MEDICARE SUPPLEMENTAL INSURANCE PURCHASING

DECISIONS AND OWNERSHIP

by

YAN YANG

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Dissertation Adviser: Dr. M.C. "Terry" Hokenstad

Mandel School of Applied Social Sciences

CASE WESTERN RESERVE UNIVERSITY

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proprietary material contained therein.

DEDICATION

This dissertation is dedicated

to my beloved parents

Yumei Guo and *Zhenjie Yang*,

to my dear husband

Yong Shu,

and to my lovely children

Richard and *Angelina*

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Medicare Supplemental Insurance Purchasing Decisions and Ownership

Abstract

by

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The majority of Medicare beneficiaries rely on supplemental insurance to help fill the gaps in Medicare's benefit package and to protect themselves from large, unanticipated health care expenses. Medigap is the only supplemental insurance available to all beneficiaries in the private health insurance market. Although numerous studies have been conducted on Medigap ownership, few attempts have been made to explore the decision-making process for purchasing Medigap. This dissertation examined decision factors in the dynamics of private supplemental insurance purchases by Medicare beneficiaries. Simon's Bounded Rationality Theory was utilized to develop a conceptual framework for this study.

This study is a secondary analysis, using longitudinal data from the Asset and Health Dynamics Among the Oldest-Old Survey (AHEAD). The sample consisted of 2,756 non-Hispanic Medicare beneficiaries who had Medicare coverage and were 70 and over at the 1993 baseline interview. This sample was followed at Wave II and Wave III in the 1995 and 1998 surveys.

Multilevel modeling was used to examine the time-dependent relationship of the Medigap purchasing decision. The analysis revealed that for the oldest old, Medigap purchases were related to socio-demographic and economic factors, while limited by cognitive functioning and influenced by environmental factors. Beneficiaries with Medigap coverage are better educated, more likely to be white and financially advantaged, and more likely to have better cognitive functioning. However, the beneficiaries' need for services—self-reported health status and chronic disease conditions—was not found to have impact on Medigap purchases.

The findings of this study have implications for Medicare policies that are designed to enhance health care coverage while containing health care costs through market competition. These findings are also important for public agencies and other entities helping the disadvantaged elderly make informed enrollment decisions, and for furthering empirical knowledge and research methodology on the behavioral modeling with respect to health insurance purchases.

Chapter One: Introduction

This study attempts to address the knowledge gap by exploring the decision factors in the dynamics of private supplemental insurance purchases by Medicare beneficiaries. In the introduction, the Public Medicare program and its private supplemental insurance known as Medigap plans are reviewed. Then the questionable role of Medigap in the context of Medicare reform to improving comprehensive coverage available to Medicare beneficiaries is addressed.

Overview of Medicare Program

The Medicare program was enacted by Congress in 1966 to ensure access to high-quality medical care by the aged. About forty years later, Medicare has become the nation's largest health insurance program and the primary source of health insurance coverage for people 65 years of age and older, some disabled people under 65 years of age, and people with End-Stage Renal Disease (permanent kidney failure treated with dialysis or a transplant). As of July 2003, Medicare covers about 41 million beneficiaries (United States General Accounting Office, 2005).

Benefits under this law are divided into two sections. Part A is the Hospital Insurance (HI), which helps pay for inpatient hospital care, skilled nursing facility services following a hospital stay, hospice care, and certain home health care services. It was originally available to all persons age 65 and over, but later was available without charge only to individuals eligible for Old-Age, Survivors and Disability Insurance (OASDI) retirement benefits. Others are able to buy into the program by paying a monthly premium. The coverage is funded through the OASDI system. Part B is the Supplemental

Medical Insurance (SMI), which helps pay for selected physician, outpatient hospital, laboratory, and other services. It is voluntary and requires the payment of a monthly premium, currently $78 per month (United States General Accounting Office, 2005). The premium amount is adjusted each year so that expected premium revenues equal 25 percent of expected part B spending. The funds for this coverage come from general tax revenues. Both parts of Medicare contain cost sharing provisions, such as deductibles, coinsurance and copayments[1] (see Table 1).

Table 1: Medicare Coverage and Beneficiary Cost-Sharing, 2005	
Part A Benefits	**Individual Pays**
Inpatient hospital	Deductible of $912 per benefit period*
Days 1-60	No coinsurance
Days 61-90	$228 a day
Days 90-150	$456 a day
After 150 Days	No benefits
Skilled nursing facility	
Days 1-20	No coinsurance
Days 21-100	$114 a day
After 100 days	No benefits
Home health	No deductible or coinsurance
Hospice	Copayment of up to $5 for outpatient drugs and
	5% coinsurance for inpatient respite care
Part B Benefits	
Deductible	$110 a year
Physician and other medical services	
MD accepts assignment*	20% coinsurance
MD does not accept assignment	20% coinsurance plus up to 15% over Medicare-approved fee
Outpatient hospital care	20% coinsurance
Ambulatory surgical services	20% coinsurance
X-rays; durable medical equipment	20% coinsurance
Physical, speech, and occupational therapy	20% coinsurance
Clinical diagnostic laboratory services	No coinsurance
Home health care	No coinsurance
Outpatient mental health services	50% coinsurance

*A benefit period begins when a person is admitted to a hospital and ends 60 days after discharge from a hospital or a skilled nursing facility. deductible is charged for second and subsequent hospital admissions if they occur within 60 days of the beneficiary's most recent covered inpa stay. After the first 90 days of inpatient care, Medicare may help pay for an additional 60 days of inpatient care (days 91 through 150). Each beneficiary is entitled to a lifetime reserve of 60 days of inpatient coverage.

** Assignment – physicians agree to accept the Medicare's predetermined fee as payment-in-full.

SOURCE: "HHS Announces Medicare Premium, Deductibles for 2005," press release, U.S. Department of Health and Human Services, September 3, 2004

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[1] Deductible is the portion of a subscriber's (or member's) health care expenses that must be paid out of pocket before any insurance coverage applies. Coinsurance is the provision in a member's coverage that limits the amount of coverage by the plan to a certain percentage. Copayment is the portion of a claim or medical expense that a member must pay out of pocket as a fixed amount.

Traditional Medicare's design has changed little since its inception, and in many ways has not kept pace with changing health care needs and private sector insurance practices. In Medicare, the lack of dollar limits on beneficiaries' cost-sharing obligations—deductibles, coinsurance, and copayments—puts beneficiaries with extensive health care needs at risk for very large expenses for Medicare-covered services. Similarly, Medicare's lack of coverage for certain services, especially most outpatient prescription drugs, can expose beneficiaries to substantial financial risk. The increasingly important role of pharmaceuticals in medical care and the continuing rapid increases in drug prices accentuate this risk.

Unlike most employer-sponsored plans for active workers, Medicare does not limit beneficiaries' cost-sharing liabilities, which can represent a significant share of their personal resources. In 2000, premiums, deductibles, coinsurance, and copayments that beneficiaries were required to pay for services that Medicare covers equaled an estimated 23 percent of total Medicare expenditures. However, the burden of Medicare cost-sharing can be much higher for beneficiaries with extensive health care needs. In 1998, about 3.4 million beneficiaries (11.5 percent of beneficiaries who obtained services) were liable for at least $2,000 for Medicare cost-sharing and part B premiums. Approximately 736,000 of these beneficiaries (2.5 percent) were liable for at least $5,000, and about 167,000 beneficiaries (0.6 percent) were liable for at least $10,000. A recent study of out-of-pocket spending among beneficiaries with various medical problems found that a chronically ill, frail 80-year-old woman could pay more than $10,000 within a year for her health care, supplies and prescriptions (Snyder, Rice & Kitchman, 2003). In contrast, private employer-sponsored health plans for active workers in 2000 typically limited

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maximum annual out-of-pocket costs for covered services to less than $2,000 per year for single coverage (The Kaiser Family Foundation, 2002).

Furthermore, Medicare provides no coverage for certain health care services and products typically needed by beneficiaries, such as long-term nursing home care, most outpatient prescription drugs, eyeglasses, and hearing aids. These limitations put beneficiaries at additional risk of incurring potentially catastrophic expenses. According to the U.S. General Accounting Office (GAO), "current estimates suggest that the combination of Medicare's cost-sharing requirements and limited benefits leaves about 45 percent of beneficiaries' health care costs uncovered". In 2000, the average beneficiary is estimated to have incurred about $3,100 in total out-of-pocket expenses for health care—an amount equal to about 22 percent of beneficiary income (Maxwell, Moon & Segal, 2000). The combination of Medicare cost-sharing and costs of uncovered services represents a much greater financial burden for some beneficiaries. For example, in 2000, elderly beneficiaries in poor health and with no Medicaid or supplemental insurance coverage are estimated to have spent 44 percent of their incomes on health care. Low-income single women over age 85 who are in poor health and not covered by Medicaid are estimated to have spent more than half (about 52 percent) of their incomes on health care services (Maxwell, Moon & Segal, 2000). These percentages are expected to increase over time as Medicare premiums and costs for prescription drugs and other health care goods and services rise faster than incomes.

Given the large gaps in the scope of Medicare coverage, supplemental coverage is considered essential by most observers. Research in physical and mental health status of the aged have shown that lack of supplemental health insurance can be a significant risk

factor to impede access to care and erode financial security for the elderly (Manski, 1994; Blustein, 1995; Hogan, Eppig & Waldo, 1995; Grana &Stuart, 1997; Greenberg et al., 1998; Landerman et al., 1998). In addition, older persons bear a high burden of chronic disease and financial hardship, and would be particularly vulnerable to the deleterious effects of impaired access to care (Pearlin & Skaff, 1995; Escarce & Puffer,1997). Compared to those with supplemental private health insurance, Medicare beneficiaries who rely solely on Medicare are less likely to receive preventive care such as cancer screening (Blustein, 1995), more likely to put off care due to costs and to receive medical care in a hospital setting rather than a doctor's office or clinic and in a public rather than a private facility, and they are less satisfied with the health care they receive (Landerman, et al., 1998; Safran, et al., 2002). Having private health insurance decreases the risk of disability among older Americans (Landerman, et al., 1998), delays the onset of disability among functionally independent elderly persons and is positively associated with better survival outcomes (Porell & Miltiades, 2001). It is also negatively associated with depressive symptoms among older Mexican Americans (Black, Markides, & Miller, 1998). One recent study (Min, et al., 2001) examined the lack of supplemental health insurance as a risk factor for depression symptomatology among older married couples covered by Medicare, using dyadic data from 130 African American couples and 1429 White couples in the 1993 Asset and Health Dynamics Among the Oldest Old Survey (AHEAD). The results show having supplemental health insurance has significant impact on depression, but the pattern differs by race. Therefore, it highlights the protective effects of supplemental health insurance coverage against depression among the aged.

Definition of Medigap Insurance and its Development

The majority of beneficiaries—9 in 10—rely on supplemental insurance to help fill the gaps in Medicare's benefit package and to protect themselves from large, unanticipated health care expenses. While supplemental coverage has existed virtually since the creation of Medicare in 1966, sources and types of coverage have changed over time. Beneficiaries obtain additional health coverage either through contributing towards employer-sponsored retiree health benefits as part of a pension package, or enrolling in private Medicare+Choice plans as an alternative to the traditional fee-for-service Medicare plan, or qualifying for federal-state Medicaid programs, or purchasing Medigap policies through private insurers. Together, these various supplemental insurance options have helped to shield seniors from the full effects of Medicare's high cost-sharing requirements and limited benefit package.

Since many employers do not offer retiree health insurance, M+C plans are not available in many parts of the country, and Medicaid eligibility is dependent on income, private Medigap insurance is the only supplemental insurance option widely available to seniors. In addition, results from several surveys point to an erosion of employer-sponsored retiree health benefits. Between 1988 and 2002, the share of large employers offering retiree health benefits dropped from 66 percent to 34 percent (The Kaiser Family Foundation, 2002). And the adequacy of Medicaid benefits is likely to be jeopardized by acute budgetary problems at the state level.

Medigap is individually purchased supplemental coverage for those in the Medicare fee-for-service program. When Medicare beneficiaries turn 65, they have a six month open enrollment period in which they can select any company providing Medigap

policies irrespective of their health. After that, companies can assess health status and turn the application down if they wish. But the single rate for the standardized policy in the Medigap pool could only be changed after the approval from state filing. In 2001, about 23 percent of Medicare beneficiaries were covered by Medigap policies, secondary to employer-sponsored retiree coverage—about one-third of all beneficiaries (The Kaiser Family Foundation, 2004). Because of the complexities of the private supplemental insurance market and the intensive policy attention to it lately, this paper focuses on the Medigap market in order to study the purchasing decision factors involved in the individual health care market.

The individual Medigap market has been subject to a number of problems, which has resulted in a great deal of federal regulation since the 1980s. Congress enacted the "Baucus amendments" of 1980 (P.L. 96-265) in response to marketing abuses, duplication of coverage, and consumer confusion within the Medigap market. This legislation established criteria for a voluntary certification program of qualified Medigap plans that was widely implemented by most states. Under the Baucus amendment criteria, Medigap policies have to meet minimum benefit package standards and minimum loss ratios and comply with various disclosure requirements to prospective policyholders.

The Baucus amendments reduced marketing abuses and ensured that policies provided minimum coverage, yet consumers still faced hundreds of different configurations of benefits available (Rice et al., 1997). Many were subject to abusive sales practices and purchased multiple policies, which often duplicated existing coverage. To address these problems, Congress enacted significant reforms in the Medigap market as part of the Omnibus Budget Reconciliation Act (OBRA) of 1990.

OBRA 1990 replaced voluntary state certification with national requirements that Medigap policies be standardized and allowed a maximum of 10 different benefit packages offering varying levels of supplemental coverage to be provided. The ten

Table 2: Benefits Covered by Standardized Medigap Policies

Benefits	Plan A	Plan B	Plan C	Plan D	Plan E	Plan F[a]	Plan G	Plan H	Plan I	Plan J[a]
Coverage for: • Part A coinsurance • 365 additional hospital days during lifetime • Part B coinsurance • Blood products	X	X	X	X	X	X	X	X	X	X
Skilled nursing facility coinsurance			X	X	X	X	X	X	X	X
Part A deductible		X	X	X	X	X	X	X	X	X
Part B deductible			X			X				X
Part B balance billing[b]						X	X		X	X
Foreign travel emergency			X	X	X	X	X	X	X	X
Home health care				X			X		X	X
Prescription drugs								X[c]	X[c]	X[c]
Preventive medical care					X					X

[a]Plans F and J also have a high-deductible option that requires the beneficiary to pay $1,580 before receiving Medigap coverage. This deductible is in addition to separate deductibles for prescription drugs ($250 per year for plan J) and foreign travel emergency ($250 per year for plans F and J) which are required in these plans with or without the high-deductible option.

[b]Some providers do not accept the Medicare rate as payment in full and 'balance bill' beneficiaries for additional amounts that can be no more than 15 percent higher than the Medicare payment rate. Plan G pays 80 percent of balance billing; plans F, I, and J cover 100 percent of these charges.

[c]Plans H and I pay 50 percent of drug charges up to $1,250 per year and have a $250 annual deductible. Plan J pays 50 percent of drug charges up to $3,000 per year and has a $250 annual deductible.

Source: HCFA, 2001 Guide to Health Insurance for People With Medicare.

standardized Medigap options (A, B, C, …J) are shown in Table 2. All plans cover a core set of services, and the benefits generally increase in comprehensiveness from A through J. Standardization was designed to facilitate comparison shopping for consumers.

Under OBRA 1990, Medicare beneficiaries are guaranteed access to Medigap policies within 6 months of enrolling in part B regardless of their health status. Subsequent laws have added guarantees for certain other beneficiaries. Beneficiaries who enrolled in a Medicare+Choice plan when first becoming eligible for Medicare and then

leave the plan within one year are also guaranteed access to any Medigap policy; those who terminated their Medigap policy to join a Medicare+Choice plan can return to their previous policy or, if the original policy is not available, be guaranteed access to plans A, B, C, or F. Also, individuals whose employers eliminate retiree benefits or whose Medicare+Choice plans leave the program or stop serving their areas are guaranteed access to these 4 standardized Medigap policies. However, none of these 4 guaranteed policies include prescription drug coverage. Outside of the initial or special open-enrollment periods, access to any medigap plan could depend on the individual's health, the insurer's willingness to offer coverage, and the state's laws.

Policy standardization appears to have had a major impact on the Medigap market. The range of premiums narrowed significantly between 1991 and 1994, indicating that premiums had become more competitive and consumers were better able to assess policy value (Rice, Graham & Fox, 1997; Hopkins & Kidd, 1996). Yet concerns remained about the adequacy and desirability of the benefits available.

Since the creation of the 10 standardized plans, most Medigap plan enrollment has been concentrated in two plans: F and C. The Medicare Payment Advisory Commission (MedPAC, 2002) analysis of 2000 NAIC (National Association of Insurance Commissions) data found that 35 percent of Medigap policyholders enrolled in standardized plans were in Plan F, and 26 percent were in Plan C. These plans offer identical benefits, with the exception that Plan F also provides full coverage for Part B charges in excess of the amount Medicare will allow. Plans A and B each enrolled 10 percent of policyholders in standardized plans. Altogether, the three plans with

standardized prescription drug coverage (H, I, and J) enrolled about 9 percent of the market in 2000.

Nationally, a few insurers dominate the Medigap market. In 1999, 64 percent of Medigap policies were sold by either United HealthCare or a Blue Cross Blue Shield Plan (GAO, 2001). United HealthCare offers all ten standardized plans to Medicare beneficiaries during the initial open enrollment period in nearly all states. All insurers marketing Medigap policies must offer Plan A. Many offer Plans B, C, and F, but few offer the other six plans, especially those that cover prescription drugs.

Medigap provides an important source of coverage, supplemental to Medicare. Increasingly, however, it is becoming less affordable, in part because of large increases in utilization by program beneficiaries in recent years (American Academy of Actuaries, 2002). Medigap policies can be expensive, particularly for seniors on fixed incomes. The average annual Medigap premium was more than $1,500 in 2002. Standardized plans with prescription drug coverage were more expensive—averaging more than $1,800 compared to about $1,350 for standardized plans without drug benefits. In addition to their premium payments, Medigap purchasers continue to have significant out-of-pocket costs for health care services, averaging about $1,500 in 2002 (AAA, 2002).

Medicare Reform and Medigap Market

The current Medicare program, without improvements, is not suited to serve future generations of seniors. Although the need to modernize Medicare's benefit package is compelling, the program is already fiscally unsustainable in its present form. And the disparity between program expenditures and program revenues is expected to widen dramatically in the coming years. These fiscal pressures created by the retirement of the baby boom generation and rising health care costs are just over the horizon. Between now and 2035, the number of people who are 65 and older will double. Federal health and retirement spending are expected to surge as people live longer and spend more time in retirement (GAO, 2002). In addition, advances in medical technology are likely to keep pushing up the cost of providing health care. Moreover, the baby boomers will have left behind fewer workers to support them in retirement. Financing and programmatic reforms are necessary to put Medicare on a sustainable footing for the future.

In the context of Medicare reform, Medicare+Choice plans, which include health maintenance organizations (HMO) and other private insurers who are paid a set amount each month to provide nearly all Medicare-covered services, were originally deemed the solution to injecting market forces and competition into the government sponsored program. Approximately 14 percent of Medicare beneficiaries were enrolled in Medicare+Choice plans (GAO, 2002). Compared to Medicare's traditional fee-for-service program, HMOs typically offer lower cost sharing requirements and additional benefits, including prescription drugs, in exchange for a restricted choice of providers. However, risk HMO plans appear to be cutting back on their benefits and several have left the Medicare market altogether, saying Medicare payment lagged far behind costs

(NYTIMES, 2003). Medicare + Choice plan withdrawals indicate the difficulty of providing choice of benefit while achieving savings. Moreover, M+C HMOs are not available in all parts of the country. The beneficiaries in non-metropolitan areas are left with little or no choice in the new managed care boom, as plans are not offered in their areas. In 2002, about 40 percent of all beneficiaries live in counties where there are no Medicare+Choice HMOs (GAO, 2002).

