains the total number of months of Part D plan coverage for the beneficiary.	The value in this field will be within the valid range of values '00' through '12' inclusive, dependent on the number of occurrences when the Plan indicators = H, R, S, or E.
RDS_CVRG_MOS_NUM	Retiree Drug Subsidy Coverage Months Number	CHAR	2	Contains the total number of months the employer is entitled to a retiree drug subsidy for the beneficiary.	The value in this field will be within the valid range of values '00' through '12' inclusive, dependent on the number of occurrences where the Retiree Drug Subsidy indicators = Y.
DUAL_ELGBL_MOS_NUM	Dual Eligible Months Number	CHAR	2	Contains the total number of months of dual eligibility for the beneficiary.	The value in this field will be within the valid range of values '00' through '12' inclusive, dependent on the number of occurrences when the Medicaid Dual Eligible Indicators not equal to '00' or '**'.
PTD_CNTRCT_ID_<month>	Encrypted Contract ID (occurs 12 times)	CHAR	5	Encrypted, unique number CMS assigns to each contract that a Part D plan has with CMS. This is the final contract to which the beneficiary was assigned at the time of payment reconciliation.	The first character of the contract ID is a letter representing the type of plan. H = Managed Care Organizations other than Regional PPO R = Regional PPO S = PDP E = Employer-Sponsored (starting January 2007) N = Not Part D Enrolled 0 = Not Medicare enrolled for the month * = Enrolled in Medicare A and/or B, but no Part D enrollment data for the beneficiary. *(This status was indicated as 'X' for 2006-2009)*
PTD_PBP_ID_<month>	Encrypted Plan Benefit Package ID (occurs 12 times)	CHAR	3	Encrypted, unique number CMS assigns to identify a specific plan benefit package within a contract (12 monthly occurrences).	

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
PTD_SGMT_ID_<month>	Encrypted Segment ID (occurs 12 times)	CHAR	3	Encrypted segment number CMS assigns to identify a segment or subdivision of a Part D plan benefit package within a contract (12 monthly occurrences).	
CST_SHR_GRP_CD_<month>	Cost Share Group Code (occurs 12 times)	CHAR	2	Code indicating beneficiary liability of cost-sharing.	00 = Not Medicare enrolled for the month ** = Enrolled in Medicare A and/or B, but no Part D enrollment data for the beneficiary. *(This status was indicated as 'XX' for 2006-2009)* Enrolled in Medicare A and/or B and enrolled in Part D and: 01 = Bene is deemed with 100% premium-subsidy and no copayment 02 = Bene is deemed with 100% premium-subsidy and low copayment 03 = Bene is deemed with 100% premium-subsidy and high copayment 04 = Bene with LIS, 100% premium-subsidy and high copayment 05 = Bene with LIS, 100% premium-subsidy and 15% copayment 06 = Bene with LIS, 75% premium-subsidy and 15% copayment 07 = Bene with LIS, 50% premium-subsidy and 15% copayment 08 = Bene with LIS, 25% premium-subsidy and 15% copayment 09 = No premium subsidy nor cost sharing Enrolled in Medicare A and/or B, but not Part D enrolled and: 10 = Not enrolled in Part D, but employer is entitled for RDS subsidy 11 = Bene with creditable coverage but no RDS 12 = Not Part D enrolled. No RDS and no creditable coverage 13 = None of the above conditions have been met

Long SAS Name	Variable Label	Data Type	Data Length	Description	Comments
RDS_IND_<month>	RDS Code - Retiree Drug Subsidy Code (occurs 12 times)	CHAR	1	Indicates for each month of the Denominator reference year, whether the employer should be subsidized for the beneficiary.	0 = Not Medicare enrolled for the month * = Enrolled in Medicare A and/or B, but no Part D enrollment data for the beneficiary. *(This status was indicated as 'X' for 2006-2009)* Y = Employer subsidized for the retired beneficiary N = No employer subsidization for the retired beneficiary
DUAL_STUS_CD_<month>	Dual Status Code (occurs 12 times)	CHAR	2	Indicates for each month of the Denominator reference year, the dual eligibility status, if any, for the beneficiary.	00 = Not Medicare enrolled for the month ** = Enrolled in Medicare A and/or B, but no Part D enrollment data for the beneficiary. *(This status was indicated as 'XX' for 2006-2009)* NA = Non-Medicaid 01 = QMB only 02 = QMB and Medicaid coverage including RX 03 = SLMB only 04 = SLMB and Medicaid coverage including RX 05 = QDWI 06 = Qualifying Individuals 08 = Other Dual Eligibles (Non-QMB, SLMB, QWDI, or QI) w/Medicaid coverage including RX 09 = Other Dual Eligibles but without Medicaid coverage 99 = Unknown

Appendix B: Part D Event File (Data Dictionary)

Long SAS Name	Type	Length	Label	Description	Notes
PDE_ID	Char	15	CCW Encrypted Part D Event Number	Identifies a unique Part D event for a beneficiary.	
BENE_ID	Char	15	CCW Encrypted Beneficiary ID Number	A unique CCW beneficiary identifier field (BENE_ID) specific to the Chronic Condition Warehouse. This field is encrypted prior to delivery to researchers.	
DOB_DT	Date	8	Patient Date of Birth (DOB)	Date of birth of the patient as indicated on the event record.	CCYYMMDD
GNDR_CD	Char	1	Patient Gender	Gender of the patient as indicated on the event record.	CODES: Blank = Unknown 1 = Male 2 = Female
SRVC_DT	Date	8	RX Service Date (DOS)	This field contains the date on which the prescription was filled.	CCYYMMDD
PD_DT	Date	8	Paid Date	The date on which the plan originally paid the pharmacy for the prescription drug. This is an optional field.	CCYYMMDD
RX_SRVC_RFRNC_NUM	Num	10	RX Service Reference Number	This field contains the prescription reference number assigned by the pharmacy at the time the prescription is filled. Field length is 9 to accommodate proposed future NCPDP standard.	
PROD_SRVC_ID	Char	19	Product Service ID	This field identifies the dispensed drug using a National Drug Code (NDC). The NDC is reported in NDC11 format. In instances where a pharmacy formulates a compound containing multiple NDC drugs, the NDC of the most expensive drug is used.	NDC code in the following format: MMMMMDDDDPP followed by 8 spaces. CMS rejects the following codes: 99999999999, 99999999992, 99999999993, 99999999994, 99999999995 and 99999999996

Long SAS Name	Type	Length	Label	Description	Notes
PLAN_CNTRCT_REC_ID	Char	5	Encrypted Plan Contract ID	Encrypted, unique number CMS assigns to each contract that a Part D plan has with CMS. This is the final contract to which the beneficiary was assigned at the time of payment reconciliation. The first character of the contract ID is a letter representing the type of plan.	CODES: H = Managed Care Organizations other than Regional PPO R = Regional PPO S = PDP E = Employer-Sponsored (starting January 2007)
PLAN_PBP_REC_NUM	Char	3	Encrypted Plan Benefit Package ID	Encrypted, unique number CMS assigns to identify a specific plan benefit package within a contract. This is the final plan to which the beneficiary was assigned at the time of payment reconciliation.	
CMPND_CD	Num	2	Compound Code	This field indicates whether or not the dispensed drug was compounded or mixed.	CODES: 0 = Not specified 1 = Not a compound 2 = Compound

Long SAS Name	Type	Length	Label	Description	Notes
DAW_PROD_SLCTN_CD	Char	1	Dispense as Written (DAW) Product Selection Code	This field indicates the prescriber's instruction regarding substitution of generic equivalents or order to dispense the specific product written.	CODES: 0 = No Product Selection Indicated 1 = Substitution Not Allowed by Prescriber 2 = Substitution Allowed - Patient Requested That Brand Product Be Dispensed 3 = Substitution Allowed - Pharmacist Selected Product Dispensed 4 = Substitution Allowed - Generic Drug Not in Stock 5 = Substitution Allowed - Brand Drug Dispensed as Generic 6 = Override 7 = Substitution Not Allowed - Brand Drug Mandated by Law 8 = Substitution Allowed - Generic Drug Not Available in Marketplace 9 = Other
QTY_DSPNSD_NUM	Num	12	Quantity Dispensed	This field indicates the number of units, grams, milliliters, or other dispensed in the current drug event. If a compounded item, then the QUANTITY DISPENSED is the total of all ingredients. Partial-fill quantities should be submitted for the prescribed quantity.	
DAYS_SUPLY_NUM	Num	3	Days Supply	This field indicates the number of days' supply of medication dispensed by the pharmacy and will consist of the amount the pharmacy enters for the prescription.	Possible values are 0 – 999. Blanks will be accepted in PDE's where NON-STANDARD FORMAT CODE IS B, X, or P.

Long SAS Name	Type	Length	Label	Description	Notes
FILL_NUM	Num	3	Fill Number	This field indicates the number fill of the current dispensed supply.	Possible values are 0 - 99 with 0 used if FILL NUMBER is unavailable.
DSPNSNG_STUS_CD	Char	1	Dispensing Status Code	This field indicates how the pharmacy dispensed the complete quantity of the prescription. When the pharmacy partially fills a prescription, this field indicates a partial fill. When the full quantity is dispensed at one time, this field is blank.	CODES: Blank = Not specified or full quantity P = Partial fill C = Completion of partial fill
DRUG_CVRG_STUS_CD	Char	1	Drug Coverage Status Code	This field indicates whether or not the drug is covered under the Medicare Part D benefit and/or a specific PBP.	CODES: C = Covered E = Supplemental drugs (reported by Enhanced Alternative plans only) O = Over-the-counter drugs
ADJSTMT_DLTN_CD	Char	1	Adjustment Deletion Code	This field distinguishes original from adjusted or deleted PDE records so CMS can adjust claims and make accurate payment for revised PDE records.	CODES: Blank = Original PDE A = Adjustment D = Deletion R = Resubmitted
NSTD_FRMT_CD	Char	1	Non-Standard Format Code	This data element is used by CMS to identify PDE records that are compiled from non-standard sources. NCPDP is the standard format in which plans receive data from pharmacies.	CODES: X = X12 837 B = Beneficiary submitted claim C = Coordination of Benefits P = Paper claim from provider S = State-to-Plan PDEs Blank = NCPDP electronic format
PRCNG_EXCPTN_CD	Char	1	Pricing Exception Code	Indicates PDEs using pricing rules that differ from the plan's negotiated price.	CODES: M = Medicare is a secondary payer (MSP) O = Out of network pharmacy Blank = In-network pharmacy

Long SAS Name	Type	Length	Label	Description	Notes
CTSTRPHC_CVRG_CD	Char	1	Catastrophic Coverage Code	This field indicates that a beneficiary has reached the out-of-pocket threshold or attachment point. At this point, catastrophic coverage provisions begin, namely reinsurance and reduced beneficiary cost sharing.	CODES: A = Attachment point met on this event C = Above attachment point Blank = Attachment point not met
GDC_BLW_OOPT_AMT	Num	10	Gross Drug Cost Below Out-of-Pocket Threshold (GDCB)	This field represents the gross drug cost paid to the pharmacy below the out-of-pocket threshold for a given PDE for a covered drug. For claims received prior to a beneficiary reaching the attachment point, this field will contain a positive dollar amount. For claims above the attachment point, this field will contain a zero dollar value. For a claim on which the attachment point is reached, there is likely to be a positive dollar amount in this field and there will be a positive dollar amount in GDCA. When CATASTROPHIC COVERAGE CODE = blank, this field equals INGREDIENT COST PAID + DISPENSING FEE PAID + TOTAL AMOUNT ATTRIBUTED TO SALES TAX + VACCINE ADMINISTRATION FEE. When CATASTROPHIC COVERAGE CODE = A, this field equals the portion of INGREDIENT COST PAID + DISPENSING FEE PAID + TOTAL AMOUNT ATTRIBUTED TO SALES TAX + VACCINE ADMINISTRATION FEE falling at or below the OOP threshold. The remaining portion is reported in GDCA.	The inclusion of VACCINE ADMINISTRATION FEE is effective in 2010.

Long SAS Name	Type	Length	Label	Description	Notes
GDC_ABV_OOPT_AMT	Num	10	Gross Drug Cost Above Out-of-Pocket Threshold (GDCA)	This field represents the gross drug cost paid to the pharmacy above the out-of-pocket threshold for a given PDE for a covered drug. For claims received prior to a beneficiary reaching the attachment point, this field will contain a zero dollar amount. For claims above the attachment point, this field will contain a positive dollar value. For a claim on which the attachment point is reached, there is likely to be a positive dollar amount in this field and there will be a positive dollar amount in GDCB. When CATASTROPHIC COVERAGE CODE = C, this field equals INGREDIENT COST PAID + DISPENSING FEE PAID + TOTAL AMOUNT ATTRIBUTED TO SALES TAX + VACCINE ADMINISTRATION FEE above the OOP threshold. When CATASTROPHIC COVERAGE CODE = A, this field equals the portion of INGREDIENT COST PAID + DISPENSING FEE PAID + TOTAL AMOUNT ATTRIBUTED TO SALES TAX + VACCINE ADMINISTRATION FEE falling above the OOP threshold. The remaining portion is reported in GDCB.	The inclusion of VACCINE ADMINISTRATION FEE is effective in 2010.

Long SAS Name	Type	Length	Label	Description	Notes
PTNT_PAY_AMT	Num	10	Patient Pay Amount	This field lists the dollar amount the beneficiary paid that is not reimbursed by a third party (e.g., copayments, coinsurance, deductible or other patient pay amounts). This amount contributes to a beneficiary's TrOOP only when it is payment for a covered drug. Payments made by the beneficiary or family and friends shall also be reported in this field. Other third party payments made on behalf of a beneficiary that contribute to TrOOP shall be reported in field 33 (Other TrOOP Amount) or field 34 (Low-Income Cost-Sharing Amount) and payments that do not contribute shall be reported in field 35 (Patient Liability Reduction due to Other Payer Amount). Amount beneficiary paid that is not reimbursed by a third party.	
OTHR_TROOP_AMT	Num	10	Other TrOOP Amount	This field records all qualified third party payments that contribute to a beneficiary's TrOOP, except LICS SUBSIDY AMOUNT and PATIENT PAY AMOUNT. Examples include payments made on behalf of a beneficiary by a qualified State Pharmacy Assistance Program, charities or other TrOOP-eligible parties.	
LICS_AMT	Num	10	Low Income Cost Sharing Subsidy Amount (LICS)	This field contains plan-reported LICS amounts per drug event so that CMS systems can reconcile prospective LICS payments made to plans with actual LICS amounts incurred by the plan at Point of Sale. Amount the plan reduced patient liability due to a beneficiary's LICS status.	

Long SAS Name	Type	Length	Label	Description	Notes
PLRO_AMT	Num	10	Patient Liability Reduction Due to Other Payer Amount (PLRO)	This field takes into account coordination of benefits that results in reduced patient liability, excluding any TrOOP-eligible payers. Amounts by which patient liability is reduced due to payment by other payers that are not TrOOP-eligible and do not participate in Part D. Examples of non-TrOOP-eligible payers: group health plans, worker's compensation, and governmental programs (e.g. VA, TRICARE).	
CVRD_D_PLAN_PD_AMT	Num	10	Covered D Plan Paid Amount (CPP)	This field contains the net amount the plan paid for standard benefits (covered Part D drugs), where Drug Coverage Code = 'C'. If Drug Coverage Code = 'E' or 'O', the CPP field is zero. Supplemental drugs, supplemental cost-sharing, over-the-counter drugs and non-Part D drugs funded by Part C rebates are excluded from this field.	
NCVRD_PLAN_PD_AMT	Num	10	Non-Covered Plan Paid Amount (NPP)	This field contains the net amount paid by the plan for benefits beyond the standard benefit. Net amount the plan has paid for all over-the-counter drugs, enhanced alternative drugs, and enhanced alternative cost-sharing amounts.	
TOT_RX_CST_AMT	Num	10	Gross Drug Cost	This variable is derived from the sum of these variables: Ingredient Cost Paid Dispensing Fee Paid Total Amount Attributed to Sales Tax Vaccine Administration Fee	The inclusion of Vaccine Administration Fee is effective in 2010.

Long SAS Name	Type	Length	Label	Description	Notes
BENEFIT_PHASE	Char	2	The benefit phase of the Part D Event	Indicates the benefit phase in which the claim was expected to occur based on a data of service ordering of the beneficiary's claims, the beneficiary's accumulated gross drug and out-of-pocket costs, and the plan's deductible, initial coverage limit (ICL) and out-of-pocket threshold (OOPT) amount. Phases may include Deductible, Pre-ICL, ICL (Coverage Gap) or Catastrophic. Events that occur between two different phases are called straddle PDEs.	CODES: Blank = Not a covered drug XX = PDE Plan Identifiers do not link to the Plan Benefit file NA = National Pace or Employer Sponsored Plan DD = Deductible phase DP = Deductible to Pre-ICL Straddle PDE DI = Deductible to ICL (coverage gap) Straddle PDE DC = Deductible to Catastrophic Straddle PDE PP = Pre-ICL phase PI = Pre-ICL to ICL Straddle PDE PC = Pre-ICL to Catastrophic Straddle PDE II - ICL (coverage gap) Phase IC = ICL (coverage gap) to Catastrophic Straddle PDE CC = Catastrophic phase

Long SAS Name	Type	Length	Label	Description	Notes
PRIOR_AUTHORIZATION_YN	Char	2	Whether or not the drug requires prior authorization	This variable indicates whether the formulary specifies the drug product is subject to prior authorization. This variable is valid from 2006-2009. Starting in 2010, it is included in the Formulary file.	CODES: NA = NDC does not link to formulary XX = Unable to link to plan 1 = The drug is subject to prior authorization 0 = Either a) the drug is not subject to prior authorization or b) the plan is not required to submit a formulary so there are no restrictions on the drug
TIER_ID	Char	2	Medicare Part D formulary tier identifier	This field represents the minimum cost sharing tier in which the product was placed in the sponsor's formulary. This identifier is also a key that links a Part D plan's cost sharing tier record to a prescription drug event record via contract ID, plan ID, and tier ID. This variable is valid from 2006-2009. Starting in 2010, it is included in the Formulary file.	CODES: NA = The drug on the PDE does not link to the plan's formulary XX = Unable to link to plan 1-max = The tier on the plan's formulary associated with the drug on the PDE or if the plan is not required to submit a formulary then TIER_ID is assigned a value of '1'

Long SAS Name	Type	Length	Label	Description	Notes
QUANTITY_LIMIT_YN	Char	2	Whether or not the drug has quantity limits	This variable indicates whether the formulary specifies the drug product has a quantity limit. This variable is valid from 2006-2009. Starting in 2010, it is included in the Formulary file.	CODES: NA = NDC does not link to formulary XX = Unable to link to plan 1 = The drug has quantity limits 0 = Either a) the drug does not have quantity limits or b) the plan is not required to submit a formulary so there are no restrictions on the drug
STEP	Char	2	Maximum step number	This variable indicates whether the formulary specifies the drug product is subject to a step therapy protocol. This field will be populated with the maximum step value (i.e., in instances where a product may be part of two different step therapy protocols)for the product. This variable is valid from 2006-2009. Starting in 2010, it is included in the Formulary file.	CODES: Blank = Either a) the drug is not part of a Step Therapy Group or b) the drug is on Step 1 of a Step Therapy Group (i.e., not restricted) or c) the plan on the PDE is not required to submit a formulary, so there are no restrictions on the drug NA = The drug on the PDE does not link to the plan's formulary XX = Unable to link to plan 1-max = The maximum step on the plan's formulary associated with the drug on the PDE
CCW_PHARM_ID	Num	12	CCW Pharmacy ID	A CCW-assigned pharmacy identifier used to link PDE data from a given year to the Pharmacy Characteristics Lookup Table for that year.	

Long SAS Name	Type	Length	Label	Description	Notes
CCW_PRSCRBR_ID	Num	12	CCW Prescriber ID	A CCW Prescriber identification number that is used to link Prescribers on the PDE data to the Prescriber Characteristics File. The value is null when a prescriber identifier is not available on the PDE.	
PDE_PRSCRBR_ID_FRMT_CD	Char	1	PDE Prescriber ID Format Code	A code that describes if the Prescriber ID on the PDE has an NPI, DEA, or UPIN format based on the length of the Prescriber ID and the combination of alpha and numeric characters.	CODES: N = PDE Prescriber ID has an NPI format: 10 numeric characters with the first character a '1' or a '2' D = PDE Prescriber ID has a DEA format: 9 alpha-numeric characters with the first two characters alpha and the last seven numeric U = PDE Prescriber ID has a UPIN format: 6 alpha-numeric characters with the first one alpha and the remaining numeric X = PDE Prescriber ID is none of the above formats. PDE Prescriber ID could be a valid State License number, an invalid prescriber identifier, or a missing Prescriber ID
FORMULARY_ID	Char	8	Encrypted Formulary ID	This variable is first available in 2010. Encrypted ID assigned to each newly created formulary.	
FRMLRY_RX_ID	Char	8	CCW Formulary RX ID	This variable is first available in 2010. A CCW identifier for a drug product found in a Part D prescription drug plan formulary.	The value: 99999999 indicates diabetics supplies.

