THREE ESSAYS IN LABOR AND PUBLIC ECONOMICS

by

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CHAPTER I

Introduction

This dissertation explores new questions in regards to the role of health insurance in retirement decisions and the financial value of avoiding perceived crime. Research on the role of employer provided health insurance (EPHI) and retiree health insurance (RHI) in labor force participation decisions has been quite extensive over the past fifteen years. Much of this research has focused only on offers of EPHI from men's employers and only on the decision to retire or continue to work. In the case of the focus on the former, the health insurance needs of a married couple are much more complicated and not always the uniform within the couple. As for the latter concern, retirement reversals are a surprisingly common occurance and it is important to identify how health insurance availability influences this decision for public policy evaluations of health care policy. The willingness of citizens to pay to avoid areas of high actual or perceived crime is also important for the public policy evaluation of crime enforcement programs. The sudden increase in clandestine, residential methamphetamine production offers a new opportunity to measure that willingness in a way that reduces the concern of other competing forces that are also associated with decreases in property values.

Chapter 2, "Love, Toil, and Health Insurance: Why American Husbands Retire

When They Do," examines the relationship of both spouses' health insurance options to the household's timing of the husband's retirement. Previous literature has largely ignored the inter-spousal dependence of health insurance benefits. Using data from the Health and Retirement Study, an important finding is that a wife's health insurance options have an independent impact on the timing of her husband's exit from the labor force. This impact is similar in magnitude to that of a husband's own health insurance options. As the prevalence of retiree health insurance offers continues to decline, the omission of inter-spousal health insurance dependency may lead to sizable underestimations of the cost and the employment response to changes to health insurance regulations and the qualifications for Medicare. In Chapter 3, "The Lasting Effects of Crime: The Relationship of Methamphetamine Laboratory Discoveries and Home Values" estimates a household's willingness to pay to avoid crime while minimizing concerns of omitted variable bias. By assuming methamphetamine producers locate approximately at random within a narrowly defined neighborhood, this study has been able to use hedonic estimation methods to estimate the impact of the discovery of that lab on the home values near that location. Though more evidence is necessary, one interpretation is that the impact on property values reflects the valuation of the perceived risk of crime. Specifically, the analysis designates those closest to the site as the treated, while those slightly farther away act as the comparison group. The discovery of a methamphetamine laboratory has a significant effect on the property values of those homes close to the location that peaks from six to 12 months after each lab's discovery. The estimates found in this study range from a decrease in sale prices of six to ten percent in the year following a laboratory's discovery compared to the prices for homes that are slightly farther away. Chapter 4, "The Impact of Health Insurance Availability on Retirement Decision Reversals," also uses the longitudinal aspect of the Health and Retirement Study to explore the characteristics associated with reversals in retirement (referred to here as "unretirement"). Through the use of survival time analysis, this essay shows that health insurance plays a significant role in unretirement decisions. This role is underestimated when a static probit analysis is used with characteristics at an individual's retirement. The results are robust to various definitions of retirement prompted by the difficult question of how to classify partial retirements. The importance of health insurance provision in a retiree's decision also remains significant when other "shocks" and the prospect of planned unretirement are introduced.

Together these three, self-contained chapters improve upon our understanding of the important role of health insurance in retirement patterns and provide a new measure of the disutility of criminal enterprises. Each of these chapters takes a fresh look at a subject of great interest, using new data and asking new, important questions. Thus, each of these chapters provides new information to policymakers which can be useful in evaluating policy changes and expenditures.

CHAPTER II

Love, Toil, and Health Insurance: Why American Husbands Retire When They Do

2.1 Chapter Abstract

Health insurance has previously been shown to be an important determinant of retirement timing among older Americans. Because health insurance is more commonly linked to the husband's employment than the wife's, this study examines the relationship of both spouses' health insurance options to the household's timing of the husband's retirement. Previous literature has largely ignored the inter-spousal dependence of health insurance benefits. Using data from the Health and Retirement Study, I find that a wife's health insurance options have an independent impact on the timing of her husband's exit from the labor force. This impact is similar in magnitude to that of a husband's own health insurance options. The omission of inter-spousal health insurance dependency may lead to an underestimation of the cost and the employment response to changes to health insurance regulations or the qualifications for Medicare, especially as the prevalence of retiree health insurance offers continues to decline.

2.2 Introduction

Research on the role of employer provided health insurance (EPHI) and retiree health insurance (RHI) in labor force participation decisions has been quite extensive over the past fifteen years. Much of this research has focused only on offers of EPHI from men's employers. To the extent that the health insurance benefits of wives are considered, it is usually limited to whether EPHI from wives' employers could cover husbands if the husbands retire. The inter-spousal dependence on EPHI has not yet been fully considered despite the fact that in most working couples, each spouse has health insurance through the same employer's plan.[1] Specifically, the narrow focus of previous work ignores some important questions households might ask themselves before deciding whether husbands should retire.

Take a hypothetical couple, Jack and Diane, where at least one spouse relies on Jack's employer for EPHI. If the couple is deciding when Jack should retire, they will ask themselves a number of questions regarding health insurance. First, does Jack's employer offer retiree health insurance (RHI)? If the answer is no, the second question is, does Jack have a low-cost alternative to the EPHI he currently relies on from his employer? For example, if Jack is 65 years of age or older, he is likely to qualify for Medicare. Alternatively, if Diane is working and her employer offers EPHI, Jack could be covered under her plan. The third question is if Diane is also covered by Jack's employer. If the answer is yes and Jack's employer does not offer RHI, the final question is whether Diane has an affordable health insurance alternative to Jack's EPHI. It is the influence of the final two questions that the previous literature has not considered and that I examine in this study. I will also examine the relative size

[1] In near-retirement aged households where the husband is working and both spouses report employer provided health insurance (EPHI), over 87 percent of spouses are on the same plan. Sixty-nine percent of households have a plan through the husband's employer and 18 percent through the wife's. Percentages based on author's calculations using the 1992 wave of the Health and Retirement Study.

of the influence of each spouse's health insurance needs on the timing of husbands' retirements.

Most sources of group health insurance for American households are available to both spouses. One large exception to this is the federal government's health insurance program for older Americans, Medicare. Though one spouse can use the work history of the other to meet Medicare's minimal work qualification, each spouse must be of the minimum age (currently 65) to be eligible for this benefit. Based on the fact that wives are on average two to three years younger than their husbands, the rules of Medicare imply that a large share of wives do not qualify for Medicare at the same time as their husbands.[2] By including only the health insurance conditions for husbands, previous literature may be omitting any response by husbands to their wives' health insurance concerns. The previous literature may be underestimating the importance of retiree health insurance to retirement decisions if men are identified as not dependent on EPHI because they are Medicare eligible despite their wives' dependence on the husbands' EPHI. In such a case, it would appear that men are not responding to a change in their health insurance incentives when they become eligible for Medicare because they continue to work in order to recieve EPHI for their wives. Currently the number of households to which this circumstance applies is relatively small because of the prevalence of RHI offers, but the trend of declining RHI offers could significantly increase the share of households constrained by the difference in ages in the near future.

In the analysis that follows, I present evidence that a strong relationship exists between wives' health insurance needs and the timing of husbands' retirements, even independently of husbands' own health insurance concerns. Consistent with previous

[2] For a distribution of the gap in ages between spouses in the Health and Retirement Study, see Appendix Figure 2.3.

research, I find that the retirement rate for husbands who would lose their health insurance source upon retirement (regardless of whether their wives would as well) is six to nine percentage points lower than for those who would not. Not examined in previous research is a similar decline of five percentage points in the rate of husbands' retirement in households where the wife, but not the husband, would lose her current health insurance source without having an affordable alternative. These marginal effects represent a 30 to 45 percent decline in retirement rates and are not statistically different from each other. The detailed analysis is made possible by the expansive data available from the Health and Retirement Study (HRS).[3]

The timing of retirement is important for a number of reasons. If one is solely interested in individuals' "happiness," market imperfections (such as those that exist in the private health insurance market) limit people's ability to select their optimal time to reduce their labor in exchange for leisure and thus have important welfare implications. From a more pragmatic view, the timing of retirement has a number of fiscal implications. The financial outlook for Social Security is closely linked to the expected rates that individuals move from payers to receivers.[4] In recent years, the full benefit eligibility age of Social Security benefits has been increased to encourage delayed retirement. No similar changes have been made to the Medicare qualifications, but this may change in the near future as the date of projected insolvency of that program nears. The projected impacts of a number of policy changes to Medicare eligibility discussed in recent years (such as increasing the age of Medicare

[3]Though the HRS is the richest dataset for Americans in this age range currently available, the number of respondents does not allow for a parallel analysis of the relationship of spousal health insurance and the retirement of women due to the small share of women who receive health insurance from their own employers and even fewer whose husbands also rely on that insurance.

[4]Though Social Security benefits are designed to have actuarially fair benefit adjustments for those who retire before or after the normal retirement age, Coile and Gruber (2001) found that there is a small benefit disincentive to working between the ages of 55 and 61 and a large benefit penalty to working between the ages of 65 and 69 for the median male worker. The only benefit reductions for the median male worker that were found to be actuarially fair were for those between 62 and 64 but even those where unfair to almost half of individuals at age 62. Therefore, delays in retirement should improve the fiscal outlook of the Social Security program.

eligibility or allowing spouses of eligible recipients to buy into the Medicare program at a younger age) could be substantially different depending on whether the needs of younger spouses are considering. Additionally, proposals currently being discussed to make the private, non-group health insurance markets more accessible and affordable could have implications as households are given access to less expensive alternatives to EPHI. Such changes would have fiscal implications for Social Security that may be underestimated based on the methodology of previous research, especially as fewer employers offer RHI to their potential retirees.

Section 2.3 discusses the health insurance options and current trends for near-retirement married couples in the United States. Section 2.4 briefly examines how this study adds to previous research done on the relationship of EPHI and retirement. Section 2.5 reviews a simple representation of the maximization problem facing near-retirement aged households when health insurance is tied to employment. Section 2.6 describes the Health and Retirement Study, the sample used, and definitions of key elements for the analysis that follows. Section 2.7 discusses the general methodology used and addresses some concerns raised in previous literature. Section 2.8 presents the main results and a summary of outcomes following a husband's retirement. Section 2.9 concludes.

2.3 Background

Health insurance provision for working age Americans is centered around EPHI. The majority of workers receive health insurance from either their own or their spouses' employers. When Americans reach 65 years of age, they become eligible for the federal government's health insurance program, called Medicare, as long as they have worked ten years in a qualifying job (which most do). As previously mentioned, one spouse becoming eligible for Medicare does not mean that the other spouse is also eligible. Medicare is available prior to age 65 only for those with qualifying disabilities. If workers choose to retire before they reach 65 years of age, a number of insurance options exist in addition to the choice to go uninsured. For some, their employers offer to continue to provide health insurance to retirees who have worked for the employer for a certain number of years. I refer to this as an offer of retiree health insurance (RHI). The level of premium subsidization depends on the employer's specific benefits but, in general, these programs are retirees' least expensive option due to the risk pooling over all of an employer's employees. Under most RHI plans, spouses of retirees can also be covered, though again, with different levels of subsidization.

Those who retire before they or their spouse reach Medicare eligibility age and do not have an offer of RHI may still have access to health insurance, though it is usually more expensive than employee benefit plans. One option is to remain on their former employer's health insurance plan for 18 months following separation of employment, if they are willing to pay the full cost of the insurance (plus a two percent administration fee). This is commonly referred to as "COBRA" benefits (after the federal Consolidated Omnibus Budget Reconciliation Act which granted this benefit) and is discussed thoroughly in Appendix 2.10.2. A second option these retirees have is private, non-group health insurance. It is hard to estimate the average cost of such plans because of the high variability in the terms of each policy. Non-group insurance policies tend to have higher deductibles and co-payments for services than employer provided plans. Additionally, insurance companies in most states retain the option to deny coverage to individuals whom they deem too risky or limit benefits for pre-existing conditions. Examination of insurance companies' offer rates have found that companies reject 10 to 14 percent of all applicants (Pauly and Nichols, 2002; Merlis, 2005) and up to 37 percent of those with pre-existing conditions (Pollitz et al., 2001). The Congressional Budget Office (2005) estimated that the average annual premium for a private, non-group plan was $4,109 in 2002. This estimated premium is a third higher than the average total premium cost for EPHI that year ($3,083 based on survey data from the Kaiser Family Foundation and Health Research and Education Trust (2007)) despite the fact that this estimate does not control for the level of coverage (copayments and deductibles) or the cost to care for excluded pre-existing conditions (which are usually included in EPHI plans).