Employer-sponsored plans, which provide coverage to one-third of beneficiaries, have already begun limiting benefits and passing on higher costs to retirees. Based on trends noted in a new study by the Kaiser Family Foundation, fewer retirees will have health coverage in the future and those who do will pay more for their healthcare. The Kaiser Family Foundation/Hewitt Associates report (2004) shows that 10 percent of large companies eliminated health coverage for future retirees in 2003, and 20 percent say that they plan to do so in the next three years. Many employers, especially small businesses, do not offer retiree health benefits. Under the pressure of the ongoing high health cost trend and competition, the employer-sponsored retiree benefits may be vulnerable to further erosion.

However, Medigap—private health insurance designed to wrap around Medicare's benefit package—is the only supplemental coverage option available to all beneficiaries when they initially enroll in Medicare at age 65 or older. In fact, most Medicare beneficiaries who do not otherwise have employer-sponsored supplemental coverage, Medicaid, or Medicare+Choice plans, purchase Medigap policies, demonstrating the value of this coverage to the Medicare population.

As options have narrowed for seniors, policymakers have begun to consider how

Medigap plans fit into the larger puzzle of Medicare reform. Several bills had been

introduced in Congress that included provisions related to Medigap, particularly within

the context of Medicare prescription drug proposals. For instance, the president's

proposal to create two new plan types that require cost-sharing and provide coverage for

prescription drugs was intended to balance access and affordability for beneficiaries. The

potential opportunities for reform are prescription drug coverage, first-dollar coverage

and Medigap benefit design. The ten standardized benefit plans have not been updated

since they were established in 1992, let alone kept pace with the changing health care

environment. While the standardization of benefits has made them easier for the

beneficiaries to understand, it has also stifled experimentation with different types and

levels of coverage, which could potentially reduce costs or enhance the quality of

benefits. Besides shielding beneficiaries from most Medicare cost-sharing requirements,

Medigap policies exclude incentives to minimize unnecessary use. Several studies have

examined the relationship between Medicare supplemental insurance and Medicare

expenditures and have consistently found that supplemental insurance is associated with

increased costs to the Medicare program (Christenson & Shinogle, 1997; Gross &

Brangan, 1999; Poisal & Murray, 2001). In addition, the high premium, benefit design

and lack of competition made the prescription drug coverage level low for the three

standardized Medigap policies.

Intentions to add prescription drug coverage to Medicare's benefits come during a

period of rapid growth in national spending for pharmaceuticals. Between 1995 and 2000,

spending for prescription drugs rose more than 2 1/2 times faster than spending for health

care overall, and this dramatic growth is expected to continue in the coming years. Prescription drugs were ranked the #1 growth rate in all lines of insurance business (Kaiser Family Foundation/Hewitt Associates report, 2004). In the absence of a drug benefit in the Medicare program, hundreds of thousands of beneficiaries were left with high out-of-pocket costs. On December 8, 2003, President Bush signed into law the Medicare Prescription Drug Improvement and Modernization Act of 2003 (Pub. Law No. 108-173, 117 Stat. 2066, also called **Medicare Modernization Act** or **MMA**). This landmark legislation is widely believed to bring major changes to modernize the program and provide comprehensive and affordable benefits for the nation's seniors and individuals with disabilities. The enrollment in the prescription drug benefit in Medicare's history began January 1st 2006. It also gives insurance companies and private health plans a huge new role in the Medicare program. Pursuant to the Medicare Modernization Act of 2003, the compensation and business practices for insurers that offer the "Medicare+Choices" plans changed, and "Medicare+Choice" plans became known as "Medicare Advantage" (MA) plans. In addition to offering comparable coverage to Part A and Part B, Medicare Advantage plans may also offer Part D coverage for a full range of medical services. Given the difficulties of HMOs' participation in Medicare in the last five years, however, concerns are also escalated for the initiatives of substitution of public provision for market competition, and the financial sustainability of Medicare in the long run.

While interest remains high in improving comprehensive coverage available to Medicare beneficiaries while fostering the prudent use of health care services, we couldn't afford to ignore the stake of the vulnerable beneficiaries, such as rural, near-poor

and oldest old populations. Adding prescription drug coverage to the Medicare benefit package would require balancing competing concerns about program sustainability, federal obligations, and the hardship faced by some beneficiaries. If a benefit is added that has the potential to be massively expensive, it would be better to focus on meeting the needs deemed to be of the highest priority. This focus would entail targeting financial help to beneficiaries most in need. The Medigap market enrollment merits particular attention with respect to identifying the health needs deemed most paramount under overall individuals' constraints and investigating the reasonability and fairness in the distribution of health resources. This will serve as a vehicle to partially disentangle the ongoing task of better coordination of health benefit supply between public and private insurers.

Even though numerous studies have been conducted on health insurance purchases, their selection of explanatory variables has relied heavily on the results of previous empirical studies or research findings in other fields. The lack of theoretical framework for the studies ignored the causal relationship underlining the decision-making process and therefore undermined the potential improvements in policy and practical implications. Moreover, all of those studies applied cross-sectional designs, which couldn't capture the time impact on this adaptive and learning decision-making behavior in reality. And finally, it has received little attention in studies of the oldest old, who are the most vulnerable older people, and probably at greatest risk under the Medicare reform. Identifying decision factors weighted in purchasing Medigap is an important issue for benefit design and policy changes.

This study attempts to address the knowledge gap by exploring the decision factors in the dynamics of private supplemental insurance purchases by Medicare beneficiaries. Simon's Bounded Rationality theory (1955, 1957) is utilized to develop a conceptual framework for this study. Data for this study are drawn from the Asset and Health Dynamics Among the Oldest-Old Survey (AHEAD), which is a longitudinal, multipurpose survey of a nationally representative sample of community-dwelling adults aged 70 and older. Community-dwelling adults are those living in non-institutional residences such as homes or apartments; adults living in institutional settings such as nursing homes or hospitals are excluded. Thus, the research question to be addressed in this study is "what are the predictors of Medigap purchases by community-dwelling elderly persons?"

Specifically, it will consider:

- What demographic variables have an impact on Medigap purchases?

- Whether physical health is a strong predictor of Medigap purchases?

- What financial constraints (e.g. income, premium-cost relationship) would predict Medigap purchases?

- Whether cognitive ability would be related to the decision-making for purchasing Medigap?

- What contextual variables would be related to the decision-making for purchasing Medigap?

- What's the time impact on this process? Do the personal and environmental variables from a previous period impact on later decisions to purchase Medigap?

The goal of the study is to provide the field with knowledge about key factors associated with Medigap enrollment among the community-dwelling elderly persons. Those aged people are a growing segment of populations relying on public health services. The soaring health cost and benefit cut-back will greatly increase the medical and financial barriers to care, and jeopardize their ability to live independently. By uncovering the factors that are considered and weighed in the seniors' decision making, recommendations could be made for improvements in practice and public policy implications. These system improvements will lead to balanced efforts to enhance the benefits while controlling program spending and compromising with other national spending priorities. It will also help to improve social work practice and research by serving the seniors based on better understanding of their needs.

Chapter Two: Theoretical Framework and Literature Review

Estimating individuals' insurance demand has been difficult, as decisions in healthcare are almost always accompanied by varying degrees of risk and uncertainty, yet the outcomes of these decisions can literally be life or death. The health insurance purchase decision-making process is so dynamic and complex that no single theory or conceptual framework successfully explains it. Furthermore, Medigap insurance as a private sector supplement for Medicare has its unique features that make the studies even more complicated. Studies on predictors of Medigap purchases by individuals have generally been atheoretical. Selection of explanatory variables has relied heavily on the results of previous empirical studies or research findings in other fields. In order to gain a better understanding of Medigap enrollment decisions, the bounded rationality theory, which is the adaptation of economic rational choice theory to the behavioral sciences, is laid out as the theoretical framework.

Human Decision Making: Bounded Rationality

The theory of decision-making has become a natural meeting ground for psychological and economic theory. Economics has almost uniformly treated human behavior as rational. Psychology, on the other hand, has always been concerned with both the irrational and the rational aspects of behavior.

A rational individual making decisions under risk is assumed to behave according to the Von Neumann and Morgenstern (1947) axioms, i.e. the person selects the option that maximizes expected utility. Broadly speaking, the rational choice approach begins with

the assumption that individuals have given wants, goals, values or 'utility functions'. It then assumes that these goals cannot all be equally realized. People live in a world of scarcity and therefore must select between alternative courses of action. They will, it is assumed, do so rationally, by selecting the course of action which is the most effective means to their goal (if they have a single goal) or by selecting the course which leads to their most preferred goal (if they have many, equally attainable goals). This is sometimes called the principle of 'utility maximization' (Arrow, 1951; Green and Shapiro, 1994).

Rational choice theory is a welcome advance in social theory. It contributes to an understanding of social life based on rationality. As Coleman (1990) puts it, the success of a social theory based on rationality lies in successively diminishing the domain of social activity that cannot be accounted for by the theory. However, what is problematic in rational choice theory is that it reduces the whole complexity of social life to terms of economic calculation and transaction and therefore covers only a limited realm of social life. Thus, its explanatory power is limited. At the same time, empirically adequate explanations of certain social phenomena provided by rational choice theory are adequate only under precise conditions. Problems result from extending these constraints in ways inconsistent with its assumptions and thus beyond its proper scope. As Hannan (1992) claims, the limits of rational choice theory's explanations show that it cannot be a comprehensive social theory and it can remain vital only by incorporating other theories at different levels of explanation.

This 'economic man' assumption under neoclassical economics has been criticized by Herbert Simon (1955, 1957). Simon was a pioneer in bringing psychology into economics and into the understanding of decision making via the introduction of the

concept of bounded rationality. He is a key figure in the history of 20th century social sciences. From his early work and throughout his life, Simon felt that only by applying psychological research to economic questions related to the understanding of decision-making would we be able to make empirically valid statements about human behavior.

In the 1950s, Herbert Simon (1955, 1956) argued that the optimization model based on the "global rationality of man" was an implausible descriptive model of most human decision-making contexts, especially those that require individuals to compare many options or options with many features. Rather than optimizing, Simon argued, individuals "satisfice" in many situations: they develop aspirations and select decision options that meet them, without regard to whether another "better" decision choice might theoretically exist. Simon believed that limitations on individuals' cognitive ability to process large and complicated data sets bound their capacity to make so-called "rational" decisions, so that bounded rational behavior is an unavoidable aspect of the human condition.

In his 1955 paper 'A Behavioral Model of Rational Choice', Simon proposed a simple and very general model of behavioral choice where the 'choosing organism', be it humans, organizations or economists, is analyzed in terms of its basic properties to understand what is meant by rational behavior. He introduced simplifying assumptions for the rational choice model, including the 'choice alternatives' (the number of choices), the 'pay-off function' (utility function), possible 'future states' (outcomes), as well as the information about the probability that a particular choice will lead to a particular outcome. He defined the theoretical and probabilistic procedures that according to rational choice theory will guide the organism's choices. But immediately afterwards he turned to the simplifications of this model, stressing that upon careful examination, 'we

see immediately what severe demands they make upon the choosing organism' (Simon, 1955). In models of rational choice, the organism must be able to 'attach definite payoffs (or at least a definite range of payoffs) to each possible outcome' (Simon, 1955). There is thus no room in such models for 'unanticipated consequences', no scope for 'surprise', or for incomplete orderings of preferences. This provides grounds for being suspicious of the claimed worth of the rational model of decision-making.

When Simon tried to combine his interests in human decision making with the complexity of the real world, he conceptualized the decision maker as having both internal and external constraints. "All intended rational behavior is behavior within constraints" (Simon, 1955). Of particular importance are 'the limits on computational capacity'. Thus, in order to simplify the structure of the decision as a consequence of the lack of computational power and information, Simon assumed a simple pay-off function where decision makers interpret outcomes as either satisfactory or unsatisfactory, and in which an aspiration level constitutes the boundary between satisfactory and unsatisfactory. In Simon's simplified model there are only two possible outcomes and the decision maker is playing a satisficing strategy; she/he only has to look for an outcome that is good enough. Therefore, instead of assuming the maximization of a utility function, bounded rationality postulates a satisficing strategy; instead of assuming known probability distributions of outcomes, it introduces estimating procedures for them.

After the pioneering work of Simon (1955, 1956) in establishing the concept of bounded rationality that takes into account the cognitive limitations of the decision maker (limitations of both knowledge and computational capacity), bounded rationality became a central theme in the behavior decision theory. The essence of bounded rationality has

been incorporated into economics, political science, management theory, organization theory, social psychology, and cognitive psychology (McCorduck, 1979). More recent work by psychologists and some economists (Kahneman et al., 1982; Tversky & Kahneman, 1990; Chase et al., 1998; Frey, 1999; Friedrichs & Opp, 2002), uses empirical evidence drawn from behavioral decision-making experiments. These studies demonstrate cognitive constraints on information processing leading to various decisional biases and judgmental errors. A number of behavioral regularities, including framing effects (Tversky & Kahneman, 1990), status quo effects (Samuelson & Zechhauser, 1988), uncertainty aversion (Ellsberg, 1961), and social learning (Bandura, 1986), demonstrate that individuals make choices in violation of expected-utility theory, and human decisions are, indeed, boundedly rational.

On the other hand, the important role of environment or context in rational decision-making has been emphasized by New Institutional Economics, which incorporates a theory of institutions into economics. In the last forty years or so, New Institutional Economics have criticized Neoclassical economics as being unrealistically based on the assumption of atomistic individuals living in anonymous societies and operating in a zero transaction costs world of perfect markets without institutions. Even though neoclasscical economic theory has also been challenged by behavioral studies of decision-making showing that cognitive constraints lead to various decisional biases and judgmental errors, new institutional economists argue both neoclassical economic theory and the popular behavioral models of risky choice have largely ignored environmental variables such as social structure (group size, group composition, kinship structure, etc.) and institutional infrastructure (the formal and informal 'rules of the game').

Several studies have been done to show how social structure and institutions serve as important constraints influencing rational choice in risky situations (Landa, 1994; Londa and Wang, 2001). These studies show that people are sensitive to the ecological, social and cultural features of the task environment and are capable of managing risks adaptively under these constraints. Wang's experimental work shows that a famous 'cognitive illusion' called framing effects disappears when kinship relations, the smallness of group size, and group homogeneity are taken into account. Landa's field work and theory of EHMG (ethnically-homogeneous Chinese middleman group) show how Confucian social norms of mutual aid played a very important role in economizing on transaction costs of contract enforcement and information costs. In an environment characterized by contract uncertainty, positive transaction costs traders choose their trading partners along kinship and other particularistic basis, which contradicts the Neoclassical theory of impersonal exchange.

Taking a bounded rationality approach, Simon views decision making as a process of problem solving under constraints. According to Simon (1990), bounded rationality is shaped by a pair of scissors whose two blades are 'the computational capacities of the actor and the structure of task environments'. And in Simon's view it's the study of organizations, of bounded rationality and of the psychological aspects of decision making which ultimately will bring the theories in closer touch with the real world.

The theme of bounded rationality lies in its interdisciplinary thinking. The idea that human agents are, although intending to make rational decisions, bounded by their limited ability and environment has been continuously expanded and elaborated on in economics, political science and psychology. This idea is also utilized as the theory

framework for the present study on Medigap purchases, which tries to emphasize that those risky choice theories of decision-making need to take into account both the cognitive limitations of the mind, and the social contexts in which a decision task is presented.

Complexity, Bounded Rationality and Medigap Purchase

Considering that the complexity of the mechanism the health care market is revolving, this study will use bounded rationality theory to further the understanding of Medigap purchasing decision making. As of the more realistic descriptive feature for the bounded rationality approach compared to rational choice models, however, there is the tradeoff of the uncertainty of the theory pathway in explaining phenomena and challenges for replication due to the complexity of the situations, as well as different individuals. In order to operationalize the bounded rationality model in the context of Medigap purchase decision-making, this paper utilizes the strategy of developing complements to existing rationality models. The explanation of rational choice theory will serve as a starting point of application of bounded rationality to Medigap purchases. In the rationality model used by the study, all the ordinary factors are included, which are supposed to be known information to individuals and have been considered when they make purchasing decisions as rational human-beings. Then the rational model is extended to incorporate more variables based on bounded rationality theory, such as internal and external constraints. These constraints might be not realized by the individuals, but will limit their choices and have an impact on their Medigap purchase decision-making.

Rational Choice: Expected Utility Maximation

This modern economic basis for rational choice under uncertainty, as formulated by

Von Neumann and Morgenstern (1947), postulates that individuals will choose between

alternatives depending upon which offers the highest total expected utility (E(u)). This is

expressed in terms of the probability (P) multiplied by the total expected value of the

outcome (x), i.e. E(u) = U(x) P(x).

Goddard and Smith (1998) outline a simple model of demand for medical care where

public and private care exists. This can be used to explore the impact that income, and the

price and quality of public care, have on the demand for a private care alternative. The

model in this study follows Goddard and Smith in explaining that older people have two

discrete choices: to use Medicare alone, or to purchase Medigap for supplementing

Medicare. And it also follows McFadden (1974) and Phelps (1973) in forming the

expected utility expressions.

Formally, in the context of health care insurance, we consider that a typical consumer

can be ill with an individual probability P. From the Medicare program, he or she could

consume the treatment of Q. Including enrollment in Medigap, the treatment would be

Q+q. Then the typical consumer could be characterized as follows:

- U(y) is the consumer's utility function when he is healthy. U(.) depends

positively on his/her wealth (y) at a decreasing marginal rate, i.e., $U'(y) \geq 0$ and

$U''(y) \leq 0$

- u(q, y) is the utility achieved when the individual is ill and receives a treatment

q. u(.) has the same relationship with wealth. In addition, for a given level of wealth

y, the utility increases with the quality and quantity of the treatment, i.e., $u_y(q, y) \geq 0$, $u_{yy}(q, y) \leq 0$, and $u_{qy}(q, y) \geq 0$.

Let m be the price of the premium paid to Medigap by the consumers, and c be the out-of-pocket cost that the consumers would otherwise need to pay for the treatment without Medigap coverage. Therefore, the possible satisfaction levels of the consumer (utility levels), are:

- $U(y-m)$, if healthy but having subscribed to a Medigap insurance plan
- $U(y)$, if healthy but not purchasing the Medigap insurance
- $u(Q+q, y-m)$, if ill and receiving a treatment of Q+q with Medigap coverage
- $u(Q, y-c)$, if ill and receiving a treatment of Q without Medigap coverage, but paying the out-of-pocket of copayment, deductibles and uncovered benefits.

Since the individual's probability of being ill is P, the expected utility, $E(u)$, if he/she buys private supplemental health insurance, is

$$E(u)_1(p, Q, q, y, m) = P * u(Q+q, y-m) + (1-P) * U(y-m).$$

Similarly, if the individual does not purchase supplemental health insurance, the expected utility is

$$E(u)_0(p, Q, y, c) = P * u(Q, y-c) + (1-P) * U(y).$$

Thus, potential Medigap health insurance purchasers compare the difference in the expected utility of medical care under supplemental insured and uninsured scenarios. The typical consumer will only subscribe to a Medigap insurance plan whenever

$E(u)_1(p, Q, q, y, m) > E(u)_0(p, Q, y, c)$

Therefore, buying Medigap health insurance, among other factors, depends on:

- The individual's perceived value of more benefits q Medigap covered compared to that of care received under Medicare Q

- The family's expected out-of-pocket costs c for health care

- The premium m for Medigap insurance

- Individual (household) characteristics such as income level, *y*, and health status or risk of illness, p.

In a typical rational choice modeling, then the optimization operator such as econometrics, linear and dynamic programming could define what's the best choice for the decision maker given his/her health care needs and financials. It implicitly suggests known distribution of risk and quantifiable utility function based on several variables.

Bounded Rationality: Decision Making Under Constraints

The efficient outcome or choice defined above depends on the assumption that consumers are ruthless rationalists and optimizers. It assumes consumers carefully compare the detailed descriptions and fine print of health insurance plans and make complicated tradeoffs between price and services. In the market for health care, the assumption seems highly implausible. Common experience suggests that consumers select their health insurance plan in a less rigorous way. They do not conduct a thorough analysis that takes into account and values every attribute of each available plan.

In addition, the optimal, utility-maximizing decision requires a large amount of information about options and complex processing of that information to be able to maximize the accuracy of decisions. In addition to incomplete information and the cost of searching for it, the filtering and processing of the information is also challenging to consumers. In the bounded rationality model, the decision makers must compromise between the desire to achieve accuracy and the desire to minimize cognitive effort (Wright, 1975; Payne, 1993). Therefore, selecting a decision-making strategy can be seen as choosing a balance between maximizing accuracy and minimizing effort.