Long SAS Name	Type	Length	Label	Description	Notes
RX_ORGN_CD	Char	1	Prescription Origin Code	Code first available in 2010. A code indicating the origin of the prescription.	CODES: 0 = Not Specified 1 = Written 2 = Telephone 3 = Electronic 4 = Facsimile Blank is also allowed

Appendix C: Carrier Claims File (Base Claims, Inpatient and Outpatient)

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
Base Claim File						
BENE_ID	BENE_ID	Encrypted 723 Beneficiary ID	CHAR	15	1	1
CLM_ID	CLM_ID	Claim ID	CHAR	15	2	2
RIC_CD	NCH_NEAR_LINE_REC_IDENT_CD	NCH Near Line Record Identification Code	CHAR	1	3	3
CLM_TYPE	NCH_CLM_TYPE_CD	NCH Claim Type Code	CHAR	2	4	4
FROM_DT	CLM_FROM_DT	Claim From Date	DATE	8	5	5
THRU_DT	CLM_THRU_DT	Claim Through Date	DATE	8	6	6
WKLY_DT	NCH_WKLY_PROC_DT	NCH Weekly Claim Processing Date	DATE	8	7	7
FI_CLM_PROC_DT	FI_CLM_PROC_DT	FI Claim Process Date	DATE	8	8	8
QUERY_CD	CLAIM_QUERY_CODE	Claim Query Code	CHAR	1	9	9
PROVIDER	PRVDR_NUM	Provider Number	CHAR	6	10	10
FAC_TYPE	CLM_FAC_TYPE_CD	Claim Facility Type Code	CHAR	1	11	11
TYPESRVC	CLM_SRVC_CLSFCTN_TYPE_CD	Claim Service classification Type Code	CHAR	1	12	12

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
FREQ_CD	CLM_FREQ_CD	Claim Frequency Code	CHAR	1	13	13
FI_NUM	FI_NUM	FI Number	CHAR	5	14	14
NOPAY_CD	CLM_MDCR_NON_PMT_RSN_CD	Claim Medicare Non Payment Reason Code	CHAR	2	15	15
PMT_AMT	CLM_PMT_AMT	Claim Payment Amount	NUM	12	16	16
PRPAYAMT	NCH_PRMRY_PYR_CLM_PD_AMT	NCH Primary Payer Claim Paid Amount*	NUM	12	17	17
PRPAY_CD	NCH_PRMRY_PYR_CD	NCH Primary Payer Code	CHAR	1	18	18
ACTIONCD	FI_CLM_ACTN_CD	FI Claim Action Code	CHAR	1	19	
PRSTATE	PRVDR_STATE_CD	NCH Provider State Code	CHAR	2	20	19
ORGNPINM	ORG_NPI_NUM	Organization NPI Number	CHAR	10	21	20
AT_UPIN	AT_PHYSN_UPIN	Claim Attending Physician UPIN Number	CHAR	6	22	21
AT_NPI	AT_PHYSN_NPI	Claim Attending Physician NPI Number	CHAR	10	23	22
OP_UPIN	OP_PHYSN_UPIN	Claim Operating Physician UPIN Number	CHAR	6	24	23
OP_NPI	OP_PHYSN_NPI	Claim Operating Physician NPI Number	CHAR	10	25	24
OT_UPIN	OT_PHYSN_UPIN	Claim Other Physician UPIN Number	CHAR	6	26	25
OT_NPI	OT_PHYSN_NPI	Claim Other Physician NPI Number	CHAR	10	27	26
MCOPDSW	CLM_MCO_PD_SW	Claim MCO Paid Switch	CHAR	1	28	27
STUS_CD	PTNT_DSCHRG_STUS_CD	Patient Discharge Status Code	CHAR	2	29	28

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
PPS_IND	CLM_PPS_IND_CD	Claim PPS Indicator Code	CHAR	1	30	
TOT_CHRG	CLM_TOT_CHRG_AMT	Claim Total Charge Amount	NUM	12	31	29
ADMSN_DT	CLM_ADMSN_DT	Claim Admission Date	DATE	8	32	
TYPE_ADM	CLM_IP_ADMSN_TYPE_CD	Claim Inpatient Admission Type Code	CHAR	1	33	
SRC_ADMS	CLM_SRC_IP_ADMSN_CD	Claim Source Inpatient Admission Code	CHAR	1	34	
PTNTSTUS	NCH_PTNT_STATUS_IND_CD	NCH Patient Status Indicator Code	CHAR	1	35	
PER_DIEM	CLM_PASS_THRU_PER_DIEM_AMT	Claim Pass Thru Per Diem Amount	NUM	12	36	
DED_AMT	NCH_BENE_IP_DDCTBL_AMT	NCH Beneficiary Inpatient Deductible Amount	NUM	12	37	
COIN_AMT	NCH_BENE_PTA_COINSRNC_LBLTY_AM	NCH Beneficiary Part A Coinsurance Liability Amount	NUM	12	38	
BLDDEDAM	NCH_BENE_BLOOD_DDCTBL_LBLTY_AM	NCH Beneficiary Blood Deductible Liability Amount	NUM	12	39	30
PCCHGAMT	NCH_PROFNL_CMPNT_CHRG_AMT	NCH Professional Component Charge Amount	NUM	12	40	31
NCCHGAMT	NCH_IP_NCVRD_CHRG_AMT	NCH Inpatient Noncovered Charge Amount	NUM	12	41	

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
TDEDAMT	NCH_IP_TOT_DDCTN_AMT	NCH Inpatient Total Deduction Amount	NUM	12	42	
PPS_CPTL	CLM_TOT_PPS_CPTL_AMT	Claim Total PPS Capital Amount	NUM	12	43	
CPTL_FSP	CLM_PPS_CPTL_FSP_AMT	Claim PPS Capital FSP Amount	NUM	12	44	
CPTLOUTL	CLM_PPS_CPTL_OUTLIER_AMT	Claim PPS Capital Outlier Amount	NUM	12	45	
DISP_SHR	CLM_PPS_CPTL_DSPRPRTNT_SHR_AMT	Claim PPS Capital Disproportionate Share Amount	NUM	12	46	
IME_AMT	CLM_PPS_CPTL_IME_AMT	Claim PPS Capital IME Amount	NUM	12	47	
CPTL_EXP	CLM_PPS_CPTL_EXCPTN_AMT	Claim PPS Capital Exception Amount	NUM	12	48	
HLDHRMLS	CLM_PPS_OLD_CPTL_HLD_HRMLS_AMT	Claim PPS Old Capital Hold Harmless Amount	NUM	12	49	
DRGWTAMT	CLM_PPS_CPTL_DRG_WT_NUM	Claim PPS Capital DRG Weight Number	NUM	8	50	
UTIL_DAY	CLM_UTLZTN_DAY_CNT	Claim Utilization Day Count	NUM	3	51	
COIN_DAY	BENE_TOT_COINSRNC_DAYS_CNT	Beneficiary Total Coinsurance Days Count	NUM	3	52	
LRD_USE	BENE_LRD_USED_CNT	Beneficiary LRD Used Count	NUM	3	53	
NUTILDAY	CLM_NON_UTLZTN_DAYS_CNT	Claim Non Utilization Days Count	NUM	5	54	
BLDFRNSH	NCH_BLOOD_PNTS_FRNSHD_QTY	NCH Blood Pints Furnished Quantity	NUM	3	55	

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
QLFYFROM	NCH_QLFYD_STAY_FROM_DT	NCH Qualified Stay From Date	DATE	8		
QLFYTHRU	NCH_QLFYD_STAY_THRU_DT	NCH Qualify Stay Through Date	DATE	8		
NCOVFROM	NCH_VRFD_NCVRD_STAY_FROM_DT	NCH Verified Noncovered Stay From Date	DATE	8	56	
NCOVTHRU	NCH_VRFD_NCVRD_STAY_THRU_DT	NCH Verified Noncovered Stay Through Date	DATE	8	57	
CARETHRU	NCH_ACTV_OR_CVRD_LVL_CARE_THRU	NCH Active or Covered Level Care Thru Date	DATE	8	58	
EXHST_DT	NCH_BENE_MDCR_BNFTS_EXHTD_DT_I	NCH Beneficiary Medicare Benefits Exhausted Date	DATE	8	59	
DSCHRGDT	NCH_BENE_DSCHRG_DT	NCH Beneficiary Discharge Date	DATE	8	60	
DRG_CD	CLM_DRG_CD	Claim Diagnosis Related Group Code	CHAR	3	61	
OUTLR_CD	CLM_DRG_OUTLIER_STAY_CD	Claim Diagnosis Related Group Outlier Stay Code	CHAR	1	62	
OUTLRPMT	NCH_DRG_OUTLIER_APRVD_PMT_AMT	NCH DRG Outlier Approved Payment Amount	NUM	12	63	
ADMTG_DGNS_CD	ADMTG_DGNS_CD	Claim Admitting Diagnosis Code	CHAR	7	64	

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ADMTG_DGNS_VRSN_CD	ADMTG_DGNS_VRSN_CD	Claim Admitting Diagnosis Code Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	65	
PRNCPAL_DGNS_CD	PRNCPAL_DGNS_CD	Primary Claim Diagnosis Code	CHAR	7	66	32
PRNCPAL_DGNS_VRSN_CD	PRNCPAL_DGNS_VRSN_CD	Primary Claim Diagnosis Code Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	67	33
ICD_DGNS_CD1	ICD_DGNS_CD1	Claim Diagnosis Code I	CHAR	7	68	34
ICD_DGNS_VRSN_CD1	ICD_DGNS_VRSN_CD1	Claim Diagnosis Code I Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	69	35
CLM_POA_IND_SW1	CLM_POA_IND_SW1	Claim Diagnosis Code I Diagnosis Present on Admission Indicator Code	CHAR	1	70	
ICD_DGNS_CD2	ICD_DGNS_CD2	Claim Diagnosis Code II	CHAR	7	71	36
ICD_DGNS_VRSN_CD2	ICD_DGNS_VRSN_CD2	Claim Diagnosis Code II Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	72	37

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
CLM_POA_IND_SW2	CLM_POA_IND_SW2	Claim Diagnosis Code II Diagnosis Present on Admission Indicator Code	CHAR	1	73	
ICD_DGNS_CD3	ICD_DGNS_CD3	Claim Diagnosis Code III	CHAR	7	74	38
ICD_DGNS_VRSN_CD3	ICD_DGNS_VRSN_CD3	Claim Diagnosis Code III Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	75	39
CLM_POA_IND_SW3	CLM_POA_IND_SW3	Claim Diagnosis Code III Diagnosis Present on Admission Indicator Code	CHAR	1	76	
ICD_DGNS_CD4	ICD_DGNS_CD4	Claim Diagnosis Code IV	CHAR	7	77	40
ICD_DGNS_VRSN_CD4	ICD_DGNS_VRSN_CD4	Claim Diagnosis Code IV Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	78	41
CLM_POA_IND_SW4	CLM_POA_IND_SW4	Claim Diagnosis Code IV Diagnosis Present on Admission Indicator Code	CHAR	1	79	
ICD_DGNS_CD5	ICD_DGNS_CD5	Claim Diagnosis Code V	CHAR	7	80	42

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_VRSN_CD5	ICD_DGNS_VRSN_CD5	Claim Diagnosis Code V Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	81	43
CLM_POA_IND_SW5	CLM_POA_IND_SW5	Claim Diagnosis Code V Diagnosis Present on Admission Indicator Code	CHAR	1	82	
ICD_DGNS_CD6	ICD_DGNS_CD6	Claim Diagnosis Code VI	CHAR	7	83	44
ICD_DGNS_VRSN_CD6	ICD_DGNS_VRSN_CD6	Claim Diagnosis Code VI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	84	45
CLM_POA_IND_SW6	CLM_POA_IND_SW6	Claim Diagnosis Code VI Diagnosis Present on Admission Indicator Code	CHAR	1	85	
ICD_DGNS_CD7	ICD_DGNS_CD7	Claim Diagnosis Code VII	CHAR	7	86	46
ICD_DGNS_VRSN_CD7	ICD_DGNS_VRSN_CD7	Claim Diagnosis Code VII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	87	47
CLM_POA_IND_SW7	CLM_POA_IND_SW7	Claim Diagnosis Code VII Diagnosis Present on Admission Indicator Code	CHAR	1	88	

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_CD8	ICD_DGNS_CD8	Claim Diagnosis Code VIII	CHAR	7	89	48
ICD_DGNS_VRSN_CD8	ICD_DGNS_VRSN_CD8	Claim Diagnosis Code VIII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	90	49
CLM_POA_IND_SW8	CLM_POA_IND_SW8	Claim Diagnosis Code VIII Diagnosis Present on Admission Indicator Code	CHAR	1	91	
ICD_DGNS_CD9	ICD_DGNS_CD9	Claim Diagnosis Code IX	CHAR	7	92	50
ICD_DGNS_VRSN_CD9	ICD_DGNS_VRSN_CD9	Claim Diagnosis Code IX Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	93	51
CLM_POA_IND_SW9	CLM_POA_IND_SW9	Claim Diagnosis Code IX Diagnosis Present on Admission Indicator Code	CHAR	1	94	
ICD_DGNS_CD10	ICD_DGNS_CD10	Claim Diagnosis Code X	CHAR	7	95	52
ICD_DGNS_VRSN_CD10	ICD_DGNS_VRSN_CD10	Claim Diagnosis Code X Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	96	53

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
CLM_POA_IND_SW10	CLM_POA_IND_SW10	Claim Diagnosis Code X Diagnosis Present on Admission Indicator Code	CHAR	1	97	
ICD_DGNS_CD11	ICD_DGNS_CD11	Claim Diagnosis Code XI	CHAR	7	98	54
ICD_DGNS_VRSN_CD11	ICD_DGNS_VRSN_CD11	Claim Diagnosis Code XI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	99	55
CLM_POA_IND_SW11	CLM_POA_IND_SW11	Claim Diagnosis Code XI Diagnosis Present on Admission Indicator Code	CHAR	1	100	
ICD_DGNS_CD12	ICD_DGNS_CD12	Claim Diagnosis Code XII	CHAR	7	101	56
ICD_DGNS_VRSN_CD12	ICD_DGNS_VRSN_CD12	Claim Diagnosis Code XII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	102	57
CLM_POA_IND_SW12	CLM_POA_IND_SW12	Claim Diagnosis Code XII Diagnosis Present on Admission Indicator Code	CHAR	1	103	
ICD_DGNS_CD13	ICD_DGNS_CD13	Claim Diagnosis Code XIII	CHAR	7	104	58

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_VRSN_CD13	ICD_DGNS_VRSN_CD13	Claim Diagnosis Code XIII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	105	59
CLM_POA_IND_SW13	CLM_POA_IND_SW13	Claim Diagnosis Code XIII Diagnosis Present on Admission Indicator Code	CHAR	1	106	
ICD_DGNS_CD14	ICD_DGNS_CD14	Claim Diagnosis Code XIV	CHAR	7	107	60
ICD_DGNS_VRSN_CD14	ICD_DGNS_VRSN_CD14	Claim Diagnosis Code XIV Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	108	61
CLM_POA_IND_SW14	CLM_POA_IND_SW14	Claim Diagnosis Code XIV Diagnosis Present on Admission Indicator Code	CHAR	1	109	
ICD_DGNS_CD15	ICD_DGNS_CD15	Claim Diagnosis Code XV	CHAR	7	110	62
ICD_DGNS_VRSN_CD15	ICD_DGNS_VRSN_CD15	Claim Diagnosis Code XV Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	111	63
CLM_POA_IND_SW15	CLM_POA_IND_SW15	Claim Diagnosis Code XV Diagnosis Present on Admission Indicator Code	CHAR	1	112	

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_CD16	ICD_DGNS_CD16	Claim Diagnosis Code XVI	CHAR	7	113	64
ICD_DGNS_VRSN_CD16	ICD_DGNS_VRSN_CD16	Claim Diagnosis Code XVI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	114	65
CLM_POA_IND_SW16	CLM_POA_IND_SW16	Claim Diagnosis Code XVI Diagnosis Present on Admission Indicator Code	CHAR	1	115	
ICD_DGNS_CD17	ICD_DGNS_CD17	Claim Diagnosis Code XVII	CHAR	7	116	66
ICD_DGNS_VRSN_CD17	ICD_DGNS_VRSN_CD17	Claim Diagnosis Code XVII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	117	67
CLM_POA_IND_SW17	CLM_POA_IND_SW17	Claim Diagnosis Code XVII Diagnosis Present on Admission Indicator Code	CHAR	1	118	
ICD_DGNS_CD18	ICD_DGNS_CD18	Claim Diagnosis Code XVIII	CHAR	7	119	68
ICD_DGNS_VRSN_CD18	ICD_DGNS_VRSN_CD18	Claim Diagnosis Code XVIII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	120	69

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
CLM_POA_IND_SW18	CLM_POA_IND_SW18	Claim Diagnosis Code XVIII Diagnosis Present on Admission Indicator Code	CHAR	1	121	
ICD_DGNS_CD19	ICD_DGNS_CD19	Claim Diagnosis Code XIX	CHAR	7	122	70
ICD_DGNS_VRSN_CD19	ICD_DGNS_VRSN_CD19	Claim Diagnosis Code XIX Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	123	71
CLM_POA_IND_SW19	CLM_POA_IND_SW19	Claim Diagnosis Code XIX Diagnosis Present on Admission Indicator Code	CHAR	1	124	
ICD_DGNS_CD20	ICD_DGNS_CD20	Claim Diagnosis Code XX	CHAR	7	125	72
ICD_DGNS_VRSN_CD20	ICD_DGNS_VRSN_CD20	Claim Diagnosis Code XX Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	126	73
CLM_POA_IND_SW20	CLM_POA_IND_SW20	Claim Diagnosis Code XX Diagnosis Present on Admission Indicator Code	CHAR	1	127	
ICD_DGNS_CD21	ICD_DGNS_CD21	Claim Diagnosis Code XXI	CHAR	7	128	74

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_VRSN_CD21	ICD_DGNS_VRSN_CD21	Claim Diagnosis Code XXI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	129	75
CLM_POA_IND_SW21	CLM_POA_IND_SW21	Claim Diagnosis Code XXI Diagnosis Present on Admission Indicator Code	CHAR	1	130	
ICD_DGNS_CD22	ICD_DGNS_CD22	Claim Diagnosis Code XXII	CHAR	7	131	76
ICD_DGNS_VRSN_CD22	ICD_DGNS_VRSN_CD22	Claim Diagnosis Code XXII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	132	77
CLM_POA_IND_SW22	CLM_POA_IND_SW22	Claim Diagnosis Code XXII Diagnosis Present on Admission Indicator Code	CHAR	1	133	
ICD_DGNS_CD23	ICD_DGNS_CD23	Claim Diagnosis Code XXIII	CHAR	7	134	78
ICD_DGNS_VRSN_CD23	ICD_DGNS_VRSN_CD23	Claim Diagnosis Code XXIII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	135	79
CLM_POA_IND_SW23	CLM_POA_IND_SW23	Claim Diagnosis Code XXIII Diagnosis Present on Admission Indicator Code	CHAR	1	136	

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_CD24	ICD_DGNS_CD24	Claim Diagnosis Code XXIV	CHAR	7	137	80
ICD_DGNS_VRSN_CD24	ICD_DGNS_VRSN_CD24	Claim Diagnosis Code XXIV Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	138	81
CLM_POA_IND_SW24	CLM_POA_IND_SW24	Claim Diagnosis Code XXIV Diagnosis Present on Admission Indicator Code	CHAR	1	139	
ICD_DGNS_CD25	ICD_DGNS_CD25	Claim Diagnosis Code XXV	CHAR	7	140	82
ICD_DGNS_VRSN_CD25	ICD_DGNS_VRSN_CD25	Claim Diagnosis Code XXV Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	141	83
CLM_POA_IND_SW25	CLM_POA_IND_SW25	Claim Diagnosis Code XXV Diagnosis Present on Admission Indicator Code	CHAR	1	142	
FST_DGNS_E_CD	FST_DGNS_E_CD	First Claim Diagnosis E Code	CHAR	7	143	84
FST_DGNS_E_VRSN_CD	FST_DGNS_E_VRSN_CD	First Claim Diagnosis E Code Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	144	85
ICD_DGNS_E_CD1	ICD_DGNS_E_CD1	Claim Diagnosis E Code I	CHAR	7	145	86
ICD_DGNS_E_VRSN_CD1	ICD_DGNS_E_VRSN_CD1	Claim Diagnosis E Code I Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	146	87