If near-retirement aged individuals choose to go without insurance, they are facing higher medical costs on average than younger Americans, with much higher variability. Gruber and Madrian (1996) found that the average medical expenditures for individuals between the ages of 55 and 64 was just over 50 percent higher than those between 45 and 54 while the standard deviation was almost 65 percent higher.[5] This relationship has continued in more recent data. Tabulations from the Medical Expenditure Panel Survey (MEPS) show the 2005 mean medical expenditure for individuals between 55 and 64 years of age to be again over fifty percent higher than for individuals between the ages of 45 and 54 at $5923 and $3775, respectively.[6] Medical costs are also growing faster than inflation. Using the MEPS data, the average medical costs between 1996 and 2005 increased at an annualized rate of six percent per year for individuals between 55 and 66 years of age, while annual inflation was between 1.6 and 4.1 percent in the same period. Data for 2006 showed medical costs increasing at twice the rate of inflation (Poisal, 2007).

[5] Gruber and Madrian (1996) calculated that the average medical expense in the 1992 HRS was $1395 with a standard deviation of $4001 for respondents between 45 and 54 and $2144 and $6532 for those between 55 and 64.

[6] MEPS is available through the U.S. Department of Human Services' Agency for Healthcare Research and Quality at http://www.meps.ahrq.gov/mepsweb/index.jsp

Evidence exists that the current dependence on EPHI and RHI is changing as fewer employers offer these benefits to their employees than did a decade ago. According to a 2007 survey of employers, the percentage of employers offering EPHI is down from 69 percent in 2000 to 60 percent in 2007 (Kaiser Family Foundation and Health Research and Education Trust, 2007). The decline in RHI offers has also been dramatic. Among large employers offering EPHI, the rate of RHI offers is down over 50 percent since 1988 and 11 percent since 1999 (33 percent offering RHI in 2007, down from 66 and 40 percent, respectively). A larger study using MEPS found that only one-quarter of private-sector employees were working at firms that offered retiree health benefits in 2003 compared to 32 percent in 1997 (Buchmueller et al., 2006).

2.4 Previous Literature

This study contributes to the existing literature relating health insurance provision and men's retirement by directly accounting for the effects of a wife's potential health insurance options following a husband's retirement. Papers by Madrian (1994), Karoly and Rogowski (1994), Gruber and Madrian (1995) and later, Blau and Gilleskie (2001) all found a strong link between men's RHI and their retirement hazard using reduced-form analyses, but none tested the impact of possible changes to wives' health insurance status. Though most of the above studies examine the health insurance of wives prior to retirement, it is only as a possible health insurance source for husbands if they retire. Similarly, a number of papers that use structural models to analyze retirement decisions have all incorporated an individual's health insurance, but not that of their spouse if they retire.[7] Nor have recent

[7] Most prominently, the studies using structural models to identify the role of health insurance in the decision to retire include Gustman and Steinmeier (1994), Lumsdaine et al. (1994), Rust and Phelan (1997), and French and Jones (2007).

extensions in this literature examining the the frequency of "joint" or coordinated retirement within dual-earning households accounted for the influence of spouses' health insurance needs on each individual's decision to retire. More recently, Blau and Gilleskie (2006) separately model the decisions of each spouse in a dual-earning household, but do not allow the spouses to consider how their retirement would affect the other's health insurance status. Similarly, Kapur and Rogowski (2007) include each spouse's RHI status when examining the order (not timing) of retirement within households, but their analysis does not allow for explicit identification of cross-spouse dependency. That said, Kapur and Rogowski (2007) find that the propensity of simultaneous retirements more than doubles if wives possess RHI, which suggests an important role for health insurance in the timing of retirement within households. Coile (2004) found a similar result examining the influence of pension plans in dual earning households. By defining terms appropriately and expanding the sample to single earner households, this study will be able to identify separately the influence of each spouse's health insurance options on a husband's decision to retire.

One study has addressed the effect of inter-spousal health insurance dependency. In trying to isolate the affect of Medicare on mens' retirement, Madrian and Beaulieu (1998) use the difference in ages between spouses to proxy for differences in health insurance availability upon retirements. Because the authors use Census data, they did not have the ability to include RHI offers in their examination. Despite this limitation, Madrian and Beaulieu (1998) are able to find an increase in the retirement hazard of 55 to 69 year old men with Medicare eligible wives compared to those whose wives are not Medicare eligible. This study supports the idea that a wife's health insurance prospects are an important determinant of the timing of a husband's retirement, but it is unable to identify the size of this influence or compare it to that of the husband's health insurance because they cannot separately identify those who are constrained by the Medicare qualification age (i.e. those without RHI) and those who are unconstrained. The wealth of detailed data in the HRS allows me to estimate the impact of cross-spouse health insurance dependency and control for factors other than age that may influence the decision to retire.

2.5 Theoretical Motivation

Figure 2.1 shows a graphical representation of a husband's labor-leisure optimization problem when health insurance is tied to employment. For ease of analysis, I assume the wife's labor supply decision has already been made and the household is choosing the husband's labor supply to maximize its utility given the household budget constraint. One could imagine that this is the result of a common preference approach to family behavior (such as models based on Samuelson (1956) or Becker (1974)) in which an employment decision for the wife is made first. Alternatively, the optimization problem presented here could represent the decision faced by a husband in a Nash bargaining framework where each spouse takes the other's actions as given. This framework is common in much of the literature on cooperative family bargaining models.[8]

In this example, households have some level of income not earned by the husband in the current period (which may include income earned by the wife) and the value of any benefits not linked to on-going employment. Husbands can earn a constant wage for each hour of leisure they relinquish for labor. Because EPHI is usually a benefit offered only to full-time employees, the representation of the household's budget constraint is discontinuous at the point where the husband would be considered a full-time employee. The height of the kink could be thought of as the cost of non-

[8] For a more detailed discussion of the models of household decision making, see Lundberg and Pollack (1996).

group health insurance, as the expected additional medical costs to the household if not insured, or as the amount the household is willing to pay to avoid the risk of extremely large medical costs due to a negative health shock. The solid black line in Figure 2.1 represents the budget constraint for a household where both spouses rely on the husband's employer for EPHI. By this, I mean that if the husband were not to work full-time, both the husband and the wife would be left with the choice between only high-cost private, non-group health insurance or going uninsured (because they do not have the options of Medicare, EPHI from the wife's employer, or RHI from the husband's employer). Though not represented in Figure 2.1, other benefits (pecuniary and non-pecuniary) for full-time workers would simply increase the size of the kink at full-time work while maintaining the less than full-time representations of the possible budget constraints.

The size of the kink in the budget constraint depends on how many household members are dependent on the husband's EPHI. In couples where the husband has retiree health insurance coverage, insurance through the wife's employer, or both spouses are eligible for Medicare, the budget constraint would be continuous because there is no added value of working full-time other than additional wages. This scenario is represented in Figure 2.1 as the fully linear budget constraint where the unearned income is the total of non-current employment-based income and the value of health insurance for both spouses. The budget line with a smaller discontinuity represents the case where only one spouse does not have an alternative health insurance source (for example, when only one spouse is eligible for Medicare). Prior research has excluded this case when examining the decision of men to retire.

Based on the depiction in Figure 2.1, individuals with many differently sloped indifference curves will maximize their utility by choosing full-time employment if both spouses rely on the husband's employer for health insurance. If the husband becomes eligible for Medicare and the wife does not, the shape of an individual's indifference curve will determine whether the husband would maximize the household utility by continuing to work full-time or by reducing his labor. As depicted in Figure 2.1, a husband who becomes eligible for Medicare while his wife does not would still maximize the household's utility by working full-time. Models that do not include this intermediary case would predict that the husband would reduce his labor and may construe the lack of that response as an unresponsiveness to health insurance incentives.

2.6 Data

The analysis that follows uses detailed longitudinal data on a nationally representative sample of American households from the University of Michigan's Health and Retirement Study (HRS). The initial cohort of the HRS included households where at least one member was between the ages of 51 and 61 in 1992. A new cohort, labeled the War Baby Cohort, was added in 1998 and includes households in which one spouse was between the ages of 51 and 56 at the time of their first interview.[9] The HRS includes data from re-interviews that occur every two years, with the most recent interview "wave" included in this study occuring in 2006. Much of the primary data used here comes from the RAND Center for the Study of Aging which provides a more user-friendly version of the raw HRS data (St. Clair, 2008). I have supplemented this data source with important variables from the raw files (mostly detailed health insurance variables) that are not available in the RAND HRS data files.

[9] An additional retirement age cohort was added in 2004 to examine the patterns of baby boomers but there has not yet been enough data accumulated to include this cohort in the following analysis.

Since this study will focus on husbands' decisions to retire, it is important to clearly define retirement. Past literature has used many definitions of retirement, including (1) leaving the labor force, (2) a significant reduction in hours worked, (3) leaving a career job, (4) starting to receive a pension or Social Security benefit, or simply (5) self-identification as retired (Karoly and Rogowski, 1994). I use a combination of (2) and (5). In the HRS, individuals are given multiple opportunities to identify themselves as "retired." Following the methodology used in the RAND data files and many other studies, I will define full and partial retirement based on both the amount worked by a respondent and these self-reports. Those who work full-time (defined as 35 hours or more per week and at least 36 weeks in the last year) will not be considered retired regardless of their self-designation. Those working part-time will be identified as partially retired if they self-identify as retired or simply part-time if they do not. Finally, anyone not working and reporting being retired will be considered "fully retired" while those not working and not identifying themselves as retired (the unemployed, disabled, and those not in the labor force but not retired) will be excluded from the sample. This study defines retirement as moving from a working, non-retired classification (full-time or part-time) to a retired labor force status (partial or full retirement).[10]

It is important to carefully categorize the health insurance circumstances of a couple and how I define expectations for health insurance provision if the husband were to retire. Since I am studying the link between health insurance and labor force transitions, it is important to identify alternative sources of insurance that may not be linked to continued employment. Affordable alternatives to EPHI from

[10]A weakness of this definition is that an individual working part-time can change their classification to partially retired without changing their work level since the difference between the two categories is purely based on self-reported retirement status. The same is not true for a full-time worker since the definition does not allow a full-time worker to be classified as retired. Appendix Table 2.10 presents the results of much of the analysis below with different definitions of retirement. The results are generally comparable to the findings below.

the husband's employer include RHI, Medicare, or EPHI through a wife's employer. Therefore, I will identify a husband as "at risk" of losing his low-cost health insurance upon retirement if he reports that his employer does not offer employees RHI, his wife does not receive EPHI from her current or former employer, and he will be under 65 as of the next wave. Similarly, I will identify a wife as "at risk" if her current health insurance source is her husband's employer, that employer does not offer RHI, and she will be under 65 years of age at the time of the next wave.[11] One weakness of the HRS is that it does not ask respondents whether they have declined EPHI from their employer. Therefore some individuals may be identified as at risk despite the fact that their wives' employers offer EPHI to their employees. Appendix Table 2.11 presents results of a similar analysis using estimates of whether wives' employers are likely to offer EPHI based on their firm size and finds only minor changes to the results below.

The definition of health insurance "risk" used in this paper is depicted as a flowchart in Figure 2.2 and includes the portion of those not at risk for various reasons. About 20 percent of the working male sample is classified as "not at risk" because they are already uninsured or report a current health insurance source other than their own employer (such as a wife's employer, the government, or a private insurer). Another 50 percent of the male sample is categorized as not at risk because they report an RHI offer. About three percent of married men are deemed not at risk because they will turn 65 years of age before their next interview and another ten percent have wives with EPHI from their own employers. The remaining 20 percent of working husbands are classified as "at risk" of losing their health insurance if they retire before the next wave. The distribution of reasons why wives are not identified

[11] The assumption that wives are eligible for RHI if the husband reports RHI is based on survey results that find this to be the case 91 percent of the time Kaiser Family Foundation (2002).

as at risk of losing their health insurance is similar except that more rely on the wife's own employer for EPHI (though at a much lower rate than husbands relied on their own employers) and fewer will be 65 years of age or older in the next wave.