There is substantial empirical literature analyzing the demand for private health insurance. Some studies specifically concern the determinants of demand for private health insurance to supplement Medicare coverage. The following discussion of the key variables is accompanied with the important prior findings, which factor into decision makers' considerations for purchasing Medigap.

<u>Health status</u>   If health is a normal good and ordinary consumers are risk averse,

health status is one key explanatory variable. It represents the value the family attaches to

the purchase of insurance and also their risk tolerance based on their illness possibilities.

Thus, those who anticipate high medical expenditures purchase supplemental insurance,

either based on their current health status or illness possibilities in the forecast. In health

economics this phenomenon is more often called 'adverse selection'—the tendency of

poorer-than-average health risks to apply for or maintain insurance coverage.

However, the body of empirical evidence shows inconsistent findings on health

status. The majority of studies have not found that self-reported health and disability have

significant effect on the demand for supplemental insurance (Wolfe & Goddeeris, 1991;

Shea & Steward, 1995; Ettner, 1997; Hurd & McGarry, 1997; Pourat et al., 2000). On the

basis of the first wave of the Asset and Health Dynamics Survey, Hurd & McGarry

(1997) found those who are most heavily insured use the most health care services.

However, there is no evidence to support the effect of the adverse selection in the

purchase of Medigap because the data show no positive relationship between observable

health measures and either the propensity to hold or to purchase private insurance. Using

data from the 1980 National Medical Care Utilization and Expenditure Survey, Garfinkel

et al. (1987) conducted an analysis to determine how personal and community

characteristics affect coverage by private insurance to supplement Medicare coverage.

The presence of chronic conditions was the only one of three measures of health status

(the other two are perceived health status and functional limitations) to show significant

impact. In view of the positive effect of chronic conditions on supplemental coverage and

the absence of any effect for the other two health status measures, they draw the

conclusion that "there is no unambiguous evidence that persons in poor health were less likely to obtain private supplemental insurance than other persons".

On the contrary, the study conducted by Rice & McCall (1985) analyzing responses to a random survey of Medicare beneficiaries and of copies of the private insurance policies owned by these beneficiaries, found self-perceived health status to be an important determinant of policy ownership. Ownership does not differ between those in fair health and those in good or excellent health; ownership rates for those in poor health, however, are significantly lower than those in excellent or good health. One study (Marquis & Long, 1995) on worker demand for health insurance in the non-group market also supports that those in poor or fair health were significantly less likely to purchase insurance than otherwise similar individuals.

While it sounds counter to intuition, the discrepant findings could be possibly explained by the underwriting practice, which may make individually purchased insurance less accessible to the persons having higher risk to incur medical expenses (Wolfe & Goddeeris, 1991; Marquis & Long, 1995). To the extent that insurers can identify those at risk, for example, through the use of simple application form questionnaires on pre-existing conditions, individuals with high risk may be unable to purchase insurance or able to do so only at a considerably higher price, thus reducing the incentive for those anticipating high expenses to insure. Rice and McCall (1985) also surveyed those without Medigap to determine reasons for noncoverage: about half cited inability to afford insurance, and no other response approached this one in frequency. Very few reported denial or cancellation by insurers. If it's true, then the effect of health status on Medigap purchasing is concealed by exogenous factors, such as income and

wealth. From this perspective, a new research question arises: what is the impact of health status on Medigap purchases after the Medigap policy standardization under OBRA 1990 with guaranteed access? Thus, inability to purchase Medigap insurance, which represents the obstacle to accessing medical resources for the high risk beneficiaries, suggests a problem actually on the supply side, not on the demand side in the Medigap market. The elements associated with the private supply of insurance policies, such as medical underwritten, pre-existing medical conditions, could put Medicare beneficiaries into a difficult position to find an affordable coverage. In addition, the lack of availability of private insurance in less lucrative markets leaves beneficiaries with even less choice of supplemental coverage. Another aspect of the supply impact lies in the sources of supplemental insurances. It's worth noting that since Medicaid virtually serves as a catastrophic coverage for the poor, lower-income beneficiaries could qualify for Medicaid and do not value much on private insurance.

Expected health care cost One factor which is also associated with health status is the expected health care cost. Based on the same premise that people generally prefer certainty to risk, they would be more likely to supplement Medicare coverage if they anticipate incurring higher cost. Researchers studying adverse selection in the insurance market found that families reported greater willingness to pay for supplementary insurance in accordance with the amount of their anticipated expenditures (Wolfe & Goddeeris, 1991; Marquis & Long, 1995; Ettner, 1997). However, it's hard to estimate the expected spending if the family purchases or does not purchase the supplemental insurance. As noted above, any variables not captured by the insurers' risk-adjustment,

e.g., a recent acute medical problem, might play a significant role in insurance demand. Individuals who have recently experienced high health care expenses unexplained by their personal characteristics find it advantageous to buy supplemental insurance, because current and past health care needs are correlated.

Also, unobservable preferences regarding the use of medical services may be an important factor in insurance choice. This is reflected in the results of Vistnes and Banthin (1995), which showed that 1987 National Medical Expenditure Survey respondents who had a more positive attitude towards physicians and medical care were also more likely to purchase supplemental insurance and had higher average medical expenditures. This kind of personal attitude toward health insurance is also unknown to the insurer and thus cannot be used in underwriting and rating insurance coverage. Individuals who are more satisfied with medical care and health insurance are prone to use more services, therefore to purchase supplemental coverage.

Premium   In all classic economic theories, the key player is the supply and demand equilibrium decided by price. One leading contender in national health reform is the managed competition approach. This emphasizes market incentives and seeks to control costs by making consumers face the full cost differential between more and less expensive health plans, thereby encouraging cost-conscious shopping by consumers and hence competition among plans. During recent years, increasing costs and a volatile health market have made premium levels a very important factor in patient selection of health plans.

A body of empirical evidence indicates that consumers are very price sensitive in health insurance purchasing decisions (Etheredge, 1996; Jensen, 1997; Chernew and Scanlon, 1998). Etheredge (1996) discusses the Department of Labor study, noting that individuals tend to select lower-price plans from employers' multiple-choice offerings and even small premium differences can drive enrollment shifts among health plans. Another study concerning the private insurance market estimates an individual's insurance demand, showing that the price elasticity for those workers who don't have employment-based insurance is -.3 to -.4 (Marquis & Long, 1995). It means that a 10 percent decrease in price would lead to an increase of about 3 or 4 percent in the number of individuals who voluntarily purchase insurance. Low income families were found to be somewhat more sensitive to price changes than higher income families. Chernew and Scanlon (1998) examining the health plan reports and insurance choice conclude that "nearly all existing studies have found 'price' to have a statistically significant negative effect on the probability of enrolling in a health plan".

The Medigap market has experienced similar competition pressure as presented in other group or individual health care markets nationally. It has wide variety in premiums across regions and product types, Plans A—J. Some rich plans, such as the ones with prescription drug coverage, are too expensive for most to afford. Utilizing Medicare's Current Beneficiary Survey, Ettner (1997) found respondents living in states with higher Medigap premiums were significantly less likely to have Medigap insurance from any source, controlling for the cost of living.

Estimating the effect of the premium on Medigap demand has been hampered because of imperfect measures for the price of insurance and the institutional

arrangements under which health insurance is purchased. In addition, the premium levels are difficult to compare because of variations in benefit designs, health plans, and geographical regions, as well as special discounts or subsidies. One approach for getting around the lack of premium data is to use exogenous proxies such as marginal tax rates, since the exclusion of premium from individual's taxable income introduces variation in the net price of insurance that varies with marginal tax rates (Farley & Wilensky, 1985). Another approach imputes a dollar premium to each plan (Marquis and Long, 1994). Both approaches have had to rely on imperfect price measures since data to estimate demand generally come from household surveys which do not obtain the detail about insurance plan offers and prices facing families. Some recent studies have overcome this methodological problem by explicitly measuring the individuals' out-of-pocket premium for the various options and supplying data for both insurance takers and decliners (Blumburg et al., 2001). To do so, they have had to focus on demand response by a limited population.

Income and level of wealth   The effect of an increase of income and wealth on health insurance demand seems obvious. Again, assuming that health is a normal good, an increase in income and wealth increases the probability of choosing whichever provider offers the highest quality and most benefits. Therefore, it's expected that an increase of income and wealth will raise Medigap insurance demand. This increase of demand based on growing income is slowing down, since the proportion of the Medigap premium cost in the person's total income becomes less and less as the wealth grows and the risk aversion is decreasing.

The empirical evidence about the effects of income and wealth on Medigap purchase is consistent: wealthier beneficiaries enroll in Medigap in proportionally greater numbers (Rice & McCall, 1985; Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997; Ettner, 1997; Pourat et al., 2000). Earlier descriptive and more advanced studies show that elderly persons who have private supplemental insurance are generally wealthier. Pourat and his colleagues (2000) examined the income impact on private supplemental insurance coverage and found it important. Compared with higher income Medicare beneficiaries ($25,000 or more a year), the lowest-income beneficiaries (less than $10,000 a year) have lower odds (0.25, $p < .001$) of any private supplemental coverage.

Wealth is an indicator of income accumulated over the course of life. As such, it may be a better indicator of overall economic status than is contemporaneous income. It's the case especially for the elderly, who generally no longer work. Using data from the first wave of Asset and Health Dynamics Survey (1994), Hurd and McGarry (1997) quantified the importance of adverse selection in the market for private supplemental insurance among the elderly, and the role of insurance coverage in influencing consumption. They found both income and wealth are strongly associated with having private insurance, controlling for health status and other variables. For example, beneficiaries in the lowest income and wealth quartiles are about 24 percent points less likely to have private insurance than those in the top quartiles.

Both Rice and McCall (1985) and Hurd and McGarry (1997) studies suggest a strong and ceaseless positive wealth effect on insurance demand, which is inconsistent with the common assumption that risk aversion decreases with wealth, particularly because the

effect of wealth on health care spending is not very large. It suggests that for the kind of

protection that Medigap insurance provides, risk aversion is increasing rather than

decreasing in accordance to the wealth of the beneficiaries. As evidenced by national

GDP spending, the growth in individual income and wealth can't keep pace with the

escalating health care cost. Another possible interpretation of the strong positive wealth

effects on the demand for private insurance is that public programs serve as catastrophic

coverage for the poor (Wolfe & Goddeeris, 1991; Pauly, 1996). The presence of

Medicaid and other public assistance programs lessen the incentive to purchase private

coverage. Those with low wealth may perceive less value from Medigap insurance

because they have little to protect and the existence of Medicaid guarantees them some

level of health care access.

Not only the presence of Medicaid decreases the incentive to purchase Medigap; this

same logic applies to other competing private supplemental insurance such as employer-

sponsored post-retirement coverage and Medicare HMO plans. The Medicare

beneficiaries with access to alternatively cheaper and/or richer supplemental insurance

may view no advantage to being over-insured from Medigap purchases. It implies further

analysis needs to be conducted regarding the impact of other forms of supplemental

insurance on Medigap purchases.

Demographic characteristics   Demographic factors are individual characteristics that

produce differences in the tendency to make purchase decisions. Age, education, gender

and race, which indirectly reflect the individual's aversion to risk, are key predictors of

health insurance purchases and health care utilization. These demographic factors affect

the demand for health insurance, since the greater financial benefits, health security and accessibility from the purchase of Medigap are more valued by some populations than their counterparts. Except for race, all other measures are readily available to insurers and commonly used in underwriting and rating insurance coverage. While the benefits of having supplemental insurance are greater for these individuals, thus leading to the expectation that they would be more likely to purchase insurance, financial and environmental constraints, such as income level and underwriting practice, may make individually purchased insurance less appealing or accessible for them.

Consistently, a number of articles found that the elderly who are younger, better educated, female and white are more likely than their counterparts to purchase supplementary insurance (Rice & McCall, 1985; Garfinkel et al., 1987; Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997; Ettner, 1997; Pourat et al., 2000). For example, Garfinkel et al. (1987) found that beneficiaries 75 years of age or over were less likely to have private supplemental coverage than younger beneficiaries. Among the personal characteristics, education has the most significant effect. The probability of having private supplemental coverage increased about 2.1 percent with each additional year of education. Whites had a 14.1 percent greater probability of coverage than non-whites. Using data from the first wave of Asset and Health Dynamics Survey (1994), Hurd and McGarry (1997) found that having an eighth grade education or less lowered the probability of having private insurance. Also, in this study, the whites were more likely to have private insurance than non-whites.

Construct of constraints

As pointed out in the bounded rational choice model, however, individuals have internal and external constraints to rationally make their choice on Medigap. Even though each decision maker extensively weights the factors discussed above, the limitations on cognitive ability and information availability, and the contextual constraints at the decision-making time point could have huge impact on their final choice.

Grounded in bounded rationality, this study tries to examine several aspects of such limitations. A few prior studies have shed light on some of the constraints when individuals are faced with choice in health insurance enrollments.

Cognitive ability and information   The bounded rationality model takes the actual capacities of the human mind into account in describing the decision process. Substantial empirical studies support these limitations of the human mind in the decision-making process (Payne, 1993; Kahn and Baron, 1995; Garbarino and Edell, 1997). These studies extend Simon's (1955, 1956, 1957) assumption of 'bounded rationality' not only to the limited perception of alternatives and consequences but also to the avoidance of information search costs. The most general cause of these limitations is the limited cognitive capacity of individuals. Even those who are experts at comparing health insurance plans appear prone to such simplification. In a survey of health insurance purchasers for large corporations, 50 percent said that considering all the relevant variables when making purchasing decisions was difficult, and 12 percent reported that they made purchasing decisions based on only a single variable such as cost, or provider

network. Only 20 percent of the survey respondents reported making cost-quality

tradeoffs in a systematic way (Hibbard, 1997).

As for the oldest old, cognitive impairment could be a very strong risk factor in the

process of decision making for purchasing supplemental health insurance. Age

differences in adult cognitive functioning are well established and are clearly documented

for dimensions such as learning new materials and speed of information processing

(Hultsch & Dixon, 1990; Poon, 1985; Christensen et al., 1994). Age-related decline in

cognitive functioning and onset of cognitive impairments are likely factors in the

development of functional impairment, disability, and problems with independent living

(Fillenbaum et al., 1988; Perlmutter & Nyquist, 1990; Dartigues et al., 1992; Herzog &

Wallace, 1997). Cognitive decline and impairments among the oldest old and their

associated need for personal assistance, formal health care and economic resources

present a major challenge to our aging society. With limited cognitive ability, even

though the choice might be for their best interest/utility maximization, the aged might not

have the ability to efficiently pursue and process the information in order to make the

right choice.

In reviewing the literature, the study on Medigap purchases by the oldest old has been

overlooked in prior research. Very few studies have examined the decision by this

population group on insurance purchases. Considering their vulnerability in terms of

declining health status and cognitive impairments, the extent of protection from health

care insurance merits great attention. It's especially prominent under the current

Medicare policy changes, such as managed competition and cost containment via health

savings accounts.

From another perspective, despite the information processing ability of individuals, the possibility of consistent and complete choice is limited by incomplete information. As a matter of fact, when the individual does not possess complete information about the environment, the formation of an appropriate preference order—key to the possibility of rational choice—may not be possible. The study conducted by Davison et al. (1992) explicitly recognized the interaction between insurance information and health status in health plan choice. This examination was made possible by a unique data set, which combines measures of beneficiary knowledge of Medicare coverage with measures of perceived health status, socio-economic characteristics, and insurance coverage choices for a sample of Medicare beneficiaries who participated in an educational workshop about their insurance coverage options. A Knowledge of Medicare coverage scale (5 true-false questions) was constructed to measure the health insurance knowledge with which the beneficiary could compare the relative benefits of HMO membership and private supplementation on the basis of standard Medicare coverage.

The results show that knowledge of coverage does have a differential impact on the decision to purchase health insurance depending on health status. With a high level of knowledge, sicker beneficiaries are more likely to have Medigap or HMO policies than to have Medicare alone; healthier beneficiaries are more likely to have Medigap membership than to be enrolled in HMOs. The findings could be interpreted as the interactions between consumer preferences for certain delivery system characteristics and for certain insurance characteristics, when information is available and complete. With respect to the first finding, knowledgeable high risk beneficiaries would be better off to be covered with richer benefits, such as more benefits, low cost-sharing and high benefit

maximums. They could accomplish this either by purchasing supplemental insurance or enrolling in the HMO with a limited physician network. The implications of the second finding are that knowledgeable low risk beneficiaries would place more value on certain delivery characteristics, such as preserving their choice of provider, less intervention, or maintaining a longstanding provider relationship. They are more likely to remain in the fee-for-service (FFS) program, relying on Medigap to fill the gap left by traditional Medicare.

Contextual variables   On the other blade of the bounded rationality scissors, humans have always lived in groups (e.g., families, clans, tribes, villages, communities). In the later stage of life, the aged become more reliant on spouse and kin for day-to-day living and communications. One research study conducted by Landa and Wang (2001) suggests that the closer relationship among kin elicits a stronger 'we all live or die together' attitude. Therefore, it's reasonable to assume the Medigap enrollment decision is highly related to the family structure. This includes family size and family relationships. In view of purchasing health insurance as a part of taking care of the well-being of the whole family, the probability that an individual will enroll is very high, compared to individuals without family. As expected, family size/marital status is found to be an important determinant of insurance purchase in all the research studies addressed before. The significant and positive coefficient of family size in the statistical models suggests that households with more members have a higher probability of being insured. For the oldest old who typically have no young children to depend upon, marital status was used as the proxy of the family structure in those studies. Married individuals were more likely to

own supplemental insurance than were single Medicare beneficiaries. In all previous studies, marital status was treated as one of the social-demographic variables. For example, Garfinkel et al. (1987) found beneficiaries who were married had about a 6 percent greater probability of having private insurance than those who were unmarried. Because poverty level is also included in that model, the lower rate of coverage among unmarried Medicare beneficiaries is probably not attributable to the loss of income associated with the loss of a spouse, which was suggested in the explanation in their study. Therefore, marital status is treated as a contextual variable here, consistent with the bounded rationality theoretical framework.

It's also possible that the characteristics of the community in which beneficiaries live influence the extent to which they participate in supplemental insurance. Measures of the cost of living, cost of medical care, geographic region and availability of medical care resources, are suggested to determine whether local resources and economic characteristics of a community underlie the Medigap purchasing difference (Chernew, Frick & McLaughlin, 1997). In the study conducted by Garfinkel et al. (1987), geographic region has been found to have significant impact on purchasing private insurance to supplement Medicare. Persons living in the West region of the United States were 10-16 percent less likely to have a Medicare supplement than persons living in the Northeast, North Central and South regions. The region difference in private supplemental insurance reflects the availability of insurance in various geographic areas. It's possibly related to the Medigap supply and more severe private supplemental insurance competition from Medicare HMOs in the West region. The national insurance carriers specializing in managed care could gain significant Medicare HMO market

presence in the West region. The effect of urban/rural strata on the probability of

purchasing Medigap insurance was also strongly significant (Browne & Doerpinghaus,

1995; Hopkins & Kidd, 1996). Compared to rural areas, cities and towns have more

Medigap insurance carriers to choose from, as well as extensive knowledge diffusion

about the importance of Medigap.

Some studies have specifically sought to explore possible underlying community-

level determinants of the disparities in uptake of nongroup (individual) health insurance

for the population under the age of 65 (Kawachi and Kennedy, 1997; Saver et al., 2003).

In the study conducted by Saver et al., it was hypothesized that the higher levels of

inequality on the community-level or state-level measures, such as strength of the local

safety net, inequality and social capital measures, would result in members of

disadvantaged groups being less likely to purchase nongroup health insurance. This

reflects greater feelings of disenfranchisement and lower likelihood of adopting a

mainstream view of the importance of buying health insurance if it was not otherwise

available. Data for this study came from the Community Tracking Study (CTS)

Household Survey, a telephone survey of 60,446 individuals conducted in 1996 and 1997

(Kemper et al., 1996), representing the U.S community-dwelling population. The survey

enabled the analysis on community-level with individual and family-level factors

simultaneously.