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
CLM_E_POA_IND_SW1	CLM_E_POA_IND_SW1	Claim Diagnosis E Code I Diagnosis Present on Admission Indicator Code	CHAR	1	147	
ICD_DGNS_E_CD2	ICD_DGNS_E_CD2	Claim Diagnosis E Code II	CHAR	7	148	88
ICD_DGNS_E_VRSN_CD2	ICD_DGNS_E_VRSN_CD2	Claim Diagnosis E Code II Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	149	89
CLM_E_POA_IND_SW2	CLM_E_POA_IND_SW2	Claim Diagnosis E Code II Diagnosis Present on Admission Indicator Code	CHAR	1	150	
ICD_DGNS_E_CD3	ICD_DGNS_E_CD3	Claim Diagnosis E Code III	CHAR	7	151	90
ICD_DGNS_E_VRSN_CD3	ICD_DGNS_E_VRSN_CD3	Claim Diagnosis E Code III Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	152	91
CLM_E_POA_IND_SW3	CLM_E_POA_IND_SW3	Claim Diagnosis E Code III Diagnosis Present on Admission Indicator Code	CHAR	1	153	
ICD_DGNS_E_CD4	ICD_DGNS_E_CD4	Claim Diagnosis E Code IV	CHAR	7	154	92

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_E_VRSN_CD4	ICD_DGNS_E_VRSN_CD4	Claim Diagnosis E Code IV Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	155	93
CLM_E_POA_IND_SW4	CLM_E_POA_IND_SW4	Claim Diagnosis E Code IV Diagnosis Present on Admission Indicator Code	CHAR	1	156	
ICD_DGNS_E_CD5	ICD_DGNS_E_CD5	Claim Diagnosis E Code V	CHAR	7	157	94
ICD_DGNS_E_VRSN_CD5	ICD_DGNS_E_VRSN_CD5	Claim Diagnosis E Code V Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	158	95
CLM_E_POA_IND_SW5	CLM_E_POA_IND_SW5	Claim Diagnosis E Code V Diagnosis Present on Admission Indicator Code	CHAR	1	159	
ICD_DGNS_E_CD6	ICD_DGNS_E_CD6	Claim Diagnosis E Code VI	CHAR	7	160	96
ICD_DGNS_E_VRSN_CD6	ICD_DGNS_E_VRSN_CD6	Claim Diagnosis E Code VI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	161	97
CLM_E_POA_IND_SW6	CLM_E_POA_IND_SW6	Claim Diagnosis E Code VI Diagnosis Present on Admission Indicator Code	CHAR	1	162	

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_E_CD7	ICD_DGNS_E_CD7	Claim Diagnosis E Code VII	CHAR	7	163	98
ICD_DGNS_E_VRSN_CD7	ICD_DGNS_E_VRSN_CD7	Claim Diagnosis E Code VII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	164	99
CLM_E_POA_IND_SW7	CLM_E_POA_IND_SW7	Claim Diagnosis E Code VII Diagnosis Present on Admission Indicator Code	CHAR	1	165	
ICD_DGNS_E_CD8	ICD_DGNS_E_CD8	Claim Diagnosis E Code VIII	CHAR	7	166	100
ICD_DGNS_E_VRSN_CD8	ICD_DGNS_E_VRSN_CD8	Claim Diagnosis E Code VIII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	167	101
CLM_E_POA_IND_SW8	CLM_E_POA_IND_SW8	Claim Diagnosis E Code VIII Diagnosis Present on Admission Indicator Code	CHAR	1	168	
ICD_DGNS_E_CD9	ICD_DGNS_E_CD9	Claim Diagnosis E Code IX	CHAR	7	169	102
ICD_DGNS_E_VRSN_CD9	ICD_DGNS_E_VRSN_CD9	Claim Diagnosis E Code IX Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	170	103

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
CLM_E_POA_IND_SW9	CLM_E_POA_IND_SW9	Claim Diagnosis E Code IX Diagnosis Present on Admission Indicator Code	CHAR	1	171	
ICD_DGNS_E_CD10	ICD_DGNS_E_CD10	Claim Diagnosis E Code X	CHAR	7	172	104
ICD_DGNS_E_VRSN_CD10	ICD_DGNS_E_VRSN_CD10	Claim Diagnosis E Code X Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	173	105
CLM_E_POA_IND_SW10	CLM_E_POA_IND_SW10	Claim Diagnosis E Code X Diagnosis Present on Admission Indicator Code	CHAR	1	174	
ICD_DGNS_E_CD11	ICD_DGNS_E_CD11	Claim Diagnosis E Code XI	CHAR	7	175	106
ICD_DGNS_E_VRSN_CD11	ICD_DGNS_E_VRSN_CD11	Claim Diagnosis E Code XI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	176	107
CLM_E_POA_IND_SW11	CLM_E_POA_IND_SW11	Claim Diagnosis E Code XI Diagnosis Present on Admission Indicator Code	CHAR	1	177	
ICD_DGNS_E_CD12	ICD_DGNS_E_CD12	Claim Diagnosis E Code XII	CHAR	7	178	108

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_DGNS_E_VRSN_CD12	ICD_DGNS_E_VRSN_CD12	Claim Diagnosis E Code XII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	179	109
CLM_E_POA_IND_SW12	CLM_E_POA_IND_SW12	Claim Diagnosis E Code XII Diagnosis Present on Admission Indicator Code	CHAR	1	180	
ICD_PRCDR_CD1	ICD_PRCDR_CD1	Claim Procedure Code I	CHAR	7	181	110
ICD_PRCDR_VRSN_CD1	ICD_PRCDR_VRSN_CD1	Claim Procedure Code I Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	182	111
PRCDR_DT1	PRCDR_DT1	Claim Procedure Code I Date	DATE	8	183	112
ICD_PRCDR_CD2	ICD_PRCDR_CD2	Claim Procedure Code II	CHAR	7	184	113
ICD_PRCDR_VRSN_CD2	ICD_PRCDR_VRSN_CD2	Claim Procedure Code II Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	185	114
PRCDR_DT2	PRCDR_DT2	Claim Procedure Code II Date	DATE	8	186	115
ICD_PRCDR_CD3	ICD_PRCDR_CD3	Claim Procedure Code III	CHAR	7	187	116
ICD_PRCDR_VRSN_CD3	ICD_PRCDR_VRSN_CD3	Claim Procedure Code III Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	188	117
PRCDR_DT3	PRCDR_DT3	Claim Procedure Code III Date	DATE	8	189	118
ICD_PRCDR_CD4	ICD_PRCDR_CD4	Claim Procedure Code IV	CHAR	7	190	119
ICD_PRCDR_VRSN_CD4	ICD_PRCDR_VRSN_CD4	Claim Procedure Code IV Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	191	120
PRCDR_DT4	PRCDR_DT4	Claim Procedure Code IV Date	DATE	8	192	121
ICD_PRCDR_CD5	ICD_PRCDR_CD5	Claim Procedure Code V	CHAR	7	193	122
ICD_PRCDR_VRSN_CD5	ICD_PRCDR_VRSN_CD5	Claim Procedure Code V Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	194	123
PRCDR_DT5	PRCDR_DT5	Claim Procedure Code V Date	DATE	8	195	124
ICD_PRCDR_CD6	ICD_PRCDR_CD6	Claim Procedure Code VI	CHAR	7	196	125
ICD_PRCDR_VRSN_CD6	ICD_PRCDR_VRSN_CD6	Claim Procedure Code VI Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	197	126
PRCDR_DT6	PRCDR_DT6	Claim Procedure Code VI Date	DATE	8	198	127

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_PRCDR_CD7	ICD_PRCDR_CD7	Claim Procedure Code VII	CHAR	7	199	128
ICD_PRCDR_VRSN_CD7	ICD_PRCDR_VRSN_CD7	Claim Procedure Code VII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	200	129
PRCDR_DT7	PRCDR_DT7	Claim Procedure CodeVII Date	DATE	8	201	130
ICD_PRCDR_CD8	ICD_PRCDR_CD8	Claim Procedure Code VIII	CHAR	7	202	131
ICD_PRCDR_VRSN_CD8	ICD_PRCDR_VRSN_CD8	Claim Procedure Code VIII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	203	132
PRCDR_DT8	PRCDR_DT8	Claim Procedure Code VIII Date	DATE	8	204	133
ICD_PRCDR_CD9	ICD_PRCDR_CD9	Claim Procedure Code IX	CHAR	7	205	134
ICD_PRCDR_VRSN_CD9	ICD_PRCDR_VRSN_CD9	Claim Procedure Code IX Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	206	135
PRCDR_DT9	PRCDR_DT9	Claim Procedure Code IX Date	DATE	8	207	136
ICD_PRCDR_CD10	ICD_PRCDR_CD10	Claim Procedure Code X	CHAR	7	208	137
ICD_PRCDR_VRSN_CD10	ICD_PRCDR_VRSN_CD10	Claim Procedure Code X Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	209	138
PRCDR_DT10	PRCDR_DT10	Claim Procedure Code X Date	DATE	8	210	139
ICD_PRCDR_CD11	ICD_PRCDR_CD11	Claim Procedure Code XI	CHAR	7	211	140
ICD_PRCDR_VRSN_CD11	ICD_PRCDR_VRSN_CD11	Claim Procedure Code XI Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	212	141
PRCDR_DT11	PRCDR_DT11	Claim Procedure Code XI Date	DATE	8	213	142
ICD_PRCDR_CD12	ICD_PRCDR_CD12	Claim Procedure Code XII	CHAR	7	214	143
ICD_PRCDR_VRSN_CD12	ICD_PRCDR_VRSN_CD12	Claim Procedure Code XII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	215	144
PRCDR_DT12	PRCDR_DT12	Claim Procedure Code XII Date	DATE	8	216	145
ICD_PRCDR_CD13	ICD_PRCDR_CD13	Claim Procedure Code XIII	CHAR	7	217	146
ICD_PRCDR_VRSN_CD13	ICD_PRCDR_VRSN_CD13	Claim Procedure Code XIII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	218	147
PRCDR_DT13	PRCDR_DT13	Claim Procedure Code XIII Date	DATE	8	219	148
ICD_PRCDR_CD14	ICD_PRCDR_CD14	Claim Procedure Code XIV	CHAR	7	220	149
ICD_PRCDR_VRSN_CD14	ICD_PRCDR_VRSN_CD14	Claim Procedure Code XIV Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	221	150

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
PRCDR_DT14	PRCDR_DT14	Claim Procedure Code XIV Date	DATE	8	222	151
ICD_PRCDR_CD15	ICD_PRCDR_CD15	Claim Procedure Code XV	CHAR	7	223	152
ICD_PRCDR_VRSN_CD15	ICD_PRCDR_VRSN_CD15	Claim Procedure Code XV Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	224	153
PRCDR_DT15	PRCDR_DT15	Claim Procedure Code XV Date	DATE	8	225	154
ICD_PRCDR_CD16	ICD_PRCDR_CD16	Claim Procedure Code XVI	CHAR	7	226	155
ICD_PRCDR_VRSN_CD16	ICD_PRCDR_VRSN_CD16	Claim Procedure Code XVI Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	227	156
PRCDR_DT16	PRCDR_DT16	Claim Procedure Code XVI Date	DATE	8	228	157
ICD_PRCDR_CD17	ICD_PRCDR_CD17	Claim Procedure Code XVII	CHAR	7	229	158
ICD_PRCDR_VRSN_CD17	ICD_PRCDR_VRSN_CD17	Claim Procedure Code XVII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	230	159
PRCDR_DT17	PRCDR_DT17	Claim Procedure Code XVII Date	DATE	8	231	160
ICD_PRCDR_CD18	ICD_PRCDR_CD18	Claim Procedure Code XVIII	CHAR	7	232	161
ICD_PRCDR_VRSN_CD18	ICD_PRCDR_VRSN_CD18	Claim Procedure Code XVIII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	233	162
PRCDR_DT18	PRCDR_DT18	Claim Procedure Code XVIII Date	DATE	8	234	163
ICD_PRCDR_CD19	ICD_PRCDR_CD19	Claim Procedure Code XIX	CHAR	7	235	164
ICD_PRCDR_VRSN_CD19	ICD_PRCDR_VRSN_CD19	Claim Procedure Code XIX Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	236	165
PRCDR_DT19	PRCDR_DT19	Claim Procedure Code XIX Date	DATE	8	237	166
ICD_PRCDR_CD20	ICD_PRCDR_CD20	Claim Procedure Code XX	CHAR	7	238	167
ICD_PRCDR_VRSN_CD20	ICD_PRCDR_VRSN_CD20	Claim Procedure Code XX Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	239	168
PRCDR_DT20	PRCDR_DT20	Claim Procedure Code XX Date	DATE	8	240	169
ICD_PRCDR_CD21	ICD_PRCDR_CD21	Claim Procedure Code XXI	CHAR	7	241	170
ICD_PRCDR_VRSN_CD21	ICD_PRCDR_VRSN_CD21	Claim Procedure Code XXI Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	242	171
PRCDR_DT21	PRCDR_DT21	Claim Procedure Code XXI Date	DATE	8	243	172

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
ICD_PRCDR_CD22	ICD_PRCDR_CD22	Claim Procedure Code XXII	CHAR	7	244	173
ICD_PRCDR_VRSN_CD22	ICD_PRCDR_VRSN_CD22	Claim Procedure Code XXII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	245	174
PRCDR_DT22	PRCDR_DT22	Claim Procedure Code XXII Date	DATE	8	246	175
ICD_PRCDR_CD23	ICD_PRCDR_CD23	Claim Procedure Code XXIII	CHAR	7	247	176
ICD_PRCDR_VRSN_CD23	ICD_PRCDR_VRSN_CD23	Claim Procedure Code XXIII Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	248	177
PRCDR_DT23	PRCDR_DT23	Claim Procedure Code XXIII Date	DATE	8	249	178
ICD_PRCDR_CD24	ICD_PRCDR_CD24	Claim Procedure Code XXIV	CHAR	7	250	179
ICD_PRCDR_VRSN_CD24	ICD_PRCDR_VRSN_CD24	Claim Procedure Code XXIV Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	251	180
PRCDR_DT24	PRCDR_DT24	Claim Procedure Code XXIV Date	DATE	8	252	181
ICD_PRCDR_CD25	ICD_PRCDR_CD25	Claim Procedure Code XXV	CHAR	7	253	182
ICD_PRCDR_VRSN_CD25	ICD_PRCDR_VRSN_CD25	Claim Procedure Code XXV Claim Procedure Version Code (ICD-9 or ICD-10)	CHAR	1	254	183
PRCDR_DT25	PRCDR_DT25	Claim Procedure Code XXV Date	DATE	8	255	184
RSN_VISIT_CD1	RSN_VISIT_CD1	Reason for Visit Diagnosis Code I	CHAR	7		185
RSN_VISIT_VRSN_CD1	RSN_VISIT_VRSN_CD1	Reason for Visit Diagnosis Code I Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1		186
RSN_VISIT_CD2	RSN_VISIT_CD2	Reason for Visit Diagnosis Code II	CHAR	7		187
RSN_VISIT_VRSN_CD2	RSN_VISIT_VRSN_CD2	Reason for Visit Diagnosis Code II Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1		188
RSN_VISIT_CD3	RSN_VISIT_CD3	Reason for Visit Diagnosis Code III	CHAR	7		189
RSN_VISIT_VRSN_CD3	RSN_VISIT_VRSN_CD3	Reason for Visit Diagnosis Code III Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1		190
PTB_DED	NCH_BENE_PTB_DDCTBL_AMT	NCH Beneficiary Part B Deductible Amount	NUM	12		191

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
PTB_COIN	NCH_BENE_PTB_COINSRNC_AMT	NCH Beneficiary Part B Coinsurance Amount	NUM	12		192
PRVDRPMT	CLM_OP_PRVDR_PMT_AMT	Claim Outpatient Provider Payment Amount	NUM	12		193
BENEPMT	CLM_OP_BENE_PMT_AMT	Claim Outpatient Beneficiary Payment Amount	NUM	12		194
LUPAIND	CLM_HHA_LUPA_IND_CD	Claim HHA Low Utilization Payment Adjustment (LUPA) Indicator Code	CHAR	1		
HHA_RFRL	CLM_HHA_RFRL_CD	Claim HHA Referral Code	CHAR	1		
VISITCNT	CLM_HHA_TOT_VISIT_CNT	Claim HHA Total Visit Count	NUM	3		
HHSTRTDT	CLM_ADMSN_DT	Claim HHA Care Start Date	DATE	8		
HSPCSTRT	CLM_HOSPC_START_DT_ID	Claim Hospice Start Date	DATE	8		
HOSPCPRD	BENE_HOSPC_PRD_CNT	Beneficiary's Hospice Period Count	NUM	1		
IME_OP	IME_OP_CLM_VAL_AMT	Operating Indirect Medical Education (IME) Amount*	NUM	12	256	
DSH_OP	DSH_OP_CLM_VAL_AMT	Operating Disproportionate Share Amount*	NUM	12	257	
DOB_DT	DOB_DT	Date of Birth from Claim (Date)	DATE	8	258	195
GNDR_CD	GNDR_CD	Gender Code from Claim	CHAR	1	259	196

Short SAS Name	Long SAS Name	Short Description	Type	Length	Inpatient	Outpatient
RACE_CD	BENE_RACE_CD	Race Code from Claim	CHAR	1	260	197
CNTY_CD	BENE_CNTY_CD	County Code from Claim (SSA)	CHAR	3	261	198
STATE_CD	BENE_STATE_CD	State Code from Claim (SSA)	CHAR	2	262	199
ZIP_CD	BENE_MLG_CNTCT_ZIP_CD	Zip Code of Residence from Claim	CHAR	9	263	200
CLM_MDCL_REC	CLM_MDCL_REC	Claim Medical Record Number	CHAR	17	264	201

Appendix D: Carrier Claims File (Base Claims, Inpatient and Outpatient)

Short SAS Name	Long SAS Name	Short Description	Type	Length	Carrier
Base Claim File					
BENE_ID	BENE_ID	Encrypted 723 Beneficiary ID	CHAR	15	1
CLM_ID	CLM_ID	Claim ID	CHAR	15	2
RIC_CD	NCH_NEAR_LINE_REC_IDENT_CD	NCH Near Line Record Identification Code	CHAR	1	3
CLM_TYPE	NCH_CLM_TYPE_CD	NCH Claim Type Code	CHAR	2	4
FROM_DT	CLM_FROM_DT	Claim From Date	DATE	8	5
THRU_DT	CLM_THRU_DT	Claim Through Date	DATE	8	6
WKLY_DT	NCH_WKLY_PROC_DT	NCH Weekly Claim Processing Date	DATE	8	7
ENTRY_CD	CARR_CLM_ENTRY_CD	Carrier Claim Entry Code	CHAR	1	8
DISP_CD	CLM_DISP_CD	Claim Disposition Code	CHAR	2	9
CARR_NUM	CARR_NUM	Carrier Number	CHAR	5	10
PMTDNLCD	CARR_CLM_PMT_DNL_CD	Carrier Claim Payment Denial Code	CHAR	2	11
PMT_AMT	CLM_PMT_AMT	Claim Payment Amount*	NUM	12	12
PRPAYAMT	CARR_CLM_PRMRY_PYR_PD_AMT	Carrier Claim Primary Payer Paid Amount*	NUM	12	13
RFR_UPIN	RFR_PHYSN_UPIN	Carrier Claim Referring Physician UPIN Number	CHAR	12	14
RFR_NPI	RFR_PHYSN_NPI	Carrier Claim Referring Physician NPI Number	CHAR	12	15
ASGMNTCD	CARR_CLM_PRVDR_ASGNMT_IND_SW	Carrier Claim Provider Assignment Indicator Switch	CHAR	1	16

