HEALTH STATUS, INSURANCE, AND EXPENDITURES IN THE TRANSITION FROM WORK TO RETIREMENT

Hugo Benítez-Silva
Economics Department
SUNY-Stony Brook
Stony Brook, NY 11794-4384
hugo.benitez-silva@sunysb.edu

Emine Boz
University of Maryland
College Park, MD 20742
boz@econ.umd.edu

Moshe Buchinsky
UCLA
9357 Bunche Hall
Box 951477
Los Angeles, CA 90095-1477
buchinsky@econ.ucla.edu

Joseph B. Nichols
University of Maryland
nichols@econ.bsos.umd.edu

Sharbani Roy
NERA

John Rust
Corresponding Author
4115 Tydings Hall
College Park, MD 20742
jrust@gemini.econ.umd.edu

Ignez Tristao
University of Maryland
3150 Tydings Hall
College Park, MD 20742
tristao@econ.umd.edu

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1 Introduction

Access to health insurance has become one of the single most important aspects considered by individuals when making employment and labor force participation decisions, including retirement. The role of the government programs—Medicare and Medicaid—in these decisions is crucial for understanding the behavior of older Americans as they try to balance career decisions and life decisions at a time when their health is deteriorating, and the costs of health care are rising without end in sight. In this paper we portray the choices and constraints faced by a large and representative sample of older Americans as they approach retirement, and estimate the complex set of relationships underlying the heterogeneous coverage, utilization, and behavior, explicit in the rich HRS data we study.

This paper presents a descriptive empirical analysis of the dynamics of health insurance, health expenditures, and health status.[1] We use a panel of older individuals, tracked over the decade between 1992 and 2002, as they transition from work into retirement. We study a cohort of 13,594 individuals, most of whom born between 1930 and 1940, who were surveyed in one or more of the first six waves of the Health and Retirement Survey (HRS).[2] The median age of individuals in the first survey wave was 55, and although there was significant attrition in subsequent waves, the median age in the sixth wave was 65. Thus, the HRS permits us to follow this "depression era" birth cohort over a key decade when most of these individuals were making the important transition from work into retirement.

The beginning of the 1990s was a period of an unprecedented rapid escalation in health care costs in the United States. Total per capita health care spending was rising at an unsustainable rate of 11% per year at the beginning of the decade. However, a combination of factors—including policies adopted under the Clinton administration that fostered the entry and growth of HMOs— lead to a deceleration in the growth of health care costs, bottoming out at a growth rate of 4.6% per year by 1998 (e.g. Ginsburg and Pickreign 1996), and with the average growth rate between 1993

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[1] See Currie and Madrian (1999) for a survery of the relationship between health insurance and labor market behavior, and Blau and Gilleskie (2000) for a model of health insurance choices of older Americans.

[2] The HRS is a survey conducted by the Survey Research Center (SRC) at the University of Michigan and funded by the National Institute on Aging. See Juster and Suzman (1995), Gustman, Mitchell and Steinmeier (1994 and 1995), or the HRS web page for additional information. The first wave of the HRS was conducted between April 1992 and March 1993. The subsequent 5 waves were conducted at approximate two year intervals following the first wave, so that we can view HRS subjects as being interviewed (approximately) in the six even numbered years between 1992 and 2002.

and 1999 standing at less than 1.9% (Glied 2003). Thereafter, a combination of factors, including widespread failures and exits of HMOs, and huge increases in the prices of prescription drugs and hospital outpatient services, lead to a renewed acceleration in the growth rate of health costs, which peaked at 10% in 2001. Growth rates have moderated only slightly since then, to a rate of 8.2% in 2004 (Strunk and Ginsburg, 2004).

The average growth rate of health care costs has approximately doubled the rate of growth in GDP, so it is not surprising that the ratio of total health care spending to GDP has risen steadily over the 1990s, from about 12% of GDP in 1990 to nearly 15% of GDP by 2002 (US Department of Census). The rapid growth in health care costs was matched by an even steeper increase in health insurance premiums charged to individuals and rms. For example, in 2004 employer health insurance premiums increased by over 11%, nearly four times the rate of in ation (Kaiser Family Foundation, September 2004).

As a result a growing number of U.S. rms, facing increasingly tough international competitive pressures, have discontinued employer-provided health care plans during the last decade. This, in turn, contributed to the growing number of U.S. citizens (approximately 45 million today) without health care coverage. For example, rms in industries such as textiles employ poorly educated workers who are paid low wages, but they must compete against foreign imports from countries such as China, whose workers are paid even lower wages. In other manufacturing industries such as autos, domestic automakers such as GM must pay high health care costs (approximately $1500 per vehicle) to its unionized workers. The main competitors, the Japanese automakers, avoid these high costs since their workers are largely covered by Japan's national health insurance plan. Although it is not clear whether the decline in insurance coverage is driven mostly by the rapid growth in health costs (Chernew, 2002), or by foreign competitive and cost-cutting pressures, it is clear that both have contributed to the problem. According to Census gures, 13.9% of the U.S. population had no form of health insurance in 1990. By 2002 this share had reached 15.2%.

With this background in mind, we study how the HRS cohort of "depression babies" has fared over this same decade. There are plenty of anecdotal evidences that many members of this cohort were permanently "scarred" by the Great Depression. In particular, memories of bare cupboards and long unemployment lines may have instilled a stronger sense of frugality and a stronger savings motive relative to other cohorts, particularly the "baby boomers" who were raised in much more bountiful times. In fact, a number of recent studies (Gustman and Steinmeier 1999, and

Scholz, Seshadri and Khitatrakun 2004), have concluded that the vast majority of the HRS cohort is quite well prepared financially for their retirement years, having accumulated substantial pension, housing, and financial wealth that appears more than adequate to support them during retirement. The paper by Scholz, Seshadri and Khitatrakun (2004) shows that a calibrated version of the classical "life-cycle model" in could explain over 85% of the accumulated wealth among married households and over 70% of the variation in wealth among single households – far more than can be explained by any other competing theory they examined.[3]

Our study can be viewed as addressing a closely related question: Are members of the HRS cohort as equally well prepared for retirement in terms of their ability to handle risks of unexpected health care costs? Along with risks associated with loss of income due to unemployment, disability, financial risks associated with ownership of housing (e.g. loss due to fire, flooding, etc.) and other financial risks (e.g. risky stock market returns), the risk of large uninsured health care costs may constitute one of the biggest financial risks facing members of the HRS cohort. Even if an individual has accumulated a substantial level of retirement savings, these savings may not be "adequate" if the person faces significant risk that these savings may be depleted to cover the costs of uninsured out-of-pocket health care expenditures. Catastrophic health events are quite common and carry with them substantial costs (See French and Jones 2004 for an analysis of these events using the same data set we are analyzing, and Feenberg and Skinner 1994 for an earlier analysis of the dynamics of health care expenditures, with an emphasis on the persistence of those catastrophic events, using a panel of tax returns).

A variety of sources of evidence suggest that the risk associated with uninsured health care costs is a major concern for many Americans, particularly among older Americans approaching retirement. Almost 50% of the American public reports being worried about paying for health care and/or health insurance, and 42% reports being worried about not being able to afford health care services (Henry J. Kaiser Family Foundation, October 2004). A recent study by Appelby (2005) finds that 50% of all bankruptcy filings were partly a result of medical expenses. Approximately 50% of workers in low- to middle-wage jobs had problems paying medical bills in the past 12 months or were paying off medical debts (Commonwealth Fund, 2004). Furthermore, the double-digit rates of increase in health insurance premiums have forced increasing numbers of Americans

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[3] They conclude that: "The fact that our predictions and the data closely align suggests two things. First, as mentioned above, Americans are saving enough to maintain living standards in retirement. And second, the life-cycle model provides a very good representation of behavior related to the accumulation of retirement wealth." (p. 34).

to forgo health insurance completely and "self insure" against such risks.

Indeed, a recent survey finds that the primary reason Americans are uninsured is because the health insurance coverage is too expensive (Kaiser Family Foundation, November, 2004). An earlier study by Rust and Phelan (1997) found that a significant number of Americans are "health insurance constrained". While they would have liked to retire earlier than they do, the lack of employer-provided retiree health benefits forces a significant number of them to continue working for employers who provide health insurance coverage to their employees until they reach age 65 and are eligible for Medicare benefits. Thus, Rust and Phelan concluded that an important explanation for the "age 65 peak" in retirements is due to the interacting effect of incomplete private health care coverage and government provided Medicare coverage.

Our empirical analysis suggests that a majority of individuals in the HRS have significant gaps in their health insurance coverage, and these gaps in coverage constitute a major financial risk, which could jeopardize their retirement savings, and their health and welfare before and after retirement. We find that the main gaps in coverage occur prior to age 65, at a time when individuals are still not eligible for Medicare. We find that Medicare, and to a lesser extent Medicaid, are major "safety nets" that provide a relatively high level of security against health care costs to the vast majority of the sample who are over 65. However, before age 65, we find very striking differences among the respondents of the HRS sample in terms of their degree of protection against health care costs. We identify three main types of individuals in our sample: 1) those who are *persistently uninsured,* 2) those who are *transitorily uninsured* and 3) those who are *continuously insured.*

The persistently uninsured are individuals who do not have any type of health insurance coverage (not even through a spouse) at each survey wave that they are interviewed prior to turning 65 (when virtually all individuals in the HRS become eligible for Medicare benefits). Fortunately, the persistently uninsured constitute the smallest component of the HRS cohort: 549 of the 13,594 individuals, or 4%, of our sample. A surprising finding is that the group of transitorily uninsured individuals constitutes *55% of our sample. That is, over half of the individuals in the HRS experienced one or more spells without any form of health insurance coverage over the 10 years that we followed them.* Thus, the probability of being "temporarily uninsured" over a decade is more than three times larger than the fraction of individuals who are uninsured at any particular point in time. Finally, the group of continuously insured individuals constitutes about 40% of our sample.

When we analyze the characteristics of these three groups, we observe the huge divisions and

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inequalities separating the "haves" and the "have nots" that are quite common in our society. In particular, there is a fairly clear ordering of the three groups in terms of economic resources, health status, education, and overall socioeconomic status. Individuals who are persistently uninsured are more likely to be non-white, female, singles, and they have significantly lower education and wages, and lower accumulated wealth than the other two groups. In fact, the mean total family income for individuals in the persistently uninsured group is at or below the poverty line. These individuals also have materially worse health status, and despite their significantly lower income and wealth, their out-of-pocket health care expenditures are about the same as those for the other two, better insured, groups. Perhaps due to the need to cover these proportionately much larger health care costs, individuals in the persistently uninsured group work longer and retire later than those in the other two groups.

Individuals in the continuously insured group are, not surprisingly, the richest and most financially well prepared of the three groups. They are better educated, have significantly higher wages, and are employed at firms that are much more likely to offer health insurance benefits, and even retiree health insurance benefits, than individuals in the other two groups. Furthermore, a variety of different health indicators reveals that these individuals are significantly healthier, and are more likely to survive to old age compared to the others. In addition, perhaps due to their greater financial resources, individuals who are continuously insured have greater savings and are able to retire earlier compared to the other two groups.

The transitorily uninsured have characteristics that are intermediate between the two other groups. They have average levels of education, earnings, and moderate wealth accumulations. They also have generally worse health compared to those who are continuously insured, but generally better health than those who are persistently uninsured. We do not yet fully understand the reasons why individuals in this group are covered in some periods and not in others. Are the gaps in coverage due to job changes, or is this evidence of "strategic timing" (i.e., purchasing insurance during periods where an individual expects to have a high need for health care services and letting policies lapse in periods where health care needs are expected to be lower)? In subsequent versions of this paper we intend to provide more insight into these questions, which have considerable importance to private insurance companies due to their implications for adverse selection dynamics.

Overall, the results we have obtained so far highlight a characteristically American paradox.

Individuals who are continuously uninsured are in many respects the least healthy of the individuals in the HRS survey. Yet, at the same time, they also have the least degree of access to medical care—at least prior to age 65. Of course, this outcome is bene cial to private insurance companies, since it is consistent with "pro table selection", namely, the most generous health care coverage is provided to those who need and use it the least. Whether this pattern of screening and sorting is an intentional or unintentional outcome, in the end it serves to exacerbate the already large pre-existing inequalities in income and wealth in the U.S. It contributes to the increasing degree of inequality in the provision of health care, which, in turn, ampli es the already wide existing inequalities in health status and mortality.[4]

The main silver lining in our analysis is the powerful role played by Medicare, and to a lesser extent Medicaid, in providing bene ts and a greater degree of security to individuals who lack health insurance prior to being eligible for Medicare. We also observe self-reported measures of satisfaction with the quality of and level of access to health care rising after becoming eligible for Medicare, and we observe an increase in utilization of health care services (e.g. hospitalizations and doctor visits) after individuals become eligible for Medicare. This may re ect a degree of "pent up" or deferred medical care that these individuals undertake once they are covered by insurance.

The remainder of the paper is organized as follows. Section 2 presents a detailed description of the type of health care coverage that HRS respondents had in the 1992 to 2002 period. Section 3 presents the estimates of a discrete choice econometric model of health insurance coverage and health insurance transitions, with an emphasis on understanding the determinants of having coverage through employers, having private insurance, or having no insurance. Section 4 analyzes the health care costs and health care utilization of HRS respondents. Section 5 provides non-parametric density estimates of the out-of-pocket health expenditures in the sample. We also present results of tting a Pareto distribution to these data. Section 6 summarizes our ndings, and concludes.

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[4] See Wagstaff and Van Doorslaer (2000), and Williams and Cookson (2000) for surveys on issues of equity in health and health care.

2 Descriptive Analysis of Health Care Coverage

In this section we explore the dynamics of health insurance coverage across waves of the HRS. Speci cally , we examine the most common combinations of coverages, and the characteristics of the insured and uninsured respondents.

In general there are numerous insurance options available for the individuals in the data set. However, in this paper we categorize the respondents into the following insurance plans: (1) employer- or former employer-provided insurance; (2) private health insurance; (3) Medicare; (4) Medicaid; (5) Medigap; and (6) Champus, VA, and union health insurance plans.[5]

Figure 2.1 provides two snapshots of the distribution of health insurance coverage of the HRS respondents. On the left hand the gure depicts the distribution at the very rst interview in 1992 (Wave 1), while the distribution on the right hand is for the latest available interview, namely in 2002 (Wave 6). The primary coverage is a mutually exclusive designation of the "most important type of insurance coverage" for the HRS respondents who have multiple types of health insur- ance coverage simultaneously. The primary health insurance plan was determined as the plan that would provide the individual with the "best" possible bene t (i.e., the highest degree of protection) in the following order: (1) private health insurance (excluding Medigap), (2) employer-provided insurance, (3) retiree or COBRA coverage from a former employer, (4) union, VA or Champus, (5) "self-insurance" (including Medical savings accounts), (6) Medicaid or Medicare who also have Medigap, (7) Medicare only, (8) Medicaid only, and (9) the residual primary insurance category, namely no insurance.