For the analysis in Section 2.8.1, households are identified by which household members, if any, are at risk of losing their health insurance if the husband retires before the next wave. Table 2.1 presents the rates that husbands and wives are identified as being at risk. For households with working husbands, each spouse has similar rates of risk (between 20 and 21 percent) that overlap about 85 percent of the time. The pattern is similar if the sample is limited to those households in which the wife is not working except that the rates are higher (approaching 30 percent for both genders). The second set of columns focus on the rates of health insurance risk in the wave prior to a husband's retirement. Comparing all waves to only those immediately prior to a husband's retirement, the share of households where a husband is at risk diminishes more dramatically just before his retirement than do the share of households where a wife is at risk. This may suggest a greater focus by men on their own insurance than that of their spouse, which I will formally test in the analysis below. The main source of risk for one spouse but not the other is non-employment based health insurance. This category includes government provided insurance, non-group private insurance, and no insurance. For husbands, currently having government insurance accounts for the majority (about 70 percent) of the cases where only the wife is at risk of losing health insurance. Those turning 65 years of age between the current and the next wave (and thus assumed to become eligible for Medicare) make up over half of the remaining cases (17 percent). For the cases where the husband is at risk only, government insurance and being 65 at the time of the next wave make up a much smaller portion (about 53 percent) of the reasons wives are not at risk while prior uninsurance (30 percent) or non-group insurance (15 percent) make up a larger portion.

Some concerns about the reliability of retiree health insurance reports are discussed in Appendix 2.10. Fortunately for the analysis in this study, inaccurate responses to the retiree health insurance questions should bias the following results toward zero impact since having one or both members of the household classified as "at risk" when they are truly not and vice versa should make it more difficult to identify differences in retirement rates. The fact that the household risk category is divided into many categories does not complicate the sign of the bias significantly since the differentiation is based mostly on age and current health insurance sources, which are both measured with a high degree of accuracy.[12] Generally, the HRS is considered one of the best available sources for data on retirement age Americans, which is why this data, and specifically the retiree health insurance questions, have been used extensively in the previous literature discussed above.

The risk of losing affordable health insurance at the time of a husband's retirement is correlated with other characteristics. Table 2.2 shows a comparison, by the husband's risk category, of the means of a number of characteristics that will be used later as additional factors in predicting a husband's retirement. The fact that husbands who are not at risk of losing health insurance are more likely to be older and have working spouses is not surprising since age and EPHI from a wife's employer are used in identifying "risk." Additionally, at risk husbands have poorer self-rated health (as do their wives), are more likely to have a defined contribution pension plans, and have lower levels of educational attainment.

[12]In addition to concerns about the reliability of responses, significant changes were made to the phrasing of the HRS survey questions asked to respondents regarding RHI in the HRS between the second and third interviews. To address this concern, the analyses in Section 2.8.1 are repeated using only HRS waves 3 through 8 in Appendix 2.10. The general patterns remain unchanged.

2.7 Empirical Methodology

Like much of the literature discussed in Section 2.4, this paper focuses on reduced form analysis to study the relationship of health insurance and retirement decisions. There is also a large literature that employs a structural approach to similar questions. I have opted for the reduced form approach primarily for its simplicity and clarity. Previous structural models are extremely complex without introducing the wife's insurance needs to the analysis. As Kapur and Rogowski (2007) stated in their analysis of joint retirement, the interpretive advantages of a reduced-form analysis outweigh the potential predictive gains available with a structural model, which I believe is particulary true when looking at a complex question like this one for the first time.

Throughout the literature focused on the impact of health insurance offers on labor force decisions, there is an open question as to the appropriateness of using health insurance as an independent variable in reduced-form studies due to its possible endogeneity. Specifically, endogeneity may be a concern if those with a preference for early retirement select into jobs that offer RHI. Additionally, RHI may be correlated with other, unobserved qualities of a job. Recently, a number of researchers have rejected the endogeneity concern when conditioning on offers of EPHI both on a practical basis and with specification checks. Kapur and Rogowski (2007) make three main arguments for not being concerned about the possible endogeneity of retiree health insurance. First, Gustman and Steinmeier (2001) and Schur et al. (2004) provide evidence that individuals are not well informed about their retiree health benefit packages, which suggests a lack of planning for early retirement. Second, most employers require ten years or more of tenure to qualify for RHI, which would require job changes prohibitively far in advance of an expected retirement. Third, retirement planning is difficult because retiree health insurance has been scaled back dramatically in the last two decades and thus, there is no guarantee that RHI will still be available when an individual retires. Unlike pensions which are insured through the federal government, no legal requirement or guarantee exists to maintain retiree health benefits offered before retirement. Additionally, Strumpf (2007) conducted a number of specification checks to support her use of RHI as an independent variable and found no evidence that RHI was endogenous conditional on offers of EPHI.[13] For this study, I limit the sample studied to those households where at least one spouse receives EPHI and include a specification using a number of job characteristics to control for job quality.[14]

The question of the inter-spousal influence of health insurance needs is analyzed using probit analyses with household-wave pairs as the observation level.[15] Additionally, I only examine those who are entering retirement for the first time.[16] This restriction is based on the concern that jobs following retirement reversal may not be similar to pre-retirement jobs and that those who have retired previously might have unobserved differences from those who are considering retirement for the first time.

In the section that follows, I present the results from three parallel analyses. In the baseline specification, the only health insurance variable included is the husband's risk of losing low-cost coverage. With this specification, households where only the wife is at risk of losing her health insurance upon a husband's retirement are included

[13]Strumpf's robustness checks included reanalysis on subsamples of those with over twelve years of tenure and those over four years from retirement when first observed.

[14]Additional specifications have shown that limiting the sample to those households with EPHI does not significantly influence the results in regard to health insurance risk.

[15]I cluster observations at the household level in order to report the correct standard errors.

[16]Re-entry is quite common as shown by Maestas (2007) and Congdon-Hohman (2006).

with the control group along with households where neither spouse is at risk. This specification is consistent with the analyses done in previous research. The second analysis adds a control for whether the wife alone is at risk of losing her health insurance. This specification is meant to address the question of whether households include the wife's health insurance circumstances when deciding on the timing of the husband's retirement. Additionally, the control group is more logically limited to only those households where neither spouse is at risk of losing his or her health insurance if the husband retires. The third specification separately identifies households where both spouses, only the husband, or only the wife may lose their low-cost health insurance, which allows me to examine the relative importance of each spouse's risk. The following equations present the specifications more formally:

$$P\left(\mathrm{HR}|HI_{\mathrm{husb}}\right) = \Phi\left(\alpha_0 + \alpha_1 HI_{\mathrm{husb}} + \alpha_4 X + \alpha_5 W\right) \tag{2.1}$$

$$P\left(\mathrm{HR}|HI_{\mathrm{husb}}, HI_{\mathrm{w\ only}}\right) = \Phi\left(\beta_0 + \beta_1 HI_{\mathrm{husb}} + \beta_2 HI_{\mathrm{w\ only}} + \beta_4 X + \beta_5 W\right) \tag{2.2}$$

$$\begin{aligned} P\left(\mathrm{HR}|HI_{\mathrm{both}}, HI_{\mathrm{h\ only}}, HI_{\mathrm{w\ only}}\right) &= \Phi(\gamma_0 + \gamma_1 HI_{\mathrm{both}} + \gamma_2 HI_{\mathrm{h\ only}} \\ &\quad + \gamma_3 HI_{\mathrm{w\ only}} + \gamma_4 X + \gamma_5 W) \end{aligned} \tag{2.3}$$

In these specifications, HR is an indicator for the husband's retirement before the next wave, HI_{husb} indicates whether the husband is "at risk" of losing his health insurance if he retires before the next wave (regardless of his wife's risk), $HI_{\mathrm{h\ only}}$ and $HI_{\mathrm{w\ only}}$ indicate that only the husband or only the wife is at risk, and HI_{both} indicates both spouses are at risk. The X variable represents additional factors that may be associated with a husband's decision to retire. Included in X are each spouse's age, the household's non-housing wealth, and each spouse's level of educational attainment. Additionally, X includes indicators for whether the husband has a pension plan from his employer, whether each spouse is between 62 and 64 years of age or age 65 and older, and whether each spouse rates their health as poor or fair (on a five point scale). W represents a series of dummy variables for each wave of the HRS and is included to capture any time trends in the dependent variable.[17] Additional specifications include other factors as control variables.

The results are presented as mean marginal effects (MMEs) rather than probit coefficients or marginal effects at the mean. Mean marginal effects are simply the average of the calculated marginal effects of a change in the variable of interest (from zero to one if binary or a one unit change if continuous) for each individual in the sample if all other covariates are as reported. By contrast, marginal effects at the mean is the calculated marginal effect if all other covariates are evaluated at their mean value.

2.8 Estimation Results

2.8.1 Husband's Retirement

Table 2.3 presents husbands' rates of retirement between HRS waves by the health insurance "risk" to each spouse in the earlier wave. Again, in order to be classified as "at risk" of losing health insurance if the husband retires, a husband must report EPHI but not RHI, not have a wife with EPHI from her own employer, and be under 65 years of age in the next wave. For wives to be at risk, they must report their husbands' employer as their source of EPHI with no offer of RHI and be under 65. As one might expect given the results of past research on the importance of health insurance, husbands' retirement rates between waves of the HRS are highest if neither spouse is identified as at risk (a group that makes up over three-quarters

[17] The mean marginal effects (MME's) for the wave indicators from the probit analysis are not included in any of the tables below in order to save space. The MME's of the wave dummies are generally not significant at traditional levels.

of the sample). When looking at the full sample of married men who have not previously retired, the retirement rate between waves for this group is 18 percent. The rate is lower if the husband has a working spouse and higher if his spouse is not working. If the husband is at risk of losing his health insurance if he retires before the next wave, the retirement rate is eight percentage points lower than if neither spouse is at risk in the full sample, six percentage points lower if his wife is working, and 14 percentage points lower if his wife is not working. Retirement rates are also lower for husbands whose wives are at risk. If the risk categories are divided into mutually exclusive groups, the rates of retirement are similar if both spouses are at risk of losing their health insurance if the husband retires or the husband alone is at risk (ranging from 10 to 12 percent if both are at risk and five to 14 percent if the husband alone is at risk). The rates of retirement when the wife alone is at risk of losing health insurance are much higher ranging from 21 to 26 percent. The fact that the husband's retirement rate is relatively similar in households where the husband alone or both spouses may lose their health insurance if he retires but is much higher if only the wife is at risk suggests that a wife's health insurance circumstances have less influence than the husband's on the timing of a husband's retirement and may be in the opposite direction. I test in the analysis that follows whether this continues to be true when other demographic and household characteristics are taken into account.

Table 2.4 presents the results from the probit analyses outlined in the previous section. Columns 1 through 3 present the mean marginal effects (MMEs) when other covariates (the above X's) are excluded. The results in these columns reflect the surprising pattern from Table 2.3 that the MMEs of both spouses being at risk and the husband alone being at risk are of a similar magnitude, while the wife's sole risk is associated with a significant increase in the retirement rate.

Column 4 through 6 of Table 2.4 duplicate the estimations presented in columns 1 through 3 with the addition of covariates. Column 4 (based on specification (2.1)) presents the results if a wife's health insurance risk is not explicitly considered. A husband's "risk" of losing affordable health insurance if he retires is associated with a six percentage point decline in the retirement rate, which is significant at the one percent level. Given that the sample retirement rate is 17 percent, this implies a 35 percent drop. The six percentage point decline in husbands' retirement rate if they stand to lose their health insurance is consistent with previous estimates of the impact of retiree health insurance found in Madrian (1994) (seven to 15 percent decline in likelihood of retiring before a man reaches 65), Karoly and Rogowski (1994) (eight percentage point decline in retirement rate for men without RHI), and Blau and Gilleskie (2006) (eight percentage point point difference in labor force exit for men with and without RHI).

Column 5 of Table 2.4 presents the results for Specification (2.2), which adds an indicator for the wife only being at risk. Despite separating the households where the wife alone is at risk of losing her health insurance from the comparison group, the MME of the husband's risk is left unchanged. The addition of covariates changes the MME of the wife's exclusive "risk" from positive to significantly negative. These results suggest that a household does consider a wife's risk of losing her health insurance when choosing the timing of a husband's retirement, but that the segment of the population where the husband and the wife have different health insurance prospects is not currently large enough for its exclusion to have an impact on estimations of the importance of health insurance when only the husband is considered. As discussed earlier, the trend in RHI offers may change this fact in the near future.

To identify whether each spouse's health insurance risk is equally weighted in household decision making, I next separately identify households where only the husband is at risk and both spouses are at risk (Specification (2.3)). The results in column 6 of Table 2.4 show the MME of the indicator for the husband's sole risk to be about 50 percent larger than the MME for both at risk. Though this result is surprising, a Wald test suggests that the difference is only significant at the 20 percent level, so equality could not be rejected at conventional levels of confidence. Similarly, the hypothesis that the MMEs for the sole health insurance risk indicators for each spouse are equal cannot be rejected with more than 83 percent confidence despite the fact that the husband's sole risk MME is twice that of the wife's. The hypothesis that all three risk categories are equal also cannot be rejected at traditional levels of confidence.