Only one of the community and state-level factors characterizing the safety net was

significant in the multivariate models—the annual per capita number of teaching and

public hospital outpatient department visits was associated with modestly lower odds of

purchasing nongroup insurance. Lack of supporting evidence on the community factors in
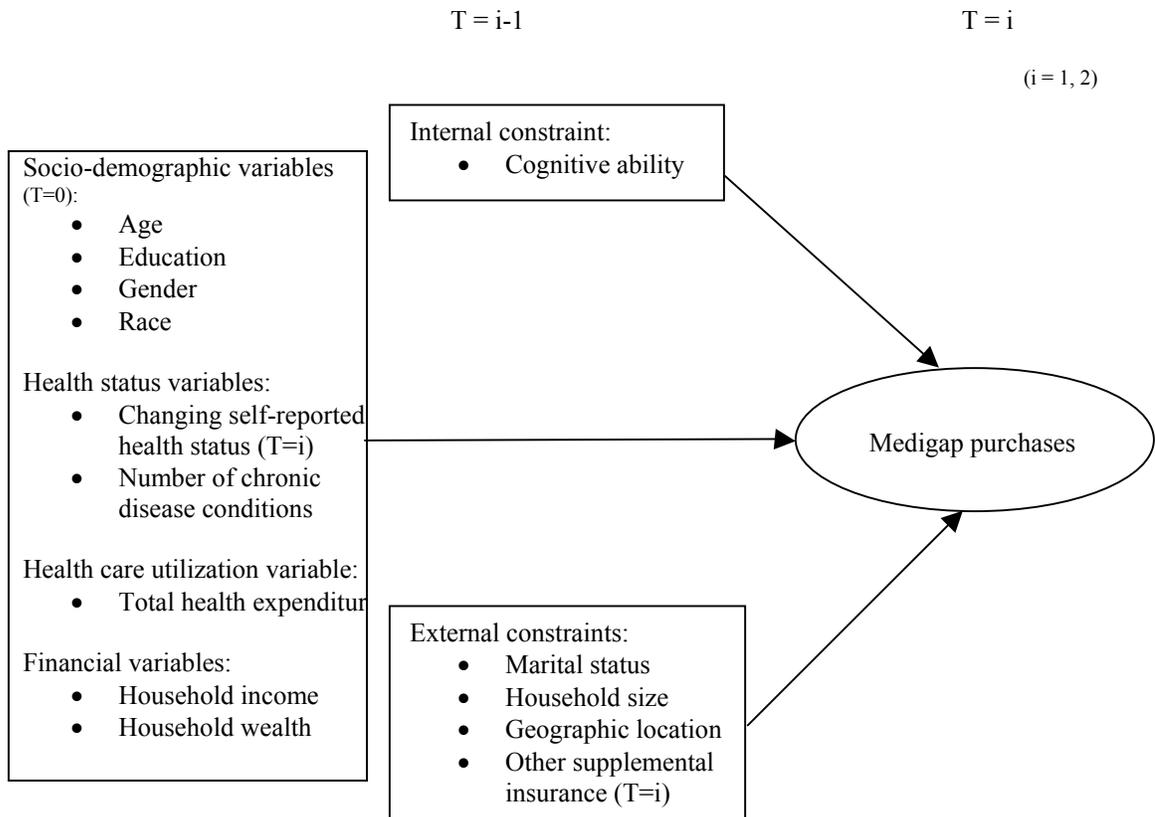
the purchase of nongroup health insurance suggests, overall, that the decision to purchase health insurance is predominantly an individual or family-level decision. But Saver et al. found that, after adjusting for income and other factors, members of minority groups and those less educated continue to be substantially less likely to purchase nongroup health insurance. It addressed one policy issue by concluding that until there is a better understanding of factors underlying the disparities in the purchase of nongroup health insurance, programs relying on voluntary enrollment are likely to widen, not narrow, disparities in coverage between more- and less-advantaged Americans.

All the literature review and discussions addressed above pave the road for the present study on Medigap purchases. There is one more point, however, which is worth emphasizing here. As is well known, one of the main features that distinguishes the demand for medical care from the demand for other goods and services is that of decision making under uncertainty, because not only the incidence of illness is uncertain, but the physical and financial damage caused by disease is also uncertain. Individuals respond to this uncertainty by modifying their behavior in a dynamic way. It's difficult for a static model to fully describe the effects of uncertainty because individuals do not make a one-time change in their behavior, but rather they make adjustments over time. In reviewing the literature, all of the prior studies applied a static model as their primary statistical technique. It is implicitly assumed that the decision of enrolling in Medigap is exclusively determined by current state factors, while the time impact on this adaptive behavior of decision making is totally ignored.

An individual's current demand for supplement health insurance depends in part on results of previous decisions and on his/her future expectations. The purchasing decisions are not independent from one year to the next. Therefore, instead of one large maximization of their expected utilities, individuals make the optimization problem a result of a series of sequential decisions—time paths. A multi-period study would make an interesting research project to determine the impact of causal factors from a previous period on later decisions to purchase Medigap insurance. For example, this would include examining the impact of previous trajectory health status, health care consumption and health insurance purchases, as well as the state variables (gender, race, etc.), on the decision of whether or not to purchase health insurance.

In sum, the conceptual framework of this study is derived from bounded rationality theory. As presented in Figure 1, a bounded rationality model for Medigap purchases is proposed.

Figure 1. A bounded rationality model for Medigap purchases by Medicare beneficiaries.

T = i-1   T = i

(i = 1, 2)

Internal constraint:
  • Cognitive ability

Socio-demographic variables (T=0):
  • Age
  • Education
  • Gender
  • Race

Health status variables:
  • Changing self-reported health status (T=i)
  • Number of chronic disease conditions

Health care utilization variable:
  • Total health expenditur

Financial variables:
  • Household income
  • Household wealth

Medigap purchases

External constraints:
  • Marital status
  • Household size
  • Geographic location
  • Other supplemental insurance (T=i)

The model assumes that Medicare beneficiaries make Medigap purchase decisions starting from their expected utilities, which are expressed by their socio-demographics, health status, health care utilizations, and financial conditions, while bounded by their internal and external constraints. Socio-demographics affect the demand for health insurance in the way of reflecting individual's preference of health security and benefits. Consistently, research findings showed that demographic factors such as younger age, being female, higher education, and being White influenced Medigap purchases.

The impact of health status on Medigap purchases was found to be ambiguous in the literature, even though health status is the most direct explanatory variable. The majority of studies have not found a significant relationship between self-reported health status and the demand for supplemental insurance (Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Ettner, 1997; Hurd & McGarry, 1997; Pourat et al., 2000). However, some studies showed that those in poor health were significantly less likely to purchase insurance than otherwise similar individuals (Rice & McCall, 1985; Marquis & Long, 1995). Based on bounded rationality theory, the study assumes that those in deteriorated health conditions will value Medigap coverage and are more likely to purchase Medigap than those in fairly good conditions. The chosen health status variables include changing self-reported health status and number of chronic disease conditions.

Health care utilizations directly relate to the expected health care expenses, thus influencing Medicare beneficiaries' willingness to purchase supplemental insurance to fill in the 'gap' of Medicare coverage. Research findings showed that total health expenditures were highly and consistently related to Medigap purchases among Medicare beneficiaries.

Household income and household wealth are chosen financial variables, which reflect Medicare beneficiaries' financial freedom. It has been strongly supported in the literature that higher household income and wealth had a positive impact on Medigap purchases.

One of the innovations of this model lies in its incorporation of cognitive ability and contextual variables into the conceptual framework based on bounded rationality theory. No prior research has focused on human internal constraints, such as cognitive ability, in studying Medigap purchases by the elderly. Since age-related decline in cognitive

functioning and onset of cognitive impairment is well documented in the literature, the

aged might not have the ability to efficiently pursue and process the information in order

to make the right choice. It is proposed in this study that cognitive ability is one of the

key internal constraints which hinder the oldest old from making efficient Medigap

purchase decisions. The chosen contextual variables include marital status, household

size, geographic location, and other supplemental insurance coverage, which reflect the

environmental influence from the family structure, geographic region, insurance carriers'

competition, as well as other government sponsored insurances. Married

beneficiaries/households with more members have higher stakes to purchase Medigap so

as to be emotionally and financially protected from catastrophic consequences. Medigap

and Medicare+Choice plans' availability and competition in regions also influence

Medicare beneficiaries' purchasing decisions. And those beneficiaries with coverage

from Medicaid, other government sponsored insurances, and employment-based

insurance are already well covered and are much less likely to have other supplemental

insurance.

As noted above, there exists a time factor—personal and environmental variables

from a previous period impact on later decisions to purchase Medigap. The causal

relationship presented in Figure 1 explicitly reflects this time-dependent relationship by

noting the time-varying variables, e.g. changing health status, health care utilization, etc.

Chapter Three: Methodology

This chapter will articulate the research questions and hypotheses to be addressed in this study. It will then describe the design of the study, data sources and study sample, description of the dependent and independent variables used in this study, and data analysis.

Research Questions and Hypotheses

This study attempts to address the knowledge gap by exploring the factors influencing Medicare beneficiaries' purchasing decisions on private supplemental insurance (Medigap). The research question to be addressed is "what are the predictors of Medigap purchases by community-dwelling elderly persons?" The determination of purchasing Medigap is influenced by many factors including the characteristics of individuals and families, anticipated health care expenditures, financial resources, and tolerance for risks. And these factors are changing over time. This study aims to address six research questions focusing on each of the decision-making aspects.

Research Question 1

What socio-demographic variables influence Medigap purchases?

Hypothesis 1: older Medicare beneficiaries will be less likely to purchase Medigap than younger ones.

Hypothesis 2: higher educated beneficiaries will be more likely to purchase Medigap than less educated ones.

Hypothesis 3: female Medicare beneficiaries will be more likely to purchase Medigap insurance than males.

Hypothesis 4: Whites will be more likely to purchase Medigap insurance than African Americans.

The first question focuses on the demographic factors that produce differences in the tendency to make purchasing decisions. Hypotheses (#1 - #4) were formulated based on previous research as documented in the Chapter Two review of prior studies. For example, the impact of education on Medigap purchase was hypothesized because prior studies have consistently found that more highly educated beneficiaries are more likely to purchase Medigap policies (Rice & McCall, 1985; Garfinkel et al., 1987; Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997; Ettner, 1997; Pourat et al., 2000).

Research Question 2

What is the impact of health status on Medigap purchases?

Hypothesis 5: declining self-reported health status will increase the likelihood of Medigap purchases.

Hypothesis 6: the greater number of chronic disease conditions will increase the subsequent likelihood of Medigap purchases.

The second question is focused on the impact of health status on Medigap purchases. Health status was the main focus of previous studies on private supplemental insurance purchases. However, the body of empirical evidence shows inconsistent findings on health status. The majority of studies have not found that self-reported health and

disability have significant effect on the demand for supplemental insurance (Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997; Ettner, 1997; Pourat et al., 2000). Some studies found self-perceived health status to be important determinants of policy ownership (Rice & McCall, 1985; Marquis & Long, 1995). The presence of chronic conditions was the only one of three measures of health status (the other two are perceived health status and functional limitations) to show significant impact in the study conducted by Garfinkel et al. (1987). Hypotheses (#5-#6) were formulated based upon bounded rational choice theory, which proposes that those who anticipate high medical expenditures, either based on their current health status or future illness possibilities, are more likely to purchase supplemental insurance. Thus, it was hypothesized that beneficiaries whose self-perceived health status is declining are more likely to purchase supplemental insurance. It was also hypothesized that, as the number of chronic conditions increases, the probability of purchasing Medigap increases.

Research Question 3

What is the impact of total health care expenditure on Medigap purchases?

Hypothesis 7: higher total health care expenditures at an earlier occasion will increase the likelihood of Medigap purchases at a later occasion.

The third question is focused on the impact of health care expenditure on Medigap purchases. It's been found in the literature that there are high correlations between current and past health care needs, and people who had higher average medical expenditures were also more likely to purchase supplemental insurance (Wolfe & Goddeeris, 1991; Long, 1994; Vistnes & Banthin, 1995; Ettner, 1997). Hypothesis #7 was formulated

based upon consistent findings from previous studies. It was also formulated to represent the time impact on purchase decisions that earlier health care expenditure will have on later Medigap purchases.

Research Question 4

What financial constraints predict Medigap purchases?

Hypothesis 8: higher household income will increase the likelihood of Medigap purchases.

Hypothesis 9: higher household wealth will increase the likelihood of Medigap purchases.

The fourth question is focused on the impact of financial resources on Medigap purchases. The literature documents that wealthier beneficiaries are more likely to purchase Medigap than poorer ones (Rice & McCall, 1985; Wolfe & Goddeeris, 1991; Davison et al., 1992; Browne & Doerpinghaus, 1995; Pauly, 1996; Hurd & McGarry, 1997; Shea & Steward, 1995; Ettner, 1997; Pourat et al., 2000). Based on the findings of previous studies, the fourth question is tested with two hypotheses, which address two correlated measures of financial status—income and level of wealth. This question is posed to test whether the sample of this study exhibits the same pattern on Medigap purchases under the financial constraints, as established in the literature.

Research Question 5

Is cognitive ability related to decision making for purchasing Medigap?

Hypothesis 10: beneficiaries with better cognitive functioning will be more likely to purchase Medigap than those with cognitive limitations.

The fifth question is focused on the impact of cognitive limitation on Medigap purchases. The cognitive ability posed in hypothesis #10 is drawn from bounded rational choice theory as the main internal constraint for Medigap purchase decision making. As for the oldest old, cognitive impairment could be a very strong risk factor in the process of decision making for purchasing supplemental health insurance. With limited cognitive ability, it could become extremely difficult for the aged to be able to efficiently pursue and process information. For that reason, as rapid changes were occurring in the health care market in recent decades, the oldest old might have been left out of the choice-making to protect their best interests. Therefore, cognitive limitation was formulated to have a negative effect on Medigap enrollments, controlling for all the other factors.

Research Question 6

What contextual variables would be related to decision making for purchasing Medigap?

Hypothesis 11: married beneficiaries will be more likely to purchase Medigap than those unmarried or widowed.

Hypothesis 12: a larger number of household members will increase the likelihood of Medigap purchase.

Hypothesis 13: beneficiaries living in the West region will be less likely to purchase Medigap than those living in the Northeast, Midwest and South regions.

Hypothesis 14: beneficiaries living in urban/suburban areas will be more likely to purchase Medigap than those living in rural areas.

Hypothesis 15: beneficiaries with other forms of supplemental insurance will be less likely to purchase Medigap than those with none.

The last question, as a counterpart to the fifth question, focuses on the impact of the external constraints of decision making on Medigap purchase. Hypotheses (#11-#15) were formulated based upon consistent findings from previous studies. It has been firmly supported by the literature that marital status and family size are strongly related to Medigap purchase. They indicate the social and economic support and reliance at the family level. The effect of location on the probability of purchasing Medigap insurance has also been documented (Garfinkel et al., 1987; Short & Vistnes, 1992, Browne & Doerpinghaus, 1995; Hopkins & Kidd, 1996). It's been found that availability of Medigap and Medicare+Choice plans in regions underlies the Medigap purchasing difference. It was supported that persons living in the West region were less likely to have a Medicare supplement than persons living in the Northeast, North Central and South regions. The effect of urban/rural strata on the probability of purchasing Medigap insurance was also found strongly significant. The other combinations of insurance coverage also have strong effects on Medigap purchase (Rice & McCall, 1985; Garfinkel et al., 1987; Hurd & McGarry, 1997; Shea & Steward, 1995; Ettner, 1997). Those beneficiaries with coverage from Medicaid, other government sponsored insurances, and employment-based post-retirement insurance are already well covered and are much less likely to have other insurance.

Design

Most of the research reporting in the literature studying the demand for health insurance utilized a cross-sectional non-experimental design. Some of these studies used maximum likelihood logistic regression analysis (Henderson et al., 1995; Hopkins & Kidd, 1996; McCall et al., 1998), while others applied probit regressions (Wilcox-Gok & Rubin, 1994; Marquis & Long, 1995; Shea & Steward, 1995; Shmueli, 1998). Some studies applied the static model on longitudinal surveys and pooled sample data across survey times (Rice & McCall, 1985; Wolfe & Goddeeris, 1991). In these papers, traditional empirical models are employed to investigate the probability of the decision to purchase health insurance using a dichotomous dependent variable: whether health insurance is purchased or not. In the model design, it is implicitly assumed that the decision of enrolling in health insurance is exclusively determined by the present state of factors.

More recent studies use two-stage or two-part models in analyzing the health insurance purchasing decisions and demand for health care (Ettner, 1997; Hurd & McGarry, 1997; Cheng & Chiang, 1998; Dewar, 1998; Pourat et al., 2000). Dewar (1998) used a two-stage probit (a unit of measurement of statistical probability based on deviations from the mean of a normal distribution) model to deal with sample selection problems. The first probit model was used to estimate the probability of full-year private insurance coverage (vs. no insurance for the year), and the second probit model to estimate the probability of full year employer purchased (vs. individually purchased) insurance coverage for those insured. The two-part model, a new estimation method similar to a two-stage (Heckman) model, is widely used in modeling the usage of medical

services. The two-part model has served as a methodological cornerstone of empirical

analysis to estimate the probability of visiting a doctor and the frequency of health care

utilization (Duan et al., 1983, 1984; Manning, et al., 1987; Pohlmeier & Ulrich, 1995;

Gerdtham, 1997; Gurmu, 1997; Hurd & McGarry, 1997; Cheng & Chiang, 1998). It

consists of two stages: the first stage uses a probit equation for the dichotomous event of

having zero or positive values, and the second stage uses a linear model for non-zero

values on the log-scale.

The two-part model is well supported empirically, with explanatory variables often

playing different roles in the two parts of the model. The greater appeal of the two-part

model (TPM) over the two-stage model (TSM) is partly driven by an important feature of

the demand for medical care, which is the high incidence of zero usage. For example,

approximately 30% of typical cross-sectional samples of community-dwelling individuals

in the US report no outpatient visits in the survey year (Gerdtham, 1997). The greater

appeal of TPM in health economics is also based on its connection to a principal-agent

model (Zweifel, 1981) where the physician (the agent) determines utilization on behalf of

the patient (the principal) once initial contact is made. While at the first stage it is the

patient who determines whether to visit the physician (contact analysis), it is essentially

up to the physician to determine the intensity of the treatment (frequency analysis)

(Pohlmeier and Ulrich, 1995). The studies conducted about health insurance determinants

suggest sequential decision-making may also occur in health insurance purchases (Ettner,

1997; Cheng & Chiang, 1998; Pourat et al., 2000). For example, Ettner (1997) explored

the self-selection for private supplemental insurance among Medicare beneficiaries, by

estimating logit models of the choice of supplemental insurance (the first part), and the

choice of more vs. less comprehensive coverage among respondents who have private insurance policies (the second part). All the studies suggest the decisions of whether or not to purchase health insurance and how much to spend (or how many packages to buy) are not necessarily jointly determined, as opposed to the underlying assumption in the TSM.

This sharp dichotomy between users and non-users may be appealing in modeling data on episodes of medical care, but this distinction may not be tenable in the case of typical cross-sectional datasets. In these data, for example, health care events are recorded over a fixed time period (e.g. a year or a month) and not over an episode of illness. More generally, the first part of the TPM may be thought of as modeling the decision to initiate the first episode of treatment, while the second part is a combination of the patient's decisions to initiate subsequent treatment and the physicians' decisions about the intensity of each of those episodes. Unless one believes that the initiation of the first episode of care during a fixed time period has special characteristics (relative to initiation of subsequent episodes), the appeal of the TPM may, in principle, be diminished (Deb & Trivedi, 2002). Besides, from the statistical point of view, the TPM is also a finite mixture with a degenerate component. It combines zeros from a binomial density with the positives from a zero-truncated density. Therefore, in order to better approximate any true, but unknown, probability density, research calls for the models which could account for greater variation than what is allowed by the variance in a one-parameter exponential family (Daniels & Gatsonis, 1999).

A multilevel model is a statistical model applied to data collected at more than one level in order to elucidate relationships at more than one level (Luke, 2004). The

statistical basis for multilevel modeling has been developed over the past several decades

from a number of different disciplines, and has been called various things, including

Hierarchical linear and nonlinear models (Raudenbush & Bryk, 2002), random

coefficient models (Longford, 1993), mixed-effects models (Pinheiro & Bates, 2000).

Multilevel models increasingly are applied in the behavioral and social sciences where

context merits great importance.