Figure 2.1 shows that there is a large fraction, i.e., 17%, of uninsured individuals in Wave 1 of the HRS. This is signi cantly larger than the fraction of uninsured individuals in the U.S., which is about 13%. However, part of the reason for this apparent discrepancy is that the percentages in Figure 2.1 are unweighted, and thus re ect the strati ed nature of the HRS, which oversampled minorities and individuals in lower income groups. Note that by Wave 6 (2002), the fraction of the HRS sample who are uninsured was reduced by two thirds, to just 6% of the sample. One explanation for this large reduction is the increased fraction of the HRS population who are covered by Medicare. This fraction increased from 4% in Wave 1 to 30% by Wave 6. The other reason for this change is the dramatic decline in the employer-provided health plans, which dropped from

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[5] Champus stands for Civilian Health and Medical Program of the Uniformed Services. VA refers to the Veterans Administration.
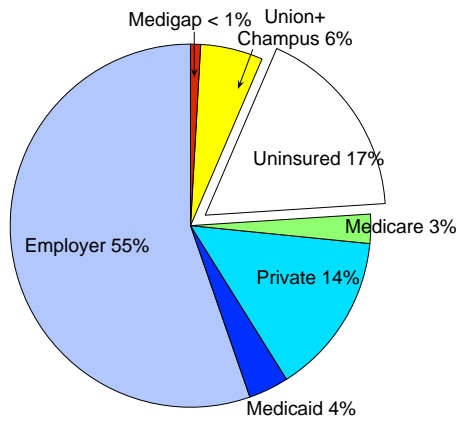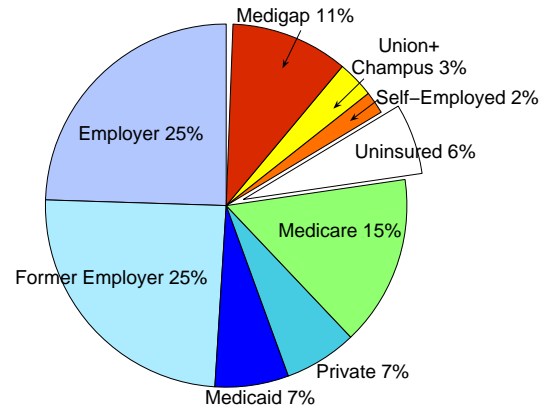
Wave 1 (1992)   Wave 6 (2002)

55% in 1992 to less than half, namely 25%, by 2002. However, this sharp drop also represents a shift into health insurance from a former employer, which composes 25% of the sample in Wave 6. Hence, the overall share of individuals covered by employer-provided health insurance, by current or former employer (via retiree health insurance or COBRA coverage) decrease only slightly to 50%.

The large expansion in Medicare coverage and the reduction in individuals covered under the health plan from a current employer simply reﬂects the aging of the HRS population. The HRS is a panel of individuals, most of whom were below retirement age in Wave 1, but by Wave 6, the majority of individuals had retired and a large proportion of them were over 65, and thus eligible for Medicare beneﬁts. We can also observe that private insurance gets replaced by Medigap in Wave 6. This happens largely because in Wave 1 respondents supplement their employer-provided insurance with private insurance, while in Wave 6 respondents supplement Medicare with Medigap. This idea is supported in Figure 2.2, in which we present the health coverage by employment status of the respondents. This ﬁgure shows that the employer and private insurance combination in Wave 1 is roughly the same as the Medicare and Medigap combination in Wave 6.

In Wave 1 of the HRS it is not possible to distinguish whether an individual was covered by an employer-provided health insurance or by a *retiree* health insurance from a former employer. However, we can infer that individuals who reported being retired and having employer-provided health insurance are those covered under a retiree health insurance plan. Similarly, the HRS did not speciﬁcally distinguish COBRA coverage.[6] Thus, HRS respondents who report that they are not

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[6] The COBRA is operated under a government regulation that obligates employers who offer health insurance to
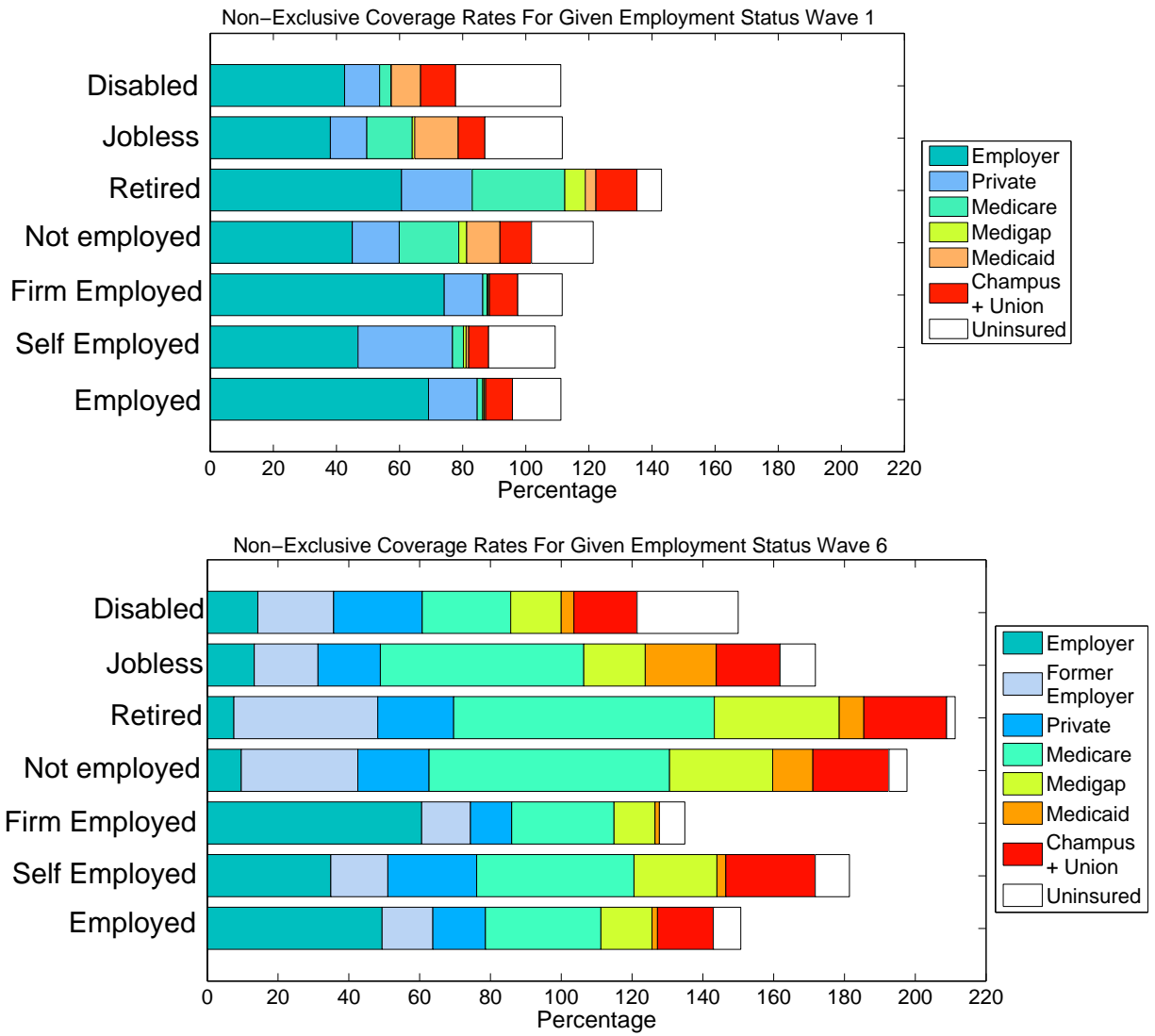
Figure 2.2: Health insurance coverage by respondent type: Waves 1 and 6

working and not retired, but are being covered by insurance from an employer/former employer, are covered by COBRA.

In addition to information on the source of insurance (e.g. employer, privately purchased plan, government-provided plan, etc.), there are some distinctions about the specific type of the program. That is, whether coverage is provided via an HMO (Health Maintenance Organization), whether it is a POS (Point of Service Plan), PPO (Preferred Provider Organization), or FFS (Fee for Service). Health insurance also differs in terms of the types of procedures covered (e.g. whether dental or psychiatric treatments are covered), as well as in the level of deductibles and co-payment rates, annual and lifetime maximums, and so forth.

Unfortunately, the HRS does not record information on most of these additional important details about the individual's specific health insurance coverage. Also, starting in Wave 2, the survey does distinguish whether the insurance is from an employer or former employer, and whether it is an HMO, PPO, or FFS. Since our main initial focus is on the basic question of whether or not individuals are covered by some type of health insurance, the analysis below ignores these various distinctions altogether.

Medicare on the other hand is a relatively standardized government-provided plan, whose rules and regulations are much better known. Specifically, there are two types of Medicare benefits, Medicare Part A (hospitalization insurance), which is available to all individuals over age 65 (and disabled covered by the Social Security disability insurance after a two year waiting period), and Medicare part B (doctor insurance), which is available to Medicare beneficiaries who also elect to pay an additional premium. Waves 1 and 2 of the HRS did not collect information on whether Medicare beneficiaries were covered under part A or parts A and B. However, this information is available starting in Wave 3. In order to maintain consistency across waves of the HRS we do not separately distinguish Medicare A and B coverage in the results reported below.

The HRS did record (in all waves) whether an individual was covered by a privately purchased "Medigap" plan, or government-provided Medicaid insurance. Medicaid is a medical assistance program for poor individuals and families, which has a strict means income and wealth tests. All individuals who are eligible for the Supplemental Security Income benefits (a program for disabled adults and children who may not be eligible for Social Security disability benefits) are also eligible

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their employees to make this coverage available to employees who leave the firm for up to 36 months, provided the former employee is willing to pay the full premium.

for Medicaid. Medigap insurance is privately-provided insurance that is designed to supplement Medicare bene ts, covering certain expenses and procedures that are not covered by Medicare.[7] The HRS also records whether a person is covered by a Union health plan, and by VA and Champus insurance, which pays for civilian medical care provided to dependents of active duty, or retired, Federal uniformed services personnel, and deceased of such personnel.

It is worth noting that the there are substantial differences in insurance coverage depending on the employment status of the respondent. Figure 2.2 documents the insurance coverages of different types of respondents in Waves 1 and 6.[8] These categories are not mutually exclusive. That is, individuals who have more than one type of insurance coverage, are included in every insurance category that they are covered by. As a result, the lengths of the bars in these gures exceed 100%. Note that all of the bars exceed 100%, which simply means that is quite common among HRS respondents to have multiple types of coverage.

For example, respondents who are retired and those who are not employed typically have two types of insurance coverage. In the case of retirees, the composition of coverage changed signi cantly between Waves 1 and 6. In Wave 1, the most common form of coverage is employer-provided (including retiree) health insurance, while the next most common type of coverage is Medicare. By Wave 6, Medicare has become the most common form of health insurance for retirees, covering more than 70% of all retirees. After Medicare, the next two most common types of coverage are the former employer and Medigap plans. For those individuals who are not employed (including individuals who are retired and some are not yet consider themselves to be retired, but who may have lost a job, and disabled individuals), employer-provided insurance (through CO-BRA coverage) is the main type of coverage in Wave 1, whereas Medicare is the main type of insurance in Wave 3.

The "employed" category we use here includes individuals who are rm-emplo yed and self-employed. In Wave 1, the self-employed have the second highest fraction of uninsured individuals (second only to the disabled individuals). The fraction of self-employed individuals who are uninsured decreases signi cantly by Wave 6, which appears largely due to the expansion in the coverage rates by Medicare and Medigap, and somewhat by the increased coverage by Champus and Union

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[7] Prior to the recent Medicare prescription drug bill, Medigap covered prescription drugs, certain procedures not covered by Medicare, nursing home stays, and bills that exceed Medicare's maximum coverage limits.

[8] The number of disabled respondents are 54 and 28 in Waves 1 and 6, respectively, so the insurance breakdown for this group must be interpreted with caution.
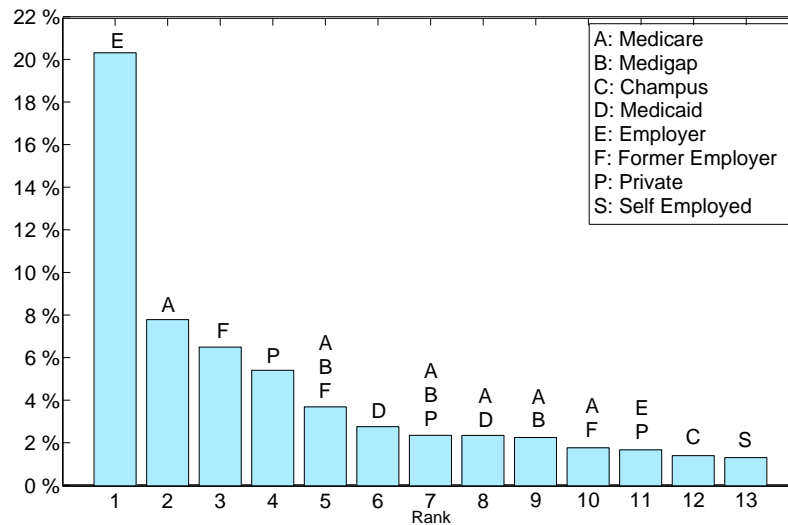
Figure 2.3: Common Combinations

plans.

Overall, we see that the bars get longer from Wave 1 to Wave 6, mainly due to the increased coverage by Medicare and other Medicare supplements. For all employment categories it appears that the expansion in Medicare coverage rates is the biggest single factor accounting for the increased coverage. At the same time, the fraction of individuals covered by employer-provided insurance is signi cantly lower. This apparent patterns stem from the fact that in Wave 1 most HRS respondents were under 65, not retired, and employed, whereas by Wave 6, the majority of respondents had already retired, were over 65, and were therefore eligible for Medicare coverage.

Figure 2.3 plots the insurance coverage combinations that exceed 1% of all possible combinations observed in the data when averaged across all 6 waves.[9] This covers approximately 62% of the individuals in the HRS. Among all possible combinations employer-provided insurance constitutes the largest fraction in the data. This may suggest that an average employer-provided insurance is good enough, so that employees need not supplement it with other types of supplemental insurance. Note however, that Medicare is typically supplemented with some other plans, such as Medigap, Former Employer plans, and Private insurance.

Table 1 compares the characteristics of insured and uninsured respondents in Waves 1 and 6.[10] The category of *uninsured* is calculated as a residual. That is, a respondent is considered

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[9] In order to avoid double counting we nd the common combinations and their percentages separately for each wave and then we average those percentages.

[10] We exclude the missing values in order not to overstate the number of uninsured respondents.