Short SAS Name	Long SAS Name	Short Description	Type	Length	Carrier
PROV_PMT	NCH_CLM_PRVDR_PMT_AMT	NCH Claim Provider Payment Amount*	NUM	12	17
BENE_PMT	NCH_CLM_BENE_PMT_AMT	NCH Claim Beneficiary Payment Amount*	NUM	12	18
SBMTCHRG	NCH_CARR_CLM_SBMTD_CHRG_AMT	NCH Carrier Claim Submitted Charge Amount*	NUM	12	19
ALOWCHRG	NCH_CARR_CLM_ALOWD_AMT	NCH Carrier Claim Allowed Charge Amount*	NUM	12	20
DEDAPPLY	CARR_CLM_CASH_DDCTBL_APLD_AMT	Carrier Claim Cash Deductible Applied Amount*	NUM	12	21
HCPCS_YR	CARR_CLM_HCPCS_YR_CD	Carrier Claim HCPCS Year Code	CHAR	1	22
RFR_PRFL	CARR_CLM_RFRNG_PIN_NUM	Carrier Claim Referring PIN Number	CHAR	14	23
PRNCPAL_DGNS_CD	PRNCPAL_DGNS_CD	Primary Claim Diagnosis Code	CHAR	7	24
PRNCPAL_DGNS_VRSN_CD	PRNCPAL_DGNS_VRSN_CD	Primary Claim Diagnosis Code Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	25
ICD_DGNS_CD1	ICD_DGNS_CD1	Claim Diagnosis Code I	CHAR	7	26
ICD_DGNS_VRSN_CD1	ICD_DGNS_VRSN_CD1	Claim Diagnosis Code I Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	27
ICD_DGNS_CD2	ICD_DGNS_CD2	Claim Diagnosis Code II	CHAR	7	28
ICD_DGNS_VRSN_CD2	ICD_DGNS_VRSN_CD2	Claim Diagnosis Code II Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	29
ICD_DGNS_CD3	ICD_DGNS_CD3	Claim Diagnosis Code III	CHAR	7	30
ICD_DGNS_VRSN_CD3	ICD_DGNS_VRSN_CD3	Claim Diagnosis Code III Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	31
ICD_DGNS_CD4	ICD_DGNS_CD4	Claim Diagnosis Code IV	CHAR	7	32
ICD_DGNS_VRSN_CD4	ICD_DGNS_VRSN_CD4	Claim Diagnosis Code IV Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	33
ICD_DGNS_CD5	ICD_DGNS_CD5	Claim Diagnosis Code V	CHAR	7	34
ICD_DGNS_VRSN_CD5	ICD_DGNS_VRSN_CD5	Claim Diagnosis Code V Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	35
ICD_DGNS_CD6	ICD_DGNS_CD6	Claim Diagnosis Code VI	CHAR	7	36
ICD_DGNS_VRSN_CD6	ICD_DGNS_VRSN_CD6	Claim Diagnosis Code VI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	37
ICD_DGNS_CD7	ICD_DGNS_CD7	Claim Diagnosis Code VII	CHAR	7	38
ICD_DGNS_VRSN_CD7	ICD_DGNS_VRSN_CD7	Claim Diagnosis Code VII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	39
ICD_DGNS_CD8	ICD_DGNS_CD8	Claim Diagnosis Code VIII	CHAR	7	40
ICD_DGNS_VRSN_CD8	ICD_DGNS_VRSN_CD8	Claim Diagnosis Code VIII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	41
ICD_DGNS_CD9	ICD_DGNS_CD9	Claim Diagnosis Code IX	CHAR	7	42

Short SAS Name	Long SAS Name	Short Description	Type	Length	Carrier
ICD_DGNS_VRSN_CD9	ICD_DGNS_VRSN_CD9	Claim Diagnosis Code IX Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	43
ICD_DGNS_CD10	ICD_DGNS_CD10	Claim Diagnosis Code X	CHAR	7	44
ICD_DGNS_VRSN_CD10	ICD_DGNS_VRSN_CD10	Claim Diagnosis Code X Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	45
ICD_DGNS_CD11	ICD_DGNS_CD11	Claim Diagnosis Code XI	CHAR	7	46
ICD_DGNS_VRSN_CD11	ICD_DGNS_VRSN_CD11	Claim Diagnosis Code XI Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	47
ICD_DGNS_CD12	ICD_DGNS_CD12	Claim Diagnosis Code XII	CHAR	7	48
ICD_DGNS_VRSN_CD12	ICD_DGNS_VRSN_CD12	Claim Diagnosis Code XII Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	49
RFR_UPIN	RFR_PHYSN_UPIN	DMERC Claim Ordering Physician UPIN Number	CHAR	12	
RFR_NPI	RFR_PHYSN_NPI	DMERC Claim Ordering Physician NPI Number	CHAR	12	
CCLTRNUM	CLM_CLNCL_TRIL_NUM	Clinical Trial Number	CHAR	8	50
DOB_DT	DOB_DT	Date of Birth from Claim (Date)	DATE	8	51
GNDR_CD	GNDR_CD	Gender Code from Claim	CHAR	1	52
RACE_CD	BENE_RACE_CD	Race Code from Claim	CHAR	1	53
CNTY_CD	BENE_CNTY_CD	County Code from Claim (SSA)	CHAR	3	54
STATE_CD	BENE_STATE_CD	State Code from Claim (SSA)	CHAR	2	55
ZIP_CD	BENE_MLG_CNTCT_ZIP_CD	Zip Code of Residence from Claim	CHAR	9	56
Line File					
BENE_ID	BENE_ID	Encrypted 723 Beneficiary ID	CHAR	15	1
CLM_ID	CLM_ID	Claim ID	CHAR	15	2
LINE_NUM	LINE_NUM	Claim Line Number	NUM	13	3
CLM_TYPE	NCH_CLM_TYPE_CD	NCH Claim Type Code	CHAR	2	4
THRU_DT	CLM_THRU_DT	Claim Through Date	DATE	8	5
PRF_PRFL	CARR_PRFRNG_PIN_NUM	Carrier Line Performing PIN Number	CHAR	15	6
PRF_UPIN	PRF_PHYSN_UPIN	Carrier Line Performing UPIN Number	CHAR	12	7
PRFNPI	PRF_PHYSN_NPI	Carrier Line Performing NPI Number	CHAR	12	8
PRGRPNPI	ORG_NPI_NUM	Carrier Line Performing Group NPI Number	CHAR	10	9
PRV_TYPE	CARR_LINE_PRVDR_TYPE_CD	Carrier Line Provider Type Code	CHAR	1	10
TAX_NUM	TAX_NUM	Line Provider Tax Number	CHAR	10	11
PRVSTATE	PRVDR_STATE_CD	Line NCH Provider State Code	NUM	2	12
PROVZIP	PRVDR_ZIP	Carrier Line Performing Provider ZIP Code	CHAR	9	13
HCFASPCL	PRVDR_SPCLTY	Line HCFA Provider Specialty Code	CHAR	3	14
PRTCPTG	PRTCPTNG_IND_CD	Line Provider Participating Indicator Code	CHAR	1	15
ASTNT_CD	CARR_LINE_RDCD_PMT_PHYS_ASTN_C	Carrier Line Reduced Payment Physician Assistant Code	CHAR	1	16
SRVC_CNT	LINE_SRVC_CNT	Line Service Count	NUM	4	17
TYPSRVCB	LINE_CMS_TYPE_SRVC_CD	Line HCFA Type Service Code	CHAR	1	18
PLCSRVC	LINE_PLACE_OF_SRVC_CD	Line Place Of Service Code	CHAR	2	19
LCLTY_CD	CARR_LINE_PRCNG_LCLTY_CD	Carrier Line Pricing Locality Code	CHAR	2	20
EXPNSDT1	LINE_1ST_EXPNS_DT	Line First Expense Date	DATE	8	21

Short SAS Name	Long SAS Name	Short Description	Type	Length	Carrier
EXPNSDT2	LINE_LAST_EXPNS_DT	Line Last Expense Date	DATE	8	22
HCPCS_CD	HCPCS_CD	Line HCFA Common Procedure Coding System	CHAR	5	23
MDFR_CD1	HCPCS_1ST_MDFR_CD	Line HCPCS Initial Modifier Code	CHAR	5	24
MDFR_CD2	HCPCS_2ND_MDFR_CD	Line HCPCS Second Modifier Code	CHAR	5	25
BETOS	BETOS_CD	Line NCH BETOS Code	CHAR	3	26
LINEPMT	LINE_NCH_PMT_AMT	Line NCH Payment Amount	NUM	12	27
LBENPMT	LINE_BENE_PMT_AMT	Line Beneficiary Payment Amount	NUM	12	28
LPRVPMT	LINE_PRVDR_PMT_AMT	Line Provider Payment Amount	NUM	12	29
LDEDAMT	LINE_BENE_PTB_DDCTBL_AMT	Line Beneficiary Part B Deductible Amount	NUM	12	30
LPRPAYCD	LINE_BENE_PRMRY_PYR_CD	Line Beneficiary Primary Payer Code	CHAR	1	31
LPRPDAMT	LINE_BENE_PRMRY_PYR_PD_AMT	Line Beneficiary Primary Payer Paid Amount	NUM	12	32
COINAMT	LINE_COINSRNC_AMT	Line Coinsurance Amount	NUM	12	33
PRPYALOW	LINE_ALOWD_CHRG_AMT	Line Primary Payer Allowed Charge Amount	NUM	12	
LSBMTCHG	LINE_SBMTD_CHRG_AMT	Line Submitted Charge Amount	NUM	12	34
LALOWCHG	LINE_ALOWD_CHRG_AMT	Line Allowed Charge Amount	NUM	12	35
PRCNGIND	LINE_PRCSG_IND_CD	Line Processing Indicator Code	CHAR	2	36
PMTINDSW	LINE_PMT_80_100_CD	Line Payment 80%/100% Code	CHAR	1	37
DED_SW	LINE_SERVICE_DEDUCTIBLE	Line Service Deductible Indicator Switch	CHAR	1	38
MTUS_CNT	CARR_LINE_MTUS_CNT	Carrier Line Miles/Time/Units/Services Count	NUM	5	39
MTUS_IND	CARR_LINE_MTUS_CD	Carrier Line Miles/Time/Units/Services Indicator Code	CHAR	1	40
LINE_ICD_DGNS_CD	LINE_ICD_DGNS_CD	Line Diagnosis Code	CHAR	7	41
LINE_ICD_DGNS_VRSN_CD	LINE_ICD_DGNS_VRSN_CD	Line Diagnosis Code Diagnosis Version Code (ICD-9 or ICD-10)	CHAR	1	42
HPSASCCD	HPSA_SCRCTY_IND_CD	Carrier Line HPSA/Scarcity Indicator Code	CHAR	1	43
DME_PURC	LINE_DME_PRCHS_PRICE_AMT	Line DME Purchase Price Amount	NUM	12	
SUPLRNUM	PRVDR_NUM	DMERC Line Supplier Provider Number	CHAR	10	
SUP_NPI	PRVDR_NPI	DMERC Line Item Supplier NPI Number	CHAR	12	
PRCNG_ST	DMERC_LINE_PRCNG_STATE_CD	DMERC Line Pricing State Code	CHAR	2	
PRVSTATE	PRVDR_STATE_CD	DMERC Line Provider State Code	CHAR	2	
SUP_TYPE	DMERC_LINE_SUPPLR_TYPE_CD	DMERC Line Supplier Type Code	CHAR	1	
MDFR_CD3	HCPCS_3RD_MDFR_CD	DMERC Line HCPCS Third Modifier Code	CHAR	5	
MDFR_CD4	HCPCS_4TH_MDFR_CD	DMERC Line HCPCS Fourth Modifier Code	CHAR	5	
SCRNSVGS	DMERC_LINE_SCRN_SVGS_AMT	DMERC Line Screen Savings Amount	NUM	12	
DME_UNIT	DMERC_LINE_MTUS_CNT	DMERC Line Miles/Time/Units/Services Count	NUM	7	
UNIT_IND	DMERC_LINE_MTUS_CD	DMERC Line Miles/Time/ Units/Services Indicator Code	CHAR	1	
CARRXNUM	CARR_LINE_RX_NUM	Carrier Line RX Number	CHAR	30	44
HCTHGBRS	LINE_HCT_HGB_RSLT_NUM	Hematocrit/Hemoglobin Test Results	NUM	4	45
HCTHGBTP	LINE_HCT_HGB_TYPE_CD	Hematocrit/Hemoglobin Test Type Code	CHAR	2	46
LNNDCCD	LINE_NDC_CD	Line National Drug Code	CHAR	11	47

Short SAS Name	Long SAS Name	Short Description	Type	Length	Carrier
CARR_LINE_CLIA_LAB_NUM	CARR_LINE_CLIA_LAB_NUM	Clinical Laboratory Improvement Amendments monitored laboratory number	CHAR	10	48
CARR_LINE_ANSTHSA_UNIT_CNT	CARR_LINE_ANSTHSA_UNIT_CNT	Carrier Line Anesthesia Unit Count	NUM	2	49

Appendix E: Medicare Provider Analysis and Review – Data Dictionary

Medicare Provider Analysis and Review (MEDPAR) Record – Data Dictionary

(December 2009)

Short Variable Name	***Label***
BENE_ID	*Beneficiary Identification Number*

Beneficiary Identification Number for this data request

LONG SAS NAME: BENE_ID
SHORT SAS NAME: BENE_ID
FIELD TYPE: CHAR
FIELD LENGTH: 15

MEDPARID	*MEDPAR ID Number*

Unique key for MEDPAR claim.

LONG SAS NAME: MEDPAR_ID
SHORT SAS NAME: MEDPARID
FIELD TYPE: CHAR
FIELD LENGTH: 15

EQ_BIC	*Equated BIC*

The code categorizing groups of BICs representing similar relationships between the beneficiary and primary wage earner

LONG SAS NAME: EQTBL_BIC_CD
SHORT SAS NAME: EQ_BIC
FIELD TYPE: CHAR
FIELD LENGTH: 2

NOTE:
The equatable BIC module electronically matches two records that contain different BICs where it is apparent both are records for the same beneficiary. It validates the BIC and returns a base BIC under which to house the record in the National Claims History (NCH) databases. (All records for a beneficiary are stored under a single BIC).
SOURCE:
NCH

AGE_CNT	*MEDPAR Beneficiary Age Count*

The beneficiary's age as of date of admission.

LONG SAS NAME: BENE_AGE_CNT
SHORT SAS NAME: AGE_CNT
FIELD TYPE: NUM
FIELD LENGTH: 4

NOTE: This field is derived by subtracting the bene date of birth from the admission date, present on the first claim record included in the stay. Exception: If the resulting age is 64, and the MSC = 10 or 11, the age is changed to 65.
SOURCE:
NCH

SEX — *MEDPAR Beneficiary Sex Code*

The sex of a beneficiary.

LONG SAS NAME: BENE_SEX_CD
SHORT SAS NAME: SEX
FIELD TYPE: CHAR
FIELD LENGTH: 1

CODES:
0 = Unknown
2 = Female
1 = Male

NOTE: This field comes from the sex code that is present on the first claim record included in the stay.
SOURCE:
NCH

RACE — *MEDPAR Beneficiary Race Code*

The race of the beneficiary.

LONG SAS NAME: BENE_RACE_CD
SHORT SAS NAME: RACE
FIELD TYPE: CHAR
FIELD LENGTH: 1

CODES:
1 = White
2 = Black
3 = Other
4 = Asian
5 = Hispanic
6 = North American Native
0 = Unknown

NOTE: This field comes from the race code that is present on the first claim record included in the stay.
SOURCE:
NCH

MS_CD *MEDPAR Beneficiary Medicare Status Code*

The CWF-derived reason for a beneficiary's entitlement to Medicare benefits, as of the reference date.

LONG SAS NAME: BENE_MDCR_STUS_CD
SHORT SAS NAME: MS_CD
FIELD TYPE: CHAR
FIELD LENGTH: 2

DERIVATIONS :
CWF derives MSC from the following:
1. Date of birth
2. Claim through date
3. Original/Current reasons for entitlement
4. ESRD indicator
5. Beneficiary claim number

Items 1,3,4,5 come from the CWF beneficiary master record; Item 2 comes from the FI/Carrier claim record. MSC is assigned as follows:

MSC	OASI	DIB	ESRD	AGE	BIC
10	YES	N/A	NO	65 AND OVER	N/A
11	YES	N/A	YES	65 AND OVER	N/A
20	NO	YES	NO	UNDER 65	N/A
21	NO	YES	YES	UNDER 65	N/A
31	NO	NO	YES	ANY AGE	T.

SOURCE:
NCH

STATE_CD *MEDPAR Beneficiary Residence SSA Standard State Code*

The SSA standard state code of a beneficiary's residence.

LONG SAS NAME: BENE_RSDNC_SSA_STATE_CD
SHORT SAS NAME: STATE_CD
FIELD TYPE: CHAR
FIELD LENGTH: 2

NOTE: This field comes from the state code that is present on the first claim record included in the stay.

SOURCE:
NCH

CNTY_CD *MEDPAR Beneficiary Residence SSA Standard County Code*

The SSA standard county code of a beneficiary's residence.

LONG SAS NAME: BENE_RSDNC_SSA_CNTY_CD
SHORT SAS NAME: CNTY_CD
FIELD TYPE: CHAR
FIELD LENGTH: 3

NOTE: This field comes from the county code that is present on the first claim record included in the stay.

SOURCE:
NCH

BENE_ZIP — *MEDPAR Beneficiary Mailing Contact Zip Code*

The zip code of the mailing address where the beneficiary may be contacted.

LONG SAS NAME: BENE_MLG_CNTCT_ZIP_CD
SHORT SAS NAME: BENE_ZIP
FIELD TYPE: CHAR
FIELD LENGTH: 5

NOTE: This field comes from the zip code that is present on the first claim record included in the stay.

SOURCE:
NCH

ADMSNDAY — *MEDPAR Admission Day Code*

The code indicating the day of the week on which the beneficiary was admitted to a facility.

LONG SAS NAME: ADMSN_DAY_CD
SHORT SAS NAME: ADMSNDAY
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS :
This field is derived from the admission date that is present on the first claim record included in the stay.

SOURCE:
NCH

DSCHRGCD — *MEDPAR Beneficiary Discharge Status Code*

The code used to identify the status of the patient as of the CLM_THRU_DT.

LONG SAS NAME:
BENE_DSCHRG_STUS_CD
SHORT SAS NAME: DSCHRGCD
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS :
This field is derived from the claim status code that is present on the last claim record included in the stay.

SOURCE:
NCH

GHOPDCD — *MEDPAR GHO Paid Code*

The code indicating whether or not a GHO has paid the provider for the claim(s).

LONG SAS NAME: GHO_PD_CD
SHORT SAS NAME: GHOPDCD
FIELD TYPE: CHAR
FIELD LENGTH: 1

NOTE: This field comes from the GHO-paid indicator that is present on the first claim record included in the stay.

SOURCE:
NCH

PPS_IND — *MEDPAR PPS Indicator Code*

The code indicating whether or not the facility is being paid under the prospective payment system (PPS).

LONG SAS NAME: PPS_IND_CD
SHORT SAS NAME: PPS_IND
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS :
If the condition code not equal 65 on all of the claims included in the stay and the third position of the provider number is numeric set MEDPAR_PPS_IND_CD to 2 (PPS). Otherwise set it to 0 (Non PPS.)

SOURCE:
NCH

ORGNPINM — *Organization NPI Number*

On an institutional claim, the National Provider Identifier (NPI) number assigned to uniquely identify the institutional provider certified by Medicare to provide services to the beneficiary.

LONG SAS NAME: ORG_NPI_NUM
SHORT SAS NAME: ORGNPINM
FIELD TYPE: CHAR
FIELD LENGTH: 10

NOTE: This field comes from the organization NPI that is present on the first claim record included in the stay.

SOURCE:
NCH

PRVDRNUM — *MEDPAR Provider Number*

MEDPAR provider number.

LONG SAS NAME: PRVDR_NUM
SHORT SAS NAME: PRVDRNUM
FIELD TYPE: CHAR
FIELD LENGTH: 6

SOURCE:
NCH

SPCLUNIT — *MEDPAR Provider Number Special Unit Code*

The code identifying the special numbering system for units of hospitals that are excluded from PPS or hospitals with SNF swing-bed designation.

LONG SAS NAME: PRVDR_NUM_SPCL_UNIT_CD
SHORT SAS NAME: SPCLUNIT
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS :
If the third position of the provider number from the first claim record included in the stay equals 'M', 'R', 'S', 'T', 'U', 'W', 'Y' OR 'Z', it is moved to this field, otherwise it is blank.

SOURCE: NCH

SSLSSNF — *MEDPAR Short Stay/Long Stay/SNF Indicator Code*

The code indicating whether the stay is a short stay, long stay, or SNF.

LONG SAS NAME: SS_LS_SNF_IND_CD
SHORT SAS NAME: SSLSSNF
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS :
This field is derived from the third position of the provider number that is present on the first claim record included in the stay.

SOURCE:
NCH

FACLMCNT — *MEDPAR Stay Final Action Claims Count*

The count of the number of claim records (final action) included in the stay.

LONG SAS NAME: STAY_FINL_ACTN_CLM_CNT
SHORT SAS NAME: FACLMCNT
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS :
This field is derived by counting the number of final action claims used to create the stay.

SOURCE:
NCH

ACRTNDT — *MEDPAR Latest Claim Accretion Date*

The date the latest claim record included in the stay was accreted (posted/processed) to the beneficiary master record at the CWF host.

LONG SAS NAME: LTST_CLM_ACRTN_DT
SHORT SAS NAME: ACRTNDT
FIELD TYPE: DATE
FIELD LENGTH: 8

DERIVATIONS :
This field comes from the highest accretion date that is present on the claim records included in the stay.

SOURCE:
NCH

EXHST_DT *MEDPAR Beneficiary Medicare Benefit Exhausted Date*

The last date for which the beneficiary had Medicare coverage. This field is completed only where benefits were exhausted before the discharge date and during the period covered by stay.