Compared to traditional analytic methods, multilevel modeling has a number of

important advantages when applied to longitudinal data where multiple observations are

nested within a single object. From the theoretical standpoint, multilevel modeling can be

extremely useful when applied to longitudinal data where the primary interest is in

modeling the structure and predictors of change over time (Luke, 2004). The multilevel

approach focuses first on modeling individual growth patterns within individual subjects

and only subsequently on analyzing between individual variations. It represents a

conceptually different approach to analyzing longitudinal data compared to the traditional

methods, which focus exclusively on "between subjects" effects. The primary purpose in

this study is to model how changing circumstances and the growth trajectory predict

Medigap purchases. Multilevel modeling reflects the essential point that an individual's

current demand for supplemental health insurance depends in part on previous changing

circumstances and on his/her future expectations.

When dealing with longitudinal data where time is nested within person, researchers

face very typical statistical difficulty caused by repeated-measures—missing data and

unbalanced design. Multilevel modeling is much more flexible and efficient. It will use

whatever data are available, and it can model change patterns even for data that are collected at varying time points.

This study uses a multi-year prospective cohort research design. Hierarchical generalized linear modeling (HGLM) is utilized to examine whether or not Medicare beneficiaries purchase Medigap, using data from the longitudinal survey, the Asset and Health Dynamics Among the Oldest-Old Survey (AHEAD). The decision of purchasing Medigap is characterized as the optimal choice based on a variety of variables, such as changing health status, medical care expenditures, wealth, cognitive functioning and family status, controlling for demographic variables. Three waves of follow-up data enable the study to estimate the effects of the independent variables over a longer period of time than has been possible in most prior studies of Medigap insurance purchasing.

Data Sources

Data for this study are drawn from the Asset and Health Dynamics Among the Oldest-Old Survey (AHEAD), which is a longitudinal, multipurpose survey of a nationally representative sample of community-dwelling adults aged 70 and older. Community-dwelling adults are those living in non-institutional residences such as homes or apartments; adults living in institutional settings such as nursing homes or hospitals are excluded. The objectives of AHEAD included monitoring transitions in physical, functional, and cognitive health in advanced old age and relating changes in health to economic resources (Soldo, Hurd, Rodgers & Wallace, 1997). AHEAD began in 1993 with a multi-stage area probability sample of households in the contiguous United States, targeting all community-dwelling adults aged 70 and older (i.e., born in 1923 or earlier).

If the target person was married or living with a partner, the spouse/partner was also interviewed, regardless of age. Supplemental oversamples were drawn for African Americans, Hispanics, and residents of Florida. Surviving respondents were surveyed in 1995 (Wave II).

In 1998, the AHEAD study (Wave III) was merged with the Health and Retirement Study (HRS) that will represent the U.S. population over age 50. By continuing to interview all sample members (and their spouses) until they die, and by continuing to add new cohorts as they age into the 51-55 age range (e.g., the leading edge of the baby boom cohorts of 1948-53 were added in 2004), the study will remain (cross-sectionally) representative of the U.S. population over age 50 for as long as it continues.

Besides detailed information on a series of personal characteristics including age, gender, marital status, highest education level attained, and health care expenditure, self-reported health status, wealth and income variables, AHEAD has a whole section related to information on insurance such as health and life insurance. Regarding health insurance, in AHEAD Wave I, data were collected on other insurance people might have besides Medicare, specifically Medicaid, other government insurance and type, other health insurance and type (Medigap, long-term care, basic health, other supplemental plan). Additional information also was collected on the total number of different policies in addition to Medicare, total payments to other health insurance, and long-term care policies. Since Wave II, there is a dramatic expansion in the health insurance section. More detailed questions are asked and some of them are more related to health care changes such as Medicare HMO enrollments, different Medigap policy purchases, extra benefits of prescription drug and long-term care coverage. Obviously, health insurance

coverage has received considerable attention in the AHEAD study. This didn't happen coincidentally. It should be noticed that the 1993—1998 period was one of the time spans when rapid changes occurred in the health market landscape.

To facilitate the use of this extremely rich and complex survey data, the RAND Center for the Study of Aging provides a particularly user-friendly version of the HRS and enhanced HRS/AHEAD data files. They contain cleaned and processed variables with consistent and intuitive naming conventions, conventional and model-based imputations and imputation flags, and spousal counterparts of most individual-level variables. All is elaborately documented, with special attention to comparability of variables across survey waves. For instance, in AHEAD and HRS, if both spouses were interviewed, one was designated as the "financial respondent." For the AHEAD entry cohort (Wave I), only the Financial Respondent was asked some medical utilization questions and all medical expenditure questions, which differs from all other waves. Questions asked only of the Financial Respondent yield household-level data, not the individual level this study is focusing on. In Rand enhanced HRS/AHEAD Fat Files, new variables for "own" and "partner" information were created by re-assigning responses to the appropriate person. The comprehensive codebook and data files can be downloaded from website: www.rand.org/labor/aging/dataprod. All the measures utilized in this study will be drawn from the publicly available data from the RAND website.

Limitations of Secondary Data

Although the study provides many variables necessary to estimate the private health insurance decision, some limitations do exist. For example, in this data set I am unable to

distinguish between different types of private Medigap policies purchased. Even though the characteristics of the policy type chosen are of great interest to the insurers and public policy makers in designing insurance programs, the study is limited to the general question of whether Medigap is purchased or not; it doesn't address what kind of Medigap policy and what amount of Medigap coverage is purchased.

Theoretically, concern about health, expected cost and attitudes toward risk are significant determinants of health insurance purchases, as justified by Bounded Rational Choice theories. However, these variables associated with expectations are not available in the AHEAD data. Given that, other observable variables such as self-reported health status, current health care cost and current insurance status will be used as proxies.

In addition, compared with primary data collection, AHEAD as a nationally-representative sample has the advantage of permitting sophisticated multivariable analysis as well as great generalizability. However, the tradeoff is less flexibility in constructing research variables. In the AHEAD data set, there is no information on the premiums for the different Medigap options and supplying data for both insurance takers and decliners, which makes it impossible to estimate the effect of premium on Medigap demand. In order to obtain this information, a focus group needs to be surveyed on supplemental insurance demand based on available premiums on the market. Moreover, the health insurance information/knowledge of coverage, interacting with health status on health plan choice, is not available in the data set. With the growth of consumerism in the health care market, both internally and externally reliable measurement instruments on consumers' knowledge of coverage will be built into the survey designs in the future studies.

Study Sample

The study unit is the individual. At Wave I, interviews were conducted with 8,222 individuals, representing 6,047 households. First, to select the sample consists of Medicare beneficiaries age 70 and over with Part A and Part B coverage, 654 individuals who were less than 70 years old at the baseline interview, and then 251 individuals who were 70 and over but didn't have Medicare coverage, were excluded. Second, because of the sparse representation of other racial or ethnic groups across waves in AHEAD, 490 individuals with other ethnic backgrounds were excluded, leaving 6827 non-Hispanic White and African American individuals. Third, because AHEAD interviewed both the respondent and the spouse in married couples, data were nested at the couple level, violating statistical assumptions of independent observations. In order to select a sample of independent individuals, one person in each married couple was eliminated randomly. Those individuals are still considered married in the following analysis. There were 1288 cases excluded for this reason. Fourth, 1081 individuals were excluded who had proxy interviews in any wave. Because of the design of the study using cross-wave measures (e.g. changing health status), 1702 additional cases were dropped if they didn't participate in any one of waves. These selection criteria resulted in a final sample of 2756 individuals.

Measurement

All measures are based on self-reporting. The dependent and independent variables are defined as following.

<u>Dependent Variable</u>

The dependent variable is whether the respondent reported self-purchasing private supplemental health insurance, as the format of yes/no. In AHEAD Wave I, data were collected on other insurance people might have besides Medicare. However, it provides no information on whether the supplemental health insurance is purchased through prior employment or subsidized by associations, or is self-purchased. Private Medigap purchases will be only computed in Wave II and beyond. At each wave, the private insurance questions were asked regardless of whether the respondents have purchased it before, which is reasonably consistent with the fact that private health insurance has to be renewed every year.

In Wave II and Wave III sections on health insurance, the respondents were asked a series of questions related to purchasing Medigap. "Do you have any health insurance that pays part of your hospital or doctor bills (sometimes this is called a Medigap policy)?" (1 = yes, 0 = no) The Medicaid and government health insurance other than Medicare were defaulted as '0' value of this variable. "Thinking about the first of these plans, how did you obtain this type of health insurance coverage? Was it through your (or your husband's/or your wife's/or your partner's…) employer or union, or through an organization or what? (1 = R employer/formal employer, 2 = R union, 3 = Spouse/partner employer/formal employer, 4 = Spouse/partner Union, 5 = Other organization, 6 = Self;

not through any organization, 7 = other (specify)). The respondents who have 'Medigap' insurance (yes) and obtain it from "Other organization" (5), "Self; not through any organization" (6) or "Other" (7) are defined as individual purchasers of private Medicare supplemental coverage in the study.

Independent Variables

The independent variables can be categorized as demographic and explanatory variables. Demographic factors (age, education, gender and race) are widely found to significantly relate to health insurance purchase. Age was the age in 1993, measured as a continuous variable. For the multilevel analysis, age was truncated at age 70. Education (highest grade of school or year of college completed) was measured in years (from 0 = none to 17 = 17 or more), also measured as a continuous variable. For the multilevel analysis, education was centered around the grand mean. Gender was coded 1 = female or 0 = male. Race was limited to non-Hispanic Whites (=1) and African-Americans (=0). These demographic factors are time-invariant variables measured at baseline.

Explanatory variables used in this analysis are declining self-perceived health status, chronic disease conditions, total health expenses, household income and wealth, cognitive functioning, marital status, family size, geographic location (region and urban/rural), and other insurance. These are time-varying variables measured across three waves.

Declining self-perceived health status

Self-perceived health status was measured by the single item, "How would you rate your health at the present time—excellent, very good, good, fair, or poor?" (1 = excellent,

2 = very good, 3 = good, 4 = fair, 5 = poor). The change in self-rated health is the difference (time 1 – time 0, time 2 – time 1) between the previous rating score and the current rating score. After grouping the positives and negatives, this three-scale variable represented the reported health status change from the last interview: improved, deteriorated, or unchanged. It was further transformed into two dummy variables— better/worse self-reported health status in multilevel analysis to address the uneven proportion of the reported health status change.

Although self-rated health (baseline) should be controlled in the multilevel analyses in addition to the change on it, there is concern about multicollinearity due to high correlations between self-rated health and chronic disease conditions (coefficient=0.6, significant at the $p \leq .001$ level). Therefore, baseline self-rated health was dropped in the analysis plan.

Chronic disease conditions

The number of chronic disease conditions is a count variable, measured by the single item, "whether or not a doctor has ever told you that you have these conditions?" (high blood pressure or hypertension; diabetes or high blood sugar; cancer or a malignant tumor of any kind except skin cancer; chronic lung disease; heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems; stroke or transient isocheims attack (TIA); emotional, nervous, or psychiatric problems; arthritis or rheumatism). For this study sample, the distribution of the variable is a bit positively skewed but approximating normal. The log transformation didn't improve much the sample distribution statistics. Therefore no transformation was used, and beneficiaries with no chronic disease are the benchmark in the multilevel analysis.

<u>Total health care expenditures</u>

The construction of total health care expenditures is complicated by differences in the questions across waves. In Waves I and II, the respondent was asked to quantify his or her use of the same type of services (hospital stays, nursing home stays, doctor visits, prescription drug use, outpatient surgery, dental care and special facility services). Beginning in Wave III, an exact amount of total expenditures is assessed. Because the household expense was allocated to the individuals in Rand dataset, the sampling method of randomly deleting one person from married couples is feasible in this study. In terms of different types of the question on health care expenditures, Rand Center for the Study of Aging imputed a consistent measure of total medical expenditures for all medical services combined across waves. Instead of using the simple hotdeck imputations from the HRS/AHEAD public release, the RAND data contain imputations, such as logistic regression, ordered logit model, of bracket and missing data values consistent across waves. For the multilevel analyses, logged values were calculated for the household level expenditures in Wave I and II. And then the total household expense was allocated among the couples based on other information, such as the out-of-pocket expense. A comprehensive codebook published on the RAND website (www.rand.org) provides detailed information on derivation descriptions for each derived variable. For the multilevel analysis, logged values were calculated for medical expenditures and centered around the grand mean.

Household income and wealth

Household income is the total income for the preceding year from all sources (e.g., husband's and wife's labor earnings, Social Security income, income from other household members). Household wealth is considered holdings of stocks and mutual funds, as well as ownership of housing equity, net of liabilities. Respondents were asked for exact monetary amounts. When unable or unwilling to provide exact amounts, they were given a set of bracketed categories and asked to pick one. The imputation algorithm of combining a number of items for income and wealth variables is the same as used for the total health care expenditures (Rand HRS/AHEAD codebook). For the multilevel analysis, logged values were calculated both for household income and wealth and centered around the grand means.

Cognitive functioning

Cognitive functioning is an aggregate index formed by summing the raw scores of respondents' total number of correct answers to tests assessing their memory (0-20) and mental status (0-15) (Herzog & Wallace, 1997). The summary measure of cognitive functioning represents both memory for newly acquired information and knowledge for established information, with a possible range from 0-35 (high scores represent better cognitive functioning). This measure displayed satisfactory psychometric properties and construct validity in the AHEAD baseline survey (Herzog & Wallace, 1997). The detailed measures of cognitive functioning in AHEAD are:

Memory test—immediate and delayed recall of ten common nouns (0-20)

Mental status test—serial 7s test (0-5), 4-dates (0-4), counting backward (0-2), name cactus (0-1), name President (0-1), name Vice President (0-1), name scissors (0-1)

"Don't know" answers and no answers (refusals) are imputed as incorrect responses or low scores (see Herzog & Wallace's paper).

For the multilevel analysis, cognitive function score was centered around the grand mean.

Marital status

The norm in the majority of insurance companies is that only married couples and eligible children (age less than 18) are considered as family plan beneficiaries in health insurance coverage. As a rule, the oldest old (age 70 and older) wouldn't have younger children or step-children dependent upon them. Also the extended kin or others living in the respondents' household are not eligible for the family health insurance plan. For this reason, self-purchased Medigap is typically member-based (an individual plan) instead of contract-based (a family plan) in insurance rating schedules. Therefore, most likely the covered persons in Medigap insurance are only one or two. The respondents were asked a single item question with answers of 'married/living with spouse', 'married/not living with spouse', 'unmarried/living with others', 'unmarried/living alone'. Marital status is used in the study as a dummy variable (1 = married/living or not living with spouse, 0 = unmarried/living with others or living alone). As with all other explanatory variables, marital status is a time-varying variable measured across three waves.

Household size

Information about household residents and children was reported in the family section of AHEAD data. The household size is a count variable, measured by the single item, "Other than you [and your (husband/wife/partner)], how many people are living with

you?" The number of household residents was computed by adding 1 for the respondent and 2 for the respondent and the spouse, if married, to the answer to this question. The distribution of household size is heavily skewed towards only one or two household members. For the multilevel analysis, household size was truncated above three members (all values equal or above three was coded as "3"), and the variable values were centered around the grand mean.

Geographic location

The respondents were asked in Wave I the location of current residence (Northeast, Midwest, South, West). This is the baseline measure of respondents' geographic location. At subsequent interviews, questions ask whether the household moved, and if so, if the move was within the same area as the previous interview residence. If the household moved out of the area, the new location is used at that wave. Then it was dichotomized for the multilevel analysis (1=West, 0=Northeast, Midwest and South).

Another equally important measure of geographic location (urban/rural) is based on the Beale Rural-Urban Continuum Code (http://www.ers.usda.gov/Data), which is collapsed to preserve respondent confidentiality in the HRS 1992-2002 Respondent Region dataset (http://hrsonline.isr.umich.edu/data/index.html). This dataset is designed to assist analysts who wish to use region and between-wave mobility information in conjunction with interview-year core and exit files. Location of residence is categorized as a metropolitan area (urban/suburban=1, Beale Rural-Urban Continuum code 0-2), or a nonmetropolitan area (rural=0, Beale Rural-Urban Continuum codes 3-9).

<u>Other insurance</u>

Except for the private supplemental insurance (Medigap), the Medicare beneficiaries can have Medicaid, other government health insurance programs (e.g. Railroad Retirement, Military programs), or employer or association sponsored insurance. Respondents were considered as having other insurance (yes/no) if they reported any of those types of health insurance in previous questions related to dependent variable.

Data Analysis

First, preliminary screening of data was performed. Except for the variables which have already been computed by Rand such as total health care expenditures, household income and wealth, all scales, indices and other variables were computed. To assess the fit of the data to the assumptions of the analytic techniques, the psychometric properties and distributions of the data were analyzed. If needed, the study variables were appropriately transformed. Descriptive statistics were calculated to describe the sample's characteristics and Medigap coverage. Correlation analyses were used to examine bivariate relationships among all the variables. Correlations among independent variables will be reviewed to identify potential problems with multicollinearity. Associations between the dependent and independent variables were considered as significant at the .05 alpha level.

Second, multilevel analyses used hierarchical generalized linear modeling (HGLM) in HLM 5.05 (Raudenbush, Bryk, Cheong, & Congdon, Jr., 2001). For the longitudinal data where the primary interest is in modeling the structure and predictors of change over

time, multilevel modeling produces smaller standard errors and, hence, more accurate statistical inferences (Rodriguez & Goldman, 1995). The most important advantages are that the time interval is not required to be fixed, and that missing time points are allowed. Hierarchical linear models (HLM) are used for continuous individual outcomes and hierarchical nonlinear models (HGLM) are appropriate when the outcome is dichotomous or nonnormally distributed. Since the outcome variable (whether or not Medigap was purchased) is a binary variable (yes/no), the HGLM analyses used a Bernoulli sampling model (Raudenbush et al., 2001). Due to the different actual variance than the model assumed, over dispersion was allowed to estimate a scalar variance.

However, the deviance statistics comparison of model fit is not available for HGLM when using the Penalized Quasi-Likelihood (PQL) estimation procedure. Although the actual estimates will usually be adequate, any test of random intercepts and slopes in multilevel models for discrete outcomes based on the likelihood may be unreliable (Raudenbush et al., 2001). In the case of the Bernoulli model, Laplace estimation is available as alternative method of estimation the deviance statistic because of its more precise standard errors than PQL. But the limitations of Laplace estimation, for example, it can not weight the data and specify an overdispersion model, overrode the justification for using Laplace.

In this study, seven alternative models were tested to investigate the predictors of Medigap purchases. In each model the intercept is specified as a random effect. A baseline model that included the time as the only predictor tested whether Medigap purchases change over time. The time ($t = 0, 1, 2$ for waves 1-3) is specified as a fixed effect. A second model added baseline demographic variables as the predictors (Research

Question 1). To test the hypotheses that health status change and chronic disease conditions will account for significant variability in Medigap purchases, the third model that adds the health status variables was examined (Research Question 2). Then the fourth model (Research Question 3) and the fifth model (Research Question 4) were examined after adding the variables of total health care expenditures, and financial resources in order. To investigate the hypotheses that Medigap purchasing decision is influenced and bounded by the person's internal and external constraints (Research Questions 5 & 6), the sixth and the seventh model (final model) were tested. The final model includes all time-invariant social-demographic variables, time-varying health status, health care expenditures, income and wealth, cognitive ability, marital status, family size, geographic locations, and other insurance.

The equations for this final model are as follows:

Level 1: $Y_{ij} = \beta_{0j} + \beta_{1j}$ (Declining health status) $_{ij} + \beta_{2j}$ (Chronic Disease) $_{i-1,j}$

$+ \beta_{3j}$ (*Medical Expenditure*) $_{i-1,j} + \beta_{4j}$ (*Income*) $_{i-1,j} + \beta_{5j}$ (*Wealth*) $_{i-1,j}$

$+ \beta_{6j}$ (*Cognitive functioning*) $_{i-1,j} + \beta_{7j}$ (Married) $_{i-1,j}$

$+ \beta_{8j}$ (*Family Size*) $_{i-1,j} + \beta_{9j}$ (West region) $_{ij} + \beta_{10j}$ (Urban) $_{ij}$

$+ \beta_{11j}$ (Other insurance) $_{ij} + \beta_{12j}$ (Time) $_{ij}$ $\qquad$ (i = 1, 2)

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age) $+ \gamma_{02}$ (*Education*) $+ \gamma_{03}$ (Female) $+ \gamma_{04}$ (White) $+ u_{oj}$

$\beta_{n,j} = \gamma_{n,0}$ $\qquad\qquad\qquad$ (n = 1, 2, …12)

(The variables in Italic were centered around the grand means.)