Table 1: Comparison of Insured and Uninsured Characteristics

	Wave 1 Insured	Wave 6 Insured	Wave 1 Uninsured	Wave 6 Uninsured
Average Age	54.3	64.7	46.6	60.8
% over 65	4.1%	52.0%	0.1%	0.7%
Mean Earnings	$26,593.42	$9,845.53	$ 15,762.75	$7,459.98
Total Family Income	$ 54,079.90	$49,162.14	$36,203.20	$ 27,936.16
Net Wealth	$ 259,324.89	$ 358,944.13	$159,394.05	$ 115,389.76
% Male	48.2	44.4	40.9	31.8
% Female	51.8	55.6	59.1	68.2
% Married	82.8	71.7	78.2	58.6
% Single	17.2	28.3	21.8	41.4
Level of Education				
% High School Diploma	33.3	30.7	25.7	24.0
% Vocational Training	24.6	22.2	21.6	20.4
% Associate Degree	3.6	3.4	2.5	1.8
% Bachelor	22.1	21.2	11.0	9.8
% Masters	5.1	5.1	2.1	1.3
% MBA	0.6	0.5	0.1	0.3
% Law/Professional	1.1	0.9	0.4	0.5
% Ph.D.	1.1	1.1	0.6	0.7
Employment Status				
% Employed	67.5	39.1	60.7	49.7
% Self-Employed	11.4	9.2	15.2	14.7
% Firm-Employed	56.1	30.0	45.5	34.9
% Not employed	32.5	60.9	39.3	49.3
% Retired	14.0	47.7	5.6	19.9
Self-Reported Health				
% Excellent Health	23.2	12.2	17.4	11.4
% Very Good Health	28.6	30.7	23.0	19.4
% Good Health	27.5	31.3	30.7	35.1
% Fair Health	13.2	18.1	18.8	25.0
% Poor Health	7.5	7.6	10.2	9.1

as uninsured if he/she does not provide information in the survey that he/she is insured. In the *insured* category we combine all respondents with any type of insurance. Clearly, the insured and uninsured are very different along several dimensions.

The uninsured are quite younger on average than the insured individuals. They also have signi cantly lower earnings, family income, and wealth. They are more likely to be female, single, and somewhat less educated. In addition, they are more likely to be *not employed*, especially in Wave 1 of the HRS. By Wave 6 a disproportional fraction of the uninsured individuals, relative to the insured individuals, have retired and are eligible for Medicare. Hence the fraction of not
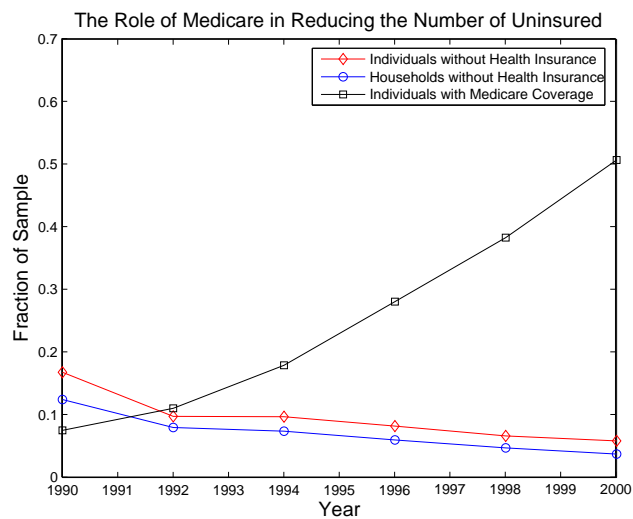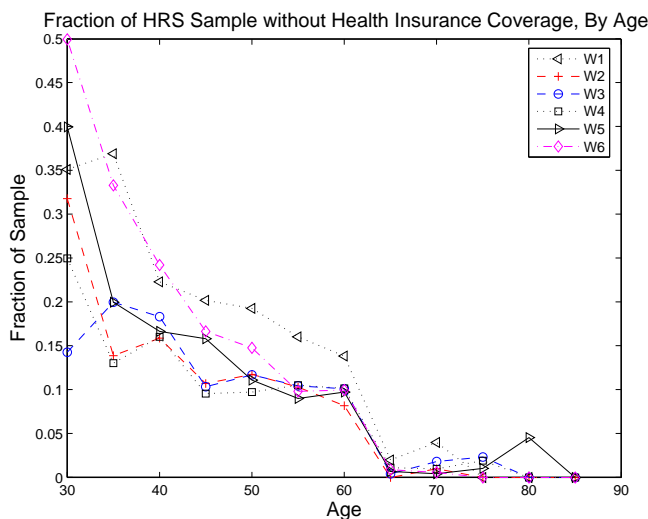
Figure 2.4: Fraction Uninsured by age and year, and the role of Medicare

employed declined relative to Wave 1.

Finally, the insured respondents are in better health condition than those who are uninsured. For example, in 1992 only 12.2% of individuals in the latter group report that they are in excellent health condition, whereas 23.2% of the insured individuals report themselves to be in excellent health condition. This reporting is reversed somewhat for the good and fair health categories. There are two opposing forces that determine the health status of the uninsured. First, while the individuals in the latter group are generally younger, they are more likely to be short of resources for maintaining their health and addressing health problems. In contrast there may be self-selection bias in play. That is, healthy younger respondents may be able to "afford" being uninsured, since they are less likely to have to incur high health care costs. Also, the uninsured in general tend to have low income, lower education, and working in low skilled jobs. Consequently, these factors might contribute to having poorer health than those in the insured group.

The left-hand panel of Figure 2.4 reports the share of respondents without insurance by age, in each of the six HRS waves. One can clearly see the overwhelming effects of Medicare on the uninsured. After age 65, when everyone universally quali es for Medicare, the share of uninsured respondents is almost in every wave. This gure also indicates that there has not been a signi cant increase in the fraction of the uninsured individual who are over age 50. If it is true, as is widely reported in the press, that the number of uninsured has grown signi cantly over the last decade, then that growth must be coming almost exclusively from younger people.

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The right-hand panel of Figure 2.4 shows the interaction between the Medicare coverage rate and the fraction of uninsured respondents. It is first important to note that the figure contains the coverage rate of Medicare, not the share of respondents for which Medicare was the primary source of insurance, as in Figure 2.1. As mentioned above, many of those with Medicare coverage in Figure 2.1 also have additional sources of insurance. As can be clearly seen, the sharp decline in the share of respondents without insurance is matched with an even sharper increase in the coverage by Medicare. Given that the average age of the population at the beginning of the panel is in the mid-fifties, this is hardly surprising. The implication is that the sharp drop in the uninsured seen in the HRS is driven by the fact that the HRS population is aging and become eligible for Medicare coverage, and not by an overall increase in general access to health insurance in the population as a whole. The figure reports the share of respondents lacking insurance, as well as the share of households where all members lack insurance. Additional work, not reported here, indicates that while there is considerable heterogeneity across households, in general either everyone in the household is covered by some health insurance or no one is covered.

To better understand the difference between the insured and uninsured we defined three groups of individuals based on their insurance status. The three groups are: (1) *persistently uninsured*; (2) *continuously insured*; and (3) *transitorily uninsured*. An individual belongs to the first group if in every survey wave where the individual was under age 65, and thus ineligible for Medicare, he/she were uninsured. A person is in the second group, i.e., is defined to be "continuously insured" if in every survey wave he/she is insured, and, in addition, in Waves 3 through 6 he/she answered "no" to the question whether the individual has been uninsured at any point since the previous wave. Finally, a person is defined to be "transitorily uninsured" if he/she is neither in the first group nor in the second. That is, the third group is merely a complement of the other two groups in the full sample.

We have constructed dozens of variables for each of the three groups, and for the full sample, ranging from employment status, coverage by health insurance, family characteristics and a comprehensive set of ADL and IADL indices. The picture is very clear, the three groups are very different along almost every observable dimension. For brevity we do not present here the full set of results. Rather, in Figures 2.5A through 2.5P we present a selected number of graphs that illustrate the inherent differences between the insured, uninsured, and transitorily uninsured individuals. Note that we have chosen to communicate our main findings graphically. However, all

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of the key results we describe below also emerge from multivariate analyses (e.g. in regressions and probit and logit estimations) that "hold constant" the effect of changes in other variables that can sometimes confound (due to "omitted variables" biases for example) correlations or trends observed in simple graphical analyses of the data.

Figure 2.5A depicts the fraction of individuals that are still in the sample in each of the six waves of the HRS. Despite a fair degree of care, there is significant attrition, with only 75 percent of the overall sample frame from wave 1 participating in the survey at wave 6. Attrition due to mortality is clearly not the fault of the HRS staff, but mortality is not the main reason for losing 25 percent of the sample by wave 6, instead it is due to "classical" attrition, i.e refusals and inability to locate individuals who have moved between successive survey waves. Clearly, the transitorily uninsured have the largest attrition rate, followed by the consistently uninsured group. In complete contrast, there is very little attrition for the continuously insured group. There are several explanations for this. First, mortality rates for these two groups are significantly higher than for the continuously insured. In addition, those who are continuously insured are substantially richer and more likely to be homeowners and have stable career jobs than individuals in the other two groups. This tends to reduce their geographic mobility, increasing the chance that HRS surveyors are able to recontact respondents in each successive wave, whereas classical sample attrition is higher for the former two groups largely due to reduced financial stability (i.e. greater likelihood of job change, greater likelihood of being a renter than an owner, greater likelihood of divorce or widowhood, etc).

Figure 2.5B depicts the fraction of individuals that are married. As noted in the introduction, the persistently uninsured and the transitorily uninsured are significantly more likely to be single compared to the continuously insured. Further, the fraction who are married declines more steeply in waves 3, 4 and 5 compared to the continuously insured group, reflecting both higher rates of widowhood due to higher mortality of spouses, and also increased rate of divorce and separation. Thus, this panel is also consistent with a reduced level of stability for transitorily and persistently insured individuals.

Figures 2.5C and D show the fraction of individuals who are employed and retired, respectively. Obviously, since we are following individuals over a decade when the median age goes from 55 to 65, we observe a substantial number of retirements, which explains the steady decline in the fraction who are employed, which is largely matched the the steady increase in the fraction who are

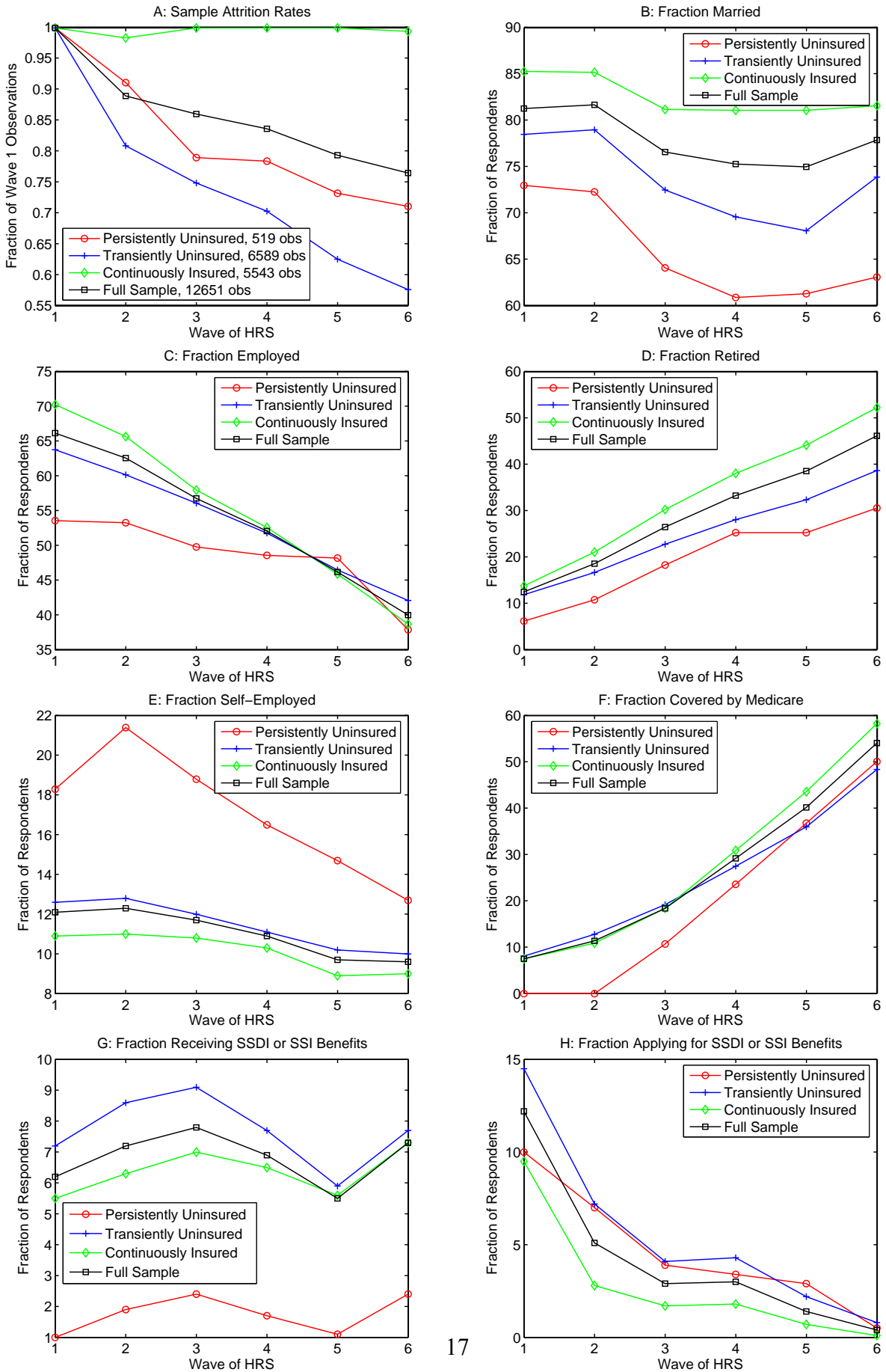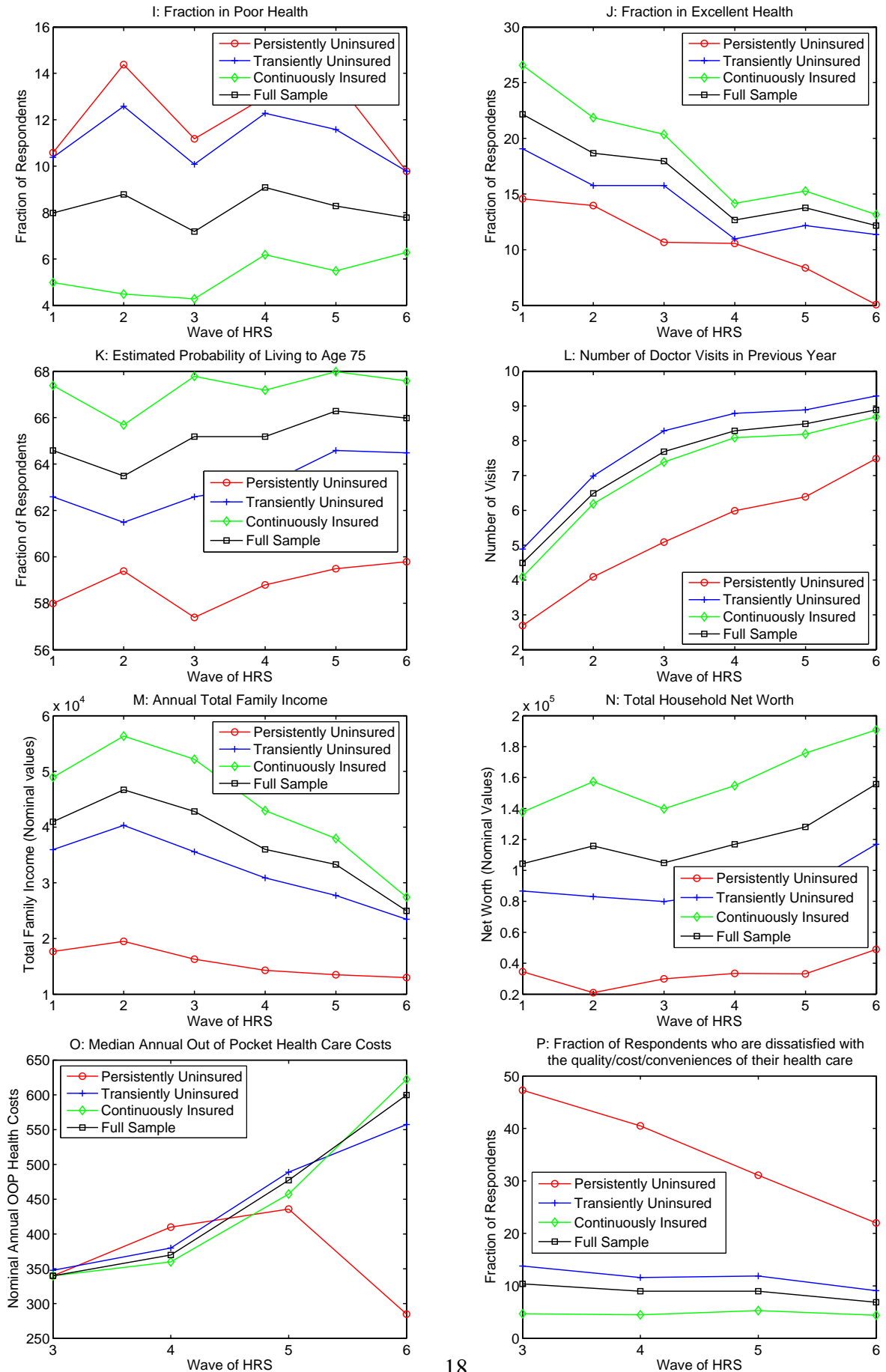Figure 2.5: Characteristics of the Insured and Uninsured, by Wave

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Figure 2.5: (Continued)

retired. The most striking feature is that the employment rates of persistently uninsured individuals are significantly lower, yet at the same time, the fraction of these individuals who are retired are uniformly below the corresponding fraction of continuously insured individuals. The "gap" between these two fractions is explained in part by unemployment, i.e. individuals who are not yet retired, but who are also not working and are searching for a job due to involuntary or voluntary unemployment. Note that by Wave 6 there is very little difference between the employment rates for the persistently insured and individuals in the other two groups. This is partly due to the fact that persistently uninsured individuals are more likely to retire as soon as they are eligible for Medicare.