The fact that the health insurance risk MMEs change when other factors are included may raise concerns about the endogeneity of the health insurance indicators. To answer this concern, the lower panel of Table 2.5 show the contribution of additional covariate groupings using the values from analogously defined ordinary least squares (OLS) specifications. The upper panel of Table 2.5 presents the equivalent OLS results to Table 2.4 and shows the OLS estimates to be very close to the MMEs from the probit analyses. Using specification (2.2) as an example, the values in the lower panel were arrived at through the following series of equations:[18]

$$\text{HR} = a_0^A + a_1^A HI_{\text{husb}} + a_2^A HI_{\text{w only}} + \varepsilon^A \tag{2.4}$$

$$\text{HR} = a_0^B + a_1^B HI_{\text{husb}} + a_2^B HI_{\text{w only}} + a_3^B X + \varepsilon^B \tag{2.5}$$

[18]Though not included in the equations here, wave dummies continue to be included at every stage.

$$x_1 = b_1 + b_1^h HI_{\text{husb}} + b_1^w HI_{\text{w only}} + \varepsilon_1 \tag{2.6}$$
$$x_2 = b_2 + b_2^h HI_{\text{husb}} + b_2^w HI_{\text{w only}} + \varepsilon_2$$
$$\vdots$$
$$x_r = b_r + b_r^h HI_{\text{husb}} + b_r^w HI_{\text{w only}} + \varepsilon_r$$

In the above equations, variables are labeled as in Section 2.7 where $X = (x_1, x_2, \ldots, x_r)$ and r is the number of additional covariates. Substituting equations (2.6) into equation (2.5) and collecting terms produces the following:

$$\begin{aligned} \text{HR} \quad = \quad & b^B + \sum_{k=1}^{r} a_{3,k}^B(b_k) + \left(a_1^B + \sum_{k=1}^{r} a_{3,k}^B(b_k^h)\right) HI_{\text{husb}} \\ & + \left(a_2^B + \sum_{k=1}^{r} a_{3,k}^B(b_k^w)\right) HI_{\text{w only}} + \left(\varepsilon^B + \sum_{k=1}^{r} a_{3,k}^B(\varepsilon_k)\right) \end{aligned} \tag{2.7}$$

Therefore, the change in the coefficients of interest can be decomposed as

$$a_1^A - a_1^B = \sum_{k=1}^{r} \left(a_{3,k}^B(b_k^h)\right) \tag{2.8}$$
$$a_2^A - a_2^B = \sum_{k=1}^{r} \left(a_{3,k}^B(b_k^w)\right)$$

Each term on the right hand side of Equation (2.8) can be interpreted as the individual impact of the inclusion of that covariate on the change in the coefficient of interest. For example, the value for the contribution of the age variables is arrived at by taking the $\sum_{j=1}^{m} \left(a_{3,j}^B(b_j^h)\right)$ for the m factors related to age.[19] The bottom panel of Table 2.5 shows that almost all of the change in the health insurance risk coefficients is due to the inclusion of age variables and not pension, wealth, health or education. If pensions or education had been large contributors to the difference in the health insurance risk MMEs, I would be concerned about other factors that this specification is not accounting for that may be associated with both the decision to retire and health insurance risk.

[19] They are husband's age, wife's age, husband 65 or over, wife 65 or over, husband 62 to 64, and wife 62 to 64.

The above analysis does not imply that health, wealth, pensions and education are not associated with a husband's decision to retire, just that their inclusion does not have a major impact on the coefficients associated with health insurance risk. Table 2.4 shows that the existence of a pension plan has a positive association with retirement and is significant at the one percent level. As seen above, a husband's age also plays an important role in the decision to retire. Each additional year in age increases the likelihood that a husband retires by two percentage points and reaching the key ages of 62 (when he first qualifies for reduced Social Security benefits) and 65 (when he becomes eligible for Medicare and unreduced Social Security benefits) is associated with large increases in the retirement rate. A wife's age is also associated with an increase in the rate of retirement but with a much smaller magnitude than her husband's (each year is only associated with a 0.2 percentage point increase in the husband's retirement rate). The key milestone ages of 62 and 65 for wives are not significantly associated with a change in the husbands' retirement rate. If a husband reports his health as fair or poor, he is also significantly more likely to retire, but not if the wife rates her health as fair or poor. The MME of a husband receiving a college degree or higher is significantly negative when compared to husbands who have only received a high school diploma.

One might be concerned that the health insurance risk indicators are acting as a proxy for a wife's employment status since EPHI from a wife's employer can change the categorization of a couple from "at risk" to "not at risk." Table 2.6 shows that the inclusion of a wife's employment status only has small impacts on the MMEs of health insurance risk indicators. Specifically, the MMEs associated with joint risk of losing health insurance are almost identical if wives' employment status is included or not. The values of the MMEs for individual only risk (wives' in all columns and the husbands' in columns 2 and 4) have increased in magnitude by about one percentage point each. Specifically in column 4, the MMEs on retirement rates move from nine to ten percent for husband only risk and from 4.7 to 5.5 percent for wife only risk when the wife's employment is included. The results of additional Wald tests suggest a lower probability that the two values are equal when the wife's employment is included, but it still fails to rise to standard levels of confidence for rejecting the null hypothesis.[20]

Though the differences are not significant at traditional levels, all specifications presented so far have shown that indicators for a wife's health insurance concerns have lower MMEs than a husband's when their risk is not shared. One reason for this may be the differences in financial costs of health care and insurance associated with each gender. In the age range examined in this study, women tend to be healthier than men and therefore tend to have lower medical costs and lower non-group insurance premiums. If this difference is an important factor that has been missed in the above analysis, I would expect that the marginal effect of the risk of losing health insurance for women would be more similar to that of men when differences in health are better controlled for. Table 2.7 includes three different measures of health and interacts those terms with the health insurance risk categories used above. In column 1, self-rated health measures for each spouse are used as additional factors as they have been used previously. Column 2 presents the results when these health measures are interacted with the appropriate health insurance risk indicator (i.e. the wife's sole risk is interacted with the wife's health measure, etc.). In columns 3 and 4, self-rated health is replaced by an indicator for the existence of a health condition

[20] Rather than controlling for a wife's employment status, one might prefer to stratify the sample and separately analyze households with different levels of the wife's employment. Unfortunately, the number of households available in each grouping make it difficult to draw strong conclusions due to the large standard errors. The results of such an analysis are available in Appendix Table 2.12.

as the measure of poor health. Health conditions include ever having any of the following: diabetes, cancer, lung disease, heart problems, or a stroke. Almost one-quarter of the sample has one of these listed conditions while only ten to 15 percent rate their health as fair or poor. Columns 5 and 6 use overnight hospital stays in the previous twelve months as an indicator of poor health. Comparing columns 1, 3, and 5, the choice of health measures has very little impact on the MMEs of the health insurance risk variables. That said, the existence of a health condition for the wife has a significantly negative association with a husband's decision to retire, while her self-rated health and a hospital stay in the last year do not.

The inclusion of interaction terms for health insurance risk and health measures in columns 2, 4 and 6 has very little impact on the health insurance MMEs that involve the husband, but has a modest impact on the MME of the "wife only at risk" category. Because of the interaction term, the MME of the health insurance risk variables now represent the marginal effect of being at risk for someone who is in good health. When the health measure is self-rated health or the existence of a health condition, the inclusion of interaction terms decreases the magnitude of the MME by up to one percentage point and reduces the significance below traditional thresholds (from significance levels around five percent to 15 percent). Though the MMEs of the interaction terms are generally negative, implying that poor health measures amplify the negative association of health insurance risk and retirement rates, they are largely insignificant at standard levels.[21] In sum, general health levels do not appear to be responsible for the differences in the MMEs of the health insurance risk associated with each spouse.

To examine the concern that health insurance may be acting as a proxy for job

[21] The MMEs and standard errors for interaction terms reported in Table 2.7 have been adjusted to reflect the true magnitude of the interaction effect described in Ai and Norton (2003).

quality, Table 2.8 presents the MMEs of a probit analysis when a large number of the husband's job characteristics are included. Specifically, I include a number of reported job requirements (whether the job often includes "physical effort," "good eyesight," "intense concentration," and "people skills") and a husband's characterizations of his job (whether he agree that the job's tasks are "difficult," the job has "a lot of stress," older workers feel "pressure to retire" or are given "less demanding tasks," and whether he "enjoys" his work). Columns 1 through 3 presents the results from repeating the analyses described in equations (2.2) and (2.3) for the subsample with non-missing job characteristics. The sample is mostly limited by the fact that questions about all the job characteristics used in columns 3 and 4 are only asked in waves 3 through 8. One should first note that the MMEs of the wife's risk of losing health insurance if her husband retires are slightly larger in magnitude when using this reduced sample, while the MME for both spouses being at risk is two percentage points lower. Columns 3 through 4 shows that though a number of job characteristics are associated with significant differences in the retirement rate of husbands, their inclusion does not have a dramatic effect on the MMEs of the risk indicators. Thus, Table 2.8 is evidence that health insurance risk is not acting as a proxy for job quality.

2.8.2 Summary of Household Outcomes at a Husband's Retirement

Though the above analysis found that husbands reduce their rate of retirement when either spouses' health insurance options would be limited, there are still numerous retirements when one or both spouses are potentially at risk of losing low-cost health insurance. This raises the question of what couples do after the husbands retire. In households where only the wives are at risk of losing their health insurance, one might expect that non-working or part-time employed wives would move to full-time work in order to qualify for EPHI. There are a number of studies looking at the role of health insurance and wives' labor force participation, but these studies generally focus on wives with working husbands. Olson (1998) and Buchmueller and Valletta (1999) both found that an offer of EPHI from a husband's employer has a large, negative effect on the likelihood that a wife is working full-time but almost no effect on the chance that she is working part-time.[22] Rather than an employment response, there may be a spike in uninsurance or non-group health insurance that would lead to increased exposure to higher medical costs for "at risk" households than for those that are not.[23] Despite the comparatively large sample of retirement age individuals in the HRS, it is difficult to draw substantive conclusions about the relationship of health insurance risk prior to retirement and outcomes after retirement from a formal analysis, especially given the relatively small subset of individuals at risk of losing their health insurance at the time of retirement.

In place of a formal analysis, Table 2.9 presents the mean rates of particular outcomes for each spouse in the waves following a husband's retirement, broken down by the risk categories of the household prior to retirement. The "husband only at risk" category has been excluded because it contained only four data points at the time of husbands' retirements. The first panel focuses on changes in a wife's employment status. In the first wave following a husband's retirement, wives do not appear to be any more likely to move from not working to working or from not working full-time to working full-time based on their households' risk category in the prior wave. This is also generally true if looking at the second wave following a husband's retirement. Similarly, there does not appear to be a different rate of

[22] Additionally, Wellington and Cobb-Clark (2000) found a twenty percent reduction in labor force participation of women if their husbands are offered employer provided health insurance.

[23] Prior research (Schimmel, 2006) has found that households avoid uninsurance even at great costs at the time of retirement.

retirement among working wives at the time of a husband's retirement. In fact, the only retirement rate for wives that is different is for the category where the wife is alone at risk, and there, the rate is 15 percentage points higher than for other categories. This may be due more to the small sample size (76 households compared to 1250 where neither spouse is at risk and 151 where both spouses are at risk) than underlying qualities of households where only the wife is at risk. The hypothesis that the means are equal across risk categories cannot be rejected at traditional levels with respect to any of the above employment changes.

The second and third panels of Table 2.9 examine the source of health insurance for each spouse following a husband's retirement. As one would expect based on how risk was defined, the rate of reported government provided health insurance is highest among those not at risk of losing their health insurance in the prior wave. Men are more likely than women to have government insurance when not at risk, largely due to husbands' older age and thus earlier eligibility on average than their wives. There are a few cases where those who were previously identified as at risk report governmental insurance after a husband's retirement. This is largely due to eligibility for a government health insurance program for a reason other than turning 65 years of age. For example, those with a disability can become eligible for Medicare, veterans can be eligible for special insurance, and those meeting certain income requirements can be eligible for Medicaid.