The HGLM Bernoulli model calculates the probability of a binary outcome by generating logit coefficients. At level 1 (interview-level), the dependent variable, $Y_{ij} = \log [p/(1-p)]$, represents the probability that Medigap will have been purchased by

individual j by time period i (i = 1 for Wave II and i =2 for Wave III). Time-varying

predictors are included at this level, including both previous and current observations.

There is no term for the level 1 error variance because the variance is completely

determined by the mean for binary variables. At level 2 (participant-level), time-invariant

predictors are included. u_{oj} is assumed as a random variable with zero mean. The

covariates are entered as fixed effects because of lack of variability within persons--only

two waves of data analysis. In addition, the personal-level weights associated with each

wave were incorporated in the models to counter-balance the oversamples for African

Americans and residents of Florida.

Chapter Four: Results

This chapter presents the findings of the study. First, a descriptive analysis of the characteristics of the study sample and their Medigap coverage is presented. Second, correlations between predictors and Medigap purchases are reviewed. Third, findings explaining Medigap coverage and the results of hypothesis testing are discussed.

Descriptive Analysis

Table 3 presents descriptive statistics of the sample. Data are drawn from the Asset and Health Dynamics Among the Oldest-Old Survey (AHEAD), conducted in 1993 (Wave I), in 1995 (Wave II) and 1998 (Wave III)[1]. At Wave I, the study sample ranged in age from 70 to 100 years, with a mean age of 76.3 (SD=5.1). Women made up 65.5% of the sample, non-Hispanic Whites 86%. Education ranged from 0 to 17 years, with a mean of 11.5 years (SD=3.2).

Two thirds of the study sample reported their health remained the same as compared with their last interviews, 64.8% at Wave II and 57.7% at Wave III. However, more respondents reported worse health status (25.4%) than better (9.8%), From Wave II to Wave III, the proportion reporting improved health even decreased (9.8% vs. 8.4%), while those reporting deteriorated health increased (25.4% vs. 33.9%). This decline of self-reported health for the aged is consistent with the other findings on their health status. Based on further analysis on health change between waves, 56.5% of respondents reporting deteriorated health at Wave II claimed continued health deterioration at Wave

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[1] Starting from 1998, the AHEAD study was merged with the Health and Retirement Study (HRS).

III. This compares to only 24.4% of those reporting health improvements at Wave II who continued to report improvement at Wave III.

Table 3. Descriptive statistics of the sample (n=2756)

	AHEAD WI		AHEAD WII		AHEAD WIII	
Age	76.3	(5.1)				
Education	11.5	(3.2)				
Female (%)	65.5					
White (%)	86.0					
Reported health change (%)	N/A					
Improved			9.8		8.4	
Deteriorated			25.4		33.9	
Unchanged			64.8		57.7	
Chronic disease conditions	1.3	(1.1)	1.8	(1.3)	2.1	(1.3)
Total health care expenditures ($) (in thousands)*	6.3	(18.1)	5.5	(38.4)	5.6	(26.0)
Household income ($) (in thousands)	25.9	(31.6)	27.1	(34.9)	28.1	(34.4)
Household wealth ($) (in thousands)	178.0	(290.7)	256.2	(950.7)	255.3	(775.9)
Cognitive functioning	20.9	(5.2)	21.0	(5.1)	21.0	(5.1)
Married (%)	42.0		39.0		35.3	
Family Size	1.7	(0.9)	1.7	(1.0)	1.7	(0.9)
West region (%)	16.2		16.2		16.3	
Urban (%)	75.5		75.4		75.0	
Other supplemental insurance (%)	N/A		34.4		37.6	
Government-sponsored (%)			11.5		9.9	
Employer-sponsored (%)			24.4		28.6	
Medigap coverage (%)	N/A		67.7		34.5	

*For ease of cross-wave comparison, the total health care expenditures have been transformed to one year spending at Wave II and Wave III; N/A for the variables unavailable in the specific wave.

The number of reported chronic disease conditions by wave is increasing as presented in Figure 2. The mean number of chronic disease conditions for the study sample at Wave I is 1.3 with the standard deviation of 1.1; the mean at Wave II is 1.8 with the standard deviation of 1.3; and the mean at Wave III is 2.1 with the standard deviation of 1.3. The average number of reported chronic disease conditions nearly doubled from Wave I to Wave III. This also reflected the deteriorating health status of the study sample.

Figure 2. Distribution of Number of Reported Chronic Disease Conditions by Wave
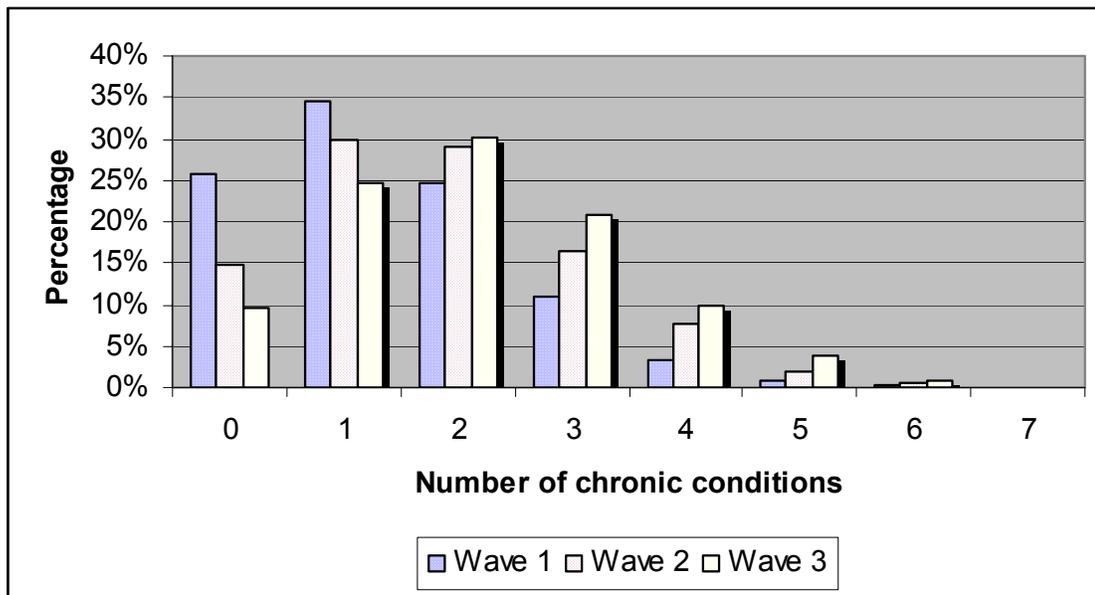
The total health care expenditures at Wave I were only reported by the Financial Respondent, but imputed for all cases by the Rand Center for the Study of Aging. At Wave I, the question was constructed to measure the previous year's medical expenditures, while beginning with Wave II it was changed to measure the previous two-year's medical expenditures. For this reason, total health care expenditures are not

directly comparable between Wave I and the following Waves. By looking at Wave II and III, the average health care expenditure only increased 5% from Wave II to Wave III, e.g., $10.9 and $11.5 thousand respectively. However, the variability was much less at Wave III. As presented in Table 3, the total health care expenditures have been averaged to one year spending for ease of comparison with the measure at Wave I. For some reason, the total health care expenditures have dropped about 10% from Wave I to Waves II & III.

The average household income increased 5% from Wave I to Wave II, and then leveled off at Wave III. In comparison the average household wealth jumped 44% from Wave I to Wave II, and then slightly decreased at Wave III. Medical expenditures, household income and wealth were not adjusted for inflation.

Cognitive functioning was measured by a 0-35 point scale. The average index stayed the same at 21 points (SD=5.1) across the waves. In the article by Herzog and Wallace (1997) on the measures on cognitive functioning in the AHEAD study, the total score for AHEAD Wave I respondents approximates the normal distribution, with a mean of 19.4 and standard deviation of 5.4. This lower mean reflects the fact that Wave I respondents have slightly lower cognitive functioning compared to the sample of this study. Identified in a different population (Henderson, 1986), there was a prevalence rate of 5% severely cognitively impaired individuals among community residents aged 70 and older. When applying this figure to the AHEAD sample distribution, Herzog and Wallace proposed a cut-off score of 8 out of 35 in total as indicative of severe cognitive impairment. Based on the studies above, 1.4% of sample respondents in this study could be considered as severely cognitively impaired.

The average family size was 1.7 with the standard deviation of 0.9, which remained the same across the three waves. However, the proportion of the study sample who were married has shown a clear decline. At Wave III, only 35.3% of the study sample reported married status compared with 42% at Wave I. The proportion of the study sample living in West region (16.2%), and the proportion living in urban areas (75.5%) didn't show much variability across the waves.

By design all members of the study sample had Medicare coverage. At AHEAD Wave I, the number of beneficiaries who privately purchased Medicare supplemental coverage (Medigap) was unknown because the detailed health insurance information hadn't been asked. Table 4 shows the distribution of demand for Medigap coverage at Waves II & III. Medigap purchases decreased dramatically from 67.7% (1,866 respondents) at Wave II to 34.5% (952 respondents) at Wave III. The Discussion of Results has more details in explaining this phenomena. Among 67.7% of the respondents purchasing Medigap at Wave II, less than half, only 832 respondents, remained with the coverage at Wave III. In the meantime, other forms of supplemental insurance, e.g., government or employer sponsored coverage, increased slightly from 34.4% at Wave II to 37.6% at Wave III.

Table 4   Medigap purchases at Wave II vs. at Wave III

Medigap purchases at Wave II	Medigap purchases at Wave III			
	No	Yes	Total	
No	770	120	890	32.3%
Yes	1034	832	1866	67.7%
Total	1804	952	2756	
	65.5%	34.5%		

Bivariate Analysis

A bivariate correlation matrix for all variables used in this analysis at baseline is shown in Table 3. At the bivariate level, the relationship between dependent variable and independent variables is consistent for most hypotheses. However, there are some exceptions.

As proposed in hypotheses (#1-#2, #4, #7-#11, #13), private Medigap purchases were significantly and positively associated with being white, having higher education, being married, having higher medical expenses, having more income and assets, and having better cognitive function. They were negatively associated with being older or living in the West region. However, hypotheses (#3, #5, #6, #12, #14, #15) were not supported at the bivariate level. For example, being female was negatively related to Medigap purchases, which is opposite to the prediction of hypothesis three. Neither of the health status variables showed the proposed relationship: Declining self-reported health status was negatively associated with Medigap purchases and the number of chronic conditions didn't show significant relationship with Medigap purchases. In addition, three of five contextual variables—household size, living in urban areas, having other types of supplemental coverage—also failed to show the expected relationship with the dependent variable. Contrary to expectations, beneficiaries living in urban areas were less likely to have Medigap coverage, while those having other types of supplemental coverage were more likely to have this coverage.

Similar results of correlations were observed between variables for the second wave. However, being female is no longer associated with Medigap purchases. Also

beneficiaries having other types of supplemental coverage were less likely to have Medigap coverage, which is more consistent with expectations.

Correlations among independent variables were reviewed to identify potential problems with multicollinearity. The strong and positive correlations between race, education, household income, household wealth, and cognitive functioning were observed in the study sample and are also firmly established in the literature. The strong correlation between marital status and household size is the only one approaching the high end of the normally acceptable range (coefficient=0.6, significant at the $p \leq .001$ level). In the conceptual framework of bounded rationality, both marital status and household size are believed as the contextual variables influencing the decision making of Medigap purchases. They are meant to measure different types of family kin relationships and family support. Although there is potential exposure to violation of the statistical assumption on multicollinearity, both of them were included in the multilevel analyses.

Table 5   Correlations for All Variables at Baseline (N=2756)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age (#)	--															
2. Education (#)	-0.10 ***	--														
3. Female (0,1)	0.14 ***	-0.06 **	--													
4. Non-Hispanic Whites (0,1)	0.00	0.31 ***	-0.07 ***	--												
5. Declining Health Status (0,1)	0.05 **	-0.04 *	0.02	-0.03	--											
6. Chronic Disease Conditions (#)	0.02	-0.13 ***	0.02	-0.09 ***	0.15 ***	--										
7. Total Health Care Expenditures (#)	0.01	0.01	-0.06 **	0.00	0.13 ***	0.28 ***	--									
8. Household Income (#)	-0.22 ***	0.44 ***	-0.33 ***	0.26 ***	-0.06 **	-0.13 ***	0.07 ***	--								
9. Household Wealth (#)	-0.12 ***	0.36 ***	-0.18 ***	0.34 ***	-0.06 ***	-0.15 ***	-0.02	0.46 ***	--							
10. Cognitive Functioning (#)	-0.28 ***	0.47 ***	-0.03	0.35 ***	-0.05 **	-0.09 ***	-0.01	0.34 ***	0.29 ***	--						
11. Marital Status (0,1)	-0.24 ***	0.14 ***	-0.40 ***	0.14 ***	0.01	-0.07 ***	0.02	0.49 ***	0.27 ***	0.14 ***	--					
12. Household Size (#)	-0.18 ***	0.00	-0.24 ***	-0.06 ***	0.00	0.00	0.05 *	0.25 ***	0.07 ***	0.00	0.60 ***	--				
13. West Region (0,1)	-0.03	0.17 ***	-0.06 ***	0.14 ***	-0.06 ***	-0.03	0.03	0.15 ***	0.11 ***	0.14 ***	0.08 ***	0.01	--			
14. Urban (0,1)	-0.03	0.16 ***	-0.03	-0.06 ***	-0.06 **	-0.03	0.03	0.13 ***	0.04 *	0.09 ***	-0.01	0.00	0.19 ***	--		
15. Other Supplemental Insurance (0,1)	0.03	-0.02	0.01	-0.06 **	0.04 *	0.07 ***	0.06 **	0.00	-0.06 **	-0.05 **	-0.02	-0.01	-0.07 ***	-0.03	--	
16. Medigap Coverage (0,1)	-0.04 *	0.24 ***	-0.05 **	0.25 ***	-0.05 *	-0.02	0.04 *	0.24 ***	0.28 ***	0.23 ***	0.12 ***	0.02	-0.10 ***	-0.06 **	0.14 ***	--

*p<.05; **p<.01; ***p<.001.

Multilevel Analyses

The following section is organized around the research questions and hypotheses as presented in Chapter Three. In this section, the research questions are presented, accompanied by the associated hypotheses, and then the results of the analysis are given. Table 4 presents the results from multilevel analysis in which each model was tested for the corresponding research question. The study results are summarized at the end of this section.

Time was not associated with hypotheses testing but included in the baseline model as solo level 1 predictor to test whether Medigap purchases change over time. The model output indicated significant variability in Medigap purchases in the study sample, Chi-square (df = 2755) = 8101.6, p < .001. The variation of log-odds of Medigap purchases among individuals was estimated to be 4.0 with standard deviation 2.0. It demonstrated time had significant impact on Medigap purchases. At AHEAD Wave II interview, respondents reported a significantly higher probability of Medigap purchases (P=1/(1+EXP(-1.34)=79.2%) than at the time of Wave III (P=1/(1+EXP(-1.34 +2.17)=30.4%). In other words, the probability of Medigap purchases declined 61.7% from Wave II to Wave III. This sharp decline in Medigap coverage is consistent with the observation in the descriptive analysis. When other variables were subsequently included in multilevel analyses, the magnitude of this time effect remained the same in every model tested.

Table 6: The Multilevel Overdispersed Bernoulli Analysis of Medigap Purchases (N=2,756)

	Base Model Coef. (SE)	Base Exp. of Coef.	Model 1 Coef. (SE)	M1 Exp. of Coef.	Model 2 Coef. (SE)	M2 Exp. of Coef.	Model 3 Coef. (SE)	M3 Exp. of Coef.	Model 4 Coef. (SE)	M4 Exp. of Coef.	Model 5 Coef. (SE)	M5 Exp. of Coef.	Final Model Coef. (SE)	Final Exp. of Coef.
Intercept, B_{00}	1.34 (.06)***		-.25 (.18)		-.31 (.19)		-.26 (.19)		-.25 (.20)		-.20 (.20)		1.00 (.25)***	
Time-invariant variables														
Age, B_{01}			.00 (.01)	1.00	.00 (.01)	1.00	.00 (.01)	1.00	.01 (.01)	1.01	.02 (.01)	1.02	.02 (.01)	1.02
Education, B_{02}			.09 (.02)***	1.09	.09 (.02)***	1.09	.09 (.02)***	1.09	.05 (.02)**	1.05	.03 (.02)	1.03	.07 (.02)***	1.07
Female, B_{03}			.10 (.11)	1.11	.10 (.11)	1.11	.12 (.11)	1.13	.30 (.11)**	1.35	.27 (.11)*	1.31	.20 (.12)	1.22
White, B_{04}			1.64 (.16)***	5.16	1.64 (.17)***	5.16	1.64 (.17)***	5.16	1.40 (.17)***	4.06	1.29 (.17)***	3.63	1.15 (.17)***	3.16
Time-varying variables														
Better self-reported health status , B_{10}					.08 (.17)	1.08	.03 (.17)	1.03	.04 (.17)	1.04	.05 (.17)	1.05	.09 (.17)	1.09
Worse self-reported health status, B_{20}					-.05 (.11)	0.95	-.11 (.11)	0.90	-.10 (.11)	0.90	-.09 (.11)	0.91	-.10 (.11)	0.90
Numb of Chronic Disease, B_{30}					.04 (.04)	1.04	.02 (.04)	1.02	.05 (.04)	1.05	.05 (.04)	1.05	.07 (.04)	1.07
Medical Expenditure, B_{40}							.08 (.03)**	1.08	.07 (.03)*	1.07	.07 (.03)*	1.07	.08 (.03)**	1.08
Household Income, B_{50}									.21 (.08)**	1.23	.20 (.08)*	1.22	.25 (.08)**	1.28
Household Wealth, B_{60}									.09 (.02)***	1.09	.09 (.02)***	1.09	.09 (.02)***	1.09
Cognitive Functioning, B_{70}											.04 (.01)**	1.04	.04 (.01)***	1.04
Married, B_{80}													.05 (.15)	1.05
Household Size, B_{90}													-.00 (.09)	1.00
West Region, B_{100}													-1.01 (.14)***	0.36
Urban, B_{110}													-.86 (.12)***	0.42
Other Insurance, B_{120}													-.84 (.09)***	0.43
Time, B_{130}	-2.17 (.08)***	0.11	-2.21 (.08)***	0.11	-2.23 (.08)***	0.11	-2.23 (.08)***	0.11	-2.28 (.08)***	0.10	-2.28 (.08)***	0.10	-2.31 (.09)***	0.10

Model Fit	Var. Comp.	Chi-square	Var. Comp.	Chi-square	Var. Comp.	Chi-square	Var. Comp.	Chi-square	Var. Comp.	Chi-square	Var. Comp.	Chi-square	Var. Comp.	Chi-square
	4.00	8102***	3.89	7723***	3.93	7749***	3.90	7712***	3.82	7570***	3.78	7510***	3.55	7295***

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

Research Question 1

What socio-demographic variables influence Medigap purchases?

Hypothesis 1: older Medicare beneficiaries will be less likely to purchase Medigap than younger ones.

Hypothesis 2: higher educated beneficiaries will be more likely to purchase Medigap than less educated ones.

Hypothesis 3: female Medicare beneficiaries will be more likely to purchase Medigap insurance than males.

Hypothesis 4: Whites will be more likely to purchase Medigap insurance than African Americans.

Model 1 added baseline demographic variables (at Wave I) as the level-2 time-invariant predictors. Education and race exerted significant impact on Medigap purchases. Hypotheses #2 and #4 were supported. Holding other predictors constant at their average or benchmark, the probability for white Medicare beneficiaries to purchase Medigap coverage is 33.7% higher than African American beneficiaries. And a one-year increase of education above the mean increased the probability of Medigap purchases of 5.1%. Unexpectedly, age and gender didn't show significant impact on Medigap purchases. Hypotheses #1 and #3 were not supported.

Research Question 2

What is the impact of health status on Medigap purchases?

Hypothesis 5: declining self-reported health status will increase the likelihood of Medigap purchases.

Hypothesis 6: the greater number of chronic disease conditions will increase the subsequent likelihood of Medigap purchases.