Figure 2.5E shows the fraction of self-employed individuals. It demonstrates that the persistently uninsured are a lot more likely to be self-employed, and more so for the earlier waves. A number of other studies have noted the problems by self-employed individuals in obtaining coverage at a fair price, which is in contrast to the higher degree of "clout" that larger firms have in obtaining more favorable group health insurance rates. As a result, individuals who are employed by firms are more likely to have health insurance coverage than those who are self-employed. So the higher propensity of persistently and to a lesser extent transitorily uninsured individuals to be self-employed relative to continuously insured individuals is likely to be part of the reason why individuals in the former two groups are uninsured.

Figure 2.5F shows that the trend in Medicare coverage is very similar for all the first two groups, but steeper for the persistently uninsured. This is consistent with what have already been indicated above, that is, that the persistently uninsured are more likely to retire earlier, when (if they are over 65) they are also eligible for Medicare.

Figures 2.5G and H show that the persistently uninsured are less likely to be supported by disability benefits from the SSA. This seems ironic, since as we show shortly, by virtually all metrics, individuals who are persistently uninsured are significantly less healthy. Panel H shows that with the exception of Wave 1 (where the transitorily uninsured are 50% more likely to apply for benefits than the persistently uninsured), the overall propensity for persistently uninsured individuals to apply for SSI and SSDI benefits is at least as high as the other two groups. Thus, there is evidence that certain *eligibility restrictions* may be responsible for the lower degree of success of persistently uninsured in gaining access to disability benefits, which after a waiting period, also confers disabled individuals access to Medicaid and Medicare benefits.

Figures 2.5I and 2.5J provide information about the self-reported health measure. As is clearly apparent, the persistently and transitorily uninsured are more likely to report that they are in poor health and are less likely to report that they are in excellent health condition relative to their counterparts who are continuously insured. Figure 2.5K is consistent with Figures 2.5I and 2.5J, in that the uninsured, especially the persistently uninsured, are not as optimistic about their probability of living to the age of 75 as the continuously insured individuals. The may also reect the fact that the uninsured realize that not being covered by a health insurance signicantly reduces their ability to maintain good health condition for themselves. In addition, Figure 2.5L shows that the persistently uninsured have far fewer doctor visits that the other two groups. An interesting observation is that while they increase the number of doctor visits by Wave 6, a substantial gap remains relative to the other groups. This might be indicating that even though by Wave 6 they can actually afford more visits, since they are covered by Medicare, they care less about maintenance of their health. This, in turn, may be the reason for them not to obtain health insurance to begin with. In related evidence (not shown here) we also found that this group is also more likely to be engaged in hazardous activity, namely smoking, and a lot more than those who are continuously insured. Maybe as a result they have, on average, more problems conducting routine ADL's, such as walking up the stairs.

Figures 2.5M and 2.5N clearly demonstrates the persistently uninsured individuals have much lower annual family income and household net worth than their continuously insured counterparts. The transitorily uninsured are, naturally, in between the two groups. As we move to Wave 6 of the HRS the gap in income shrinks some. This a result that the persistently uninsured retire earlier and get OA benets that are close to their income prior to retirement. The persistently insured individuals lose signicant amount of income when they retire. Nevertheless, they can afford it because of their accumulation of wealth. As is evident from Figure 2.5N. Furthermore, the gap in household net wealth between the insured and uninsured individuals gets larger for the later waves of the HRS.

The last two gures, Figure 2.5O and Figure 2.5P, provide information on heath care cost and utilization. Figure 2.5O shows that in the earlier waves of the HRS the out-of-pocket expenses are roughly the same for all groups. But there is a huge gap in Wave 6 when the persistently uninsured have much lower median out-of-pocket costs. Figure 2.5P indicates that the fraction of continuously insured experience relatively high rate (over 6% in all waves) lapse of policy

Table 2: Health Insurance Transitions

	Waves 1-2		Waves 2-3		Waves 3-4		Waves 4-5		Waves 5-6	
	Ins.	Unins.	Ins.	Unins.	Ins.	Unins.	Ins.	Unins.	Ins.	Uninsur.
Insured	88.76	11.24	91.93	8.07	95.00	5.00	97.45	2.55	97.45	2.55
Uninsured	40.83	59.17	63.52	36.48	46.49	53.51	60.54	39.46	50.15	49.85

coverage. We return to these last two issues below, in the discussion of the cost and utilization of health insurance.

Having established that there are systematic differences between the insured and uninsured, we next address the question: To what extent the two states of the world are persistent? Table 2 provides the transitions between the *insured* and *uninsured* states for every two consecutive waves of the HRS. The table clearly indicates the very high persistent of the former state. That is, individuals who have health insurance tend to keep their coverage in the next wave with very high probability; more than 85% percent between any two waves. Moreover, this probability increase with time, which probably is due to the fact that more individuals in the sample are being eligible for Medicare. Another interesting result is that individuals that are uninsured have high probability, of 40% or more (50% on average) of becoming insured in the next wave. While this nding indicates that the uninsured state is certainly not an absorbing state of nature, there is a signi cant probability that they will remain in the uninsured state.

3   An Econometric Analysis of Health Insurance Choice

Ideally one would like to be able to determine the most preferred insurance plans for a given respondent. However, the choice of a particular plan is constrained by some important factors, such as the employment status of the respondent, his/her family characteristics that de ne the need for a particular plan, or more generally, a set of budget constraints. This makes it impossible to determine the absolute preferences for a set of health insurance plans. Instead, we devote this section to investigating the likelihood that a respondent has, or will have, a given insurance plan conditional on a number of observed factors. Speci cally , we use the well-known logit model to evaluate the importance of the various factors discussed above in making the decision regarding the health insurance to purchase, if at all. We conduct a number of exploratory regression that are

Table 3: Logit Model for Contemporaneous Private Insurance

Variable	Coef cient	Standard Error	Marginal Effects
Constant	-5.382137*	3.190621	-0.750287
Age	0.123944	0.096828	0.000012
Age Squared	-0.000590	0.000735	-0.000097
Male	-0.335274*	0.069666	-0.037476
Self Reported Health	-0.193009*	0.035585	-0.025066
Hospital Stays	0.054369	0.028576	0.006130
Doctor Visits	-0.000010	0.003485	-0.000001
Log, Positive Wealth	0.075989*	0.014812	0.008037
Log, Negative Wealth	-0.216588*	0.075718	-0.023711
Log, Income	-0.017391	0.021536	-0.001967
Log, Spouse Income	-0.039758	0.027914	-0.004482
Health Limits Work	-0.047253	0.083262	-0.005319
Medicare	-0.185378	0.092310	-0.020945
Employer Insurance	-2.659781*	0.090831	-0.304475
Medicaid	-2.337398*	0.154048	-0.185613
Total OOP Expenses	0.000001	0.000003	0.000000
Log Likelihood	-0.3559508		
Average Probability	0.17857994		
Total Observations	8394		

* : coef cients signi cant a the 5 % level or better

designed to shed light on the nature of insurance coverage, the factors determining the probability of being in a particular state, namely insured and uninsured states, and the factors determining the transition between these two states.

Table 3 provides the results of a logit regression of current private insurance on a set of explanatory variables. For the most part the results are consistent with our prior expectations. In particular, the older an individual is, the more likely he/she is to purchase a private insurance. As we have already documented above, individuals do supplement their other insurance coverage, including the Medicare insurance, with private health insurance. However, the marginal effect is not very large.

In the regression we distinguish between those who have positive net wealth and those who are in debt (i.e., have negative wealth). We see that the higher the positive net wealth, or the smaller the debt, the more likely is the individual to have a private insurance. However, the income effect, although not statistically signi cant, seems to have the wrong sign, as is the case with the spouse income.

Respondents who currently have employer-provided health insurance or Medicaid are less

likely to also have private insurance. Note that the marginal effect of having an employer-provided insurance is very large, indicating that on average these plans provide sufficient coverage that the average individual need not supplement with a purchase of private insurance. The coefficients for the dummy variable for being a male is negative, indicating the males are less likely to have a private insurance. The coefficient on self-reported health status is also negative and significant, suggesting that healthier individuals are more likely to have a private insurance. The coefficient on total out-of-pocket health costs is positive but insignificant. The point estimate suggests though that higher out-of-pocket expenses leads individuals to purchase private insurance, but the marginal effect of these expenses are negligible. Also, hospital stay have positive effect on the probability that a person has a privately owned insurance plan, but that may simply mean that those who have private coverage tend to use it more for things like hospital stays which are relatively expensive.

One key problem with the estimation provided in the previous table is the question of timing. Including in the regression contemporaneous insurance status and out-of-pocket health costs makes it harder identify the causal link and hence to determine whether higher health costs *leads* to enrollment in a private insurance program. To address this issue we also regressed the private insurance status from the next wave of interviews on current observed variables. The results, presented in Table 4, are largely insignificant. In fact most of the coefficients, except for Medicaid, that were significant in the estimation presented above remain significant. However, this is understandable, both because of the fact that the sample size shrinks dramatically, and the fact that two full years elapse between two consecutive waves.

Few key results are worth mentioning. The coefficient on the dummy variable on whether the person has a health condition limiting his/her ability to work is negative and significant. This reflects the fact that this health condition is a pre-existing condition that limits the access to private health insurance. More importantly, the coefficient on total out-of-pocket health costs is also significant and is positive. This is consistent with the hypothesis that high out-of-pocket health costs provide a strong incentive for respondents to seek for private insurance in order to defray those expenses.

One of the most challenging obstacles in modeling access to health insurance is the endogeneity and related problems that are associated with adverse selection. Healthier individuals who do not anticipate high future health costs may consequently choose not to acquire insurance. In contrast individuals with poor health conditions might anticipate high future health costs, and are therefore

Table 4: Logit Model for Next Period Private Insurance

Variable	Coefﬁcient	Standard Error	Marginal Effects
Constant	3.069922	6.243913	0.087091
Age	-0.169681	0.200191	-0.000165
Age Squared	0.001590	0.001613	0.000001
Male	0.161755	0.224193	0.012624
Self Reported Health	-0.096464	0.102485	-0.009021
Hospital Stays	-0.047491	0.100099	-0.003675
Doctor Visits	0.004026	0.009073	0.000300
Log, Positive Wealth	0.058444	0.053856	0.004166
Log, Negative Wealth	0.109481	0.149882	0.008638
Log, Income	0.006505	0.075346	0.000500
Log, Spouse Income	0.014579	0.094045	0.001124
Health Limits Work	-0.775143*	0.262871	-0.062252
Medicare	0.207978	0.245716	0.015997
Employer Insurance	-0.062262	0.316505	-0.00475
Medicaid	-1.122388*	0.273635	-0.098078
Total OOP Expenses	0.000065*	0.000047	0.000005
Log Likelihood	-0.27434607		
Average Probability	0.092307692		
Total Observations	1235		

* : coefﬁcients signiﬁcant at the 5 % level or better

more likely to want to purchase health insurance.

In the next set of regressions we make an attempt to address some of these problems in two different ways. First, the regressions make an attempt at explaining the transition probability between different insurance statuses. Speciﬁcally, the regression does not provide estimates for the likelihood that an individual has at some speciﬁc point in time insurance coverage. Rather the regression provide estimates for the probability that a person with insurance coverage loses his/her coverage and the probability that an individual without insurance coverage will gain one. By observing the changes in insurance status we are able to explore not just why households have insurance, but also why they might change their insurance.

The second element that is introduce makes an attempt to control for the sample selection bias discussed above. Variables such as the current number of doctor visits and hospital stays are used as a proxy for future health costs. Since health statuses are relatively persistent states of nature, current consumption of health care services provide an excellent predictor for future consumption of health care. However, we should be cautious in interpreting the results, because doctor visits and hospital stays might also be endogenous. The models explore the effect of some observed

individual characteristics, such as income, age, wealth, education, marital status, sex, and race, affect the transition between different insurance statuses.

Table 5 reports the results for a logit model on the transition of a household between being covered by an insurance policy and being uninsured by the next interview date. Table 6 models the opposite transition, that is that transition from that state in which a household is not covered by health insurance to the state in which it is covered by the next interview date.

The results reported in the two tables indicate that current insurance status plays a major role in determining whether or not an individual is likely to lose health insurance coverage. Specically , HRS respondents who are covered by Medicare, Medicaid or employer-provided health insurance are far less likely to lose their insurance by the next interview date. This simply reect the persistence in the insured state that we have documented above, and the marginal effect of these factors are very large relative to the overall average probability of losing an insurance coverage.

The results presented here also provide further evidence of the close link between job status and insurance status. The variables representing employment transitions play an important role in predicting loss of health insurance coverage. For example, entering unemployment is associated with greater likelihood of losing insurance coverage. In fact, losing a job more than doubles the probability of losing one's insurance coverage. However, as can be seen from the coefcient on the transition from unemployment to employment, that transition also has a positive association with the probability of losing the insurance coverage. This may indicate that nding a job need not automatically imply that health insurance is provided. In fact, this result implies that *ceteris paribus* individual who are covered by an insurance are more likely to lose it once they get a job. Alternatively, it may reect a simple problem of timing. The transitions considered here are over a two year time span and it is unclear if the respondents rst lost their insurance, and then got a job or rst got a job and then lost their insurance. A closer examination of these specic respondents indicate that they are predominantly poor, lower income, married women, who are re-entering the work force. These re-entries into the labor force may very well be secondary wage earners in their households who are returning to the work force in response to loss of the household health insurance.