The third panel of Table 2.9 examines the proportion of individuals with other health insurance options after excluding those with government insurance. Husbands who were categorized as "at risk" prior to retirement are almost twice as likely to be uninsured following their retirement as those "not at risk" (though the hypothesis that all three are equal cannot be rejected). The difference is more stark (and significant) for at risk women who are three times more likely to be uninsured after their husbands' retirements than their not at risk counterparts. The ratios stay constant when looking at the second wave after retirement, though the rates of uninsurance are generally increasing for women and constant for men. Another option for those who might lose their health insurance upon a husband's retirement is private, non-group insurance. Men who are identified as at risk are almost three times more likely to have this type of health insurance after their retirement than those with other options. For wives, the ratio of non-group insurance rates between those at risk and not at risk is slightly smaller at less than two to one. The outliers for both men and women appear to be the cases where only the wife is classified as at risk (usually caused by the husband being 65 years of age or older while the wife is under 65). Wives are more likely to have non-group health insurance if they alone are at risk of losing their health insurance than if both spouses are at risk. Surprisingly, husband's also have higher rates of non-group health insurance if their wife alone is categorized as at risk than if both spouses are in this grouping. This may again be a reflection of the small sample in this category rather than an underlying characteristic of the group as a whole. The category was reduced from 76 households to 65 after excluding those with government health insurance, with only 17 husbands not reporting government health insurance. For both men and women, the hypothesis that proportions are equal across risk category can be rejected at traditional levels.

Next, Table 2.9 examines the health insurance provision from the husband's employer. Surprisingly, the rates of EPHI from a husband's employer are almost equal across risk category in the wave after retirement. There are a number of possible explanations. One is the exercising of mandated continuation benefits ("COBRA") options. Though the HRS does not specifically ask respondents if they enroll and pay for COBRA benefits, the fact that those who are "at risk" have lower rates of health insurance from a husband's employer in the second wave after retirement (when COBRA benefits would expire) and higher rates of paying the full cost of the benefits (which is required under COBRA) suggest a role for this type of benefit. Appendix 2.10.2 discusses the ramifications of COBRA for this study more throughly and Appendix Table 2.13 shows that incorporating the possibility of COBRA following retirement in the definition of health insurance risk does not dramatically influence the results presented earlier. Another possible reason for the comparable rates of continued EPHI from the husband's employer is that the individuals in this category reached the employer specified tenure or age to qualify for their employer's RHI benefit. Many employers who offer RHI have a sliding scale of tenure requirements by age at the time of retirement. Unfortunately, the HRS does not differentiate between those who report not having an offer of RHI because they are yet to meet their employers' qualifications for that benefit and those whose employers simply do not offer it.[24] The rate at which wives get EPHI from their husbands' employer shows a similar pattern except for a much lower rate when neither spouse is at risk. This is due to the definition of risk where if the wife has EPHI from her own employer, then neither spouse is considered at risk. In summary, it appears households with at least one member classified as at risk of losing their health insurance prior to a husband's retirement are no more likely to see an employment change for the wife and instead are more likely to go uninsured or purchase private, non-group health insurance. This suggests that those households that do not delay the husband's retirement until the wife is eligible for Medicare are either less risk averse than other

[24]The HRS asks respondents if they could "continue this health insurance until they turned 65" if they retired today.

households or have access to non-group health insurance at affordable rates.

2.9 Conclusion

Economic literature focusing on the retirement of near-elderly men has largely omitted controls for the health insurance implications of husbands' retirements for their wives. The results of this study suggest that households do consider the health insurance circumstances of both spouses when choosing the timing of a husband's retirement. I also find that the risk that a wife might lose the opportunity of low-cost health insurance has a similar impact on husbands' rate of retirement as the risk of a husband losing his own insurance. In households where the wife is the only one at risk of losing affordable health insurance if the husband retires, the husband is 30 percent less likely to retire than if neither spouse is at risk (a four to six percentage point decrease in the retirement rate). This decrease is not statistically different from the decrease if the husband is alone at risk. These findings are similar to a previous finding that husbands are responsive to their wives' pension benefits when making individual labor force decisions Coile (2004). The implications of these findings for the economic modeling of household decision making is that both spouses' financial or health insurance circumstances must be considered in order to correctly account for the incentives that each individual faces.

As a result of these findings, future policy analysis should take care to incorporate the effects for both an individual and his or her spouse when evaluating the impact of proposed changes to the Medicare program or to regulation of the private health insurance market. If the current trend of declining RHI offer rates continues, a failure to include the effect of a proposed policy change on a spouse may underestimate the impact on men's retirement rates. For example, future policy changes that make private, non-group health insurance more affordable and accessible will not only move forward the retirement of those who would have otherwise waited to become eligible for Medicare, but also those who formerly appeared to be unresponsive to their own health insurance incentives because they were waiting to retire until their wives turned 65 as well.

2.10 Appendix: Concerns Over the Retiree Health Insurance Variables in the HRS

Some concerns exist about the accuracy of the retiree health insurance (RHI) variables of the Health and Retirement Study (HRS) based both on the inconsistency of reports from wave to wave and the reported sources of health insurance after an individual separates from an employer. The top panel of Appendix Table 2.14 shows that 12 to 16 percent of respondents reporting the same job and current insurance source as the previous wave change their RHI responses from no to yes and between nine and 13 percent change in the opposite direction.[25] The rates of changes from waves one to two and two to three should be discounted for three reasons. First, respondents do not answer detailed questions about their health insurance options if they report that their benefits have not changed in wave two whereas in every other wave they are asked detailed questions. Second, the household member answering these questions may have changed between waves one to wave three. In wave one, the financially knowledgeable household member answers health insurance questions for both spouses. Starting in wave three, each spouse is asked about their own health insurance. Finally, the questions regarding RHI changed in wave three from a general question asking whether their current plan is "available to those who retire" to whether he or she could "continue this health insurance until they turned 65" if they left today.[26] The bottom panel of Appendix Table 2.14 presents the number of changes for each individual HRS respondent over time. The fact that over 34 percent of respondents change their RHI status more than once without changing jobs or EPHI provider suggests that a large portion of these changes cannot be explained

[25] A study by Gustman et al. (2007) found that the accuracy of pension responses in the HRS improved in later waves when comparing responses to employer reports which is reflected in a higher consistency of responses in later waves here.

[26] This should not be a major concern as a survey of employers found that ninety-one percent of firms that offer RHI provide coverage both before and after a retiree turns 65 years of age.Kaiser Family Foundation (2002)

simply as changes in their employer's policy or vesting in the employers benefit plan. If the sample is restricted to waves three through eight to reflect consistent questions and household respondents, the rate of error is quite lower, but there are still 16 percent of respondents with more than one change.

Unfortunately, there is not a way to verify the accuracy of responses against employer records without restricted HRS data, but I can check how pre-retirement responses compare to post-retirement outcomes. The first set of columns in Appendix Table 2.15 present measures of apparent inaccuracy of RHI responses in the wave prior to retirement. The first row presents the rate of risk for men and women in the wave prior to a husband's retirement. The second row presents the share of respondents who report not having RHI before a husband retires but continue to have EPHI from the husband's employer after he retires.[27] For men, this is the case for almost 70 percent of those reporting not being offered RHI before retirement. For wives, the rate is 50 percent.

For those reporting RHI in the wave prior to retirement, the bottom section of Appendix Table 2.15 presents the rate that they report no insurance or non-group insurance after retirement. The assumption here is that people would not voluntarily choose these options if they had an offer of RHI because RHI is likely to be less expensive. Again excluding those who have government insurance or insurance from a wife's employer, the inaccuracy rates in this group are much lower than those in the second row (a rate of about nine percent), suggesting that those who report RHI are more often correct. That said, the number of households with apparent inaccuracies are relatively similar across pre-retirement reports.

[27]Those who will be 65 or older or health insurance from a wife's employer at the next wave are excluded from the the samples in Appendix Table 2.15.

2.10.1 Attempts to Improve the Apparent Accuracy of RHI Responses

The remainder of Appendix Table 2.15 shows the results of attempts to improve the accuracy of RHI reports that incorporate individuals' responses from other waves. The third and fourth columns replace all responses for the current job with the most recent, non-missing report. This adjustment results in an increased rate of apparent inaccuracy for those responding that they have no RHI offer while leaving relatively unchanged the accuracy for those reporting RHI. Because our accuracy measures are only for the last wave before retirement, the only changes that will be identified here are for individuals who were missing an RHI response in their last wave before retirement. Appendix Table 2.16 presents the broader effect of using this method on the analysis in Section 2.8.1 since all wave values have been replaced by the last non-missing value. Using this new measure of RHI in the definition of the "risk" of losing health insurance, the negative influence of a wife's risk on the rate of husbands retirement has increased substantially and is equivalent in magnitude to the MME's of a husband's risk. The results are similar if I use the most common RHI response at a particular job instead of the last non-missing response (columns 5 and 6 in Appendix Tables 2.15 and 2.16).

2.10.2 COBRA

A possible source for the high rates of inaccuracy of RHI reports is not incorrect responses, but failure to account for continuing coverage of health insurance benefits after separation from an employer. Under federal law, employers with over 20 employees are required to allow separated employees who have EPHI to remain in their current health insurance plan, at 102 percent of the cost, for up to 18 months. This requirement is often referred to as COBRA benefits, named after the Consolidated

Omnibus Budget Reconciliation Act. Forty of the fifty U.S. states have enacted state laws amplifying COBRA by lowering the employer size requirement.(Kaiser Family Foundation, 2007) A few states have extended the benefits beyond 18 months for all employees in the state.[28] Six states have addressed the concerns of retirees specifically by requiring former employers of retirees who are near Medicare eligible age to offer continuation coverage until they reach the age of 65.[29] Unfortunately, the unrestricted HRS data does not include information on the state that a respondent lives in. The HRS does provide data on the region in which the respondents live, but the states enacting additional continuation laws are not localized to any single region. Generally, the take up rate for those who qualify for COBRA benefits is relatively low, with just over one in five exercising the option. (Flynn, 1994)

Though there is not a direct question in the HRS that asks respondents if they are taking advantage of COBRA to continue their benefits, it does ask them whether they pay the full cost of their EPHI. Appendix Table 2.17 presents the share of the costs individuals pay based on their "risk" category as defined in Section 2.6. The cost distributions presented show a slight difference in the rate of paying full cost between those who were formerly identified as at risk and those who were not. Among at risk men, about 40 percent pay the full cost of their EPHI from their former employer. For men who were not identified as at risk, the rate is about 27 percent. The gap was slightly more narrow for women with those at risk paying the full cost in 47 percent of the cases compared to 41 percent for those not at risk.

The definition of health insurance risk can be modified to incorporate the possibility that COBRA benefits play a significant role. Specifically, rather than defining "at risk" as those who depend on EPHI without an offer of RHI and will still be

[28]CT, MA, NH, NJ, NY, TX, MN, ND, SD, CA, and NV extend health insurance benefits to 36 months, FL to 29 months, and IL to 24 months.

[29]They are IL, LA, MD, MO, NH, and OR.

under 65 years of age when next observed, I lower the cut-off age by 18 months to 63 years, six months of age. After that age, a husband or wife could use COBRA to extend health insurance benefits to age 65 at which point he or she will be eligible for Medicare. Columns 1 through 3 in Appendix Table 2.13 replicate the analysis of a husband's decision to retire using the modified definitions of risk for each spouse. Compared to the original results in Table 2.4, the MMEs for most risk variables are only slightly different. Overall, the pattern of near equal importance of husbands' and wives' risk in estimating the likelihood that a husband retires remains true.

2.10.3 Analysis Using Consistent Survey Questions in Regards to Retiree Health Insurance

As discussed earlier in this section, the HRS questions regarding RHI were changed to reflect continuation of health insurance benefits until a respondent turned 65 years of age in Wave 3 (1996) of the HRS. Appendix Table 2.18 repeats the analysis from Section 2.8.1 on a subsample that includes only Waves 3 through 8. Columns 1 through 2 are equivalent to the analysis of columns 5 and 6 of Table 2.4. The magnitudes of the MMEs values for health insurance risk indicators are generally the same, but the reduced sample size has reduced the precision with respect to the importance of a wife's health insurance. The MME of the wife only risk category has gone from significant at the five percent level in the full sample to significant at the 20 percent level in the reduced sample. One additional advantage of limiting the sample to Waves 3 through 8 is that the HRS began to differentiate between current and former employers as the source of EPHI. This allows us to identify respondents who have RHI from an employer prior to their current employer. Specifically, rather than depend solely on reports of RHI, those respondents who report EPHI from a former employer before they retire can be assumed to have RHI from that employer and are therefore not at risk of losing their health insurance upon retirement. This change increases the MMEs of a husband's health insurance risk slightly, but the relationship between husbands' and wives' risk continues to be consistent (Columns 3 through 4).