Model 2 added the health status variables as the level-1 time-varying predictors. Two health status variables were used in the study, the change in health over time, and the total count of chronic disease conditions (high blood pressure, diabetes, cancer, chronic lung disease, heart problems, stroke, psychiatric problems, and arthritis). Neither of the two health status variables had a statistically significant impact on Medigap purchases. Due to the concerns of the uneven distribution of changes on the self-reported health, two dummy variables were created and substituted in the model which are better self-reported health status and worse self-reported health status. Then the hypothesis five could be slightly changed to the worse self-reported health status (yes/no), instead of the declining health ranged from -4 (the greatest improvement) to 4 (the greatest decline), as a predictor of Medigap purchases. The model output still didn't show any significant impact from these two variables on Medigap purchases. Hypotheses #5 and #6 were not supported. Education and race produced the same strong impact on Medigap purchases when controlling for health status covariates.

Research Question 3

What is the impact of total health care expenditure on Medigap purchases?

Hypothesis 7: higher total health care expenditures at an earlier occasion will increase the likelihood of Medigap purchases at a later occasion.

Model 3 added the health care expenditure variable as the level-1 time-varying predictor. Total health care expenditures had been logged and centered around the grand

mean. This hypothesis was supported. Holding other predictors constant at their average or benchmark, a one-unit increase in medical expenditure above the mean increased the probability of Medigap purchases by 2.5%. Again, education and race produced the same strong impact on Medigap purchases when controlling for other factors. Among the three, race exerted the strongest effect on Medigap purchases.

Research Question 4

What financial constraints predict the Medigap purchases?

Hypothesis 8: higher household income will increase the likelihood of Medigap purchases.

Hypothesis 9: higher household wealth will increase the likelihood of Medigap purchases.

Model 4 added financial resources as the level-1 time-varying predictors. Both household income and wealth had been logged and centered around the grand means. Hypotheses #8 and #9 were supported. Holding other predictors constant at their average or benchmark, a one-unit increase in household income above the mean increased the probability of Medigap purchases of 2.6%, a one unit increase in household wealth resulted in a 0.4% probability increase. In model 4, not only did education, race and health care expenditure show significant impact on Medigap purchases, gender exerted a significant impact for the first time. Female beneficiaries have 0.5% higher probability of purchasing Medigap than males. Race still showed the strongest impact, though.

Research Question 5

Is cognitive ability related to decision making for purchasing Medigap?

Hypothesis 10: beneficiaries with better cognitive functioning will be more likely to purchase Medigap than those with cognitive limitations.

Model 5 added cognitive functioning as the level-1 time-varying predictor. This hypothesis was supported. Cognitive functioning was a significant predictor of Medigap purchases. Consistent with expectations, beneficiaries with better cognitive functioning were more likely to purchase Medigap coverage than those with cognitive limitation. Holding other predictors constant at their average or benchmark, a one-point increase in cognitive functioning index above the mean increased the likelihood of Medigap purchases to 1.04 (=EXP(0.04)) times. In model 5, education was no longer significantly related to Medigap purchases. Race still had the strongest impact, followed by gender and household income.

Research Question 6

What contextual variables would be related to decision making for purchasing Medigap?

Hypothesis 11: married beneficiaries will be more likely to purchase Medigap than those unmarried or widowed.

Hypothesis 12: a larger number of household members will increase the likelihood of Medigap purchase.

Hypothesis 13: beneficiaries living in the West region will be less likely to purchase Medigap than those living in the Northeast, Midwest and South regions.

Hypothesis 14: beneficiaries living in urban/suburban areas will be more likely to purchase Medigap than those living in rural areas.

Hypothesis 15: beneficiaries with other forms of supplemental insurance will be less likely to purchase Medigap than those with none.

The final model was tested to investigate the hypotheses that the Medigap purchasing decision is influenced and bounded by the person's internal and external constraints. It added contextual variables as the level-1 time-varying predictors. In total, it included time-invariant social-demographic variables, time-varying health status, health care expenditures, income and wealth, cognitive ability, marital status, family size, geographic locations, and other insurance.

Marital status and household size unexpectedly didn't show strong impact. Hypotheses #11 and #12 were not supported. However, all other contextual variables manifested significant impact. Beneficiaries living in the West region reported a significantly lower likelihood of Medigap purchases (M = EXP(-1.01) = 0.36) than those living in the Northeast, Midwest and South regions. Hypothesis #13 was supported. And Medicare beneficiaries who had other forms of supplemental insurance reported significantly lower likelihood of Medigap purchases (M = EXP(-.84) = 0.43) than those with none. Hypothesis #15 was supported. Interestingly, beneficiaries living in urban/suburban areas reported significantly lower likelihood of Medigap purchases (M = EXP(-.86) = 0.42) than those living in rural areas. Hypothesis #14 is the only one that the findings showed an opposite effect than proposed.

Education, race, medical expenditure, household income and wealth, and cognitive functioning still manifested significant impact on Medigap purchases even when all the

covariates were controlled. Gender was no longer a significant predictor when all the covariates were controlled. Again, none of the health status variables showed significant impact on Medigap purchases. The strongest effects on Medigap purchases were race and living in the West region.

The predictor variables contributed significantly to the variance in Medigap purchases, as evidenced by final model Chi-square of 7294.7 compared to 8101.6 at baseline. However, the deviance statistics comparison of model fit is not available for HGLM when using the Penalized Quasi-Likelihood (PQL) estimation procedure. The final model still indicated significant variability in Medigap purchases among the study sample when the covariates were controlled for. The variation of log-odds was estimated to be 3.6 with standard deviation 1.9.

Discussion of the Results

Medigap purchases changed over time. This study found that the probability of purchasing Medigap by the elderly declined significantly from Wave II to Wave III. This decline in Medigap coverage may be driven by rapid growth in Medicare HMO plans (Laschober et al., 1999; Rice et al., 2002). At that time, the Medicare HMO was deemed a cost effective way to consolidate traditional Medicare and Medigap into one comprehensive plan. Therefore, many beneficiaries chose to enroll in Medicare HMOs for the enhanced benefits and cost savings at the cost of a very limited network. Under this changing environment, it was more interesting to investigate the long term impact of different decision-making variables on Medigap purchases.

This study hypothesized that those beneficiaries who were white, younger, female,

and better educated would be more likely than their counterparts to purchase supplementary insurance. The results of this study indicated that socioeconomic factors *did* have an effect on Medigap purchases. Race and Education demonstrated significant impact on Medigap purchases in all the models tested. This was consistent with prior investigation's predictors of Medigap coverage (Rice & McCall, 1985; Garfinkel et al., 1987; Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997; Ettner, 1997; Pourat et al., 2000). Among all the predictors, the largest difference in the likelihood of Medigap purchases resides in racial impact. White Medicare beneficiaries were more likely to purchase Medigap coverage than African Americans. Persons with higher educational levels were also more likely to purchase Medigap coverage.

However, Age and Gender didn't show a significant effect on Medigap purchases in this study. This finding is counter to the bulk of previous research. When examining the age impact on Medigap purchases by all Medicare beneficiaries with a broader age range (65 and over), the previous studies found that older persons were less likely to purchase Medigap coverage. However, the sample of the present study was restricted to the oldest old, who were 70 and older at the 1993 baseline interview. The fact that the impact of age on Medigap purchases was not statistically significant could be due to the study's sample selection criteria. The lack of variation in age might prevent the association of age to Medigap purchases in the expected direction. In order to investigate the age impact, future research would need to carefully consider the appropriate age range to be included or use the bracket with research-supported cutoff points.

Another possible explanation for no relationship between age and Medigap purchases relates to the increased popularity of a competing coverage—Medicare HMOs—during

the study time. The younger beneficiaries were more likely to quickly react to the market and take advantage of the enhanced benefits and cost saving opportunities from Medicare HMO plans. They may have chosen Medicare HMOs over Medigap in their best interests. Therefore, the declining membership from younger Medicare beneficiaries could impact on the relationship as found in the prior studies.

In the prior literature, a number of studies found female Medicare beneficiaries were more likely to purchase Medigap insurance than males. The tendency of avoiding risk by females and gender role expectation for family support were proposed as the explanation for such a relationship. However, gender didn't show a stable relationship with Medigap purchases across the tested models in this study. Female beneficiaries appeared to have a higher tendency to purchase the coverage than males when the financial and cognitive functioning variables were entered into the model. However, they were not significantly related once the contextual variables were introduced and all the covariates were controlled for in the final model. Those contextual variables are marital status, household size, living in the West region and living in urban/suburban areas. Gender's association with Medigap purchases which disappeared after including the contextual variables in the study implies a more complex relationship beyond the personal characteristics. For the oldest old, the females are older than males and many are likely to be survival spouses because of the generally longer life expectancies, Given the fact that this study sample is predominantly females (65.5%), and would be more so at the following waves, the gender influences on Medigap purchase could be different with the prior findings due to the alternate facts having been controlled in the study. It indicates the need for additional research, for example, to include interactions between gender and the contextual

variables such as marital status and family size. It is possible females could feel a stronger self-control over their health conditions if they live alone, while they need more protection from supplemental health insurance when they have to take care of their family members. Alternatively, females might feel it's difficult to follow new technologies and information if there are no husband or family members available to help. Another example for additional research would be to separate the AHEAD sample into female and male subgroups and specifically study their Medigap purchasing decisions.

It's also important to note that all prior findings were based on cross-sectional studies, while the present study used a longitudinal design. It could be possible that the earlier studies did not adequately address the gender relationship with Medigap purchases. More longitudinal studies are needed in future research to better understand the gender impact.

The prior literature has been inconclusive about the effect of health status on the likelihood of having private insurance in older age. The body of empirical evidence shows mixed findings on health status. The majority of studies have not found a significant relationship between self-reported health and disability and the demand for supplemental insurance (Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997; Ettner, 1997; Pourat et al., 2000). Only a few studies found self-perceived health status and the presence of chronic conditions to be important determinants of policy ownership (Rice & McCall, 1985; Garfinkel et al., 1987; Marquis & Long, 1995). However, those studies were either conducted a long time ago (Rice & McCall, 1985; Garfinkel et al., 1987) or focused on a much younger population of active employees (Marquis & Long, 1995).

It was hypothesized in this study that elderly persons with declining health condition, controlling for the current health status, were more likely to purchase Medigap as an attempt to insure against future high medical expenses. This hypothesis was not supported. Neither a changing self-reported health status nor the presence of most common chronic conditions was significantly related to Medigap purchases.

No effect of health status on the likelihood of having private Medigap coverage in old age could result from the supply and demand in the Medigap market. On the supply side, commercial insurers have medical underwriting and pre-existing conditions in risk selection of Medigap coverage. However, there are also some non profit plans such as Blue Cross and Blue Shield plans which do provide highly subsidized Medigap products with guaranteed issue as the insurer of last resort. The mix of insurers in the private Medicare Supplemental insurance market might conceal the risk selection on health status. On the demand side, the person experiencing health deterioration should be more willing to purchase insurance coverage. The reason that this proposition was not supported in the study could be the effect of risk selection by private health insurance carriers. It's also possible the less healthy might have failed to enroll in Medigap coverage as a result of procrastination or confusion. In addition, interval time measurements in the AHEAD study could also impact on this relationship. This study relied on measures of health status and Medigap purchases that were approximately two years apart. Therefore it may not be sensitive enough to the change in enrollment decisions. Future research examining the health effect on Medigap purchases could design the measurements within a shorter time span to be more in line with the Medigap 12-month enrollment period.

Higher total health expenditures were strongly associated with Medigap purchases. Consistent with other findings, prior health utilization was highly correlated with current utilization, and higher average medical expenditures were more related to the purchase of insurance coverage. Higher total health expenditures could be both the reason for and consequence of Medigap purchases. It is possible beneficiaries purchased Medigap insurance to protect against the anticipated high health care spending. It is also possible having Medigap coverage reduced financial barriers to health care, and even provided incentive for the consumption of high quality health care.

Financial resources measured both by household income and household wealth are a strong predictor of individual Medigap purchases. Like in any market economy, purchasing power is one of the most important determinants of private insurance coverage. This is consistent with the rationality and bounded rationality hypotheses of this study, as well as previous research. However, prior studies relied on either household income or household wealth exclusively. This study found the purchase of Medigap was related to both household income and wealth with household income having a moderately stronger impact. This finding could be explained by people's perception of the financial aspects of health insurance purchases. If insurance purchasing was viewed as one standard living expense, then the consumption of this product would depend on the annual cash flow (household income). If it was viewed as an investment in long term health condition, then it could be funded by the accumulated assets (household wealth). Wealth can be used to supplement income to engage in good health behaviors such as dental care, as well as pay for medical expenses such as prescriptions and transportation to medical appointments. The findings may indicate that health insurance, specifically,

Medigap coverage, is both a living expense and an investment from the Medicare beneficiary's point of view. Due to the considerable reliance on medical services at older ages, health insurance has become one of the most indispensable living expenses, as demonstrated by a stronger income impact on Medigap purchases in this study.

Some of the most important findings concern the impact of internal and external constraints on the decision to purchase private insurance in the Medigap market. Cognitive functioning showed significant impact on Medigap purchases. Beneficiaries with better cognitive functioning were more likely to purchase Medigap than those with cognitive limitations. No prior research has included explanatory variables related to individual's cognitive ability. The findings of the study support that for the oldest old, cognitive impairment is a risk factor in the decision-making process for purchasing supplemental health insurance. With limited cognitive ability, the elderly might not have the ability to efficiently pursue and process the information in order to make the right choice, in spite of the likely benefits.

Marital status and household size were treated as the contextual variables in this study to be consistent with the bounded rationality theoretical framework. Unexpectedly, marital status and household size both had no statistical impact on Medigap purchases after controlling for other factors. This is counter to the findings in other studies that family size/marital status was an important determinant of insurance purchase. It is possible that the relatively high correlation of these two variables might violate the statistical assumption on multicollinearity. Future research could further investigate it by including one measure in the model a time. It is also possible that the nature of longitudinal study might reveal a more complex relationship. Family size/marital status

was used as the proxy of the family structure. In this study, the sample of married only was limited to the respondents who reported being married at the interview, but did not include anyone reported unmarried but living with others/partners. However, the decision of purchasing Medigap could be made by family members on behalf of Medicare beneficiaries, especially in their older age. It indicates the need for future research to investigate more about the impact of social support factors on Medigap purchasing decisions. It would be useful to find out which family members are the primary decision makers and how the information interaction is carried over among the family members. It would also be interesting to find out how effectively the social support from a broader network (e.g., caregivers or financial advisers) influences the decision making.

This study found that geographical region was significantly related to Medigap purchases. Beneficiaries living in the West region were less likely to have supplemental coverage than those living in the Northeast, Midwest and South regions, which is consistent with the findings of Garfinkel et al. in 1987. The region difference in private supplemental insurance reflects the availability of insurance in various geographic areas. This result was assumed to be due to a combination of few Medigap plans and more competing Medicare HMOs in West region. Living in urban/suburban areas was also related to Medigap purchases. However, this was in the opposite direction from that predicted and from the prior findings (Browne & Doerpinghaus, 1995; Hopkins & Kidd, 1996). Beneficiaries living in urban/suburban areas were found less likely to purchase Medigap insurance in this study. The opposite direction of the relationship might be driven by the same reason as the dramatic decline in Medigap memberships. Medicare beneficiaries living in urban/suburban areas who had Medigap coverage were more likely

to switch to Medicare HMO plans where the most managed care plans were available.

Having other forms of supplemental insurance was negatively related to Medigap purchases. Since the effort to reduce marketing abuses and standardize Medigap policies to 10 different benefit packages under OBRA 1990, the Medigap market has experienced significant changes. Among other positive impacts, there is less duplication of existing coverage and less abusive sales practices. In fact, it is against the rules to sell a Medigap policy to those beneficiaries with coverage from Medicaid. The skyrocketing health care cost is another contributing factor which has led to more price sensitive consumers and reduced duplicated coverage. The Medicare beneficiaries with access to alternative supplemental insurance coverage, such as Medicaid, other government sponsored insurances, and employment-based post-retirement insurance, would view no advantage to being over-insured from Medigap purchases. As a result, the number of beneficiaries with multiple supplemental insurances has dramatically decreased.

Chapter Five: Discussion and Conclusion

This chapter summarizes the overall study and major findings. It also discusses the strengths and limitations of the study. Implications for practice and Medicare policy, and recommendations for future research are presented at the end.

Summary of the Study

The purpose of the study is to examine the decision factors associated with private Medicare supplemental insurance purchases by Medicare beneficiaries. The conceptual framework for this study is derived from Simon's Bounded Rationality Theory (1955, 1957). A bounded rationality model for Medigap purchases is proposed, which assumes Medicare beneficiaries make Medigap purchase decisions based on their expected utilities, while bounded by their internal and external constraints. Since no study has been conducted on the predictors of Medigap purchases by the oldest old using a longitudinal design, this study addresses a significant gap in the existing research literature.

This study is a secondary data analysis, utilizing a multi-year prospective cohort research design. Data for this study are drawn from the Asset and Health Dynamics Among the Oldest-Old Survey (AHEAD), which is a longitudinal, multipurpose survey of a nationally representative sample of community-dwelling adults aged 70 and older. 2756 non-Hispanic Medicare beneficiaries at the 1993 baseline interview were selected as the study sample. This sample was followed at Wave II and Wave III in 1995 and 1998 surveys. The statistical techniques used are Hierarchical Generalized Linear Modeling (HGLM) for the time-dependent relationship of the Medigap purchasing decision.

Six research questions were addressed. The first four questions are focused on the impact of the traditional factors—demographic characteristics, health status, health care utilization, and financial resources for Medigap purchases. The fifth question focuses on the impact of cognitive limitation, and the last question, as a counterpart, focuses on the impact of external constraints on decision making in Medigap purchases.

The initial descriptive analysis of the sample revealed that Medigap purchases by the oldest old dramatically decreased from 67.7% at AHEAD 1995 Wave II to 34.5% at AHEAD 1998 Wave III. Among 67.7% of Medigap purchases at Wave II, less than half remained with the coverage at Wave III. The share of beneficiaries with supplemental benefits from other sources, such as government or employer sponsored coverage, was relatively stable over the period. This phenomenon is a direct result of Medicare beneficiaries switching from Medigap to Medicare HMO policies (Laschober et al., 1999; Rice et al., 2002). This shift between 1996 and 1998 occurred during a period characterized by both a rapid increase in the availability and popularity of Medicare HMOs and double-digit increases in Medigap premiums. Another observation from the descriptive analysis is the deterioration of health status in the study sample, reflected both by self-reported health and the number of reported disease conditions.

The bivariate analysis of the sample showed that beneficiaries who purchase private Medigap coverage were more likely to be younger, white and married, and more likely to have higher education, higher medical expenses, more income and assets, and better cognitive functioning, as well as more likely to live in the Northeast, Midwest and South regions. This is consistent with the research literature (Rice & McCall, 1985; Garfinkel et al., 1987; Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997;

Ettner, 1997; Pourat et al., 2000). However, gender, health status, household size, and living in urban areas didn't show the proposed relationship at bivariate level.

The HGLM analysis revealed that for the oldest old, the decision to purchase private insurance in the Medigap market was related to socio-demographic and economic factors, while limited by cognitive functioning and influenced by environmental factors. Demographic characteristics such as race and education demonstrated significant impact on Medigap purchases. Race has the strongest impact among all predictors. There is a persistent and substantial gap in Medigap purchases between African American and non-Hispanic whites. The less educated are also substantially less likely to purchase Medigap coverage. The study found higher total health expenditures were positively related to Medigap purchases. It also supported the hypothesis that financial resources represented by household income and household wealth were strong predictors of individual Medigap coverage.

Consistent with the bounded rationality theory, cognitive functioning, which is viewed as one of the most important internal constraints, manifested statistically significant impact on Medigap purchases. Beneficiaries with better cognitive functioning are more likely to purchase Medigap than those with cognitive limitations. Environmental factors identified in this study also demonstrated strong relationships with Medigap purchases. Beneficiaries living in the West region are less likely to have supplemental coverage than those living in the Northeast, Midwest and South regions. In conformity with theoretical expectations, having other forms of supplemental insurance was negatively related to Medigap purchases.