The sign on the transition to retirement is also positive and signicant, with a rather large marginal effect, implying that respondents are more likely to lose their insurance when they retire, supposedly because they are too young to qualify for Medicare. Interestingly, as can be seen from

Table 5: Logit Model for Loss of Insurance

Variable	Coef cient	Standard Error	Marginal Effects
Constant	-7.641379*	1.703772	-0.916344
Age	0.261596*	0.062384	0.000000
Age Squared	-0.002931*	0.000569	-0.000009
Over 65	-0.322135	0.206208	-0.014095
Male	0.257368*	0.046867	0.012984
Self Reported Health	0.043782	0.023662	0.002015
Hospital Stays	-0.083148*	0.033983	-0.004056
Doctor Visits	-0.011831*	0.003522	-0.000621
Log, Postive Wealth	-0.078597*	0.017448	-0.005040
Log, Negative Wealth	0.010635	0.031614	0.000529
Log, Income	0.043644*	0.011218	0.002032
Log, Spouse Income	0.040654*	0.011627	0.001951
Entered Retirement	0.370188*	0.067896	0.020775
Entered Unemployment	0.942475*	0.084219	0.066938
Left Unemployment	0.920863*	0.107471	0.065528
Remained Unemployed	0.079707	0.074804	0.004056
Health Limits Work	-0.078217	0.067940	-0.003810
Medicare	-1.402853*	0.137984	-0.044610
Employer Insurance	-0.328657*	0.051772	-0.017228
Private Insurance	0.056638	0.052492	0.002850
Medicaid	-0.227888*	0.115652	-0.010424
Married	0.104426	0.057922	0.005055
White	-0.338004*	0.049646	-0.017929
No High School	0.226847*	0.051299	0.010935
Vocational Training	-0.027987	0.053736	-0.001381
College Degree	-0.424922*	0.069400	-0.019072
Professional Degree	-0.285858*	0.110031	-0.012805
Spouse with No Insurance	0.182241*	0.066873	0.009612
Average Probability	0.054531755		
Total Observations	46450		
Log Likelihood	-0.19373347		
McFadden's Likelihood Ratio Index	0.084645029		

* : coef cients signi cant at the 5 % level or better

Table 6: Logit Model for Gain of Insurance

Variable	Coef cient	Standard Error	Marginal Effects
Constant	-2.504242*	0.307738	-0.435011
Age	0.033050*	0.004917	0.003625
Age Squared	0.000004*	0.000001	0.000001
Over 65	0.470906	0.248121	0.108745
Male	0.200693*	0.052030	0.046513
Self Reported Health	-0.081113*	0.024213	-0.018838
Hospital Stays	-0.012906	0.013282	-0.002979
Doctor Visits	0.018164*	0.003415	0.004192
Log, Postive Wealth	0.110685*	0.017647	0.024614
Log, Negative Wealth	0.057392	0.032935	0.013229
Log, Income	-0.117145*	0.013053	-0.027479
Log, Spouse Income	0.000953	0.015193	0.000220
Entered Retirement	0.660974*	0.091365	0.153159
Entered Unemployment	0.143930	0.103790	0.033300
Left Unemployment	0.074574	0.114076	0.017244
Remained Unemployed	0.096635	0.071900	0.022322
Health Limits Work	0.100995	0.065295	0.023359
Married	0.178069*	0.061039	0.041145
White	0.292457*	0.052518	0.068088
No High School	-0.218985*	0.058533	-0.050749
Vocational Training	-0.067722	0.061120	-0.015618
College Degree	0.303988	0.091010	0.070660
Professional Degree	0.178937	0.150308	0.041489
Spouse with No Insurance	-0.057951	0.075920	-0.013365
Average Probability	0.46898718		
Total Observations	7642		
Log Likelihood	-0.65363754		
McFadden's Likelihood Ratio Index	0.054374414		

* : coef cients signi cant at the 5 % level or better

Table 6 for respondents who are currently uninsured, retirement increases the chances of gaining insurance. This seems to imply that uninsured households have an incentive to keep working until they qualify for Medicare, in line with the ndings of Rust and Phelan (1997) using the Retirement History Survey. Overall, the results in Table 6 regarding the effect of job transition on the probability of gaining insurance are generally weaker that those in Table 5.

The model indicates that a male is more likely to lose their insurance, while married respondents are less likely to lose their insurance. However, the results also indicate that males and married individuals are more likely to gain insurance if the are uninsured. Respondents whose spouses have no insurance are also more likely to lose their insurance and are also less likely to gain an insurance when they are uninsured. Clearly, it is dif cult to interpret these results and attribute to them causal effects. Nevertheless, they seem to suggest the need for modeling the joint decision within the household regarding labor supply and health insurance decisions. While this is beyond the scope of this paper it will be examined in future work.

Age is signi cant in explaining both the probability of gaining and losing insurance. As respondents age those with no insurance are more likely to gain coverage, with the effect increasing with age. Those with insurance are increasingly more likely to lose their insurance, with the effect decreasing with age. The fact that the probability of gaining insured status increases with age represents the shift of old enough respondents to being covered by Medicare. The increased probability of losing an insurance represents the fact that older individuals are more likely to lose their job, along with their health insurance, but they are not old enough to qualify for Medicare.

Note also that family nancial variables are of prime importance. Insured wealthier respondents are less likely to lose their insurance and uninsured wealthier respondents are more likely to gain insurance. The results for the family income variable are somewhat counter-intuitive. Individuals with higher income are more likely to lose their insurance and less likely to gain insurance if they do not already have one. However, this may indicate that higher income is used as a substitute for health insurance. That is, individual with higher income can afford to give up their health insurance, or not acquire one, in order, maybe, to increase contemporaneous consumption. A relatively healthy respondent, with no anticipated jumps in health care costs, may rationally chose to forgo paying premiums for health care if they can purchase some minimum level of health care services for less money than the alternative option of buying insurance.

The results for the two models also provide some supportive additional evidence for the pres-

ence of self-selection in health insurance. An increase in the number of hospital stays signi cantly decreases the odds of losing and gaining insurance. The number of doctor visits decreases the probability of losing an insurance, but it increases the chances for gaining insurance. This implies that a respondent who may anticipate higher future medical costs, will adjust his/her insurance coverage accordingly. Note also that respondents with poor levels of self-reported health reduces the chance of the uninsured gaining insurance. This may re ect the dif culty that respondents with signi cant pre-existing conditions might be facing in acquiring health insurance.

The results also indicate that there are some difference in accessing health insurance across black and whites, and education levels. White respondents and those with high school diplomas are both less likely to lose their health insurance and more likely to gain coverage. Also having college or professional degree increases the ability to retain coverage. These results imply that under-educated minorities have limited access to health insurance relative to the more highly educated white counterparts, even after controlling for family background variable such as income and wealth, and self-selection.

One possible explanation of these results is discrimination. Health care providers and insurance companies may be rationing their services to minority and under-educated individuals. This may re ect what is referred to as "taste" discrimination or simply "statistical" discrimination, especially when we consider differences across education groups, re ecting the economic incentives of insurance companies to ration their policies. This rationing behavior could take the form of denying coverage, or more subtly, a restriction on provision in areas with a higher concentration of minorities and under-educated.

An alternative, and perhaps more plausible explanation, may lie in the quality of the jobs held by individuals in these groups. Since compensation consists of both salary and bene ts. companies may reward workers who have a higher education with both a higher wage and better bene ts, including health care coverage. The implication is that when comparing the effects of education on life-time earnings, the increases access to health care and other non-wage bene ts should be accounted for as well.

4   Analysis of Health Care Costs and Health Care Utilization

In this section we analyze the costs and utilization of health care for the six waves of the HRS. Health care costs are divided into health insurance premiums and out-of-pocket health expenses. The latter are further divided into hospital costs, doctor costs, special services, and prescription drugs. In the case of health care utilization, we will focus mostly on the annual number of doctor visits and the annual number of hospital stays (in days). We then analyze the connection between health coverage and health outcomes, mostly based on self-reported variables in the HRS, which include self-reported health, health precluding ability to work, health limiting ability to work and health limiting ability in general, among others.

4.1   Analysis of Health Care Costs

Table 7 reports the mean and median of out-of-pocket expenses broken down by components across the four most recent waves of the HRS.[11] The average total out-of-pocket health expenditures is an average of the sum of all the individual components. We can see that the average out-of-pocket expenditures for the individuals in the sample did not change much between 1996 (Wave 3 of the HRS) and 2000 (Wave 5), but increased signi cantly after that, with the average values changing much more dramatically than the median, indicating that some individuals incurred very large out-of-pocket expenses in the last available interview of the HRS. The median average out-of-pocket expenditures rose steadily during the period of analysis, for a total increase of 85% over the six-year period from 1996 to 2002. Looking at the trends in the individual components, we observe that between 1996 and 2000 hospital and nursing home costs decreased sharply, while the rest of the components either decreased of stayed around their values as of 1996. One of the main changes driving the overall trend of the aggregate measure is the large drug cost increase between the 2000 interview and the 2002 interview, namely 169% and 27% for the average and median, respectively. The rest of the components increased more moderately over the same period.

The upper-left-hand side panel of Figure 4.1 shows the evolution of total out-of-pocket health costs, illustrating graphically the evidence from Table 7. Over the 1996 to 2000 period both the average and the median remain fairly at, but it is in the last period that we see the major increases

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[11] Due to data limitations in the rst waves of the HRS, for this analysis we mostly use data from the 1996-2002 period, except when it is possible to recover previous information. In those cases we use data from all available waves.

Table 7: Health Insurance Out-of-Pocket Expenditures (2004 US Dollars)

	Wave 3	Wave 4	Wave 5	Wave 6
Nursing and Hospital Costs				
Mean	1368.08	1414.17	1043.80	1602.14
Median	708.00	580.00	495.00	525.00
Doctor, Surgery and Dentists Costs				
Mean	507.15	509.93	512.15	1287.03
Median	242.00	232.00	220.00	262.50
Drug Costs				
Mean	1073.85	808.82	825.16	2217.75
Median	290.40	278.40	396.00	504.00
Home Care and Special Services Costs				
Mean	515.84	428.77	553.68	1052.23
Median	151.25	116.00	110.00	130.99
Average Total Out-of-Pocket Expenditures				
Mean	1207.55	1077.33	1098.70	3045.24
Median	423.50	445.44	533.50	781.20

in both the mean and the median of out-of-pocket expenses. The upper-right-hand side panel presents the total out-of-pocket health costs by age. We can see that it is increasing with age up to around age 70, when it reaches $2400. The median of out-of-pocket costs are much atter with a peak just above $500, also around age 70. This suggests that the behavior of the average is driven by a relatively small number of individuals with very large out-of-pocket expenses, something expected and well documented given the very nature of the health uncertainties and heterogeneous coverage of expenses of this population (e.g. Roos, Shapiro, and Tate 1989, Berk and Monheit 1992 and 2001, Eichner, McClellan, and Wise 1998, and Cutler and Zeckhauser 2000).

The lower panels of Figure 4.1 show the median out-of-pocket health care costs broken into hospital, doctor, drugs, and special costs, over time and by age. From the lower-left-hand side panel the most striking result is the combination of falling hospital costs and sharply increasing prescription drugs costs, as we have already documented above. The lower-right-hand side panel shows the same analysis by age. The median hospital costs are the largest and most volatile component of the health care costs, especially for relatively younger workers, likely re ecting some catastrophic health events affecting these individuals. However, these results have to be taken with some caution, since our sample is only representative of the older age groups of the population. These costs oscillate around an average amount of about $600, and then drop sharply as individuals enter Medicare in their 60s. At the same time drug costs follow an increasing trend that peaks at
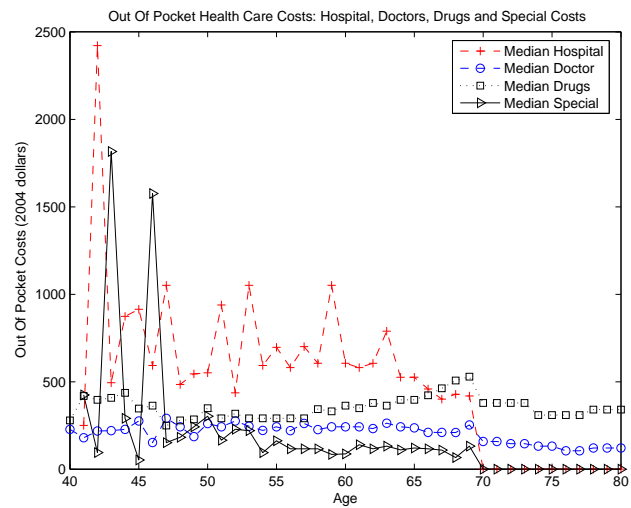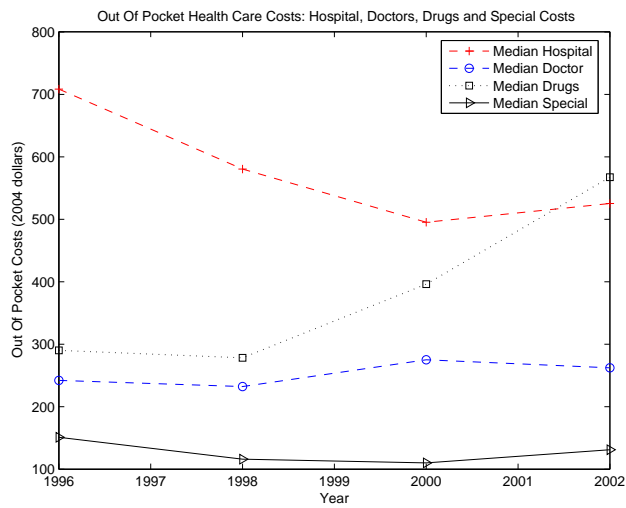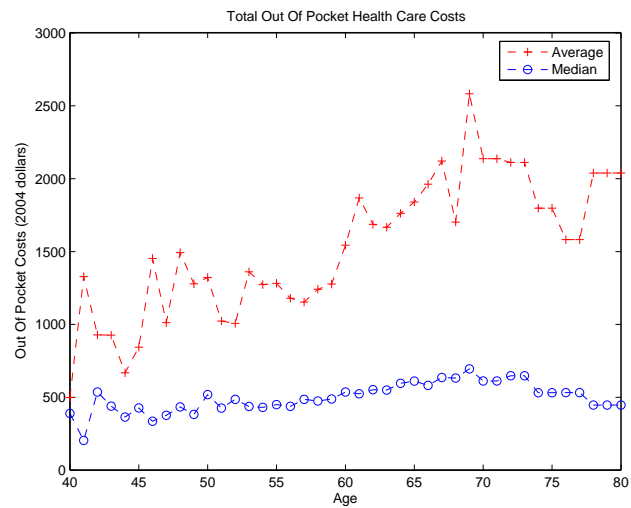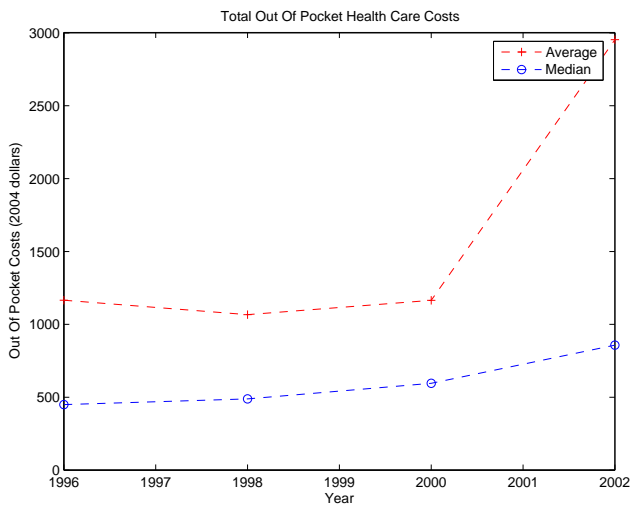
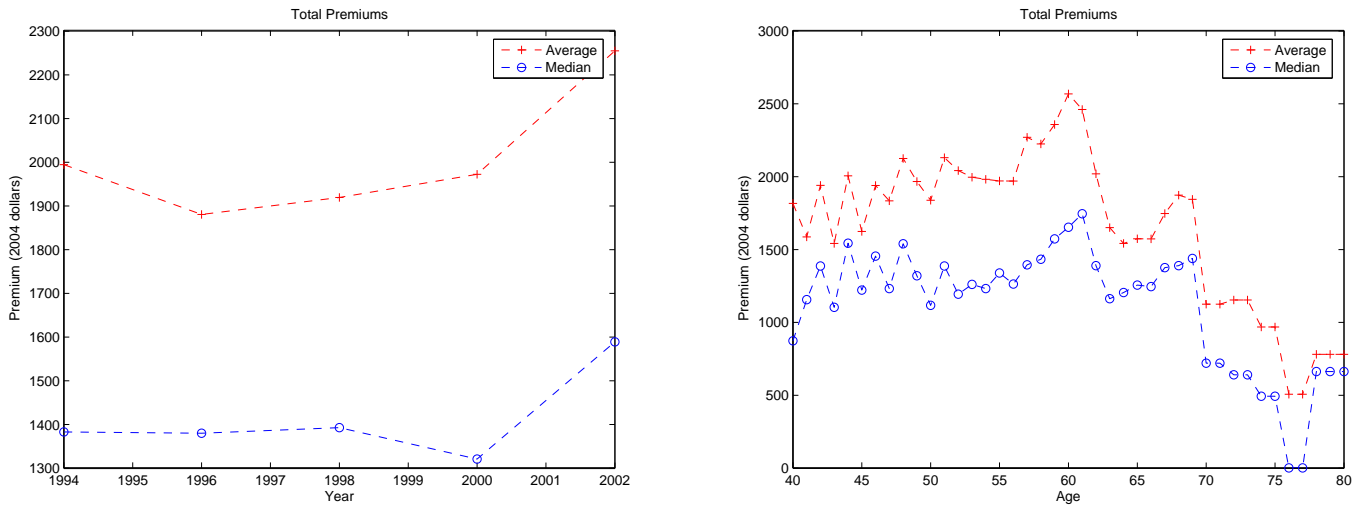Figure 4.1: Health Care Costs by Year and Age