Figure 2.1

An Example of the Optimization Problem when Health Insurance is Linked to Employment

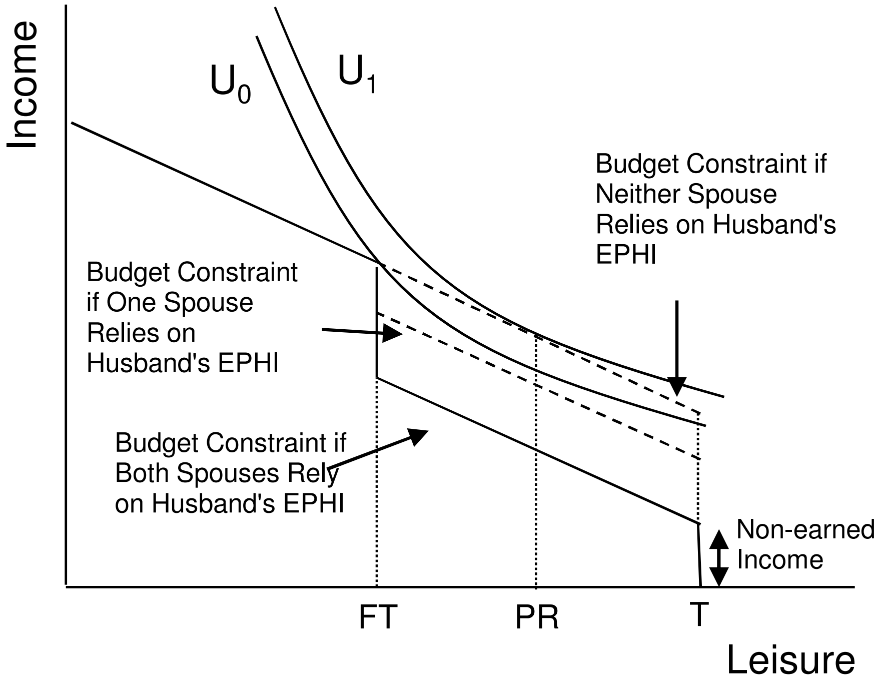
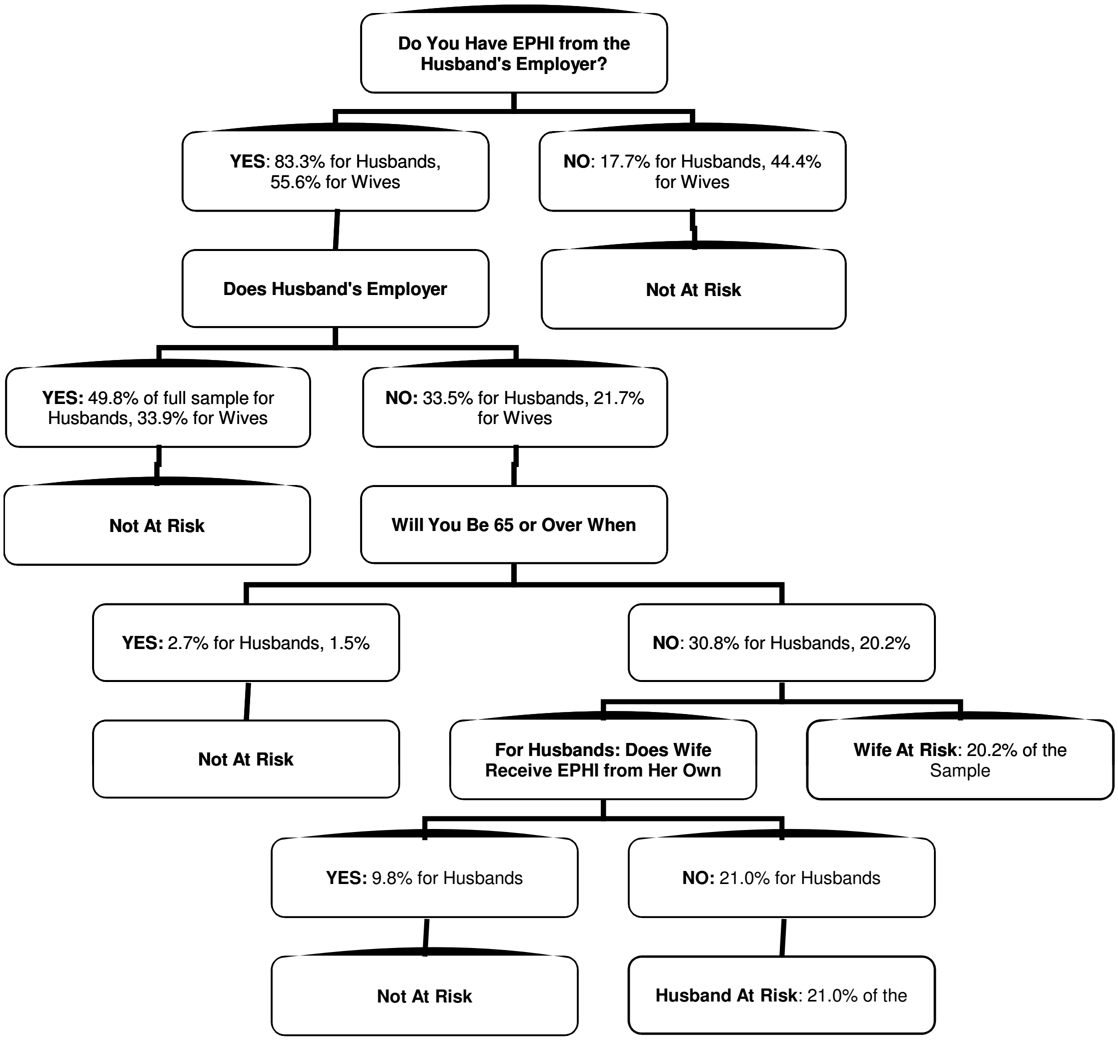


Figure 2.2

Defining the Risk of Losing Health Insurance upon a Husband's Retirement



Note: Sample is all married couples where one spouse has EPHI, husband has not previously retired, husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS. Values are weighted based on HRS household sampling weights.

Table 2.1

Summary of the Risk of Losing Low-cost Health Insurance for Husbands and Wives

	All Working Husbands		All Working Husbands in the Wave Prior to Retirement	
	All	With Non-working Wife	All	With Non-working Wife
Husband "At Risk" of Losing Health Insurance if He Retires	0.209	0.293	0.128	0.151
Wife "At Risk" of Losing Health Insurance if Husband Retires	0.202	0.280	0.147	0.185
Both "At Risk" of Losing Health Insurance if Husband Retires	0.174	0.233	0.105	0.119

Sample: Married, Husband not previously retired and not self-employed, HRS age-eligible, and one spouse with EPHI

Note: Values are weighted based on HRS household sampling weights.

Table 2.2

Comparing Characteristics of Those "At Risk" of Losing Health Insurance at a Husband's Retirement and Those Not "At Risk"

	Mean if Husband Is At Risk	Mean if Husband Is Not At Risk	Probability "Not At Risk" Mean Equals "At Risk" Mean
Wife is Working	0.541	0.710	0.00
Wife is Working Full-time	0.322	0.529	0.00
Husband's Age	56.2	57.6	0.00
Husband is Over 65	0.000	0.061	0.00
Husband is between 62 and 64	0.058	0.138	0.00
Wife's Age	54.0	54.2	0.12
Wife is Over 65	0.031	0.024	0.09
Wife is between 62 and 64	0.040	0.068	0.00
Husband's Self-rated Health is Fair or Poor	0.144	0.117	0.00
Husband Reports a Health Condition	0.242	0.263	0.07
Husband had a Hospital Stay in the Last Year	0.132	0.139	0.44
Wife's Self-rated Health is Fair or Poor	0.212	0.143	0.00
Wife Reports a Health Condition	0.278	0.247	0.01
Wife had a Hospital Stay in the Last Year	0.165	0.141	0.01
Husband Reports any Pension	0.807	0.792	0.16
Husband Reports a DB Pension	0.428	0.483	0.00
Husband Reports a DC Pension	0.467	0.402	0.00
Husband Reports Both Types of Pensions	0.180	0.189	0.41
Household Non-Housing Wealth (in 100,000 units of 2000 Dollars)	1.62	1.982	0.12
Husband's Education: Less than High School Diploma	0.180	0.169	0.29
Husband's Education: High School Diploma	0.369	0.345	0.06
Husband's Education: Less than College Degree	0.188	0.204	0.11
Husband's Education: College Degree	0.261	0.278	0.15
Wife's Education: Less than High School Diploma	0.204	0.146	0.00
Wife's Education: High School Diploma	0.337	0.333	0.75
Wife's Education: Less than College Degree	0.236	0.238	0.81
Wife's Education: College Degree	0.155	0.200	0.00
Household-Wave Observations	1749	7586	
Number of Households	426	2238	

Note: Probabilities represent the results from a simple t-test. "DB" is a defined benefit pension. "DC" is a defined contribution pension.

Sample: All married men in couples where one spouse reports EPHI from an employer in waves prior to retirement, are not self-employed, and are age eligible for the Initial or the War Baby Cohort of the HRS.

Table 2.3

Mean Rates of Husbands' Retirements by Risk of Losing Low Cost Health Insurance

	All Households		Households With Working Wives		Households With Non-working Wives	
	Percent of Sample	Husbands' Retirement Rate	Percent of Sample	Husbands' Retirement Rate	Percent of Sample	Husbands' Retirement Rate
Neither Spouse "At Risk" of Losing Health Insurance if Husband Retires	76.9%	0.180	81.9%	0.157	67.6%	0.265
Husband "At Risk" of Losing Health Insurance if Husband Retires	20.2%	0.100	16.2%	0.094	26.5%	0.125
Wife "At Risk" of Losing Health Insurance if Husband Retires	20.3%	0.120	16.8%	0.110	25.8%	0.152
Both "At Risk" of Losing Health Insurance if Husband Retires	17.4%	0.100	14.8%	0.097	19.9%	0.119
Husband "At Risk" of Losing Health Insurance if He Retires but Wife is Not	2.8%	0.095	1.3%	0.054	6.6%	0.142
Wife "At Risk" of Losing Health Insurance if Husband Retires but Husband is Not	2.9%	0.238	1.9%	0.211	5.9%	0.261
Observations	8643		5836		2783	

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Note: Values are weighted based on HRS sampling weights.

Table 2.4

The Mean Marginal Effects (MMEs) of Both Spouses' Health Insurance Risk on Husbands' Retirements

Model: Probit, Dependent Variable (DV): Husband Retires Fully or Partially before the Next Wave (Mean=0.166)

	Means	1 Husband's Risk Only	2 Husband's Risk and Wife's Non-shared Risk	3 Fully Exclusive Risk Categories	4 Husband's Risk Only	5 Husband's Risk and Wife's Non-shared Risk	6 Fully Exclusive Risk Categories
Husband "At Risk" of Losing Health Insurance if He Retires	0.202	-0.082*** [0.010]	-0.080*** [0.010]		-0.063*** [0.012]	-0.063*** [0.012]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.174			-0.079*** [0.010]			-0.059*** [0.013]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.028			-0.087*** [0.019]			-0.090*** [0.022]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.029		0.050* [0.028]	0.050* [0.028]		-0.047** [0.023]	-0.046** [0.024]
Husband has a Pension Plan (DB, DC, or Both)	0.812				0.039*** [0.011]	0.039*** [0.011]	0.038*** [0.011]
Husband's Age in Years at Next Wave (NW)	58.6				0.017*** [0.002]	0.017*** [0.002]	0.017*** [0.002]
Wife's Age in Years at NW	55.6				0.002* [0.001]	0.002* [0.001]	0.002* [0.001]
Husband Will be Between 62 & 64 Years Old at NW	0.164				0.148*** [0.020]	0.147*** [0.020]	0.147*** [0.020]
Wife Will be Between 62 & 64 Years Old at NW	0.088				-0.006 [0.016]	-0.005 [0.016]	-0.005 [0.016]
Husband Will be 65 Years Old or Older at NW	0.090				0.079*** [0.027]	0.087*** [0.028]	0.086*** [0.027]
Wife Will 65 Years Old or Older at NW	0.052				-0.015 [0.020]	-0.02 [0.020]	-0.016 [0.021]
Husband's Self-rated Health is Fair or Poor	0.107				0.053*** [0.016]	0.053*** [0.016]	0.053*** [0.016]
Wife's Self-rated Health is Fair or Poor	0.142				0.009 [0.014]	0.009 [0.014]	0.01 [0.014]
Real Total Non-housing Assets (in 100k's)	2.19				0 [0.000]	0 [0.000]	0 [0.000]
Husband's Educational Attainment is Less than High School Diploma	0.125				-0.02 [0.014]	-0.02 [0.014]	-0.02 [0.014]
Husband's Educational Attainment is Some College but No Degree	0.214				-0.005 [0.013]	-0.006 [0.013]	-0.006 [0.013]
Husband's Educational Attainment is College Degree or More	0.322				-0.019 [0.013]	-0.018 [0.013]	-0.018 [0.013]
Wife's Educational Attainment is Less than High School Diploma	0.115				-0.006 [0.014]	-0.004 [0.014]	-0.004 [0.014]
Wife's Educational Attainment is Some College but No Degree	0.264				-0.008 [0.012]	-0.008 [0.012]	-0.008 [0.012]
Wife's Educational Attainment is College Degree or More	0.227				-0.019 [0.014]	-0.019 [0.014]	-0.019 [0.014]
Observations	8444	8444	8444	8444	8444	8444	8444
Wald Test Probability that:							
Husband's Risk MME equals Wife's Only Risk MME			0.00			0.53	
Joint Risk MME equals Husband Only Risk MME				0.69			0.20
Husband Only Risk MME equals Wife Only Risk MME				0			0.17
All Three HI Risk MMEs are equal				0			0.34

Standard errors in brackets, Clustered by Household. * significant at 10%; ** significant at 5%; *** significant at 1%

Note: Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications.