LONG SAS NAME: BENE_MDCR_BNFT_EXHST_DT
SHORT SAS NAME: EXHST_DT
FIELD TYPE: DATE
FIELD LENGTH: 8

DERIVATIONS :
This field comes from the highest benefits exhausted date that is present on the claim records included in the stay.

SOURCE:
NCH

QLFYFROM *MEDPAR SNF Qualification From Date*

The beginning date of the beneficiary's qualifying stay. For Inpatient claims, the date relates to the PPS portion of the inlier for which there is no utilization to benefits. For SNF claims, the date relates to the qualifying stay from a hospital that is at least two days in a row if the source of admission is an 'a', or at least three days in a row if the source of admission is other than an 'a'.

LONG SAS NAME : SNF_QUALN_FROM_DT
SHORT SAS NAME: QLFYFROM
FIELD TYPE: DATE
FIELD LENGTH: 8

DERIVATIONS :
This field comes from occurrence span code = 70 and related occurrence span from date, if present on any of the claim records included in the stay. If more than one record has an occurrence span code = 70, with different span dates, the date from the last claim record included in the stay is used.

SOURCE:
NCH

QLFYTHRU — *MEDPAR SNF Qualification Through Date*

The ending date of the beneficiary's qualifying stay. For Inpatient claims, the date relates to the PPS portion of the inlier for which there is no utilization to benefits. For SNF claims, the date relates to the qualifying stay from a hospital that is at least two days in a row if the source of admission is an 'A', or at least three days in a row if the source of admission is other than an 'A'.

LONG SAS NAME: SNF_QUALN_THRU_DT
SHORT SAS NAME: QLFYTHRU
FIELD TYPE: DATE
FIELD LENGTH: 8

DERIVATIONS :
This field comes from the occurrence span code = 70 and related occurrence span thru date, if present on any of the claims included in the stay. If more than one record has an occurrence span code = 70, with different span dates, the date from the last claim record included in the stay is used.

SOURCE:
NCH

ADMSNDT — *MEDPAR Admission Date*

The date the beneficiary was admitted for Inpatient care or the date that care started.

LONG SAS NAME: ADMSN_DT
SHORT SAS NAME: ADMSNDT
FIELD TYPE: DATE
FIELD LENGTH: 8

NOTE: This field comes from the admission date that is present on the first claim record included in the stay.

SOURCE:
NCH

DSCHRGDT — *MEDPAR Discharge Date*

The date on which the beneficiary was discharged or died.

LONG SAS NAME: DSCHRG_DT
SHORT SAS NAME: DSCHRGDT
FIELD TYPE: DATE
FIELD LENGTH: 8

NOTE: This field comes from the highest claim thru date that is present on the claim records included in the stay, where the claim status code is other than '30' (still patient) on the last claim record included in the stay. Inpatient claims will always have a discharge date; SNF claims could have a zero date.

SOURCE:
NCH

SSICD — *MEDPAR Internal Use SSI Indicator Code*

Internal use SSI Indicator code.

LONG SAS NAME: INTRNL_USE_SSI_IND_CD
SHORT SAS NAME: SSICD
FIELD TYPE: CHAR
FIELD LENGTH: 1

COMMENTS :
Limited availability; for internal use only; applicable to Inpatient claims only. Where not available, this field is blank.

SSIDAY — *MEDPAR Internal Use SSI Day Count*

Internal use SSI Day count.

LONG SAS NAME: INTRNL_USE_SSI_DAY_CNT
SHORT SAS NAME: SSIDAY
FIELD TYPE: NUM
FIELD LENGTH: 7

COMMENTS: Limited availability; for internal use; applicable to inpatient claims only. Where not applicable, this field will contain zeroes.

LOSCNT — *MEDPAR Length of Stay Day Count*

The count in days of the total length of a beneficiary's stay in a hospital or SNF.

LONG SAS NAME: LOS_DAY_CNT
SHORT SAS NAME: LOSCNT
FIELD TYPE: NUM
FIELD LENGTH: 7

DERIVATIONS :
This field is derived by subtracting the date of discharge (or thru date in SNF cases where beneficiary is still a patient) from the date of admission. If difference is '0,' the value becomes a '1.'

SOURCE:
NCH

OUTLRDAY — *MEDPAR Outlier Day Count*

The count of the number of days paid as outliers (either a day or cost outlier) under PPS beyond the DRG threshold.

LONG SAS NAME: OUTLIER_DAY_CNT
SHORT SAS NAME: OUTLRDAY
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS :
This field is derived by checking the MEDPAR utilization day count against the DRG threshold table (DRG weights file).

SOURCE:
NCH

UTIL_DAY *MEDPAR Utilization Day Count*

The count of the number of covered days of care that are chargeable to Medicare utilization for the stay.

LONG SAS NAME: UTLZTN_DAY_CNT
SHORT SAS NAME: UTIL_DAY
FIELD TYPE: NUM
FIELD LENGTH: 7

DERIVATIONS :
This field is derived by accumulating the utilization day count that is present on any of the claim records included in the stay (i.e., the sum of utilization days reported on the claims that comprise the stay).

SOURCE:
NCH

COIN_DAY *MEDPAR Beneficiary Total Coinsurance Day Count*

The count of the total number of coinsurance days involved with the beneficiary's stay in a facility. For Inpatient services, the beneficiary is liable for a daily coinsurance amount after the 60th day and before the 91st day in a single spell of illness; for SNF services, the beneficiary is liable for a daily coinsurance amount after the 20th day and before the 101st day in a single spell of illness.

LONG SAS NAME: TOT_COINSRNC_DAY_CNT
SHORT SAS NAME: COIN_DAY
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS :
This field is derived by accumulating the coinsurance day count that is present on any of the claim records included in the stay (i.e., the sum of coinsurance days reported on the claims that comprise the stay).

SOURCE:
NCH

LRD_USE *MEDPAR Beneficiary LRD Used Count*

The count of the number of lifetime reserve days (LRD) used by the beneficiary for this stay.

LONG SAS NAME: BENE_LRD_USE_CNT
SHORT SAS NAME: LRD_USE
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS :
This field is derived by accumulating the lifetime reserve days used count that is present on any of the claim records included in the stay (i.e., the sum of LRD reported on the claims that comprise the stay).

SOURCE:
NCH

COIN_AMT — *MEDPAR Beneficiary Part A Coinsurance Liability Amount*

The amount of money (rounded to whole dollars) identified as the beneficiary's liability for part A coinsurance for the stay.

LONG SAS NAME: BENE_PTA_COINSRNC_AMT
SHORT SAS NAME: COINT_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS :
This field is derived by accumulating the beneficiary's part a coinsurance liability amount that is present on any of the claim records included in the stay (i.e., the sum of coinsurance amounts reported on the claims that comprise the stay).

SOURCE:
NCH

DED_AMT — *MEDPAR Beneficiary Inpatient Deductible Liability Amount*

The amount of money (rounded to whole dollars) identified as the beneficiary's liability for the Inpatient deductible for the stay.

LONG SAS NAME: BENE_IP_DDCTBL_AMT
SHORT SAS NAME: DED_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS :
This field is derived by accumulating the beneficiary Inpatient deductible amount that is present on any of the claim records included in the stay (i.e., the sum of the Inpatient deductibles reported on the claims that comprise the stay).

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ Rounded; On-size (overflow) Situation = All nines

BLDDEDAM — *MEDPAR Beneficiary Blood Deductible Liability Amount*

The amount of money (rounded to whole dollars) identified as the beneficiary's liability for the blood deductible for the stay.

LONG SAS NAME: BENE_BLOOD_DDCTBL_AMT
SHORT SAS NAME: BLDDEDAM
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the beneficiary blood deductible liability amount that is present on any of the claim records included in the stay (i.e., the sum of the blood deductibles reported on the claims that comprise the stay).

SOURCE:
NCH

PRPAYAMT *MEDPAR Beneficiary Primary Payer Amount*

The amount of payment (rounded to whole dollars) made on behalf of the beneficiary by a primary payer other than Medicare, which has been applied to the covered Medicare charges for the stay.

LONG SAS NAME: BENE_PRMRY_PYR_AMT
SHORT SAS NAME: PRPAYAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the beneficiary primary payer payment amount that is present on any of the claim records included in the stay (i.e., the sum of the primary payer amounts reported on the claims that comprise the stay).

SOURCE:
NCH

EDIT RULES:
+$$$$$$$
Rounded; On-size (overflow) situation = All nines

OUTLRAMT *MEDPAR DRG Outlier Approved Payment Amount*

The amount of additional payment (rounded to whole dollars) approved due to an outlier situation over the DRG allowance for the stay.

LONG SAS NAME: DRG_OUTLIER_PMT_AMT
SHORT SAS NAME: OUTLRAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the DRG outlier approved payment amount (value code = 17 amount) that is present on any of the claim records included in the stay (i.e., the sum of outlier amounts reported on the claims that comprise the stay).

COMMENTS:
This amount is already included in the MEDPAR Medicare payment amount.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$
ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

DISP_SHR *MEDPAR Inpatient Disproportionate Share Amount*

The amount paid over the DRG amount (rounded to whole dollars) for the disproportionate share hospital for the stay.

LONG SAS NAME: IP_DSPRPRTNT_SHR_AMT
SHORT SAS NAME: DISP_SHR
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the value amount associated with value code = 18 that is present on any of the claim records included in the stay (i.e., the sum of value code 18 amounts reported on the claims that comprise the stay).

COMMENTS:
This amount is already included in the MEDPAR Medicare payment amount.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

IME_AMT *MEDPAR Indirect Medical Education (IME) Amount*

The amount of additional payment (rounded to whole dollars) made to teaching hospitals for IME for the stay.

LONG SAS NAME: IME_AMT
SHORT SAS NAME: IME_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the value amount associated with value code = 19 that is present on any of the claim records included in the stay (i.e., the sum of IME amounts - value code 19 amounts - reported on the claims that comprise the stay).

COMMENTS:
This amount is already included in the MEDPAR Medicare payment amount.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

DRGPRICE *MEDPAR DRG Price Amount*

The amount (called the 'DRG price' for purposes of MEDPAR analysis) that would have been paid if no deductibles, coinsurance, primary payers, or outliers were involved (rounded to whole dollars).

LONG SAS NAME: DRG_PRICE_AMT
SHORT SAS NAME: DRGPRICE
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the following amounts: MEDPAR Medicare payment amount, MEDPAR beneficiary primary payer payment amount, MEDPAR beneficiary coinsurance liability amount, MEDPAR beneficiary Inpatient deductible liability amount, MEDPAR beneficiary blood deductible amount; and then subtracting from the sum the MEDPAR DRG outlier approved payment amount.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

PASSTHRU *MEDPAR Total Pass Through Amount*

The total of all claim pass through amounts (rounded to whole dollars) for the stay.

LONG SAS NAME: PASS_THRU_AMT
SHORT SAS NAME: PASSTHRU
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by multiplying the pass thru per diem amount that is present on the last claim record included in the stay times the MEDPAR utilization day count (the sum of the utilization (covered) days reported on the claims that comprise the stay).

COMMENTS:
Items reimbursed as pass through include capital-related costs, direct medical education costs, kidney acquisition costs for hospitals approved as rtc's, and bad debts (per provider reimbursement manual, part 1, section 2405.2). The MEDPAR pass thru amount is not included in the MEDPAR Medicare payment amount.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

PPS_CPTL *MEDPAR Total PPS Capital Amount*

The total amount (rounded to whole dollars) that is payable for capital PPS (e.g., reimbursement for depreciation, rent, certain interest, real estate taxes for hospital buildings/equipment subject to PPS).

LONG SAS NAME: TOT_PPS_CPTL_AMT
SHORT SAS NAME: PPS_CPTL
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the total PPS capital amount that is present on any of the claim records included in the stay (i.e., the sum of total PPS capital amounts reported on the claims that comprise the stay).

COMMENTS:
This field is already included in the MEDPAR Medicare payment amount.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

TOTCHRG *MEDPAR Total Charge Amount*

The total amount (rounded to whole dollars) of all charges (covered and non-covered) for all services provided to the beneficiary for the stay.

LONG SAS NAME: TOT_CHRG_AMT
SHORT SAS NAME: TOTCHRG
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the total charge amount from all claim records included in the stay (i.e., the sum of total charges reported on the claims that comprise the stay).

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

CVRCHRG *MEDPAR Total Covered Charge Amount*

The portion of the total charges amount (rounded to whole dollars) that is covered by Medicare for the stay.

LONG SAS NAME: TOT_CVR_CHRG_AMT
SHORT SAS NAME: CVRCHRG
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by calculating the covered charges from all claim records included in the stay (i.e.,subtract the revenue center non-covered charge amount from the revenue center total charge amount for revenue center code = 0001 that is reported on the claims that comprise the stay; sum the results). Exception: if there exists an erroneous condition relative to revenue center code 0001, the calculation will be made for each revenue center code included on the claims that comprise the stay with the results summed to create the total.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

PMT_AMT *MEDPAR Medicare Payment Amount*

Amount of payment made from the Medicare trust fund for the services covered by the claim record. Generally, the amount is calculated by the fi; and represents what was paid to the institutional provider, with the exceptions noted below.
NOTE: In some situations, a negative claim payment amount may be present; e.g., (1) when a beneficiary is charged the full deductible during a short stay and the deductible exceeded the amount Medicare pays; or (2) when a beneficiary is charged a coinsurance amount during a long stay and the coinsurance amount exceeds the amount Medicare pays (most prevalent situation involves psych hospitals who are paid a daily per diem rate no matter what the charges are.)

Under IP PPS, Inpatient hospital services are paid based on a predetermined rate per discharge, using the DRG patient classification system and the pricer program. On the IP PPS claim, the payment amount includes the DRG outlier approved payment amount, disproportionate share (since 05/1/86), in- direct medical education (since 10/1/88), total PPS capital (since 10/1/91). It does not include the pass thru amounts (i.e., capital-related costs, direct medical education costs, kidney acquisition costs, bad debts); or any beneficiary-paid amounts (i.e., deductibles and coinsurance); or any other payer reimbursement.

Under SNF PPS, SNFs will classify beneficiaries using the patient classification system known as rugs III. For the SNF PPS claim, the SNF pricer will calculate/return the rate for each revenue center line item with revenue center code = '0022'; multiply the rate times the units count; and then sum the amount payable for all lines with revenue center code '0022' to determine the total claim payment amount.

Exceptions: For claims involving demos and BBA encounter data, the amount reported in this field May not just represent the actual provider payment.

For demo ids '01','02','03','04' -- claims contain amount paid to the provider, except that special 'differentials' paid outside the normal payment system are not included.

For demo ids '05','15' -- encounter data 'claims' contain amount Medicare would have paid under FFS, instead of the actual payment to the MCO.

For demo ids '06','07','08' -- claims contain actual provider payment but represent a special negotiated bundled payment for both part a and part B services. To identify what the conventional provider part a payment would have been, check value code = 'y4'.

For BBA encounter data (non-demo) -- 'claims' contain amount Medicare would have paid under FFS, instead of the actual payment to the BBA plan.

LONG SAS NAME: MDCR_PMT_AMT
SHORT SAS NAME: PMT_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the payment amount that is present on all of the claim records included in the stay (i.e, the sum of payment (reimbursement) reported on the claims that comprise the stay).

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

ACMDTNS *MEDPAR All Accommodations Total Charge Amount*

The total charge amount (rounded to whole dollars) for all accommodations (routine hospital room and board charges for general care, coronary care and/or intensive care units) related to a beneficiary's stay.

LONG SAS NAME: ACMDTNS_TOT_CHRG_AMT
SHORT SAS NAME: ACMDTNS
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is the sum of MEDPAR private room charge amounts, MEDPAR semiprivate room charge amount, MEDPAR ward charge amount, MEDPAR intensive care charge amount, and MEDPAR coronary care charge amount (i.e., the accumulation of the revenue center total charge amount associated with revenue center codes 0100 - 0219 from all claim records included in the stay).

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

DPRTMNTL *MEDPAR Departmental Total Charge Amount*

The total charge amount (rounded to whole dollars) for all ancillary departments (other than routine room and board, CCU, and ICU) related to a beneficiary's stay.

LONG SAS NAME: DPRTMNTL_TOT_CHRG_AMT
SHORT SAS NAME: DPRTMNTL
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 0220 - 0999 from all claim records included in the stay (i.e., the sum of charges for all revenue centers other than accommodations 0100 - 0219).

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

PRVTDAY *MEDPAR Private Room Day Count*

The count of the number of private room days used by the beneficiary for the stay.

LONG SAS NAME: PRVT_ROOM_DAY_CNT
SHORT SAS NAME: PRVTDAY
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS:
This field is derived by accumulating the revenue center unit count associated with accommodation revenue center codes 011x and 014x from all claim records included in the stay.
Exception for SNF rugs demo effective 3/96 SNF update: field is derived from revenue center codes in the 9033-9044 series.

SOURCE:
NCH

SPRVTDAY *MEDPAR Semiprivate Room Day Count*

The count of the number of semi-private room days used by the beneficiary for the stay.

LONG SAS NAME: SEMIPRVT_ROOM_DAY_CNT
SHORT SAS NAME: SPRVTDAY
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS:
This field is derived by accumulating the revenue center unit count associated with accommodation revenue center codes 010X, 012X, 013X, 016X - 019X from all claim records included in the stay.

Exception for SNF rugs demo eff 3/96 SNF update: field is derived from revenue center codes in the 9019-9032 series.
SOURCE:NCH

WARDDAY *MEDPAR Ward Day Count*

The count of the number of ward days used by the beneficiary for the stay.

LONG SAS NAME: WARD_DAY_CNT
SHORT SAS NAME: WARDDAY
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS:
This field is derived by accumulating the revenue center unit count associated with accommodation revenue center code 015x from all claim records included in the stay.

Exception for SNF rugs demo eff 3/96 SNF update: field is derived from revenue center codes in the 9000-9018 series.

SOURCE:
NCH

ICARECNT *MEDPAR Intensive Care Day Count*

The count of the number of intensive care days used by the beneficiary for the stay.

LONG SAS NAME: INTNSV_CARE_DAY_CNT
SHORT SAS NAME: ICARECNT
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS:
This field is derived by accumulating the revenue center unit count associated with accommodation revenue center codes 020X (all 9 subcategories) from all claims included in the stay.

SOURCE:
NCH

LIMITATIONS:
There is approximately a 20% error rate in the revenue center code category 0206 due to coders misunderstanding the term 'post ICU' as including any day after an ICU stay rather than just days in a step-down/lower case version of an ICU. 'Post' was removed from the revenue center code 0206 description, effective 10/1/96 (12/96 MEDPAR update). 0206 Is now defined as 'intermediate ICU'.

CRNRYDAY *MEDPAR Coronary Care Day Count*

The charge amount (rounded to whole dollars) for coronary care accommodations related to a beneficiary's stay.

LONG SAS NAME: CRNRY_CARE_CHRG_AMT
SHORT SAS NAME: CRNRYDAY
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with accommodation revenue center code 021X from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

PRVTAMT *MEDPAR Private Room Charge Amount*

The charge amount (rounded to whole dollars) for private room accommodations related to a beneficiary's stay.

LONG SAS NAME: PRVT_ROOM_CHRG_AMT
SHORT SAS NAME: PRVTAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 011x and 014x from all claim records included in the stay.

Exception for SNF rugs demo effective 3/96 SNF update: this field is derived from revenue center codes in the 9033-9044 series.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

SPRVTAMT *MEDPAR Semi-Private Room Charge Amount*

The charge amount (rounded to whole dollars) for semi-private room accommodations related to a beneficiary's stay.

LONG SAS NAME: SEMIPRVT_ROOM_CHRG_AMT
SHORT SAS NAME: SPRVTAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 010x, 012x, 013x, and 016x - 019x from all claim records included in the stay.

Exception for SNF rugs demo effective 03/96 SNF update: field is derived from revenue center codes in the 9019-9032 series.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

WARDAMT *MEDPAR Ward Charge Amount*

The charge amount (rounded to whole dollars) for ward accommodations related to a beneficiary's stay.

LONG SAS NAME: WARD_CHRG_AMT
SHORT SAS NAME: WARDAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 015x from all claim records included in the stay.

Exception for SNF rugs demo effective 03/96 SNF update: this field is derived from revenue center codes in the 9000-9018 series.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

ICAREAMT *MEDPAR Intensive Care Charge Amount*

The charge amount (rounded to whole dollars) for intensive care accommodations related to a beneficiary's stay.

LONG SAS NAME: INTNSV_CARE_CHRG_AMT
SHORT SAS NAME: ICAREAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with accommodation revenue center code 020x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

CRNRYAMT *MEDPAR Coronary Care Charge Amount*

The charge amount (rounded to whole dollars) for coronary care accommodations related to a beneficiary's stay.