Figure 4.2: Total Premiums by Year and Age

around age 69. All other costs drop sharply when individuals reach retirement ages.

Figure 4.2 depicts the average and median total premium value over time and by age. The total premium is the sum of Medicare, employer-provided insurance, Medigap and private health insurance premiums. From the left-hand panel, we observe that the average premium oscillates around the same values during the 1994-2000 period, going from $2000 in 1994 to slightly below that in 2000. The average premium increases then to around $2250 by 2002. The median total premium value follows a similar trend, with an initial value of just below $1400 in 1994, and almost $1600 by 2002. Looking at the premium values by age, we see in the right-hand panel of the gure that the average premium is slightly increasing with age up to around age 62. After that it decreases sharply between the ages of 62 and 65 and then increases for individuals age 66 to 70, only to drop sharply again around age 70. We believe that these uctuations are connected with the labor supply behavior of individuals responding to the incentives provided by the Social Security system, since a large proportion of individuals join Medicare at around age 65, and then again around age 70, when no more actuarial adjustments to bene ts are possible.

Table 8 shows the detailed health insurance premiums broken down by health insurance type. All values are in 2004 US dollars. We can see that Medicare premiums did not change very much between Waves 2 and 5 (1994 to 2000), but increased signi cantly between Waves 5 and 6.[12].

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[12] The HRS does not contain explicit information on Medicare premiums in Wave 2, since there is no question asking how much an individual that is covered by Medicare pays exclusively on Medicare premium.

	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6
Medicare Premium (#)	—	203	211	468	1050
Mean	—	844.09	838.27	726.47	1022.26
Median	—	609.84	612.48	594.00	680.40
Employer Premium (#)	3262	1941	1601	1312.00	2861
Mean	1928.67	1393.24	1310.29	1520.98	2150.19
Median	1228.80	847.00	835.20	943.80	1512.00
Medigap Premium (#)	110	336	558	742	1701
Mean	1188.04	1483.30	1405.08	1698.71	1999.88
Median	921.60	1205.16	1251.64	1320.00	1600.20
Private Premium (excl. Medigap)(#)	1167	743	714	525	1244
Mean	2168.10	3300.48	3512.64	3552.35	2405.30
Median	1290.24	2904.00	3004.40	3036.00	1728.30
Long Term Care Premium (#)	52	602	534	623	773
Mean	1155.30	1418.00	1502.27	2527.44	4104.01
Median	928.00	847.00	1044.00	1214.40	1827.00
Total Premium (#)	4208	4205	4005	4244	4880
Mean	2050.33	1940.38	1833.34	1971.00	2250.48
Median	1249.28	1258.40	1252.80	1293.60	1575.00

On the other hand, Medigap premiums increased steadily over the same period, with the sharpest increases in the 1998 to 2002 period. Employer-provide health insurance premiums decreased between Waves 2 and 4, and increased steadily there after, for an overall increase of 12%. We also calculated Wave 6 (2002) employer-provide health insurance premium to be $2,150.19, which is very close to what the Kaiser Family Foundation survey of employer health bene ts found for 2003, namely $2,412.

Average private insurance premiums (not including Medigap) increased steadily from $2,168.10 in Wave 2 to $3,552.35 in Wave 5, then decreased sharply to $2,405.30 in Wave 6. Long-term care premiums increased monotonically between Waves 2 and 4, and very rapidly there after, with the data showing a large increase in the mean and median premiums between Waves 5 and 6 (62% and 51%, respectively), which could be re ecting the changes made recently in the long-term care nancial system.

It is interesting to notice that as our sample ages, more individuals are reporting positive Medicare, Medigap, and long-term care health insurance premiums and less employer-provided insurance premiums. The fact that more and more individuals are becoming eligible for Medicare, and Medicare premiums are relatively lower than employer premiums, and much lower than all private
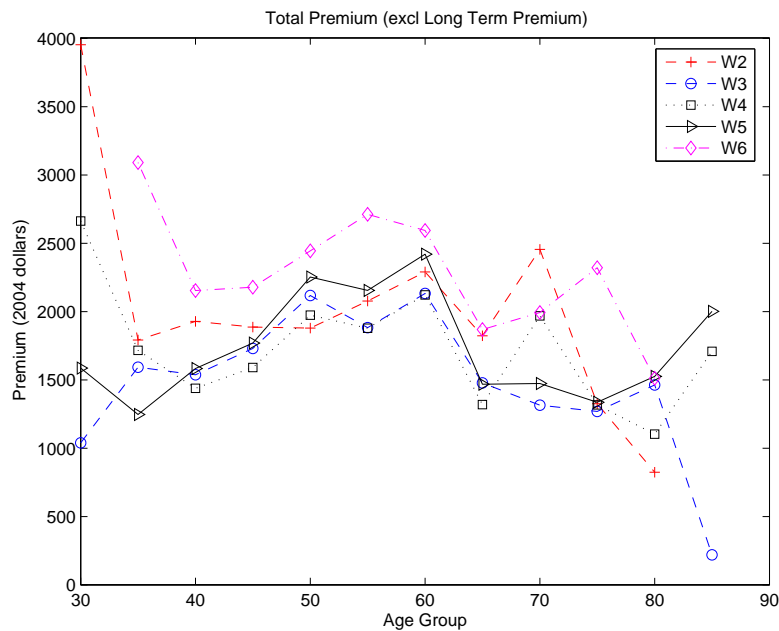
Figure 4.3: Total Premiums by Wave and Age Group

insurance premiums, explain why we are not seeing a large increase in the average total premium across waves.

It would be natural to conjecture that the trends that we observe in terms of health care premiums are driven by the aging process of our sample. However, Figures 4.3 and 4.4 present a fairly different picture. The different types of premiums do not follow a clear age trend, and are dominated by the time trend, mainly through the increasing premiums in the last sample years. The exception is the private insurance premiums plotted in the lower-left-hand side of Figure 4.4, which show an increases in premiums up to age 65 in all waves. After age 65 there is a large drop due to the fact that a large number of individuals join Medicare, and those that keep using private insurance are precisely those that are paying the least for their insurance coverage, maybe because they are comparatively healthier. Finally, long-term care premiums do grow after age 60, but the sharp increases in premiums in the 2000 and 2002 waves, dominates the age effect.
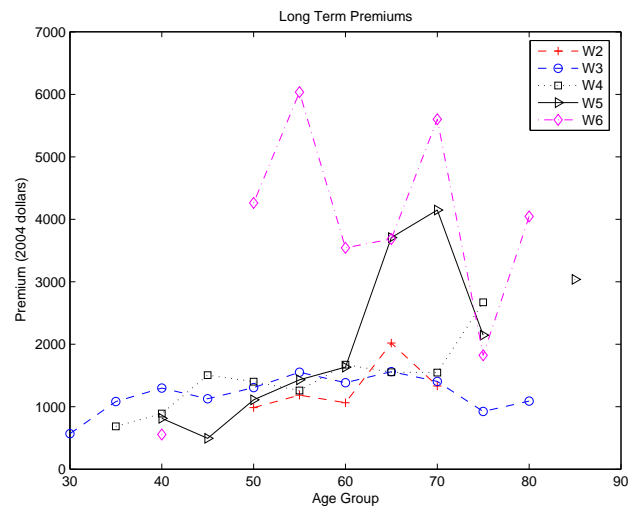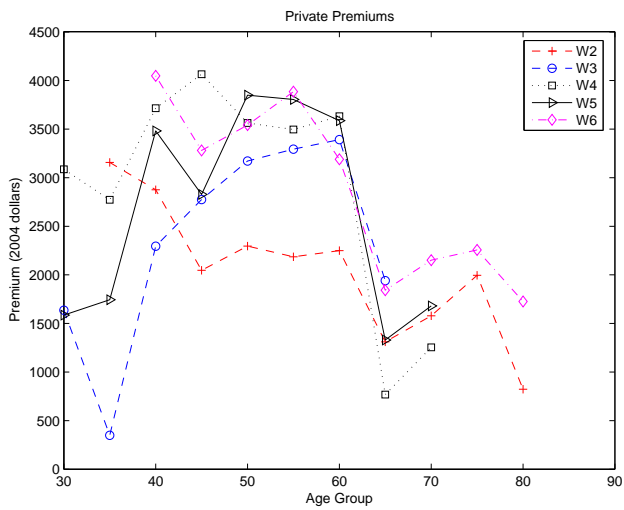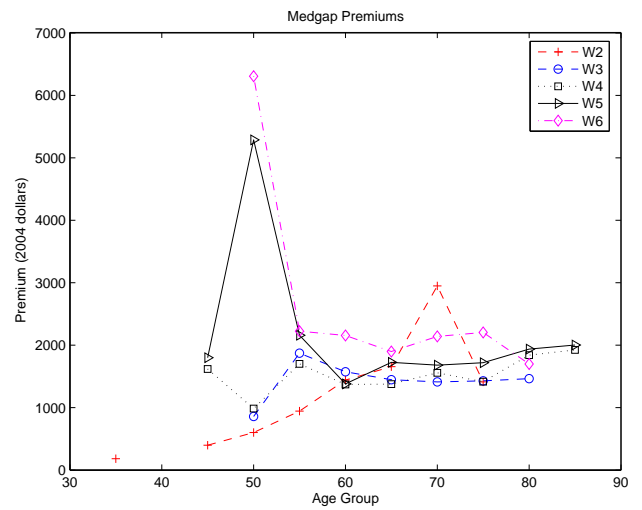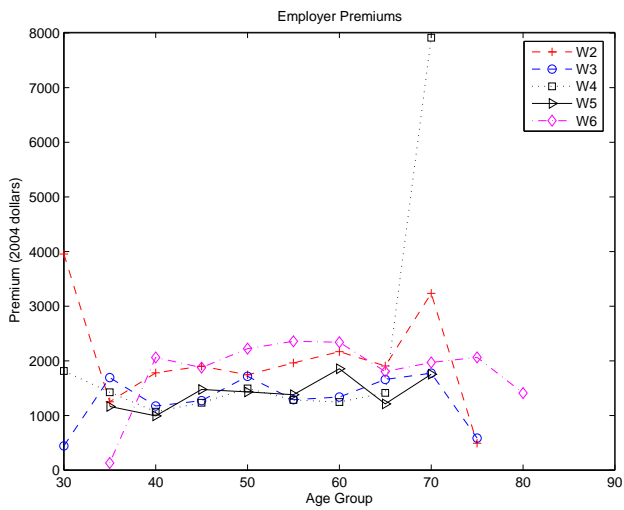
Figure 4.4: Premiums by Year and Age

4.2 Health Care Utilization and Effects on Health

In analyzing health care utilization we mainly focus on the annual number of doctor visits and the annual number of hospital stays (in days). Our analysis of health outcomes is mostly based on the self-reported variables in the HRS. Table 9 provides information on self-reported health and health care utilization by wave. It presents four different measures of self-reported health: health limitation precludes work, health limits ability to work, health limits ability in general and average self-reported health. It also includes two measures of self-reported life expectancy: belief to be alive until 75 years old and belief to be alive until 85 years old.

Not surprisingly, we observe that as our sample ages, more people report health affecting their ability to work and their ability in general. Also, the average self-reported health declines by about 14% over the period of study. Breaking down self-reported health by ve categories: excellent, very good, good, fair and poor, we can observe some interesting patterns. The number of people reporting to have very good, good and poor health uctuates somewhat but does not change much over the period. However, the number of people reporting to be in excellent health decrease from about 22% to about 11%, while the number of people reporting to be in fair health increased from 14% to 17.5%. The fraction of people that self-reports they expect to be alive by age 75 almost does not change across waves. Very similar patter happens to the percentage of people that self-report expecting to be alive by age 85, except for the last two waves, in which there is a 16% increase. This is mainly due to selection in that those individuals that survive long enough to reach Wave 6 are closer to age 85 than they were in Wave 1, and they are also more likely to be healthier.

Health care utilization is broken down by average hospital stays (in days) and average number of doctor visits. The average hospitalization stay increased from 2.11, in Wave 1, to 3.44 days in Wave 6, and the average number of doctor visits increased from 3.63, in Wave 1, to 8.23 in Wave 6. This increase in the utilization of health care services seems natural since our sample is aging, but it is also connected with the type of insurance they have as they age.