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS.

Table 2.5

Decomposition of Changes to Health Insurance Risk Probit MME's when Adding Additional Covariates Using Ordinary Least Squares

Model: Ordinary Least Squares, DV: Husband Retires Fully or Partially before the Next Wave (Mean=0.166)

A: Analogous Analysis Using Ordinary Least Squares

	1	2	3	4	5	6
	Husband's Risk Only		Husband's Risk and Wife's Non-shared Risk		Fully Exclusive Risk Categories	
Husband At Risk of Losing HI if He Retires	-0.084 [0.010]***	-0.053 [0.010]***	-0.082 [0.010]***	-0.054 [0.010]***		
Both At Risk of Losing HI if Husband Retires					-0.081 [0.011]***	-0.050 [0.010]***
Only Husband At Risk of Losing HI if He Retires					-0.091 [0.020]***	-0.081 [0.021]***
Only Wife At Risk of Losing HI if Husband Retires			0.0519 [0.029]*	-0.0492 [0.028]*	0.052 [0.029]*	-0.048 [0.028]*
Additional Covariates	No	Yes	No	Yes	No	Yes
Observations	8444	8444	8444	8444	8444	8444

B: Net Contribution of Covariate Groupings to the Difference in OLS Coefficients

	Husband's Risk Only	Husband's Risk and Wife's Non-shared Risk		Fully Exclusive Risk Categories		
	Husband at Risk	Husband at Risk	Wife Only at Risk	Both at Risk	Husband Only at Risk	Wife Only at Risk
Difference in OLS Coefficient	-0.031	-0.028	0.101	-0.030	-0.010	0.100
Age Variables	-0.035	-0.032	0.100	-0.035	-0.010	0.099
Pension & Wealth Variables	0.001	0.001	-0.003	0.002	-0.004	-0.003
Health Variables	0.002	0.002	0.002	0.001	0.004	0.002
Husband's Education Variables	0.000	0.000	0.000	0.000	0.000	0.000
Wife's Education Variables	0.000	0.000	0.001	0.000	0.000	0.001
Difference in Probit MME	-0.019	-0.017	0.097	-0.020	0.003	0.096

Notes: "HI" is health insurance. "Age Variables" include husband's and wife's raw age, whether 65 or over, and whether between 62 and 65. "Pension and Wealth" includes whether Husband has any pension and household's non-housing wealth. "Health" includes husband's and wife's self-rated health. "Education" includes categorical values of "Less than High School," "Some College," and "College Degree" for each spouse.

Table 2.6

Additional Specifications Examining Husbands' Retirements with Wives' Employment Statuses
Model: Probit, DV: Husband Retires Fully or Partially before the Next Wave (Mean= 0.165)

		1	2	3	4
		Original Specification		Including Wife's Previous Wave Employment Status	
	Mean	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories
Husband "At Risk" of Losing Health Insurance if He Retires	0.202	-0.063*** [0.012]		-0.066*** [0.012]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.175		-0.058*** [0.013]		-0.060*** [0.013]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.028		-0.090*** [0.022]		-0.100*** [0.021]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.029	-0.048** [0.023]	-0.047** [0.024]	-0.056** [0.022]	-0.055** [0.022]
Wife is Working Full-time	0.513			-0.011 [0.012]	-0.011 [0.012]
Wife is Working Part-time	0.158			-0.023 [0.015]	-0.023 [0.015]
Wife is Partially Retired	0.028			0.055* [0.031]	0.054* [0.031]
Wife is Fully Retired	0.082			0.070*** [0.022]	0.072*** [0.022]
Additional Covariates		Yes	Yes	Yes	Yes
Observations	8331	8331	8331	8331	8331
Wald Test Probability that:					
Husband's Risk MME equals Wife's Only Risk MME		0.56		0.69	
Husband Only Risk MME equals Wife Only Risk MME			0.18		0.14
All Three HI Risk MMEs are equal			0.34		0.20

Standard errors in brackets. Clustered by household. * significant at 10%; ** significant at 5%; *** significant at 1%.
Note 1: Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level. Wave dummies are included in all specifications.
Note 2 : Values are weighted based on HRS sampling weights.
Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Table 2.7

Analysis of Husbands' Retirements with Expanded Use of Various Health Measures

Model: Probit, DV: Husband Retires Fully or Partially before the Next Wave (Mean = 0.166)

		1	2		3	4		5	6
	Health Measure: Self-rated Poor Health			Health Measure: Health Conditions			Health Measure: Hospital Stay in Last Year		
	Means	Without Interactions	With Interactions	Means	Without Interactions	With Interactions	Means	Without Interactions	With Interactions
Both "At Risk" of Losing Health Insurance if Husband Retires	0.174	-0.059*** [0.013]	-0.056*** [0.015]	0.175	-0.058*** [0.012]	-0.060*** [0.016]	0.175	-0.058*** [0.013]	-0.058*** [0.015]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.028	-0.090*** [0.022]	-0.088*** [0.025]	0.028	-0.088*** [0.023]	-0.091*** [0.027]	0.028	-0.088*** [0.022]	-0.077*** [0.025]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.029	-0.046** [0.024]	-0.033 [0.026]	0.029	-0.046* [0.024]	-0.041 [0.028]	0.029	-0.044* [0.024]	-0.044* [0.026]
Husband's Health Measure is Poor	0.107	0.053*** [0.016]	0.054*** [0.017]	0.257	0.034*** [0.011]	0.035*** [0.012]	0.140	0.042*** [0.015]	0.050*** [0.016]
Wife's Health Measure is Poor	0.142	0.01 [0.014]	0.017 [0.016]	0.233	-0.026** [0.011]	-0.027** [0.012]	0.146	-0.007 [0.013]	-0.012 [0.015]
Interaction of Husband having a Poor Health Measure with Joint Health Insurance Risk	0.022		-0.009 [.040]	0.049		-0.014 [.027]	0.027		-0.041 [.034]
Interaction of Wife having a Poor Health Measure with Joint Health Insurance Risk	0.028		-0.024 [.031]	0.042		0.022 [.027]	0.025		0.035 [.034]
Interaction of Husband's Poor Health Measure with Husband Only Health Insurance Risk	0.004		-0.036 [.055]	0.006		-0.002 [.050]	0.003		-0.113*** [.044]
Interaction of Wife's Poor Health Measure with Wife Only Health Insurance Risk	0.004		-0.084*** [.042]	0.006		-0.017 [.040]	0.004		0.000 [0.052]
Additional Covariates		Yes	Yes		Yes	Yes		Yes	Yes
Observations	8444	8444	8444	8397	8397	8397	8417	8417	8417
Wald Test Probability that:									
Husband Only Risk MME equals Wife's Only Risk MME		0.17	0.13		0.20	0.19		0.18	0.35
All Three HI Risk MMEs are equal		0.34	0.31		0.37	0.40		0.36	0.64

Standard errors in brackets. Clustered by Household. * significant at 10%; ** significant at 5%; *** significant at 1%

Note 1: Health conditions include ever having diabetes, cancer, lung disease, heart problems, or a stroke. Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, health and education.

Note 2: Marginal Effects for interaction terms have been adjust based on Ai and Norton (2003).

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible.

Table 2.8

Additional Specifications Examining Husbands' Retirements with Job Characteristics
Model: Probit, DV: Husband Retires Fully or Partially before the Next Wave (Mean = 0.170)

		1	2	3	4
		Original Specification		Including Job Characteristics	
	Means	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories
Husband "At Risk" of Losing Health Insurance if He Retires	0.217	-0.064*** [0.014]		-0.062*** [0.014]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.186		-0.060*** [0.015]		-0.059*** [0.015]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.030		-0.091*** [0.027]		-0.084*** [0.028]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.032	-0.070*** [0.027]	-0.069*** [0.027]	-0.069** [0.027]	-0.068** [0.027]
Job Requirement: "Physical effort" All or Most of the Time	0.311			-0.008 [0.013]	-0.008 [0.013]
Job Requirement: "Good eyesight" All or Most of the Time	0.876			-0.021 [0.019]	-0.021 [0.019]
Job Requirement: "Intense concentration" All or Most of the Time	0.856			-0.014 [0.018]	-0.014 [0.018]
Job Requirement: "People Skills" All or Most of the Time	0.868			-0.008 [0.016]	-0.009 [0.016]
Job Condition: Strongly Agree or Agree that Job Tasks are More Difficult than Before	0.549			0.019 [0.012]	0.019 [0.012]
Job Condition: Strongly Agree or Agree that Job has a Lot of Stress	0.627			-0.006 [0.013]	-0.006 [0.013]
Job Condition: Strongly Agree or Agree that Older Workers Feel Pressure to Retire	0.169			0.072*** [0.017]	0.072*** [0.017]
Job Condition: Strongly Agree or Agree that Older Workers are Given Easier Tasks	0.345			-0.028** [0.012]	-0.028** [0.012]
Job Condition: Strongly Agree or Agree that "Enjoy" Work	0.842			-0.080*** [0.017]	-0.080*** [0.017]
Additional Covariates		Yes	Yes	Yes	Yes
Observations	5789	5789	5789	5789	5789

Standard errors in brackets. Clustered by Household. * significant at 10%; ** significant at 5%; *** significant at 1%.

Note: "Enjoy job" is only available in waves 3 through 8. Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level.

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Table 2.9

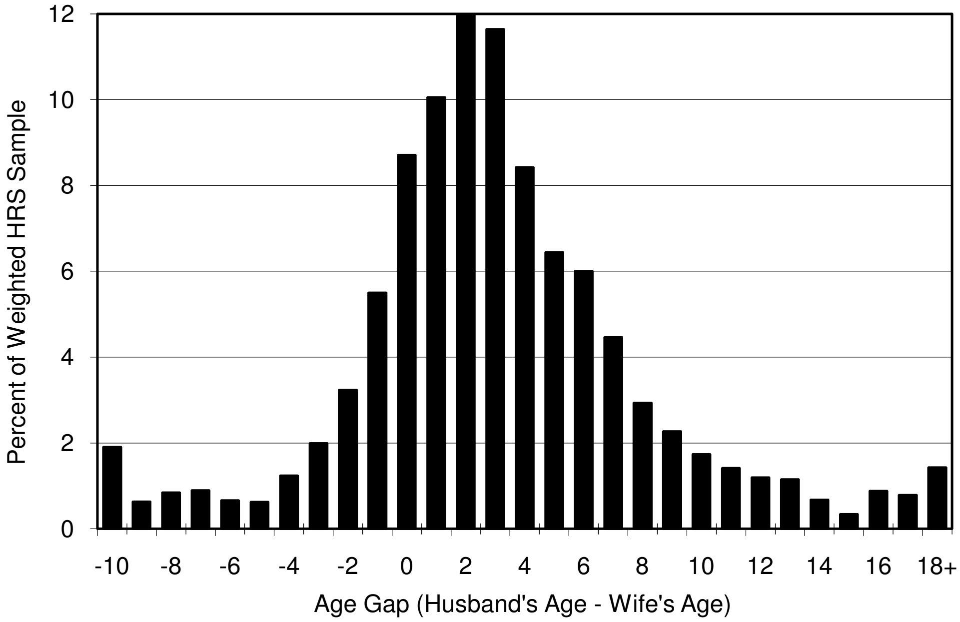
Comparing Characteristics After a Husband's Retirement by Pre-retirement Risk
Values Presented are Weighted Means based on HRS sample weights