LONG SAS NAME: CRNRY_CARE_CHRG_AMT
SHORT SAS NAME: CRNRYAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with accommodation revenue center code 021X from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

OTHRAMT *MEDPAR Other Service Charge Amount*

The charge amount (rounded to whole dollars) for other services (revenue centers that do not fit into other categories) related to a beneficiary's stay.

LONG SAS NAME: OTHR_SRVC_CHRG_AMT
SHORT SAS NAME: OTHRAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with the 'other' revenue center codes from all claim records included in the stay. The 'other' codes include 0002-0099, 022x, 023x, 024x, 052x, 053x, 055x - 060x, 064x - 070x, 076x - 078x, 090x - 095x, and 099x. (Some of these codes are not yet assigned.)

SOURCE: NCH

PHRMCAMT *MEDPAR Pharmacy Charge Amount*

The charge amount (rounded to whole dollars) for pharmaceutical costs related to the beneficiary's stay.

LONG SAS NAME: PHRMCY_CHRG_AMT
SHORT SAS NAME: PHRMCAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 025x, 026x, and 063x from all claims records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

SUPLYAMT *MEDPAR Medical/Surgical Supplies Charge Amount*

The charge amount (rounded to whole dollars) for medical/surgical supplies related to the beneficiary's stay.

LONG SAS NAME: MDCL_SUPLY_CHRG_AMT
SHORT SAS NAME: SUPLYAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 027x and 062x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

DME_AMT *MEDPAR DME Charge Amount*

The charge amount (rounded to whole dollars) for DME (purchase of new DME and rentals) related to the beneficiary's stay.

LONG SAS NAME: DME_CHRG_AMT
SHORT SAS NAME: DME_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 0290, 0291, 0292, and 0294 - 0299 from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

UDME_AMT — *MEDPAR Used DME Charge Amount*

The charge amount (rounded to whole dollars) for used DME (purchase of used DME) related to the beneficiary's stay.

LONG SAS NAME: USED_DME_CHRG_AMT
SHORT SAS NAME: UDME_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 0293 from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

PHYTHAMT — *MEDPAR Physical Therapy Charge Amount*

The charge amount (rounded to whole dollars) for physical therapy services provided during the beneficiary's stay.

LONG SAS NAME: PHYS_THRPY_CHRG_AMT
SHORT SAS NAME: PHYTHAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 042x from all claims records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

OCPTLAMT — *MEDPAR Occupational Therapy Charge Amount*

The charge amount (rounded to whole dollars) for occupational therapy services provided during the beneficiary's stay.

LONG SAS NAME: OCPTNL_THRPY_CHRG_AMT
SHORT SAS NAME: OCPTLAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 043x from all claims records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

SPCH_AMT *MEDPAR Speech Pathology Charge Amount*

The charge amount (rounded to whole dollars) for speech pathology services (speech, language, audiology) provided during the beneficiary's stay.

LONG SAS NAME: SPCH_PTHLGY_CHRG_AMT
SHORT SAS NAME: SPCH_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 044x and 047x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

INHLTAMT *MEDPAR Inhalation Therapy Charge Amount*

The charge amount (rounded to whole dollars) for inhalation therapy services (respiratory and pulmonary function) provided during the beneficiary's stay.

LONG SAS NAME: INHLTN_THRPY_CHRG_AMT
SHORT SAS NAME: INHLTAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 041x and 046x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW) SITUATION = ALL NINES

BLOODAMT *MEDPAR Blood Charge Amount*

The charge amount (rounded to whole dollars) for blood provided during the beneficiary's stay.

LONG SAS NAME: BLOOD_CHRG_AMT
SHORT SAS NAME: BLOODAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 038x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

BLDADMIN *MEDPAR Blood Administration Charge Amount*

The charge amount (rounded to whole dollars) for blood storage and processing related to the beneficiary's stay.

LONG SAS NAME: BLOOD_ADMIN_CHRG_AMT
SHORT SAS NAME: BLDADMIN
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 039x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

OROOMAMT *MEDPAR Operating Room Charge Amount*

The charge amount (rounded to whole dollars) for the operating room, recovery room, and labor room delivery used by the beneficiary during the stay.

LONG SAS NAME: OPRTG_ROOM_CHRG_AMT
SHORT SAS NAME: OROOMAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 036X, 071X, and 072X from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

LTHTRPSY *MEDPAR Lithotripsy Charge Amount*

The charge amount (rounded to whole dollars) for lithotripsy services provided during the beneficiary's stay.

LONG SAS NAME: LTHTRPSY_CHRG_AMT
SHORT SAS NAME: LTHTRPSY
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 079X from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

CRDLGY *MEDPAR Cardiology Charge Amount*

The charge amount (rounded to whole dollars) for cardiology services and electrocardiogram(s) provided during the beneficiary's stay.

LONG SAS NAME: CRDLGY_CHRG_AMT
SHORT SAS NAME: CRDLGY
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 048X and 073X from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

ANSTHSA *MEDPAR Anesthesia Charge Amount*

The charge amount (rounded to whole dollars) for anesthesia services provided during the beneficiary's stay.

LONG SAS NAME: ANSTHSA_CHRG_AMT
SHORT SAS NAME: ANSTHSA
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 037X from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

LAB_AMT *MEDPAR Laboratory Charge Amount*

The charge amount (rounded to whole dollars) for laboratory costs related to the beneficiary's stay.

LONG SAS NAME: LAB_CHRG_AMT
SHORT SAS NAME: LAB_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 030x, 031x, 074x, and 075x from all claim records included in the stay.

SOURCE:
NCH

RDLGYAMT — *MEDPAR Radiology Charge Amount*

The charge amount (rounded to whole dollars) for radiology costs (including oncology, excluding MRI) related to a beneficiary's stay.

LONG SAS NAME: RDLGY_CHRG_AMT
SHORT SAS NAME: RDLGYAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating revenue center total charge amount associated with revenue center codes 028x, 032x, 033x, 034x, 035x, and 040x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

MRI_AMT — *MEDPAR MRI Charge Amount*

The charge amount (rounded to whole dollars) for MRI services provided during the beneficiary's stay.

LONG SAS NAME: MRI_CHRG_AMT
SHORT SAS NAME: MRI_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center 061x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

OPSRVC — *MEDPAR Outpatient Service Charge Amount*

The charge amount (rounded to whole dollars) for outpatient services provided during the beneficiary's stay.

LONG SAS NAME: OP_SRVC_CHRG_AMT
SHORT SAS NAME: OPSRVC
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 049x and 050x from all claim records included in the stay.

SOURCE:
NCH

ER_AMT — *MEDPAR Emergency Room Charge Amount*

The charge amount (rounded to whole dollars) for emergency room services provided during the beneficiary's stay.

LONG SAS NAME: ER_CHRG_AMT
SHORT SAS NAME: ER_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 045X from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

AMBLNC — *MEDPAR Ambulance Charge Amount*

The charge amount (rounded to whole dollars) for ambulance services related to a beneficiary's stay.

LONG SAS NAME: AMBLNC_CHRG_AMT
SHORT SAS NAME: AMBLNC
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 054x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

PROFFEES — *MEDPAR Professional Fees Charge Amount*

The charge amount (rounded to whole dollars) for professional fees related to a beneficiary's stay.

LONG SAS NAME: PROFNL_FEES_CHRG_AMT
SHORT SAS NAME: PROFFEES
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 096x, 097x, and 098x from all claims records included in the stay.

SOURCE:
NCH

ORGNAMT *MEDPAR Organ Acquisition Charge Amount*

The charge amount (rounded to whole dollars) for organ acquisition or other donor bank services related to a beneficiary's stay.

LONG SAS NAME: ORGN_ACQSTN_CHRG_AMT
SHORT SAS NAME: ORGNAMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center codes 081x and 089x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

ESRDSETG *MEDPAR ESRD Revenue Setting Charge Amount*

The code indicating the type of dialysis received by the beneficiary during the stay. Up to 5 2-position codes may be present.

LONG SAS NAME: ESRD_SETG_IND_CD
SHORT SAS NAME: ESRDSETG
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived from the presence of the dialysis revenue center codes listed below on any of the claim records included in the stay.

SOURCE:
NCH

CLNC_AMT *MEDPAR Clinic Visit Charge Amount*

The charge amount (rounded to whole dollars) for clinic visits (e.g., visits to chronic pain or dental centers or to clinics providing psychiatric, ob-gyn, pediatric services) related to the beneficiary's stay.

LONG SAS NAME: CLNC_VISIT_CHRG_AMT
SHORT SAS NAME: CLNC_AMT
FIELD TYPE: NUM
FIELD LENGTH: 9

DERIVATIONS:
This field is derived by accumulating the revenue center total charge amount associated with revenue center code 051x from all claim records included in the stay.

SOURCE:
NCH

EDIT RULES:
+$$$$$$$ ROUNDED; ON-SIZE (OVERFLOW)
SITUATION = ALL NINES

ICUINDCD *MEDPAR Intensive Care Unit (ICU) Indicator Code*

The code indicating that the beneficiary has spent time under intensive care during the stay. It also specifies the type of ICU.

LONG SAS NAME: ICU_IND_CD
SHORT SAS NAME: ICUINDCD
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for the presence of icu revenue center codes (listed below) on any of the claim records included in the stay. If more than one of the revenue center codes listed below are included on these claims, the code with the highest revenue center total charge amount is used.

SOURCE:
NCH

LIMITATIONS:
There is approximately a 20% error rate in the revenue center code category 0206 due to coders misunderstanding the term 'post ICU' as including any day after an ICU stay rather than just days in a step-down/lower case version of an ICU. 'Post' was removed from the revenue center code 0206 description, effective 10/1/96 (12/96 MEDPAR update). 0206 Is now defined as 'intermediate ICU'.

CRNRY_CD *MEDPAR Coronary Care Indicator Code*

The code indicating that the beneficiary has spent time under coronary care during the stay. It also specifies the type of coronary care unit.

LONG SAS NAME: CRNRY_CARE_IND_CD
SHORT SAS NAME: CRNRY_CD
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for the presence of coronary care revenue center codes (listed below) on any of the claim records included in the stay. If more than one of the revenue center codes listed below are included on these claims, the code with the highest revenue center total charge amount is used.

SOURCE:
NCH

LIMITATIONS:
There is approximately a 20% error rate in the revenue center code category 0214 due to coders misunderstanding the term 'post CCU' as including any day after a CCU stay rather than just days in a step-down/lower case version of a CCU. 'Post' was removed from the revenue center code 0214 description, effective 10/1/96 (12/96 MEDPAR update). 0214 Is now defined as 'intermediate CCU'.

PHRMCYCD — *MEDPAR Pharmacy Indicator Code*

The code indicating whether or not the beneficiary received drugs during the stay. It also specifies the type of drugs.

LONG SAS NAME: PHRMCY_IND_CD
SHORT SAS NAME: PHRMCYCD
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for the presence of drug-specific revenue center codes (listed below) on any of the claim records included in the stay.

SOURCE:
NCH

TRNSPLNT — *MEDPAR Transplant Indicator Code*

The code indicating whether or not the beneficiary received a organ transplant during the stay.

LONG SAS NAME: TRNSPLNT_IND_CD
SHORT SAS NAME: TRNSPLNT
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for the presence of the transplant revenue center code (listed below) on any of the claim records included in the stay.

SOURCE:
NCH

ONCLGYSW — *MEDPAR Radiology Oncology Indicator Switch*

The switch indicating whether or not the beneficiary received radiology oncology services during the stay.

LONG SAS NAME: RDLGY_ONCLGY_IND_SW
SHORT SAS NAME: ONCLGYSW
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for revenue center code 028X on any of the claim records included in the stay.

SOURCE:
NCH

DGNSTCSW — *MEDPAR Radiology Diagnostic Indicator Switch*

The switch indicating whether or not the beneficiary received radiology diagnostic services during the stay.

LONG SAS NAME: RDLGY_DGNSTC_IND_SW
SHORT SAS NAME: DGNSTCSW
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for revenue center code 032x on any of the claim records included in the stay.

SOURCE:
NCH

THRPTCSW — *MEDPAR Radiology Therapeutic Indicator Switch*

The switch indicating whether or not the beneficiary received radiology therapeutic services during the stay.

LONG SAS NAME: RDLGY_THRPTC_IND_SW
SHORT SAS NAME: THRPTCSW
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for revenue center code 033X on any of the claim records included in the stay.

SOURCE:
NCH

NUCLR_SW — *MEDPAR Radiology Nuclear Medicine Indicator Switch*

The switch indicating whether or not the beneficiary received radiology nuclear medicine services during the stay.

LONG SAS NAME: RDLGY_NUCLR_MDCN_IND_SW
SHORT SAS NAME: NUCLR_SW
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for revenue center code 034x on any of the claim records included in the stay.

SOURCE:
NCH

CTSCANSW — *MEDPAR Radiology CT Scan Indicator Switch*

The switch indicating whether or not the beneficiary received radiology computed tomographic (CT) scan services during the stay.

LONG SAS NAME: RDLGY_CT_SCAN_IND_SW
SHORT SAS NAME: CTSCANSW
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for revenue center code 035X on any of the claim records included in the stay.

SOURCE:
NCH

IMGNG_SW — *MEDPAR Radiology Other Imaging Indicator Switch*

The switch indicating whether or not the beneficiary received radiology other imaging services during the stay.

LONG SAS NAME: RDLGY_OTHR_IMGNG_IND_SW
SHORT SAS NAME: IMGNG_SW
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for revenue center code 040X on any of the claim records included in the stay.

SOURCE:
NCH

OPSRVCCD

MEDPAR Outpatient Services Indicator Code

The code indicating whether or not the beneficiary has received outpatient services, ambulatory surgical care, or both.

LONG SAS NAME: OP_SRVC_IND_CD
SHORT SAS NAME: OPSRVCCD
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for the presence of the outpatient services revenue center codes listed below on any of the claim records included in the stay.

SOURCE:
NCH

ORGNCD

MEDPAR Organ Acquisition Indicator Code

The code indicating the type of organ acquisition received by the beneficiary during the stay.

LONG SAS NAME: ORGN_ACQSTN_IND_CD
SHORT SAS NAME: ORGNCD
FIELD TYPE: CHAR
FIELD LENGTH: 2

DERIVATIONS:
This field is derived by checking for the presence of the organ acquisition indicator revenue center codes listed below on any of the claim records included in the stay.

SOURCE:
NCH

ESRDSTG{x}
where { x } 1:5

MEDPAR ESRD Setting Indicator Code

The code indicating the type of dialysis received by the beneficiary during the stay. Up to 5 2-position codes may be present.

LONG SAS NAME: ESRD_SETG_IND_{x}_CD
SHORT SAS NAME: ESRDSTG{x}
FIELD TYPE: CHAR
FIELD LENGTH: 2

DERIVATIONS:
This field is derived from the presence of the dialysis revenue center codes listed below on any of the claim records included in the stay.

SOURCE:
NCH

DGNSCNT — *MEDPAR Diagnosis Code Count*

The count of the number of diagnosis codes included in the stay.

LONG SAS NAME: DGNS_CD_CNT
SHORT SAS NAME: DGNSCNT
FIELD TYPE: NUM
FIELD LENGTH: 3

DERIVATIONS:
This field is derived by adding '1' to the count of the other diagnosis codes reported on the last claim record included in the stay. The '1' represents the principal diagnosis code, which is reported separately from the other diagnosis.

SOURCE:
NCH

DGNSCD{x} — *MEDPAR Diagnosis Code*

where { x } 1:10

The ICD-9-CM code identifying the primary condition or other coexisting conditions shown in the medical records as affecting the services provided during the beneficiary's stay. This element is part of the MEDPAR diagnosis group which May occur up to 10 times.

LONG SAS NAME: DGNS_{x}_CD
SHORT SAS NAME: DGNSCD{x}
FIELD TYPE: CHAR
FIELD LENGTH: 6

DERIVATIONS:
This field is the actual principal diagnosis code (1st occurrence) or one of up to 9 other diagnosis codes that are present on the last claim record included in the stay.

SOURCE:
NCH

DGNS_POA — *Diagnosis Code POA Array*

Diagnosis code POA array.

LONG SAS NAME: DGNS_POA_CD
SHORT SAS NAME: DGNS_POA
FIELD TYPE: CHAR
FIELD LENGTH: 10

DERIVATIONS:
This field is the actual principal diagnosis code (1st occurrence) or one of up to 9 other diagnosis codes that are present on the last claim record included in the stay.

SOURCE:
NCH

PRCDRSW — *MEDPAR Surgical Procedure Indicator Switch*

The switch indicating whether or not there were any surgical procedures performed during the beneficiary's stay.

LONG SAS NAME: SRGCL_PRCDR_IND_SW
SHORT SAS NAME: PRCDRSW
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is derived by checking for the presence of procedure codes on the last claim record included in the stay.

SOURCE:
NCH

PRCDRCNT — *MEDPAR Surgical Procedure Code Count*

The count of the number of surgical procedure codes included in the stay.

LONG SAS NAME: SRGCL_PRCDR_CD_CNT
SHORT SAS NAME: PRCDRCNT
FIELD TYPE: NUM
FIELD LENGTH: 3

DERIVATIONS:
This field is derived by counting the procedure codes that are reported on the last claim record included in the stay.

SOURCE:
NCH

PRCDTCNT — *MEDPAR Surgical Procedure Performed Date Count*

The count of the number of dates associated with the surgical procedures included in the stay.

LONG SAS NAME: SRGCL_PRCDR_DT_CNT
SHORT SAS NAME: PRCDTCNT
FIELD TYPE: NUM
FIELD LENGTH: 3

DERIVATIONS:
This field is derived by counting the surgical procedures dates that are reported on the last claim record included in the stay.

SOURCE:
NCH

PRCDRCD{x} — *MEDPAR Surgical Procedure Code*

where { x } 1:6

The ICD-9-CM code identifying the principal or other surgical procedure performed during the beneficiary's stay. This element is part of the MEDPAR surgical procedure group. It may occur up to 6 times.

LONG SAS NAME: SRGCL_PRCDR_{x}_CD
SHORT SAS NAME: PRCDRCD{x}
FIELD TYPE: CHAR
FIELD LENGTH: 7

DERIVATIONS:
This field is the actual principal surgical procedure code (1st occurrence) or one of up to 5 other surgical procedure codes that May be present on the last claim record included in the stay.

SOURCE:
NCH

PRCDRDT{x} — *MEDPAR Surgical Procedure Performed Date*

where { x } 1:6

The date on which the icd-9-cm surgical procedure was performed during the beneficiary's stay. This element is part of the MEDPAR surgical procedure group. It can occur up to 6 times.

LONG SAS NAME: SRGCL_PRCDR_PRFRM_{x}_DT
SHORT SAS NAME: PRCDRDT{x}
FIELD TYPE: DATE
FIELD LENGTH: 8

DERIVATIONS:
This field is the actual date associated with the principal or one of up to 5 other surgical procedure codes that is present on the last claim record included in the stay.

SOURCE:
NCH

BLDFRNSH — *MEDPAR Blood Pints Furnished Quantity*

The quantity of blood (number of whole pints) furnished to the beneficiary during the stay. Note: this includes blood pints replaced as well as not replaced.

LONG SAS NAME: BLOOD_PT_FRNSH_QTY
SHORT SAS NAME: BLDFRNSH
FIELD TYPE: NUM
FIELD LENGTH: 5

DERIVATIONS:
his field is derived by accumulating the blood pints furnished quantity from all claim records included in the stay.

SOURCE:
NCH

BIC — *MEDPAR Beneficiary Identification Code*

The BIC reported on the first claim record included in the stay, representing the values existing on the CWF beneficiary master record on the date the CWF host site processed the claim.

LONG SAS NAME: BENE_IDENT_CD
SHORT SAS NAME: BIC
FIELD TYPE: CHAR
FIELD LENGTH: 2

SOURCE:
NCH

DRG_CD — *MEDPAR DRG Code*

The code indicating the DRG to which the claims that comprise the stay belong for payment purposes.

LONG SAS NAME: DRG_CD
SHORT SAS NAME: DRG_CD
FIELD TYPE: CHAR
FIELD LENGTH: 3

DERIVATIONS:
This field comes from the actual DRG code that is present on the last claim record included in the stay.
exception: if the DRG code is not present (e.g., claims from maryland and PPS-exempt hospital units do not have a DRG), a valid DRG is obtained using the grouper software and is moved to this field.

SOURCE:
NCH

DSTNTNCD — *MEDPAR Discharge Destination Code*

The code primarily indicating the destination of the beneficiary upon discharge from a facility; also denotes death or SNF/still patient situations.

LONG SAS NAME: DSCHRG_DSTNTN_CD
SHORT SAS NAME: DSTNTNCD
FIELD TYPE: CHAR
FIELD LENGTH: 2

DERIVATIONS:
This field comes from the claim status code that is present on the last claim record included in the stay.