Table 10 provides information on self-reported health by level of coverage. The HRS has information on the level of coverage only conditional on reporting the use of health care service. So the numbers in Table 10 are calculated across waves and conditional on the individuals reporting that they have used health care service. It is interesting to notice that among those who reported having some health limitation, 90% were fully or partially covered. Also, for those who reported having fair or poor health, more people were fully covered in comparison with those who reported

Table 9: Self-Reported Health and Health Care Utilization

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6
Health Limitation Precludes Work (%)	9.22	14.30	14.33	15.31	15.21	10.05
Health Limits Ability to Work (%)	21.48	25.55	25.83	25.76	26.27	26.30
Health Limits Ability in general (%)	29.41	32.01	32.42	32.23	32.66	32.81
Average Self-Reported Health (1=Excellent, 5=Poor)	2.43	2.53	2.53	2.76	2.69	2.77
Report Health as Excellent (%)	22.19	18.12	17.49	12.20	13.15	11.45
Report Health as Very Good (%)	27.51	29.14	30.54	26.84	28.99	28.24
Report Health as Good (%)	28.01	28.75	27.81	30.25	28.76	29.69
Report Health as Fair (%)	14.28	15.45	15.06	18.24	16.42	17.48
Report Health as Poor (%)	8.01	8.50	6.97	8.76	7.92	7.30
People that Self-Report believing they will live until 75	67%	66%	68%	67%	68%	67%
People that Self-Report believing they will live until 85	49%	46%	49%	48%	57%	57%
Average Hospital Stay (Days)	2.11	2.42	2.11	2.64	3.03	3.44
(%)People that was hospitalized	11.44	18.21	19.00	20.70	21.05	22.70
Average Doctor Visits (#)	3.63	5.66	6.92	7.35	7.73	8.23
(%)People that went to a doctor	79.15	88.08	87.36	86.77	85.56	83.81

having excellent, very good, and good health. Furthermore, individuals with full coverage report being less healthy than the those with partial or no coverage. A possible explanation for that is that individuals that have better health insurance coverage use more health services and therefore have a better assessment of their health status. Alternatively, it can be that those who are in worse health make sure to be more fully covered.

In order to investigate if individuals that have no health insurance coverage use less health care services, we calculate health care utilization by level of coverage across waves. Table 11 reports the results. These numbers are calculated across waves and conditional on reporting having used each speci c health care service. For example, 53.28% of the hospitalizations over the 1992-2002 period were fully covered by health insurance providers, while only 4.21% had no coverage at all. It is striking to see that less than 10% of the individuals that have seen a doctor, or have had a surgery, or have received any type of nursing home, or home medical care did not have any kind of health insurance. This is to say that more than 90% of the individuals that received health care are covered by some health insurance. This nding strongly suggests that individuals that are uninsured are really constrained in their use or their ability to be receiving health care.

Table 11 also shows the average days in the hospital and number of doctor visits by the level of coverage. We nd that individuals with no health insurance have less hospital stays and less doctor

Table 10: Self-Reported Health by Level of Coverage in Doctor Visits

	Full	Partial	None
Health Limitation Precludes Work (%)	41.3	49.5	8.0
Health Limits Ability to Work (%)	35.4	55.3	8.4
Health Limits Ability in general (%)	32.8	58.0	8.3
Average Self-Reported Health (1=Excellent, 5=Poor)	2.34	2.17	2.20
Report Health as Excellent (%)	23.4	67.3	8.8
Report Health as Very Good (%)	22.8	68.7	8.0
Report Health as Good (%)	25.3	63.5	10.5
Report Health as Fair (%)	33.0	56.0	10.5
Report Health as Poor (%)	42.1	46.8	9.7
People that Self-Report believing they will live until 75	15.7%	27.1%	23.9%
People that Self-Report believing they will live until 85	17.5%	26.0%	21.0%

Table 11: Health Care Utilization by Level of Coverage

	Full	Partial	None
Hospital Stay (%)	53.28	40.16	4.21
Average Days in the Hospital	1.31	1.26	1.02
Nursing Home (%)	60.94	19.20	9.38
Doctor Visits (%)	27.04	62.86	9.46
Average Number of Doctor Visits	6.67	6.52	4.22
Outpatient Surgery (%)	46.70	46.91	3.89
Dental Care (%)	13.39	44.24	41.92
Prescription Drugs (%)	13.18	69.54	17.02
Home Medical Care (%)	76.07	15.46	5.19

visits, again reinforcing the idea that they are constrained in their utilization of health services.

Table 12 further explores this issue by showing the level of health insurance coverage of people who have seen a doctor or have been hospitalized by waves. Again we nd that a relatively small fraction of the individuals that have used those services had no health insurance coverage. This is especially true for hospital stay, but may re ect the fact that individuals with no coverage would do everything they can to avoid the expensive service of hospitalization.

In order to further investigate the linkage between health care utilization and insurance coverage, Tables 13 and 14 provide an overview of transitions from one insurance one state to another. The Tables also provide detailed information about the interactions between the transitions and utilization of health care, measured by the number of doctor visits and hospital stays.

Table 13 shows that the insured state is quite persistent across waves, especially in the last three

Table 12: Health Insurance Coverage by Wave

	Wave 3	Wave 4	Wave 5	Wave 6
Doctor Visits				
Full	23.77	25.62	27.28	31.82
Partial	62.04	63.28	64.77	61.34
None	13.47	10.60	7.52	5.92
Hospital Stay				
Full	47.54	53.14	56.56	55.53
Partial	44.03	40.37	37.92	38.59
None	6.23	4.70	3.59	2.50

Table 13: Health Insurance Coverage Across Waves

	Waves 1&2	Waves 2&3	Waves 3&4	Waves 4&5	Waves 5&6
Insured to Insured (#)	8255	7758	8224	8258	8263
(%)	73.9	74.6	82.1	85.9	90.5
Insured to Uninsured (#)	1045	681	433	216	216
(%)	9.4	6.5	4.3	2.2	2.4
Uninsured to Insured (#)	766	1247	630	689	326
(%)	6.9	12.0	6.3	7.2	3.6
Uninsured to Uninsured (#)	1110	716	725	449	324
(%)	9.9	6.9	7.2	4.7	3.5

waves of the HRS. However, a signi cant fraction of individuals, between 6% and 16% depending on the wave, do change their insurance status. This is especially clear in the transitions from Wave 1 to Wave 2 and from Wave 2 to Wave 3. Table 14 and its various panels explores the possible interactions between these transitions and health care use, trying to uncover a pattern of health care utilization that is correlated with these changes in insurance coverage.

Panel A of Table 14 shows the percentage of individuals who increased their number of doctor visits as a function of the evolution of their insurance status. We can observe that those who transit from the no insurance state to the insurance state are very similar in their behavior to those that remained insured. Moreover, those who lose their insurance are clearly less likely to see the doctor more often than before. Panel B of Table 14 presents the complementary results, with the percentage that decreased their number of doctor visits. Here the main nding is that for most waves those that lose their insurance are clearly more likely to go to the doctor less.

Panels C and D of Table 14 present similar evidence but for hospital stays for this same popu-lation. Again the insurance transitions explain quite well the differential utilization of health care over time.

Table 14: Health Care Utilization and Health Insurance Transitions

Panel A: % in each group that increased their number of Doctor Visits

	Waves 1-2		Waves 2-3		Waves 3-4		Waves 4-5		Waves 5-6	
	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins
Ins	61.5	58.3	50.1	46.3	44.8	38.0	44.3	35.7	44.5	30.2
Unins	60.9	54.5	52.8	39.8	44.6	37.7	45.9	41.0	45.9	38.4

Panel B: % in each group that decreased their number of Doctor Visits

	Waves 1-2		Waves 2-3		Waves 3-4		Waves 4-5		Waves 5-6	
	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins
Ins	22.5	21.7	32.6	34.3	39.0	42.1	39.9	41.48	39.3	51.0
Unins	22.7	21.3	29.9	33.8	35.4	36.5	37.0	35.5	37.8	36.1

Panel C: % in each group that increased their number of Hospital Stays

	Waves 1-2		Waves 2-3		Waves 3-4		Waves 4-5		Waves 5-6	
	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins
Ins	15.3	15.2	14.7	12.6	15.6	13.2	15.9	14.4	17.5	8.8
Unins	18.8	11.0	15.2	8.5	17.5	8.4	16.1	9.4	16.3	9.0

Panel D: % in each group that decreased their number of Hospital Stays

	Waves 1-2		Waves 2-3		Waves 3-4		Waves 4-5		Waves 5-6	
	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins	Ins	Unins
Ins	7.5	6.9	11.7	11.2	12.8	13.4	14.4	15.7	13.9	9.3
Unins	8.4	4.1	10.1	8.7	10.0	10.2	10.2	8.7	10.1	8.0

5 Out-of-Pocket Health Expenditures: Non-parametric and Parametric Analysis

This section examines the distribution of out-of-pocket health care costs, conditional on the type of insurance coverage. We use two approaches to examine how the health insurance coverage impacts the distribution of out-of-pocket health care costs. The rst approach involves estimating a kernel density of the cost of health care services, separately for six mutually exclusive categories of insurance coverage. As in Section 2, the categorization is based on the highest level of insurance available to the individual, (1) Employer provided, (2) Private or spouse other than Medigap, (3) Medigap, (4) Medicare, (5) Medicaid, and (6) No Insurance. Therefore, a respondent with both Medicare and employer provided insurance is assigned to the rst category. The second approach is based on the work of Rust and Phelan (1997), who concluded that out-of-pocket health cost were best modeled with a mass point at a given cutoff and with a Pareto distribution above this cutoff point. In this paper we estimate the Pareto distribution of total out-of-pocket health costs, conditioning on a range of demographic, health, insurance coverage, and health care utilization variables.

5.1 Non-parametric density estimates

In Figures 5.1 we estimate kernel densities (based on Epanechnikov kernel function) for the total out-of-pocket costs, drug costs, hospitalization, and doctor visit and dental costs, conditional on types of insurance. We pool the data from all 6 waves, and de ate the out-of-pocket costs in order to take in ation into account.

The density estimations for total out-of-pocket costs show that uninsured respondents are more likely to incur large costs in catastrophic health events. The order of the insurance types in terms of the lowest costs, based on covering costs of up to \$800 is: employer, private, Medicaid, Medicare, Medigap, and Unions. For costs higher than \$1,200, Medicaid has the best coverage, as indicated by the estimated lower area below the Medicaid curve for values above that threshold. A rather surprising result is that for costs higher than \$2,600, the estimated density for the uninsured falls below Medigap. We have checked if this is due to having a low number of observations in that interval, which could make the results inaccurate. We nd that the number of observations for the uninsured category with costs greater than \$ 2,600 is 388, and for Medigap is 510. Therefore, the
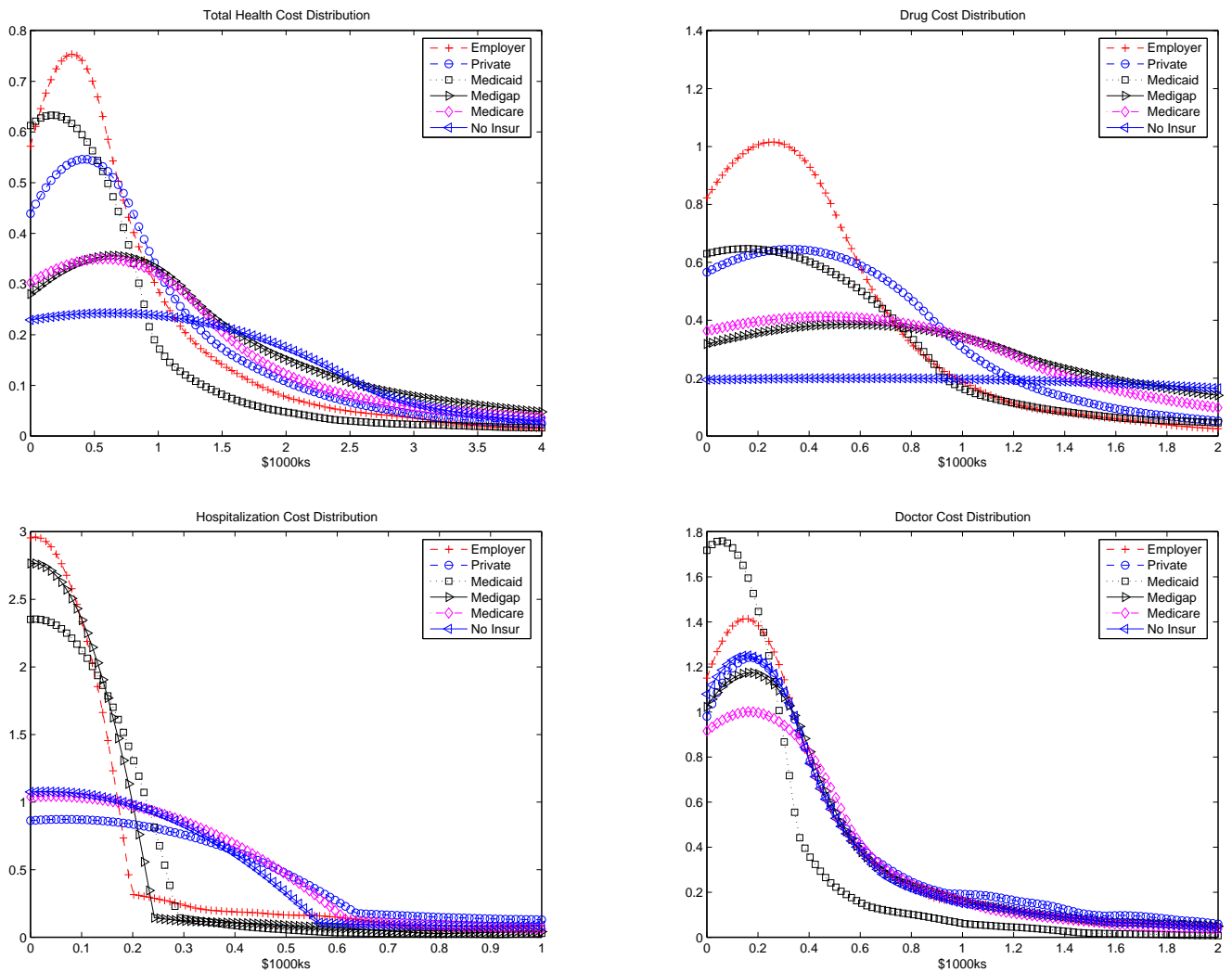
Figure 5.1: Kernel density estimations of out-of-pocket costs

results do not suffer from the small cell-count problem. In addition, the estimated density for the uninsured falls below Medicare at around $3,600.

There might be two explanations for this phenomenon. First, the populations being compared can be quite different, with those on Medicare and Medigap belonging to a considerably older pool, that is more likely to have health problems. Second, it might be due to selection bias. That is, individuals who expect catastrophic costs in the future, due to their medical history, would avoid being uninsured.

Next, we decompose the total out-of-pocket costs into drug costs, doctor visits, and hospitalization costs. The estimated distributions for the drug costs in the upper-right-hand corner of Figure 5.1 indicate that the distribution for the uninsured is close to a uniform. Hence, the selection

bias discussed above, does not seem to be present for drug costs. In addition, employer-provided insurance has the best coverage for high costs of drugs, and this might be because most of the employees have the option to get prescription coverage for a small additional amount to their regular premiums. Medicare and other government-provided coverages do not cover prescription drugs (other than certain cancer drugs) so their distributions are somewhat close to uniform as well.