As discussed at the end of the previous chapter, however, several variables didn't exhibit the expected relationship or were inconsistent with prior findings. Age and Gender didn't show a significant effect on Medigap purchases in this study. Health status variables, either a changing self-reported health status or the presence of most common chronic conditions, didn't impact on Medigap purchases. Living in urban/suburban areas was negatively related to Medigap purchases, opposite to the proposed relationship and the prior findings. Marital status and household size also had little impact on Medigap purchases.

Strengths of the Study

This study has significant strengths. First, it is based on the bounded rationality model (Simon, 1955, 1957), which was developed in light of multiple disciplines including economics, political science, social and cognitive psychology. This model emphasizes that human decision making in the complexity of the real world has both internal and external constraints. This model is useful in studying Medigap purchases since Medicare beneficiaries have to make a choice in purchasing individual coverage. Although previous research on Medigap enrollment recognized the importance of socio-demographic and economic factors (Rice & McCall, 1985; Garfinkel et al., 1987; Wolfe & Goddeeris, 1991; Shea & Steward, 1995; Hurd & McGarry, 1997; Ettner, 1997; Pourat et al., 2000), it has mainly been based on empirical observations. The bounded rationality model makes the decision-making function of Medigap purchases explicit by providing theoretical explanations on framing rational choices in the context of cognitive functioning and environmental constraints.

Second, this study also utilized a more advanced statistical model in examining Medigap purchases. Hierarchical generalized linear modeling (HGLM) is particularly useful in a longitudinal multi-level study design. It takes into account Medicare beneficiaries' behavior change over time, such as purchasing extra health insurance as a precaution against future periods of illness. It also reflects the fact that an individual's current demand for supplemental health insurance depends in part on previous decisions and on his/her future expectations. It has clear advantage over a static model in describing these effects of uncertainty since the time impact on this adaptive behavior of decision making can be captured in the multilevel modeling.

Third, this study used data from the Asset and Health Dynamics Among the Oldest-Old study (AHEAD). This is a high quality longitudinal dataset from a nationally representative sample of community-dwelling adults aged 70 and older. The large number of respondents interviewed for AHEAD, and supplemental oversamples for African Americans, Hispanics, and residents of Florida, made it possible to select a large sample of respondents for this study. The final sample size of 2,756 individuals for this study assured sufficient explanatory power and generalizability of the findings to White and Black community-dwelling Medicare beneficiaries aged 70 and older living in the United States.

Limitations of the Study

This study is not without its limitations. One important threat to internal validity involves possible misspecification of the model due to omission of variables that influence purchasing Medigap coverage as the consequence of conducting secondary data analysis. Supplemental insurance purchases are affected by a number of social support and community-level variables that couldn't be examined in this study because they were either not available in the AHEAD study or were not asked consistently across waves. Some studies have specifically sought to explore possible underlying community-level determinants of the disparities in nongroup (individual) health insurance purchases for the population under the age of 65 (Kawachi and Kennedy, 1997; Saver et al., 2003). In the study conducted by Saver et al., it was hypothesized that the higher levels of inequality on the community-level or state-level measures, such as strength of the local safety net, inequality and social capital measures, would result in members of disadvantaged groups being less likely to purchase nongroup health insurance. A next step to extend this study would be to examine the Medigap purchasing decisions with interactions between micro and macro level factors.

Another area related to Medigap purchases is the supply side factors which are also incomplete in the AHEAD study. The availability of Medigap plans and the level of market competition in a geographic region would be expected to positively influence the probability that consumers enroll in Medigap plans. Although it's not available for the direct measurement of the number of Medigap plans and each market share, the premium of the Medigap coverage could be potentially used to approximate the level of market competition. But the major drawback is that it is also likely to capture the effects of the

other omitted variables: the benefits of Medigap plans and the affordability of Medigap policies. Future research could be conducted to estimate the effect of premium on the demand for Medigap coverage based on detailed information on different Medigap options and supplying data for both insurance takers and decliners.

Implications for Practice and Medicare Policy

This study confirms, as established in the literature, that persons with Medigap coverage have distinctive socio-demographic characteristics, as compared to those without any supplemental insurance. They are better educated, more likely to be white and financially advantaged, and more likely to have better cognitive functioning. Further, the findings of this study have shown little relationship between the beneficiaries' need for services—self-reported health status and chronic disease conditions—and Medigap insurance. It indicates the supplemental coverage is disproportionately provided to the well off. In a less-than-totally comprehensive public health system, traditionally disadvantaged persons are less likely to have private supplemental insurance. This suggests that they bear a disproportionate share of the risks for catastrophic health care expenditures.

On the other hand, the fact that higher total health expenditures are strongly related to Medigap purchases suggests the attractiveness of Medigap to high utilization beneficiaries. The first dollar coverage of Medigap reduces financial barriers to health care by covering the full Medicare deductible, but also diminishes beneficiaries' sensitivity to costs. This outdated benefit design may partially be responsible for higher spending. Therefore, the mix of public and private supply and financing of medical care

that primarily covers people age 65 or older achieves neither efficiency nor equity (Pauly, 2000; Pourat et al., 2000; GAO, 2001; Maxwell, et al., 2002). It suggests the importance of reconsidering the coverage and cost-sharing policies, both within the Medicare program and within any supplemental options that may be available. This policy suggestion also needs to be reviewed in the context of The Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003.

This new law not only created the largest expansion of benefits in Medicare's history, it also brought in major changes to the program's structure. Interesting enough, the same cost increases that are driving employers out of the private health insurance market are driving public programs into that market. Health care expenditures in the U.S. represent a greater percentage of Gross Domestic Product than in any other country, and the National Health Expenditures, about 16.5% GDP in 2006, are projected to represent as much as 20% of GDP by 2015 (Medical Cost Reference Guide, 2007). The government, primarily through public programs such as Medicare and Medicaid, continues to be the largest player in purchasing health care services, bearing almost half of the total costs. The budgetary pressure and the concerns on efficiency of traditional Medicare played a significant role in reshaping the program. One of the key structural decisions made in enacting the law was to offer prescription drug coverage only through private plans, either stand-alone private drug insurance plans or Medicare Advantage (MA) managed care plans. The structure of the new Medicare prescription drug benefit (Part D) moves the commercial health insurance industry from Medicare's margins to its mainstream (Robinson, 2006). Attracted by the market expansion opportunity and lucrative government payments, the commercial carriers strive to enter Medicare Advantage and

Part D markets to consolidate into firms that serve the full range of public and private purchasers.

This study's findings have particular implications for attempts to contain health care costs through the promotion of market competition in providing health care to Medicare beneficiaries. The government policies designed to enhance health care coverage while containing health care costs need to take into account the impact on all stakeholders as well as consumers' likely response. Although the study sample reported deteriorating health status both on self-reported health and the number of chronic disease conditions, the findings that changing health status did not predict Medigap purchases has important policy implications. Wolff and his colleagues (2002) found that 82 percent of Medicare beneficiaries have at least one chronic condition and 65 percent have multiple chronic conditions, which account for 95 percent of all Medicare expenditures. Correspondingly, those beneficiaries also have larger out-of-pocket expenses to cover the 'gaps' such as the copays and deductibles. However, the general practice of medical underwriting and pre-existing condition exclusion by the private insurers might drive the beneficiaries with multiple chronic conditions away from purchasing Medigap coverage. In addition, the lack of availability of private insurance in less lucrative markets leaves beneficiaries with even less choice of supplemental coverage. The MMA of 2003 implemented payment rate adjustments in order to reflect the relative insured risks by each commercial carrier. However, the industry practice revealed the most profitability is not coming from either the most healthy or the least healthy elderly, but the ones in between. If Medicare policy continues on the path of containing health care costs through market competition, the

policy will need to be more effective in bringing the unhealthy beneficiaries into the new program.

Second, the findings of this study reflected the reliability issue of private supply for a public medical program. A major share of beneficiaries affected by the Medicare+Choice withdrawals in late 90's and early 2000s experienced a decline in their supplemental benefits, an increase in their premiums, and some disruption in their care arrangements (Laschober et al., 1999; Rice et al., 2002). Laschober and his colleagues (1999) surveyed a national representative sample of Medicare beneficiaries who were involuntarily disenrolled from their HMOs at the end of 1998. They found the beneficiary groups most adversely affected by the transition from their former HMO were those most likely to have no supplemental coverage—the under-age-sixty-five disabled, those eighty five and older, racial and ethnic minorities, the poor and near poor, and beneficiaries reporting fair or poor health. This study supports the above findings that the Medicare beneficiaries of racial and ethnic minority groups with low income and wealth were most likely to have no supplemental coverage. This study's findings of beneficiaries' dramatic decline in Medigap coverage from AHEAD Wave II to Wave III indicated the adverse impact of Medicare HMO withdrawals would have been more severe on the oldest old. Due to the lack of understanding and support in the transition period, it would have been very difficult for the oldest old to find an alternative source of coverage after HMOs dropped their coverage.

The withdrawals of HMOs from the Medicare market appear to be due to a combination of Medicare payment reforms, new regulatory requirements, and other factors affecting plan's ability to compete profitably in local markets (Dallek et al.,

2003). The MMA of 2003 created a new upswing in the Medicare managed care cycle,

legislating additional payments to drug-specific and full-service health plans. However,

the current Medicare Advantage and Part D plans are not insulated from the above

factors. The fact that the commercial health insurance industry closely monitors

government payment rate and produces profitability and competition analysis implies the

potential withdrawals if federal payment cuts occur. To avoid the unintended

consequences (such as involuntary disenrollment), Medicare policy makers, especially

the Centers for Medicare and Medicaid Services (CMS), have to evolve Medicare policy

in anticipation of the potential impact on the private sector as well as the beneficiaries'

behaviors.

The third implication is related to the policy restriction on Medicare Part D only to be

offered by private plans. With the new, separate Part D drug benefits, beneficiaries could

only obtain a comprehensive coverage through a private Medicare Advantage policy with

drug coverage for the integrated insurance benefits. Otherwise, they have to patch

together three separate plans: basic Medicare Parts A and B for hospital and physician

services; Part D, a private prescription drug plan; and supplemental private coverage to

help cover Medicare's high cost sharing and protect against catastrophic costs (Davis et

al., 2005). In addition, the new Medicare Part D does not allow the purchase of Medigap

Insurance to cover premiums, co-pays and gap provision (a.k.a., "doughnut hole") in

which members have full cost sharing before reaching a catastrophic benefit. Even when

MMA drug coverage begins, beneficiaries will still pay about two thirds of their drug

expenses on average (Moon, 2004). This patching together of multiple plans creates

consumer confusion, and creates the potential for risk selection and higher administrative

expenses (Davis et al., 2005). The multilevel modeling results of this study found that private insurances tend to attract healthier and financially better off beneficiaries than others. The findings of this study have shown that members of minority groups and those who are less educated and financially disadvantaged continue to be substantially less likely to purchase Medigap. In addition, beneficiaries with better cognitive functioning are more likely to purchase Medigap than those with cognitive limitations. These findings highlight the complexity of insurance mechanism and the disparities in Medigap coverage by socioeconomic status. MMA and its further fragmentation of coverage increase the selection risk and intensify the need for a comprehensive benefit under Fee-For-Service (FFS) Medicare. A comprehensive benefit offered by traditional Medicare would have strong advantages for Medicare beneficiaries. It would provide an alternative to MA that permits choices to be made according to beneficiaries' preferences and the relative efficiency of both options. Providing more choices is indeed attractive from a public policy point of view.

Davis and his colleagues (2005) proposed a comprehensive benefit structure based on the benefits typically featured by employer plans, particularly the Federal Employees Health Benefits Program (FEHBP). Assuming the same covered benefits under current Medicare and the new drug benefit, the proposed benefit structure has a different cost-sharing structure. A single $250 deductible per person would replace the current deductibles for Parts A and B. Part B coinsurance would be reduced from 20 percent to 10 percent; Part A coinsurance for hospitals would be eliminated; and home health and selected preventive care would continue to be exempt from coinsurance. There would be no deductible for prescription drugs, and an average coinsurance of 25 percent would be

assessed with no gaps in coverage. Beneficiaries' out-of-pocket outlays for all covered services, including prescription drugs, would be subject to a $3,000 ceiling. The ceiling would replace the current catastrophic drug benefit, which covers 95 percent of drug expenses after beneficiaries have paid $3,600 out of pocket for prescription drugs alone. It would eliminate the doughnut hole for drugs and put a more affordable ceiling on out-of-pocket expense for all services. Rather than requiring beneficiaries to pay $3,600 in drug costs out of pocket to reach a catastrophic benefit that is estimated to benefit only 5–6 percent of beneficiaries, the Medicare comprehensive would cap all out-of-pocket expenses at $3,000.

In addition to Medicare policy, the study results also have implications to practice. Given the fact that numerous private Medicare Advantage plans and prescription drug plans have grown rapidly in the Medicare market, focused outreach efforts are needed to help the most vulnerable segments of the Medicare population make rational enrollment and planned decisions. The CMS has an extensive outreach program (the Low-Income Subsidy, or LIS) and a Special Enrollment Period without a late enrollment penalty for low-income nonenrollees for Part D prescription drug plans. However, the evidence from most voluntary enrollment programs, even those that are free, suggests that racial/ethnic disparity is a common problem (Avruch et al., 1998; Moon et al., 1998; Lamphere and Rosenbach, 2000). The findings of the study have supported the persistent and substantial racial disparities in Medigap coverage between African American and non-Hispanic whites. In fact, among all the predictors, the largest difference in the likelihood of Medigap purchases resides in racial impact. It suggests the need for government agencies, local and state coalitions and others (e.g., financial advisors, insurance consultants and

social workers) to work as advocacy for them on their improved sharing of opportunities. They can also work directly with the minority groups to help them make informed choices about Medicare Advantage and prescription drug coverage. For example, government agencies or insurance carriers may coordinate with community-based minority organizations to provide lectures or enrollment assistance to Medicare beneficiaries. Culturally sensitive outreach materials (e.g., available in additional languages) and communications might be more effective to help minority Medicare beneficiaries and their families understand the new Medicare Prescription Drug benefit, assess their personal situation, compare plan options and make the enrollment decision that is right for their health and their financial situation. Another benefit of "person-centered" outreach programs is they occur at various community settings and therefore can provide the opportunity to creatively engage those elderly into a trusting relationship. This relationship is extremely helpful to be able to identify their needs and provide them with appropriate information and assistance in the long run.

The design of the Medicare program, especially the new Medicare Prescription Drug benefit, is not easy to understand. It could be confusing and even intimidating for less educated seniors. The study findings that the less educated are substantially less likely to purchase Medigap coverage also suggest the need for nationwide education and outreach. These efforts need to focus on reducing confusion and providing beneficiary support in decision making and enrollment. It's important to educate people that Medicare Prescription Drug coverage is in their interest, to help them understand their choices and compare different plan options. It could be a "person-centered" approach using trusted intermediaries to provide one-on-one assistance for multiple benefits enhanced results.

The U.S. health care system continues its transformation to focus more on the wants and needs of consumers and consumers are responding. For example, eight in ten Internet users go online for health information. More than half of consumers who use the Internet have utilized features from their health insurer's online Web site (Medical Cost Reference Guide, 2007). Assistance such as the use of technology for online eligibility and benefit explanation tools, and the development of robust decision-support tools can empower consumers to make optimal enrollment choices.

At the same time to provide more information to Medicare beneficiaries, the individuals' ability to pursue and process the information has to be considered. This study is the first to incorporate the cognitive ability in examining Medigap purchasing decisions. One of the key findings addressed its impact that beneficiaries with better cognitive functioning are more likely to purchase Medigap than those with cognitive limitations. It highlights the need to simplify the enrollment process and standardize the benefit packages in implementing private supply of Medicare Advantage and prescription drug plans. By doing this, it could save a lot of consumers' time and energy in their shopping process while allow them to focus on the best interested options. It also suggests the need for a targeted outreach for those beneficiaries having cognitive impairment in the communities. Especially, social workers who are better trained in helping those vulnerable subgroups can play a significant role in this area. They can work directly with them and provide advices and needed support to facilitate the shopping for their most valued benefits.

Recommendations for Future Research

This study found substantial racial disparities in Medigap coverage. However, the analysis in the present study was limited to non-Hispanic White and African American Medicare beneficiaries due to the sparse representation of other racial or ethnic groups across waves in AHEAD. The gap in Medigap purchases between African American and non-Hispanic whites more than likely also exists for the other minority groups. There is a need for research studies that include the other minority groups in the sample selection and examine their decision-making factors on Medigap purchases.

Future research should carefully consider the way that the age and gender impact on Medigap purchases is assessed. The current study used the AHEAD sample of community-dwelling adults aged 70 and older. The study sample was restricted to a much narrower range compared to previous research. To test the relationship between age and Medigap purchases, future studies need to evaluate the inclusion of an appropriate age range. Another approach is to use the bracket with research-supported cutoff points so that a meaningful reference group could be defined in the analysis.

Instability of the relationship between gender and Medigap purchases in the study implies a more complex relationship varied by the context. It is possible females could behave differently in response to their presumed responsibilities for the family or for themselves. Additional research is needed to examine the interaction terms between gender and the contextual variables such as marital status and family size. And given the fact that this study sample included the predominantly female respondents who were also likely to be older and be survival spouses, future studies specifically examining this subgroup could shed a different light on gender influences on Medigap purchases.

There is a need for research studies that collect more accurate data regarding the timing of health changes relative to supplemental insurance enrollment. This study relied on measures of health status and Medigap purchases that were approximately two years apart and, therefore, may not be sensitive enough to the change in enrollment decisions. There was no sufficient information to determine whether the changes in health status between those two waves occurred before, during, or after the decision to make Medigap purchases. Future research examining the health effect on Medigap purchases could design the measurements within a shorter time span to be more in line with the Medigap 12-month enrollment period or specifically ask the questions on health status related to insurance purchases. On the other hand, the commonly used self-assessed health status is missing a numerical scaling on the individual's perception of future health status. Those who anticipate high medical expenditures purchase supplemental insurance, either based on their current health status or illness possibilities in the forecast. This study used an implicit assumption that the changing health status reflected the growth trajectory of the person's future health status. There is a need for research studies to bring the assumption explicit by including expected future health status, e.g., the subjective probability of survival, the expected health condition in five years.

Another area of research that needs further exploration is the impact of social support and community services on a person's choices of Medicare Supplemental insurance. The extended family members and community services would help individuals not only in their daily life but also in their financial planning. This impact must be explored if the service system and social network are to be optimally effective in serving the oldest old. It would be useful to understand which family members are the primary decision makers

and how the information interaction is carried over among the family members. It would also be useful to find out how effective the social support from a broader network (e.g., caregivers or financial advisers) influences the decision making.

Along this line, the influence of macro-level factors on the individual's decision making is also worth investigating. While this study found evidence of a dramatic decline in Medigap membership, the factors moving the beneficiaries to different plans are still unknown. It could be massive advertisement by Medicare HMO plans, or encouragement by CMS to relieve the financing problem, or information disseminated by consumer advocacy and associations (e.g., AARP). The multilevel modeling approach employed in this study permits the inclusion of macro-level or community-level factors in the analyses to test the linkage to individual's decision making.

Future research on Medigap purchases needs to incorporate more data on the supply side and demand side of the insurance market. More specifically, there is a need for research studies to investigate consumers' knowledge of coverage, and the impact of premiums and richness of the benefits on different choices of Medigap coverage, especially when interacting with health status. Including these variables will expand the understanding of the complex nature of Medigap purchases, and insurance purchases in general.

Future research should also examine the impact of evolving Medicare policy on Medigap purchases. It's interesting to study who switched to a MA plan and who remains in the traditional plan while having a private drug plan and a Medigap plan to obtain a comprehensive coverage. Such studies will supply invaluable information for Medicare policy and could be used for midcourse corrections to the new drug benefit. This

information will be particularly important when national health coverage debates are

reheated for the 2008 presidential election.

In addition to these directions for quantitative research, there is also a need for more

qualitative research on the individual's insurance purchasing decision. The human

being's behavior is so complex and dynamic that almost no quantitative research studies

could capture all the elements. Although some studies could model it to some degree, the

nature of changing behavior in response to varying environment makes it next to

impossible to quantify the impact and forecast future changes. So there is a need for

mixed methods with open-ended interviews regarding the reasons for Medigap purchases.

There is also a need for qualitative research about the experience of purchases, family

involvement in the purchasing decisions, and interactions between customers, providers

and insurers in the inter-related health care system. Although the behavioral modeling

with respect to health economics and purchasing decisions involves many complexities, it

is a significant research area with visible policy and practice implications.

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