SOURCE:
NCH

OUTLR_CD — *MEDPAR DRG/Outlier Stay Code*

The code identifying (1) for PPS providers if the stay has an unusually long length (day outlier) or high cost (cost outlier); or (2) for non-PPS providers the source for developing the DRG.

LONG SAS NAME: DRG_OUTLIER_STAY_CD
SHORT SAS NAME: OUTLR_CD
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field is the actual DRG outlier stay code that is present on the last claim record included in the stay.

Applicable to PPS providers:
0 = No Outlier
1 = Day Outlier
2 = Cost Outlier

Applicable to Non-PPS Providers:
6 = Valid DRG Received From Intermediary
7 = HCFA-Developed DRG
8 = HCFA-Developed DRG Using Claim Status Code
9 = Not Groupable

SOURCE:
NCH

PRPAY_CD *MEDPAR Beneficiary Primary Payer Code*

The code indicating the type of payer who has primary responsibility for the payment of the Medicare beneficiary's claims related to the stay.

LONG SAS NAME: BENE_PRMRY_PYR_CD
SHORT SAS NAME: PRPAY_CD
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field comes from the primary payer code that is present on the first claim record included in the stay.

SOURCE:
NCH

ESRD_CD *MEDPAR ESRD Condition Code*

The code indicating if the beneficiary had an ESRD condition reported during the stay.

LONG SAS NAME: ESRD_COND_CD
SHORT SAS NAME: ESRD_CD
FIELD TYPE: CHAR
FIELD LENGTH: 2

DERIVATIONS:
This field is derived by checking for condition codes 70 - 76 on any of the claim records included in the stay.

SOURCE:
NCH

SRC_ADMS *MEDPAR Source Inpatient Admission Code*

The code indicating the source of the beneficiary's admission to an Inpatient facility or, for newborn admission, the type of delivery.

LONG SAS NAME: SRC_IP_ADMSN_CD
SHORT SAS NAME: SRC_ADMS
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field comes from the source Inpatient admission code that is present on the last claim record included in the stay.

SOURCE:
NCH

TYPE_ADM *MEDPAR Inpatient Admission Type Code*

The code indicating the type and priority of the beneficiary's admission to a facility for the Inpatient hospital stay.

LONG SAS NAME: IP_ADMSN_TYPE_CD
SHORT SAS NAME: TYPE_ADM
FIELD TYPE: CHAR
FIELD LENGTH: 1

DERIVATIONS:
This field comes from the Inpatient admission type code that is present on the last claim record included in the stay.

SOURCE:
NCH

FICARR *MEDPAR Fiscal Intermediary/Carrier Identification Number*

The identification of the intermediary processing the beneficiary's claims related to the stay.

NOTE: This field comes from the intermediary number that is present on the first claim record included in the stay.

LONG SAS NAME: FICARR_IDENT_NUM
SHORT SAS NAME: FICARR
FIELD TYPE: CHAR
FIELD LENGTH: 5

SOURCE:
NCH

AD_DGNS *MEDPAR Admitting Diagnosis Code*

The ICD-9-CM code indicating the beneficiary's initial diagnosis at the time of admission.

NOTE: This field comes from the admitting diagnosis code that is present on the last claim record included in the stay.

LONG SAS NAME: ADMTG_DGNS_CD
SHORT SAS NAME: AD_DGNS
FIELD TYPE: CHAR
FIELD LENGTH: 5

SOURCE:
NCH

DEATHDAY — *MEDPAR Admission Death Day Count*

The count of the number of days from the date the beneficiary was admitted to a facility to the beneficiary's date of death (DOD).

LONG SAS NAME: ADMSN_DEATH_DAY_CNT
SHORT SAS NAME: DEATHDAY
FIELD TYPE: NUM
FIELD LENGTH: 7

DERIVATIONS:
This field is derived by counting the number of days between the MEDPAR admission date (the admission date present on the first claim record included in the stay) and MEDPAR beneficiary death date (the death date present on the enrollment database, which is accessed prior to creation of the quarterly MEDPAR file).

SOURCE:
NCH/EDB

IPSBCD — *MEDPAR Internal Use (By IPSB) Code*

Limited availability; for internal use only. Where not available, this field will contain zeroes.

LONG SAS NAME: INTRNL_USE_IPSB_CD
SHORT SAS NAME: IPSBCD
FIELD TYPE: CHAR
FIELD LENGTH: 3

FILDTCD — *MEDPAR Internal Use File Date Code*

Limited availability; for internal use only to to identify fiscal year/calendar year segments. Where not available, this field will contain a zero.

LONG SAS NAME: INTRNL_USE_FIL_DT_CD
SHORT SAS NAME: FILDTCD
FIELD TYPE: CHAR
FIELD LENGTH: 1

SMPLSIZE — *MEDPAR Internal Use Sample Size Code*

Limited availability; for internal use only to identify the MEDPAR sample size: 20% (HIC 9th digit = 0, 5); 20% (HIC 9th digit = 4, 8; 60% (remainder). Where not available, this field will contain a zero.

LONG SAS NAME: INTRNL_USE_SMPL_SIZE_CD
SHORT SAS NAME: SMPLSIZE
FIELD TYPE: CHAR
FIELD LENGTH: 1

WRNGCD *MEDPAR Warning Indicators Code*

The codes (commonly called warning indicators) specifying detailed billing information obtained from the claims analyzed for the stay process. The purpose of these codes is to provide additional information for the MEDPAR user; i.e., let the user know whether or not the stay included adjustments, a single claim or multiple claims, any error conditions, etc.

LONG SAS NAME: WRNG_IND_CD
SHORT SAS NAME: WRNGCD
FIELD TYPE: CHAR
FIELD LENGTH: 18

DERIVATIONS:
This field is packed. Each of the digits identify a specific item of interest to users of the MEDPAR file. Warning indicators 1 and 6, and the first two values of indicator 8, are set early in the process – while processing all claims through the final action algorithm, prior to the creation of the stay record. The other indicators are derived from the claims remaining after the final action processing, which are used to created the stay record.

SOURCE:
MEDPAR

Appendix F: Non-LIS Zip Codes

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
11235	319	319	0.18%
10002	230	549	0.31%
11224	214	763	0.43%
11230	209	972	0.54%
11214	203	1175	0.66%
11229	200	1375	0.77%
91770	188	1563	0.88%
92683	183	1746	0.98%
33012	171	1917	1.07%
78521	164	2081	1.17%
78040	153	2234	1.25%
11204	150	2384	1.34%
94112	149	2533	1.42%
92231	147	2680	1.50%
11223	146	2826	1.58%
91205	146	2972	1.67%
78501	145	3117	1.75%
90012	144	3261	1.83%
11219	138	3399	1.90%
78520	135	3534	1.98%
11691	133	3667	2.05%
33125	133	3800	2.13%
10032	129	3929	2.20%
11220	126	4055	2.27%
90027	126	4181	2.34%
60640	125	4306	2.41%
90046	125	4431	2.48%
91335	125	4556	2.55%
60616	124	4680	2.62%
78577	124	4804	2.69%
91744	121	4925	2.76%
7093	118	5043	2.83%
7087	116	5159	2.89%
11373	116	5275	2.96%
33165	116	5391	3.02%
11355	114	5505	3.08%
99999	114	5619	3.15%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
33010	112	5731	3.21%
78572	112	5843	3.27%
91331	112	5955	3.34%
94110	110	6065	3.40%
11206	108	6173	3.46%
94133	108	6281	3.52%
11218	107	6388	3.58%
10029	107	6495	3.64%
78852	106	6601	3.70%
33126	104	6705	3.76%
33135	104	6809	3.81%
78840	104	6913	3.87%
90026	103	7016	3.93%
92243	103	7119	3.99%
90057	102	7221	4.05%
10033	101	7322	4.10%
90029	101	7423	4.16%
91206	101	7524	4.22%
91706	101	7625	4.27%
91801	101	7726	4.33%
11375	100	7826	4.38%
7047	100	7926	4.44%
90042	100	8026	4.50%
78596	100	8126	4.55%
91950	99	8225	4.61%
90006	98	8323	4.66%
90004	98	8421	4.72%
11211	97	8518	4.77%
10025	97	8615	4.83%
91748	96	8711	4.88%
11368	95	8806	4.93%
21215	94	8900	4.99%
90650	94	8994	5.04%
78582	92	9086	5.09%
94587	91	9177	5.14%
75216	90	9267	5.19%
91754	90	9357	5.24%
2135	89	9446	5.29%
90280	89	9535	5.34%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
93257	88	9623	5.39%
95116	88	9711	5.44%
60617	87	9798	5.49%
33155	87	9885	5.54%
91745	87	9972	5.59%
11239	86	10058	5.64%
90201	86	10144	5.68%
78537	85	10229	5.73%
91402	85	10314	5.78%
92126	85	10399	5.83%
93033	85	10484	5.87%
92114	84	10568	5.92%
91776	84	10652	5.97%
94115	83	10735	6.01%
79915	83	10818	6.06%
90019	83	10901	6.11%
90745	83	10984	6.15%
60639	82	11066	6.20%
33013	82	11148	6.25%
90022	82	11230	6.29%
90063	82	11312	6.34%
92804	82	11394	6.38%
11226	81	11475	6.43%
91342	81	11556	6.47%
78584	81	11637	6.52%
91755	80	11717	6.56%
91405	80	11797	6.61%
95111	80	11877	6.65%
95076	80	11957	6.70%
60620	79	12036	6.74%
11374	79	12115	6.79%
95035	79	12194	6.83%
95122	79	12273	6.88%
94122	79	12352	6.92%
94102	79	12431	6.96%
91606	79	12510	7.01%
90031	79	12589	7.05%
11377	78	12667	7.10%
11385	78	12745	7.14%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
10009	78	12823	7.18%
90028	78	12901	7.23%
94109	78	12979	7.27%
60621	77	13056	7.31%
60619	77	13133	7.36%
7055	77	13210	7.40%
94103	77	13287	7.44%
90005	77	13364	7.49%
90255	77	13441	7.53%
11209	76	13517	7.57%
78586	76	13593	7.62%
95148	76	13669	7.66%
60625	75	13744	7.70%
10031	75	13819	7.74%
78041	75	13894	7.78%
60629	74	13968	7.83%
78207	74	14042	7.87%
93702	74	14116	7.91%
60628	73	14189	7.95%
4240	73	14262	7.99%
33016	73	14335	8.03%
91732	73	14408	8.07%
93030	73	14481	8.11%
92704	73	14554	8.15%
90033	73	14627	8.20%
70570	72	14699	8.24%
2740	72	14771	8.28%
11234	72	14843	8.32%
33175	72	14915	8.36%
90640	72	14987	8.40%
79936	72	15059	8.44%
92173	72	15131	8.48%
60608	71	15202	8.52%
11221	71	15273	8.56%
20019	71	15344	8.60%
92105	71	15415	8.64%
60647	70	15485	8.68%
60623	70	15555	8.72%
60618	70	15625	8.75%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
11212	70	15695	8.79%
79907	70	15765	8.83%
33142	69	15834	8.87%
91201	69	15903	8.91%
90011	69	15972	8.95%
91605	69	16041	8.99%
92843	69	16110	9.03%
94134	69	16179	9.06%
10467	68	16247	9.10%
7501	68	16315	9.14%
33177	68	16383	9.18%
91911	68	16451	9.22%
90250	68	16519	9.26%
11354	67	16586	9.29%
90805	67	16653	9.33%
78046	67	16720	9.37%
78573	67	16787	9.41%
91766	67	16854	9.44%
92154	67	16921	9.48%
93307	67	16988	9.52%
38109	66	17054	9.55%
95132	66	17120	9.59%
96817	66	17186	9.63%
78043	66	17252	9.67%
90703	66	17318	9.70%
60651	65	17383	9.74%
11236	65	17448	9.78%
11372	65	17513	9.81%
11106	65	17578	9.85%
90044	65	17643	9.88%
19116	64	17707	9.92%
33014	64	17771	9.96%
90813	64	17835	9.99%
79905	64	17899	10.03%
95127	64	17963	10.06%
94116	64	18027	10.10%
91910	64	18091	10.14%
60653	63	18154	10.17%
60612	63	18217	10.21%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
10701	63	18280	10.24%
7104	63	18343	10.28%
27893	63	18406	10.31%
91406	63	18469	10.35%
95206	63	18532	10.38%
94606	63	18595	10.42%
78550	63	18658	10.45%
90032	63	18721	10.49%
11208	62	18783	10.52%
10040	62	18845	10.56%
33174	62	18907	10.59%
32209	62	18969	10.63%
90018	62	19031	10.66%
94607	62	19093	10.70%
92840	62	19155	10.73%
93274	62	19217	10.77%
95823	62	19279	10.80%
60610	61	19340	10.84%
10458	61	19401	10.87%
2721	61	19462	10.90%
33145	61	19523	10.94%
39120	61	19584	10.97%
91789	61	19645	11.01%
90037	61	19706	11.04%
78574	61	19767	11.08%
60626	60	19827	11.11%
70501	60	19887	11.14%
2780	60	19947	11.18%
2118	60	20007	11.21%
10460	60	20067	11.24%
10463	60	20127	11.28%
7306	60	20187	11.31%
78589	60	20247	11.34%
92708	60	20307	11.38%
11717	59	20366	11.41%
2124	59	20425	11.44%
33144	59	20484	11.48%
33018	59	20543	11.51%
94121	59	20602	11.54%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
60644	58	20660	11.58%
60634	58	20718	11.61%
60637	58	20776	11.64%
2148	58	20834	11.67%
10456	58	20892	11.71%
48238	58	20950	11.74%
94501	58	21008	11.77%
90023	58	21066	11.80%
60624	57	21123	11.83%
60609	57	21180	11.87%
4401	57	21237	11.90%
48126	57	21294	11.93%
90247	57	21351	11.96%
90638	57	21408	11.99%
90660	57	21465	12.03%
91202	57	21522	12.06%
93215	57	21579	12.09%
92335	57	21636	12.12%
60016	56	21692	12.15%
10452	56	21748	12.18%
33139	56	21804	12.22%
33193	56	21860	12.25%
94536	56	21916	12.28%
94538	56	21972	12.31%
90007	56	22028	12.34%
90020	56	22084	12.37%
78570	56	22140	12.40%
78541	56	22196	12.44%
78526	56	22252	12.47%
60622	55	22307	12.50%
60636	55	22362	12.53%
10472	55	22417	12.56%
33157	55	22472	12.59%
94601	55	22527	12.62%
95121	55	22582	12.65%
94124	55	22637	12.68%
91780	55	22692	12.71%
91803	55	22747	12.74%
92801	55	22802	12.78%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
2151	54	22856	12.81%
1902	54	22910	12.84%
20002	54	22964	12.87%
94108	54	23018	12.90%
93905	54	23072	12.93%
90001	54	23126	12.96%
90706	54	23180	12.99%
60632	53	23233	13.02%
20011	53	23286	13.05%
8360	53	23339	13.08%
11213	53	23392	13.11%
7305	53	23445	13.14%
7002	53	23498	13.17%
33172	53	23551	13.20%
48212	53	23604	13.22%
90025	53	23657	13.25%
93722	53	23710	13.28%
95341	53	23763	13.31%
94565	53	23816	13.34%
60659	52	23868	13.37%
75217	52	23920	13.40%
77083	52	23972	13.43%
10453	52	24024	13.46%
30721	52	24076	13.49%
94612	52	24128	13.52%
92115	52	24180	13.55%
78516	52	24232	13.58%
78853	52	24284	13.61%
60804	51	24335	13.63%
10013	51	24386	13.66%
8861	51	24437	13.69%
7024	51	24488	13.72%
6513	51	24539	13.75%
1040	51	24590	13.78%
1201	51	24641	13.81%
33055	51	24692	13.83%
48203	51	24743	13.86%
90065	51	24794	13.89%
92101	51	24845	13.92%

BENE_ZIP_CD	Count of Included Benes from Deemed LIS and Non-Deemed LIS	Accumulating Count	Accumulating Percentage of Total Beneficiaries in Dataset After Exclusions
92227	51	24896	13.95%
91401	51	24947	13.98%
95112	51	24998	14.01%
95828	51	25049	14.03%
60638	50	25099	14.06%
2119	50	25149	14.09%
11203	50	25199	14.12%
20001	50	25249	14.15%
48235	50	25299	14.17%
32401	50	25349	14.20%
42101	50	25399	14.23%
37110	50	25449	14.26%
91792	50	25499	14.29%
93277	50	25549	14.31%
90038	50	25599	14.34%

Appendix G: Excluded Beneficiaries

Sample Group ID	Number of Beneficiaries	Death Exclusion	Under 65 Exclusion	ESRD Exclusion	HMO Exclusion	Cost-Share Exclusion	Percentage of Total Beneficiaries in Dataset
Deemed LIS	171727	N	N	N	N	N	6.41%
Deemed LIS	6	Y	N	Y	Y	N	0.00%
Deemed LIS	46	Y	Y	N	Y	N	0.00%
Deemed LIS	388	N	Y	Y	Y	N	0.01%
Deemed LIS	41	Y	Y	Y	N	N	0.00%
Deemed LIS	29235	N	Y	N	Y	N	1.09%
Deemed LIS	1	Y	Y	Y	Y	N	0.00%
Deemed LIS	42	Y	N	Y	N	N	0.00%
Deemed LIS	836	Y	N	N	N	N	0.03%
Deemed LIS	68472	N	N	N	Y	N	2.56%
Deemed LIS	4503	N	Y	Y	N	N	0.17%
Deemed LIS	308	Y	N	N	Y	N	0.01%
Deemed LIS	216	Y	Y	N	N	N	0.01%
Deemed LIS	424	N	N	Y	Y	N	0.02%
Deemed LIS	1728	N	N	Y	N	N	0.06%
Deemed LIS	139665	N	Y	N	N	N	5.22%

Sample Group ID	Number of Beneficiaries	Death Exclusion	Under 65 Exclusion	ESRD Exclusion	HMO Exclusion	Cost-Share Exclusion	Percentage of Total Beneficiaries in Dataset
Dropped_for_Switching	6070	N	N	N	Y	N	0.23%
Dropped_for_Switching	21170	Y	N	N	Y	Y	0.79%
Dropped_for_Switching	363	N	N	Y	Y	Y	0.01%
Dropped_for_Switching	2901	N	Y	N	N	N	0.11%
Dropped_for_Switching	2185	Y	N	Y	N	Y	0.08%
Dropped_for_Switching	5487	N	Y	Y	N	Y	0.20%
Dropped_for_Switching	6338	Y	Y	N	N	Y	0.24%
Dropped_for_Switching	24	N	Y	Y	Y	N	0.00%
Dropped_for_Switching	11941	N	Y	N	Y	Y	0.45%
Dropped_for_Switching	79	N	N	Y	N	N	0.00%
Dropped_for_Switching	39	Y	N	N	N	N	0.00%
Dropped_for_Switching	963108	N	N	N	N	Y	35.98%
Dropped_for_Switching	48	Y	N	N	Y	N	0.00%
Dropped_for_Switching	56	N	N	Y	Y	N	0.00%
Dropped_for_Switching	140	N	Y	Y	N	N	0.01%
Dropped_for_Switching	2	Y	N	Y	N	N	0.00%
Dropped_for_Switching	12	Y	Y	N	N	N	0.00%
Dropped_for_Switching	102180	N	N	N	Y	Y	3.82%
Dropped_for_Switching	154910	N	Y	N	N	Y	5.79%
Dropped_for_Switching	1458	N	Y	N	Y	N	0.05%
Dropped_for_Switching	1225	Y	Y	N	Y	Y	0.05%
Dropped_for_Switching	497	Y	N	Y	Y	Y	0.02%
Dropped_for_Switching	195	N	Y	Y	Y	Y	0.01%
Dropped_for_Switching	1016	Y	Y	Y	N	Y	0.04%
Dropped_for_Switching	5937	N	N	N	N	N	0.22%
Dropped_for_Switching	88	Y	Y	Y	Y	Y	0.00%
Dropped_for_Switching	74514	Y	N	N	N	Y	2.78%
Dropped_for_Switching	3671	N	N	Y	N	Y	0.14%
Non-Deemed LIS	4806	N	N	N	Y	N	0.18%
Non-Deemed LIS	1185	N	Y	N	Y	N	0.04%
Non-Deemed LIS	2	Y	Y	N	N	N	0.00%
Non-Deemed LIS	68	N	N	Y	N	N	0.00%
Non-Deemed LIS	1	Y	N	Y	N	N	0.00%
Non-Deemed LIS	76	N	Y	Y	N	N	0.00%
Non-Deemed LIS	40	Y	N	N	N	N	0.00%
Non-Deemed LIS	2217	N	Y	N	N	N	0.08%
Non-Deemed LIS	20	N	N	Y	Y	N	0.00%
Non-Deemed LIS	18	Y	N	N	Y	N	0.00%
Non-Deemed LIS	6756	N	N	N	N	N	0.25%