In the lower-left-hand corner of Figure 5.1 we plot the density estimates for the hospitalization costs. Employer-provided insurance and Medigap have the best coverage for hospitalization costs. Their distributions are almost totally at after a value of between $200 and $250. Medicare and Medicaid, however, pick up the costs that are higher than $500.[13] Private insurance has the worst coverage of all plans, even worse than uninsured for high hospitalization costs. This can again be an evidence for self-selection. That is, the respondents with private insurance, which usually does not cover hospitalizations, who tend to have worse health condition than the uninsured, pay higher out-of-pocket costs than the uninsured respondents. Hence, individuals anticipating long stays in hospital end up obtaining some supplementary insurance that cover the hospitalization costs.

The lower-right-hand corner of Figure 5.1 shows evidence supporting that generally believed fact Medicaid has generous doctor visit and dental coverage. All other insurance look rather similar, with employer-provided insurance having better coverage for low costs, and private insurance having the worst for high costs.

5.2   Parametric Model: Estimates using a Pareto Distribution

Following the insights from Rust and Phelan (1997), we t a conditional Pareto distribution to the data on out-of-pocket health costs in the HRS. This alternative approach is motivated by the fact that the distribution of out-of-pocket health costs, as was seen in the earlier charts, tends to peak at relatively low levels. This represents the relatively low recurring costs associated with regular, preventative medical care; i.e. co-pays for check-ups, or the occasional purchases of drug prescriptions. In analyzing out-of-pocket health care, the more pressing issue is the occurrence of extremely high out-of-pocket health costs, triggered by some catastrophic negative health shock. This could consist of expensive hospital stays, high levels of prescription drug costs, and other expensive services.

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[13] In fact the deductible for hospitalization costs of Medicare Plan A is around $700-800 for the 1990-2000 period, and around $40-$100 for Plan B in the same period.
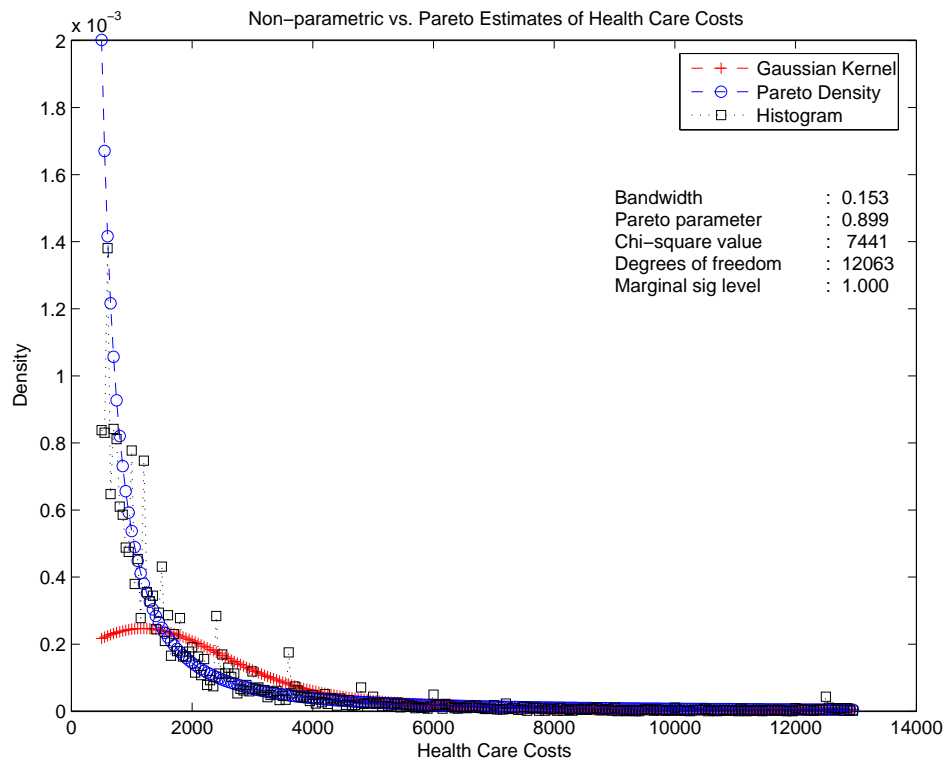
Figure 5.2: Non-parametric vs Pareto estimation of total out-of-pocket costs

In Figure 5.2 the Pareto distribution, for out-of-pocket health costs above a given cutoff level, is compared to an estimate of a non-parametric kernel density. As can be seen, both in the graphical results and the results from the Chi-square test (which has a small value compared with its degrees of freedom), the Pareto distribution provides a superior match. Given that a Pareto distribution provides a better t to the distribution of out-of-pocket health care costs, the next step is to estimate a conditional Pareto distribution model. This will allow us to determine what factors lead to a higher instance of excessive out-of-pocket health care costs.

Table 15 below reports the results from the estimation of the conditional Pareto distribution model. The demographic variables included are: age, age-squared and sex. The variables capturing health status include: self-reported health status, and whether health limits work. Health care utilization is captured by: the number of hospital stays, and doctor visits in a given year. The nal set of variables re ects the level of insurance coverage: no insurance, Medicare, Medigap, private insurance, and employer-provided insurance (with Medicaid as the left-out category). Unlike the previous analysis, the insurance coverage variables (with the exception of no insurance) are not mutually exclusive.

Table 15: Estimation of Pareto Distribution of Total Out-of-Pocket Costs

Variable	Coef cient	Standard Error
Constant	0.771694	0.666989
Age	-0.019150	0.021677
Age Squared	0.000130	0.000177
Male	0.049018*	0.022296
Self Reported Health	-0.054194*	0.010819
Hospital Stays	-0.061451*	0.008911
Doctor Visits	-0.005069*	0.001083
Log, Postive Wealth	0.016061*	0.006860
Log, Negative Wealth	0.025224	0.018312
Log, Income	0.016061*	0.006860
Log, Spouse Income	0.025224	0.018312
No Insurance	-0.101618*	0.043371
Medicare	-0.058897	0.033802
Private Insurance	-0.077606*	0.030382
Employer Insurance	0.056082*	0.025864
Medigap	-0.037350	0.034394
Health Limit Work	-0.029054	0.026852
Log Likelihood	-8.4344671	
Total Observations	15221	

* : coef cients signi cant at the 5% level or better

In interpreting Table 15 it is important to remember the shape of the Pareto distribution. The two free parameter in the Pareto distribution are the cutoff value, here set arbitrarily at $500, and the α value. The smaller α the fatter the tails of the distribution. The conditional α values are found by taking the exponent of the average values of the independent variables multiplied by the coef cients. Given this structure, a negative coef cient value reduces α, indicating fatter tails and a higher likelihood of incurring large health care costs.

One of the most signi cant factors in the conditional Pareto distribution is the presence of employer-provided insurance. Access to employer-provided insurance results in a signi cantly higher value of α and, hence, a signi cantly thinner tail of the distribution. Of the other insurance parameters, only the presence of private insurance and no insurance are signi cant. Both coef-cients are negative, implying that those with private insurance and no insurance will also have a greater likelihood of facing substantial out-of-pocket health costs. The nding regarding those without insurance is rather expected, but the fact that those with private insurance also are at a higher risk of very high health care costs is evidence of substantial self-selection, and possible ad-verse selection (see Cutler and Zeckhauser (2000) for an up to date discussion of adverse selection

issues in health insurance markets) in health insurance.

Respondents who are relatively unhealthy and expect high out-of-pocket health costs (and can afford it) purchase the more expensive private health insurance. Respondents who are relatively healthy and expect low out-of-pocket health cost, or cannot afford it, forgo the expense of health insurance, putting themselves at higher nancial risk in case a catastrophic event. It is also interesting to note the lack of signi cance of the coef cients for both Medicare and Medigap. Respondents on Medicare do not have a greater likelihood of facing high out-of-pocket, and neither do respondents with Medigap.

In analyzing the impact of health status on the distribution of out-of-pocket health cost, we see that the measure of self-reported health status is signi cant and the coef cient for health-limiting work is insigni cant. Respondents who report poor health status have a signi cantly higher probability of incurring large out-of-pocket health costs relative to those reporting excellent health. The presence and signi cance of employer-provided insurance might explain the insigni cance of the health-limiting work variable. The coef cients for the measures of health care utilization are both signi cant and have the expected signs. The negative coef cients in the estimation results indicate that the probability of incurring large out-of-pocket health costs increases as the number of hospital and doctor visits increase.

These ndings regarding the impact of health status and health care utilization are not particularly stunning or unexpected. However, the fact that they are intuitive and match our prior beliefs gives some credibility to the estimated model and provides some con dence in the results for the level of insurance coverage. The key result from these Pareto distribution estimates is that respondents with private insurance have a higher probability of incurring large out-of-pocket health costs.

We nish this section with some comparative static using the insights from Table 15. In Table 16 we report the value of α for the conditional Pareto distribution, and the probability of incurring in health care costs above \$10,000, conditional o a particular set of exogenous of individual characteristics. Notice that as explained above, a lower value of α implies a higher probability of incurring high levels of health care costs. We can see, for example, that someone reporting being in poor health has a probability of around 10.5% of incurring in health costs above \$10,000, while, other things equal, someone reporting being in excellent health, only has a 4.7% probability of incurring costs above that threshold. We can also see that staying in the hospital for 10 days multi-

Table 16: Estimate of Pareto Coefcient Under Different Coditions

	Value of Alpha	*Probability* > $10,000
Conditional Alpha	0.9165	7.01%
Alpha w/ poor self reported health	0.8194	10.48%
Alpha w/ excellent self reported health	1.0178	4.66%
Alpha w/ no hospital stays	0.9478	6.17%
Alpha w/ 10 hospital stays	0.5127	41.99%
Alpha w/ no doctor visits	0.9657	5.74%
Alpha w/ 25 doctor visits	0.8508	9.19%
Alpha w/ 120% Average Positive Wealth	0.8796	8.15%
Alpha w/ 80% Average Positive Wealth	0.8771	8.24%
Alpha w/ 120% Average Income	0.9093	7.22%
Alpha w/ 80% Average Income	0.9073	7.27%
Alpha w/ no ins	0.8349	9.82%
Alpha w/ ins	0.9242	6.79%
Alpha w/ medicare only	0.8912	7.77%
Alpha w/ medicare and medigap	0.8585	8.90%
Alpha w/ emp. ins	0.9489	6.14%
Alpha w/o emp. ins	0.8972	7.58%
Alpha w/ health limitations	0.8990	7.53%
Alpha w/o health limitations	0.9255	6.75%

plies by seven the probability of facing that level of health care costs compared with someone that did not stayed in the hospital at all in the previous year. Interestingly, other things equal, average income has relatively little effect on the probability of incurring in those high health care costs, likely indicating that the other controls explain most of the differential costs by income levels. The table also shows that those with employer provided insurance are the ones facing the lowest risks of high health care costs, and that health limitations have a weak effect compared with self-reported health measures.

6   Conclusions

This paper provides a comprehensive basic statistical analysis of the health care insurance for a sample of older Americans in the Health and Retirement Survey (HRS). We characterize and examine the type of health coverage that HRS respondents had in the 1992 to 2002 period. We also present estimates of discrete choice models, which make an attempt in understanding the nature of health coverage and its determinants. We also closely examine the health care cost and utilization and provide parametric and non-parametric estimates for out-of-pocket costs on various

health expenses categories.

We rst document the movement of retirees from employer sponsored and private plans to government plans in retirement as they reach eligibility age. We nd that a large proportion of the HRS respondents go through periods, of varying length, without any kind of health coverage. We show in details how both the cost and consumption of health care services vary with the type of insurance coverage they individuals have. Speci cally , respondents with no insurance visit the doctor one-forth as often as those with private insurance and are more likely to report declines in health status. A detailed analysis of the distribution of health care cost show the importance of prescription drug costs in the overall cost of health care.

While our results are certainly suggestive of major problems caused by the rapid escalation of health care costs in the U.S., it is much harder to draw rm conclusions from this analysis regarding welfare and "causality". It is certainly tempting to classify persistently uninsured individuals as "health insurance constrained" (as de ned, for example in the Rust and Phelan analysis, as individuals who have no opportunity to obtain health insurance at a reasonable price). Yet, the HRS survey does not collect suf cient information for us to be able to determine the individual's "health insurance opportunity set." In particular, we are unable to determine whether individuals who do not have health insurance are *voluntarily* uninsured (i.e. they chose not to purchase health care coverage even they it was feasible for them to do so) or whether they are *constrained*. That is, they either have a pre-existing condition and no insurance company will insure them, or that the cost of getting insurance is prohibitively high. Between these two extremes is a much more murky "grey zone" of individuals who do have several more or less satisfactory insurance alternatives, but at prices that they may regard as too high in relation to the coverage that is provided. It is not clear whether or not we should classify individuals in this intermediate category as "constrained" and it is harder to evaluate the welfare consequences of the lack of fairly priced insurance.

To some extent not being insured might re ect a conscientious decision to go without insurance. This, in turn, might re ect the outcome of a rational "risk/return" tradeoff made by the individual. The high premiums charged by insurance company may simply be passing on the high cost of health care, which is not necessarily the fault of the insurance provider. As we noted above, a recent Kaiser Family Foundation Survey suggests that the majority of Americans who are without insurance coverage are uninsured "voluntarily". That is, they could have purchased health coverage, but evidently chose not to do so due their evaluation that the bene ts it provides is not

worth the price.

We cannot directly observe the menu of various health insurance plans and their corresponding premiums that an individual could have chosen from. Hence, we cannot directly evaluate how many individuals are constrained. Among those who are unconstrained we cannot directly measure how many individuals have made a "rational" decision not to purchase health care coverage, and how many have made a short-sighted or irrational decision to go without coverage.

In future work we will seek out additional sources of data, such as the *Medical Expenditure Panel Survey* maintained by the U.S. Agency for Healthcare Research and Quality (AHRQ), and use this information to supplement the HRS data in order to make statistical inferences about the reasoning that lead some individuals to be insured and others not. In particular, we plan to use an elaborated version of the life-cycle model, similar to models developed by Rust and Phelan (1997), van der Klaauw and Wolpin (2002), Scholz, Seshadri and Khitatrakun (2004), French (2005), and particularly the very ambitious work of Khwaja (2004). In this model we plan to integrate Social Security, disability and Medicare into a detailed life-cycle model that accounts of (1) stochastically evolving health status, and (2) the role of medical care to restore/repair health problems a person may experience over their life-cycle.

Nevertheless, this paper makes an initial examination that provides a very informative picture of the evolution of health insurance coverage, out-of-pocket health insurance costs, and health, over the decade from 1992 to 2002 as individuals in the HRS transitioned from work into retirement. Our ndings are likely to be of independent interest to policy makers. They also provide an important set of "stylized facts" that the planned life-cycle models will need to match, if they were to provide good approximations to actual behavior.

Ultimately some more advanced type of life-cycle model will be necessary to address many of the most dif cult health policy issues, such as an analysis of the bene ts and costs of extending Medicare coverage to earlier age groups, or of restricting access to Medicaid. There is only so far that a descriptive empirical analysis can go in terms of addressing concrete policy questions. However, we have provided detailed assessment about the degree of success of Medicare and Medicaid in terms of provision of health care and reduction in nancial risk to the least well off members of the HRS cohort.

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