Sample Group ID	Number of Beneficiaries	Death Exclusion	Under 65 Exclusion	ESRD Exclusion	HMO Exclusion	Cost-Share Exclusion	Percentage of Total Beneficiaries in Dataset
Non-Deemed LIS	1	Y	Y	Y	N	N	0.00%
Non-Deemed LIS	1	Y	N	Y	Y	N	0.00%
Non-Deemed LIS	8	N	Y	Y	Y	N	0.00%
Non-Deemed LIS	2	Y	Y	N	Y	N	0.00%
Non-LIS Group	48	Y	Y	N	Y	N	0.00%
Non-LIS Group	6	Y	Y	Y	N	N	0.00%
Non-LIS Group	272	N	Y	Y	Y	N	0.01%
Non-LIS Group	33	Y	N	Y	Y	N	0.00%
Non-LIS Group	434356	N	N	N	N	N	16.22%
Non-LIS Group	1036	N	N	Y	Y	N	0.04%
Non-LIS Group	384077	N	N	N	Y	N	14.35%
Non-LIS Group	41	Y	Y	N	N	N	0.00%
Non-LIS Group	639	N	Y	Y	N	N	0.02%
Non-LIS Group	24695	N	Y	N	N	N	0.92%
Non-LIS Group	28789	N	Y	N	Y	N	1.08%
Non-LIS Group	1708	Y	N	N	N	N	0.06%
Non-LIS Group	46	Y	N	Y	N	N	0.00%
Non-LIS Group	1685	N	N	Y	N	N	0.06%
Non-LIS Group	1219	Y	N	N	Y	N	0.05%

Appendix H: Medication Adherence by Drug Class

Drug Class	MPR	Standard Deviation
ADRENALS	.84200374	.19532066
ALCOHOL DEPENDENCE	.847742	.19636711
ALLERGY	.75200472	.28505494
ALZHEIMER'S	.93546852	.13195246
ANESTHETICS & SEDATIVE HYPNOTICS	.94036393	.13999421
ANTI-OBESTITY DRUGS	.84217692	.21741592
ANTIARRHYTHMIC AGENTS	.92302963	.14746685
ANTIARTHRITICS	.8348835	.22883323
ANTIBIOTICS	.29547128	.26504877
ANTICOAGULANTS	.91496874	.15065184
ANTIDEPRESSANTS	.93806366	.13687845
ANTIDOTES	.82837433	.22502419
ANTIFUNGALS	.53032211	.31969833
ANTIHISTAMINE DRUGS	.70555215	.29281188
ANTIHYPERTENSIVES	.9415912	.13486101
ANTIHYPERTENSIVES/CHF	.89247784	.21176346
ANTIHYPERTENSIVES/IHD	.96588627	.10398844
ANTIMYCOBACTERIALS (TB AGENTS)	.95962161	.11956728
ANTINEOPLASTIC AGENTS	.88310738	.19251157
ANTIPARASITICS	.8941751	.17193266
ANTIPARKINSON'S DRUGS	.93658287	.13794643
ANTIPLATELET	.95197042	.11446003
ANTIPSYCHOTIC AGENTS	.94224369	.13579126
ANTIPSYCHOTICS	.94085844	.12739706
ANTISEIZURE	.90742564	.16209929
ANTISPASMODICS	.86220536	.21771866
ANTIVIRAL & ANTIRETROVIRAL AGENTS	.74190716	.34110648
ANXIETY & INSOMNIA	.87825034	.19112352
BIOLOGIC RESPONSE MODIFIERS	.94599771	.12121045
BPH	.94712692	.12644556
CARDIOVASCULAR AGENTS	.92989452	.14259265
CHF	.95378749	.11318001
CNS STIMULANTS	.88842359	.17409892
CONTRACEPTIVES	.9866666	.0298144
DIABETIC THERAPY	.95192608	.12351215
ED	.52731356	.26165546
GERD & GI AGENTS	.89306977	.19553279
HEMATOPOIETIC AGENTS	.85046932	.20174568
HEMOSTATICS	.61499433	.40496726
HRT	.9023352	.1787944
IMMUNE SUPPRESSION	.95030085	.12122255
LIPOTROPICS	.93953433	.1328734
MS	.8097128	.21002976
Misc.	.79264267	.26038424
OPHTHALMIC PREPS (ANTIBIOTICS_ AN	.8119943	.24661192
OSTEOPOROSIS	.92006042	.14754685
PAIN & INFLAMMATION	.6513721	.31962646
RESPIRATORY TRACT AGENTS (ASTHMA	.86717037	.2148659
SMOKING CESSATION	.7992662	.23924943
STEROIDS	.6373581	.35364234
THYROID AGENTS	.96286768	.09964026
Total	.86723077	.23943641

Appendix I: Brand/Generic Drug Utilization by Group (2009)

Brand/Generic Drug Utilization (2009)					
	Total Beneficiary Count	% of Generic Drugs	% of Brand Drugs	Total #of Generic Drugs	Total #of Brand Drugs
Deemed	158,055	0.674	0.326	106529.07	51525.93
Non-Deemed	6,381	0.707	0.293	4511.367	1869.633
Non-LIS	7,485	0.678	0.322	5074.83	2410.17
	171,921	0.686	0.314	117937.806	53983.194

Appendix J: Specialty Drug Utilization

	Deemed	**Non-Deemed**	**Non-LIS**
Total Claims	158,055	6,381	7,485
Specialty Utilization Rate	0.98%	0.97%	1.50%
Specialty Claims	1548.939	61.8957	112.275
Average Specialty Cost	810.7	721.7	888.5
Total Specialty Cost	1255724.847	44670.12669	99756.3375
Total Drug Cost	10,211,933	378,903	512,273
% of Total Cost	0.12296642	0.117893304	0.194732765

Hausman Test Differences-in-Differences with Fixed Effects Model

Hausman test was conducted and the result was significant. Therefore, the fixed effects model is used to estimate the effects of being in deemed in 2009 vs. non-deemed 2010 (i.e. switcher 1 vs. 2), and deemed 2009 vs. non-LIS 2010 (switcher 1 vs. 3).

Appendix K: Fixed Effects Model – Prescription Expenditure

```
. xtreg $ylist $xlist, fe
note: 1.time omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =    281974
Group variable: time                            Number of groups   =         2

R-sq:  within  = 0.9987                         Obs per group: min =    140987
       between = 1.0000                                        avg =  140987.0
       overall = 0.9987                                        max =    140987

                                                F(14,281958)       =  1.57e+07
corr(u_i, Xb)  = 0.0241                         Prob > F           =    0.0000
```

totalrxcostamount	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
switcher						
2	17.67601	7.830221	2.26	0.024	2.328991	33.02303
3	13.97321	4.729967	2.95	0.003	4.702608	23.24382
1.time	0	(omitted)				
time#switcher						
1 2	13.93721	11.10661	1.25	0.210	-7.83144	35.70586
1 3	126.3134	7.059057	17.89	0.000	112.4778	140.149
pdeiddistinctcount	-.0264409	.0196113	-1.35	0.178	-.0648784	.0119967
totalquantity	.000023	.0000215	1.07	0.286	-.0000192	.0000651
totaldaysofsupply	.0082968	.0006724	12.34	0.000	.0069789	.0096147
totalpatientpayamount	1.03245	.0030796	335.25	0.000	1.026414	1.038486
totallowincomesubsidyamount	.995604	.0003098	3214.08	0.000	.9949969	.9962111
totalcovereddplanpaidamount	1.000775	.0001222	8190.60	0.000	1.000536	1.001014
age	-.0741734	.0404601	-1.83	0.067	-.1534741	.0051273
avg_mpr_limited	-.7259102	1.609314	-0.45	0.652	-3.880122	2.428301
quantitylimitcount	-.1483126	.0214988	-6.90	0.000	-.1904496	-.1061756
priorauthorizationcount	.5243839	.1568	3.34	0.001	.2170602	.8317076
_cons	5.547825	3.302271	1.68	0.093	-.9245355	12.02018
sigma_u	.44956629					
sigma_e	159.62678					
rho	7.932e-06	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(1, 281958) =     1.09           Prob > F = 0.2958
```

Appendix L: Random Effects Model – Prescription Utilization

```
. xtreg $ylist $xlist

Random-effects GLS regression                   Number of obs      =    281974
Group variable: time                            Number of groups   =         2

R-sq:  within  = 0.8575                         Obs per group: min =    140987
       between = 1.0000                                        avg =  140987.0
       overall = 0.8575                                        max =    140987

                                                Wald chi2(15)      =  1.70e+06
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

pdeiddistinctcount	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
switcher						
2	-2.557493	.7519169	-3.40	0.001	-4.031223	-1.083763
3	-1.401669	.4542117	-3.09	0.002	-2.291908	-.5114307
1.time	-1.622192	.0583216	-27.81	0.000	-1.736501	-1.507884
time#switcher						
1 2	-8.399021	1.066439	-7.88	0.000	-10.4892	-6.30884
1 3	-23.42196	.6768207	-34.61	0.000	-24.7485	-22.09542
totalrxcostamount	-.0002438	.0001808	-1.35	0.178	-.0005983	.0001106
totalquantity	.0000267	2.07e-06	12.94	0.000	.0000227	.0000308
totaldaysofsupply	.0266234	.0000407	653.91	0.000	.0265436	.0267032
totalpatientpayamount	.0330933	.0003441	96.16	0.000	.0324188	.0337678
totallowincomesubsidyamount	-.0008639	.0001825	-4.73	0.000	-.0012216	-.0005063
totalcovereddplanpaidamount	.000674	.0001814	3.72	0.000	.0003186	.0010295
age	-.040399	.0038846	-10.40	0.000	-.0480127	-.0327853
avg_mpr_limited	-12.20231	.1528222	-79.85	0.000	-12.50183	-11.90278
quantitylimitcount	.3736278	.0019411	192.49	0.000	.3698234	.3774323
priorauthorizationcount	.507938	.0150272	33.80	0.000	.4784853	.5373907
_cons	12.3515	.3156969	39.12	0.000	11.73275	12.97026
sigma_u	0					
sigma_e	15.328744					
rho	0	(fraction of variance due to u_i)				

Appendix M: Random Effects Model – Prescription Utilization

```
. xtreg $ylist $xlist

Random-effects GLS regression                   Number of obs      =    281974
Group variable: time                            Number of groups   =         2

R-sq:  within  = 0.8575                         Obs per group: min =    140987
       between = 1.0000                                        avg =  140987.0
       overall = 0.8575                                        max =    140987

                                                Wald chi2(15)      =  1.70e+06
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

pdeiddistinctcount	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
switcher						
2	-2.557493	.7519169	-3.40	0.001	-4.031223	-1.083763
3	-1.401669	.4542117	-3.09	0.002	-2.291908	-.5114307
1.time	-1.622192	.0583216	-27.81	0.000	-1.736501	-1.507884
time#switcher						
1 2	-8.399021	1.066439	-7.88	0.000	-10.4892	-6.30884
1 3	-23.42196	.6768207	-34.61	0.000	-24.7485	-22.09542
totalrxcostamount	-.0002438	.0001808	-1.35	0.178	-.0005983	.0001106
totalquantity	.0000267	2.07e-06	12.94	0.000	.0000227	.0000308
totaldaysofsupply	.0266234	.0000407	653.91	0.000	.0265436	.0267032
totalpatientpayamount	.0330933	.0003441	96.16	0.000	.0324188	.0337678
totallowincomesubsidyamount	-.0008639	.0001825	-4.73	0.000	-.0012216	-.0005063
totalcovereddplanpaidamount	.000674	.0001814	3.72	0.000	.0003186	.0010295
age	-.040399	.0038846	-10.40	0.000	-.0480127	-.0327853
avg_mpr_limited	-12.20231	.1528222	-79.85	0.000	-12.50183	-11.90278
quantitylimitcount	.3736278	.0019411	192.49	0.000	.3698234	.3774323
priorauthorizationcount	.507938	.0150272	33.80	0.000	.4784853	.5373907
_cons	12.3515	.3156969	39.12	0.000	11.73275	12.97026
sigma_u	0					
sigma_e	15.328744					
rho	0	(fraction of variance due to u_i)				

Appendix N: Marginal Effects

```
. margins, dydx(*) atmeans

Conditional marginal effects                    Number of obs   =     281974
Model VCE    : Conventional

Expression   : Linear prediction, predict()
dy/dx w.r.t. : 2.switcher 3.switcher 1.time totalrxcostamount totalquantity totaldaysofsupply
               totalpatientpayamount totallowincomesubsidyamount totalcovereddplanpaidamount a
               quantitylimitcount priorauthorizationcount
at           : 1.switcher      =    .9888926 (mean)
               2.switcher      =    .0029577 (mean)
               3.switcher      =    .0081497 (mean)
               0.time          =          .5 (mean)
               1.time          =          .5 (mean)
               totalrxcos~t    =    3673.549 (mean)
               totalquant~y    =    2931.769 (mean)
               totaldayso~y    =    1821.122 (mean)
               totalpatie~t    =    113.7439 (mean)
               totallowin~t    =    1673.416 (mean)
               totalcover~t    =     1877.23 (mean)
               age             =    76.64375 (mean)
               avg_mpr_li~d    =    .8407015 (mean)
               quantityli~t    =    16.93855 (mean)
               priorautho~t    =     .435416 (mean)
```

	Delta-method					
	dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
switcher						
2	-6.757004	.5342576	-12.65	0.000	-7.80413	-5.709878
3	-13.11265	.3402539	-38.54	0.000	-13.77954	-12.44576
1.time	-1.837916	.0580506	-31.66	0.000	-1.951693	-1.724139
totalrxcostamount	-.0002438	.0001808	-1.35	0.178	-.0005983	.0001106
totalquantity	.0000267	2.07e-06	12.94	0.000	.0000227	.0000308
totaldaysofsupply	.0266234	.0000407	653.91	0.000	.0265436	.0267032
totalpatientpayamount	.0330933	.0003441	96.16	0.000	.0324188	.0337678
totallowincomesubsidyamount	-.0008639	.0001825	-4.73	0.000	-.0012216	-.0005063
totalcovereddplanpaidamount	.000674	.0001814	3.72	0.000	.0003186	.0010295
age	-.040399	.0038846	-10.40	0.000	-.0480127	-.0327853
avg_mpr_limited	-12.20231	.1528222	-79.85	0.000	-12.50183	-11.90278
quantitylimitcount	.3736278	.0019411	192.49	0.000	.3698234	.3774323
priorauthorizationcount	.507938	.0150272	33.80	0.000	.4784853	.5373907

Note: dy/dx for factor levels is the discrete change from the base level.

Appendix O: Marginal Effects Continued

```
. margins, dydx(*)

Average marginal effects                        Number of obs   =     281974
Model VCE    : Conventional

Expression   : Linear prediction, predict()
dy/dx w.r.t. : 2.switcher 3.switcher 1.time totalrxcostamount totalquantity totaldaysofsupply
               totalpatientpayamount totallowincomesubsidyamount totalcovereddplanpaidamount age avg_mpr_limited
               quantitylimitcount priorauthorizationcount
```

	Delta-method					
	dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
switcher						
2	-6.757004	.5342576	-12.65	0.000	-7.80413	-5.709878
3	-13.11265	.3402539	-38.54	0.000	-13.77954	-12.44576
1.time	-1.837916	.0580506	-31.66	0.000	-1.951693	-1.724139
totalrxcostamount	-.0002438	.0001808	-1.35	0.178	-.0005983	.0001106
totalquantity	.0000267	2.07e-06	12.94	0.000	.0000227	.0000308
totaldaysofsupply	.0266234	.0000407	653.91	0.000	.0265436	.0267032
totalpatientpayamount	.0330933	.0003441	96.16	0.000	.0324188	.0337678
totallowincomesubsidyamount	-.0008639	.0001825	-4.73	0.000	-.0012216	-.0005063
totalcovereddplanpaidamount	.000674	.0001814	3.72	0.000	.0003186	.0010295
age	-.040399	.0038846	-10.40	0.000	-.0480127	-.0327853
avg_mpr_limited	-12.20231	.1528222	-79.85	0.000	-12.50183	-11.90278
quantitylimitcount	.3736278	.0019411	192.49	0.000	.3698234	.3774323
priorauthorizationcount	.507938	.0150272	33.80	0.000	.4784853	.5373907

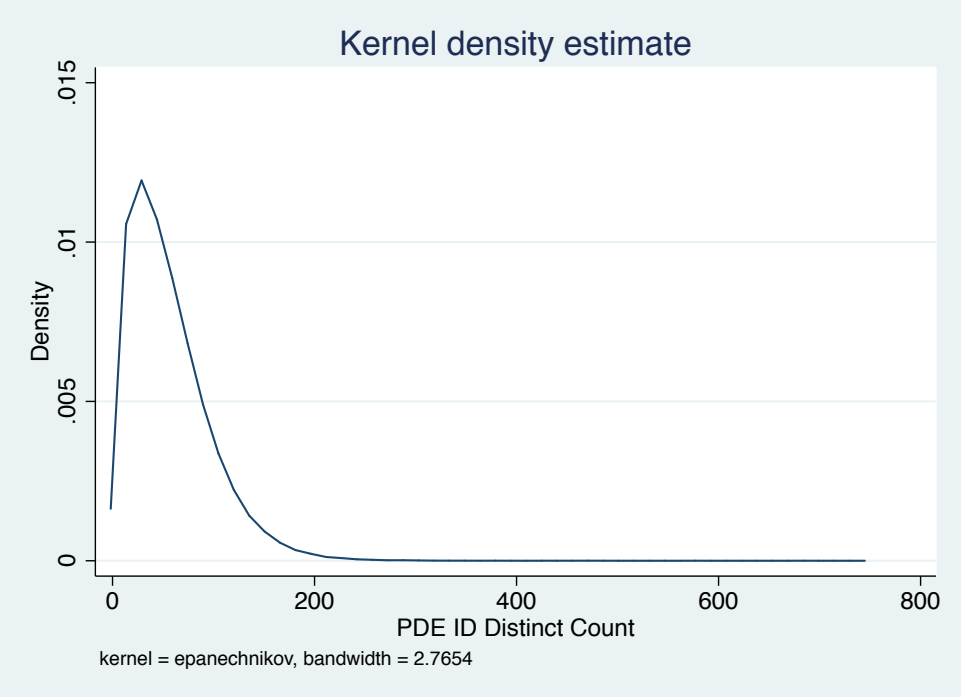
Note: dy/dx for factor levels is the discrete change from the base level.

Appendix P: Random Effects Model – Medication Possession Ratio

```
. xtreg $ylist $xlist

Random-effects GLS regression                   Number of obs      =    281974
Group variable: time                            Number of groups   =         2

R-sq:  within  = 0.1625                         Obs per group: min =    140987
       between = 1.0000                                        avg =  140987.0
       overall = 0.1628                                        max =    140987

                                                Wald chi2(15)      =  54810.60
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

avg_mpr_limited	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
switcher						
2	-.0013845	.0091631	-0.15	0.880	-.019344	.0165749
3	.0047449	.0055352	0.86	0.391	-.0061038	.0155937
1.time	-.0015703	.0007117	-2.21	0.027	-.0029652	-.0001755
time#switcher						
1 2	-.0366598	.012997	-2.82	0.005	-.0621335	-.0111862
1 3	-.1029718	.008263	-12.46	0.000	-.1191671	-.0867765
pdeiddistinctcount	-.0018121	.0000227	-79.85	0.000	-.0018565	-.0017676
totalrxcostamount	-9.94e-07	2.20e-06	-0.45	0.652	-5.31e-06	3.33e-06
totalquantity	-1.10e-07	2.52e-08	-4.35	0.000	-1.59e-07	-6.02e-08
totaldaysofsupply	.0001211	7.53e-07	160.82	0.000	.0001197	.0001226
totalpatientpayamount	.0000959	4.26e-06	22.53	0.000	.0000876	.0001043
totallowincomesubsidyamount	-5.87e-06	2.22e-06	-2.64	0.008	-.0000102	-1.51e-06
totalcovereddplanpaidamount	-3.28e-07	2.21e-06	-0.15	0.882	-4.66e-06	4.00e-06
age	.0013594	.0000473	28.75	0.000	.0012667	.001452
quantitylimitcount	.0001423	.0000252	5.66	0.000	.000093	.0001917
priorauthorizationcount	-.0006045	.0001835	-3.29	0.001	-.0009641	-.0002449
_cons	.6197022	.0036768	168.54	0.000	.6124959	.6269086
sigma_u	0					
sigma_e	.18679813					
rho	0	(fraction of variance due to u_i)				

Appendix Q: Sample Distribution of Prescription Utilization



Appendix R: Sample Distribution of Prescription Drug Expenditures