	Risk Category in Wave Prior to Husband's Retirement			Probability Three
	Neither at Risk	Both At Risk	Wife Only At Risk	Categories are Equal
Wife Moves to Working if Not Previously Working	0.105	0.091	0.103	0.954
In the 2nd Wave after Husband's Retirement	0.204	0.270	0.182	0.615
Wife Moves to Full-time Work if Not Previously Doing So	0.065	0.075	0.029	0.273
In the 2nd Wave after Husband's Retirement	0.145	0.114	0.097	0.521
Wife Retires if Not Previously Retired	0.250	0.248	0.424	0.246
Husband Has Government Provided Health Insurance	0.235	0.033	0.732	0.000
Wife Has Government Provided Health Insurance	0.102	0.044	0.137	0.013
Excluding those with Government Provided Health Insurance:				
Husband Uninsured	0.053	0.087	0.045	0.486
In the 2nd Wave after Husband's Retirement	0.051	0.083	0.000	0.000
Wife Uninsured	0.032	0.106	0.106	0.016
In the 2nd Wave after Husband's Retirement	0.051	0.150	0.153	0.015
Husband has Non-group, Private Health Insurance	0.034	0.097	0.207	0.027
In the 2nd Wave after Husband's Retirement	0.050	0.132	0.353	0.086
Wife has Non-group, Private Health Insurance	0.048	0.079	0.163	0.026
In the 2nd Wave after Husband's Retirement	0.071	0.160	0.272	0.005
Husband has EPHI from own Employer	0.718	0.741	0.748	0.865
In the 2nd Wave after Husband's Retirement	0.742	0.652	0.562	0.364
Husband has EPHI from own Employer and Pays Full Cost	0.217	0.296	0.221	0.372
Wife has EPHI from Husband's Employer	0.461	0.622	0.579	0.005
In the 2nd Wave after Husband's Retirement	0.467	0.515	0.562	0.784
Wife has EPHI from Husband's Employer and Pays Full Cost	0.288	0.213	0.349	0.588
Observations	1250	151	76	

Sample: Husband was not previously retired, Husband or Wife had EPHI in the previous wave, Husband was not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Appendix Figure 2.3

Distribution of the Age Gap between Spouses in a Household



Note: Distribution is based on household weights for HRS households where husband is working at the first interview.

Appendix Table 2.10

Analysis of Husbands' Retirements with Alternative Definitions of Retirement

Model: Probit, DV: Husband Retires Fully or Partially (Mean = 0.166 and .164 from FT work), Full-Retirement only (.110 and .118), and Leaving FT employment (.183) before the Next Wave

		1	2	3	4	5	6	7	8	9	10
		Full & Partial Retirement		Full & Partial Retirement from Full-time Work		Full-Retirement Only		Full-Retirement from Full-time Work Only		Leaving Full-time Work	
	Means	Husband and Wife's Risk	Fully Exclusive Risk Categories	Husband and Wife's Risk	Fully Exclusive Risk Categories	Husband and Wife's Risk	Fully Exclusive Risk Categories	Husband and Wife's Risk	Fully Exclusive Risk Categories	Husband and Wife's Risk	Fully Exclusive Risk Categories
Husband "At Risk" of Losing Health Insurance if He Retires	0.202	-0.063*** [0.012]		-0.063*** [0.012]		-0.036*** [0.010]		-0.040*** [0.011]		-0.061*** [0.013]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.174		-0.059*** [0.013]		-0.058*** [0.013]		-0.033*** [0.011]		-0.036*** [0.011]		-0.060*** [0.014]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.028		-0.090*** [0.022]		-0.091*** [0.022]		-0.055*** [0.018]		-0.063*** [0.020]		-0.067** [0.028]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.029	-0.047** [0.023]	-0.046** [0.024]	-0.046* [0.024]	-0.045* [0.024]	-0.036** [0.016]	-0.035** [0.016]	-0.047*** [0.017]	-0.046*** [0.018]	-0.036 [0.029]	-0.035 [0.029]
Additional Covariates		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8444	8444	8444	8142	8142	9267	9267	8257	8257	7701	7701
Wald Test Probability that:											
Husband's Risk MME equals Wife's Only Risk MME		0.53		0.53		1.00		0.72		0.42	
Husband Only Risk MME equals Wife Only Risk MME			0.17		0.17		0.41		0.51		0.45
All Three HI Risk MMEs are equal			0.34		0.31		0.54		0.45		0.71

Standard errors in brackets, Clustered by Household. * significant at 10%; ** significant at 5%; *** significant at 1%.

Note: Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level.

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Appendix Table 2.11

Analysis of Husbands' Retirements using Employer Size as a Proxy for Offers of EPHI
Model: Probit, DV: Husband Retires Fully or Partially before the Next Wave (Mean = 0.187)

		1	2		3	4
	Original Risk Definition			Using Wife's Employer Size as Proxy for EPHI		
	Mean	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Mean	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories
Husband "At Risk" of Losing Health Insurance if He Retires	0.202	-0.063*** [0.012]		0.171	-0.063*** [0.012]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.174		-0.059*** [0.013]	0.145		-0.060*** [0.013]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.028		-0.090*** [0.022]	0.025		-0.080*** [0.023]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.029	-0.047** [0.023]	-0.046** [0.024]	0.024	-0.039 [0.026]	-0.038 [0.026]
Additional Covariates		Yes	Yes		Yes	Yes
Observations	8444	8444	8444	8515	8515	8515

Standard errors in brackets. Clustered by Household. * significant at 10%; ** significant at 5%; *** significant at 1%.

Note 1: For columns 3 and 4, Wife's employer is assumed in the definition of risk to offer EPHI to it's employees if it has over 50 employees at that location. Companies with over 50 employees offer EPHI to its employees over 95% of the time (Kaiser 2007).

Note 2: Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level.

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Appendix Table 2.12

Analysis of Husbands' Retirements by Wives' Employment Statuses

Model: Probit, DV: Husband Retires Fully or Partially before the Next Wave (Means= 0.206, 0.155, and 0.145)

		1	2		3	4		5	6
	Wife Not Working in Previous Wave			Wife Working Part-time in Previous Wave			Wife Working Full-time in Previous Wave		
	Means	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Means	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Means	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories
Husband "At Risk" of Losing Health Insurance if He Retires	0.295	-0.107*** [0.019]		0.247	-0.086*** [0.023]		0.132	-0.021 [0.019]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.234		-0.105*** [0.021]	0.226		-0.083*** [0.024]	0.122		-0.015 [0.021]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.062		-0.119*** [0.033]	0.021		-0.115** [0.054]	0.010		-0.098*** [0.034]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.050	-0.065 [0.043]	-0.064 [0.043]	0.024	0.041 [0.064]	0.041 [0.065]	0.017	-0.080*** [0.024]	-0.079*** [0.024]
Additional Covariates		Yes	Yes		Yes	Yes		Yes	Yes
Observations	2697	2697	2697	1528	1528	1528	4189	4189	4189
Wald Test Probability that:									
Husband's Risk MME equals Wife's Only Risk MME		0.37			0.06			0.05	
Husband Only Risk MME equals Wife Only Risk MME			0.32			0.08			0.66
All Three HI Risk MMEs are equal			0.60			0.15			0.03

Standard errors in brackets, clustered by household. * significant at 10%; ** significant at 5%; *** significant at 1%

Note: Values are weighted based on HRS sampling weights. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level. Wave dummies are included in all specifications.

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Appendix Table 2.13

Analysis Using Definitions of Health Insurance Risk that Incorporate Possibility of COBRA
Model: Probit, DV: Husband Retires Fully or Partially before the Next Wave (Mean = 0.166)

	Means	1 Husband's Risk using Maximum Age 63.5	2 Husband's Risk and Wife's Non-shared Risk using Max Age 63.5	3 Fully Exclusive Risk Categories using Maximum Age 63.5
Husband "At Risk" of Losing Health Insurance if He Retires	0.187	-0.062*** [0.013]	-0.063*** [0.012]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.160			-0.061*** [0.013]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.027			-0.076*** [0.025]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.033		-0.050** [0.021]	-0.049** [0.021]
Additional Covariates		Yes	Yes	Yes
Observations	8484	8484	8484	8484
Wald Test Probability that:				
Husband's Risk MME equals Wife's Only Risk MME			0.57	
Husband Only Risk MME equals Wife Only Risk MME				0.41
All Three HI Risk MMEs are equal				0.72

Note: Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level.

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Appendix Table 2.14

Inconsistencies in the Reports of Retiree Health Insurance (RHI) among Those Reporting the Same Job and Insurance Source

Wave to Wave Changes	Moving from No RHI to RHI	Moving from RHI to No RHI	Observations
Waves 1 to 2	0.006	0.037	1442
Waves 2 to 3	0.132	0.196	976
Waves 3 to 4	0.149	0.127	725
Waves 4 to 5	0.134	0.107	905
Waves 5 to 6	0.155	0.106	632
Waves 6 to 7	0.124	0.096	491
Waves 7 to 8	0.148	0.094	352
Total Number of Changes	All Waves	Waves 1 to 3	Waves 3 to 8
0	0.343	0.464	0.617
1	0.316	0.269	0.223
2	0.203	0.267	0.105
3	0.087		0.034
4+	0.053		0.020
Observations	2346	1807	2696

Sample: Married men reporting the same job (not self-employment) and insurance source as previous wave and age eligible for Initial or War Baby Cohort

Appendix Table 2.15

Ex-post accuracy of Reported RHI and Attempted Corrections

	Report in Previous Wave and Excluding Missing		Replace Missing with Last Non-missing Report		Replace Missing with Most Common Report	
	Husband	Wife	Husband	Wife	Husband	Wife
Percent "At Risk" of Losing HI if Husband Retires	10.1%	11.8%	10.8%	12.6%	10.3%	11.7%
Of those Reporting No RHI Offer in the Previous Wave, Percent Reporting EPHI from Husband's Employer after Retirement	0.678	0.500	0.744	0.680	0.727	0.675
Observations	211	240	195	172	187	163
Of those Reporting RHI Offer in the Previous Wave, Percent Reporting Non-Group or No Insurance after Retirement	0.088	0.132	0.089	0.132	0.087	0.136
Observations	695	487	711	499	715	509

Sample: All married men at their first retirement (not self-employed) who are age eligible for Initial or War Baby cohorts of the HRS

Appendix Table 2.16

Comparing Analyses with Alternative Corrections for RHI Values

		1	2		3	4		5	6
	Report in Previous Wave and Excluding Missing			Replace Missing with Last Non-missing Report			Replace Missing with Most Common Report		
	Means	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Means	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Means	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories
Husband "At Risk" of Losing Health Insurance if He Retires	0.202	-0.064*** [0.012]		0.221	-0.069*** [0.011]		0.216	-0.067*** [0.011]	
Both "At Risk" of Losing Health Insurance if Husband Retires	0.174		-0.059*** [0.013]	0.190		-0.066*** [0.012]	0.185		-0.064*** [0.012]
Only Husband "At Risk" of Losing Health Insurance if He Retires	0.028		-0.090*** [0.022]	0.032		-0.091*** [0.021]	0.031		-0.090*** [0.020]
Only Wife "At Risk" of Losing Health Insurance if Husband Retires	0.029	-0.044** [0.022]	-0.046** [0.024]	0.034	-0.100*** [0.019]	-0.099*** [0.019]	0.031	-0.087*** [0.019]	-0.086*** [0.019]
Additional Covariates		Yes	Yes		Yes	Yes		Yes	Yes
Observations	8444	8444	8444	8827	8827	8827	8835	8835	8835
Wald Test Probability that:									
Husband's Risk MME equals Wife's Only Risk MME		0.43			0.14			0.35	
Husband Only Risk MME equals Wife Only Risk MME			0.17			0.77			0.90
All Three HI Risk MMEs are Equal			0.34			0.21			0.35

Standard errors in brackets, clustered by household. * significant at 10%; ** significant at 5%; *** significant at 1%.
Note: Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level.
Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS

Appendix Table 2.17

Evidence of COBRA in Cost Sharing Amongst Those Reporting EPHI from a Husband's Former Employer

	Full Cost by Respondent	Shared Cost with Employer	Full Cost by Employer
Husbands "At Risk" of Losing HI if Husband Retires but Report EPHI after Retirement	0.398	0.305	0.297
Husbands "Not At Risk" of Losing HI if Husband Retires and Report EPHI after Retirement	0.263	0.443	0.293
Wives "At Risk" of Losing HI if Husband Retires but Report EPHI after His Retirement	0.463	0.366	0.171
Wives "Not At Risk" of Losing HI if Husband Retires but Report EPHI after His Retirement	0.417	0.370	0.213

Sample: Limited to waves 3 through 8 because current vs. former employer was not differentiated until that time.

Appendix Table 2.18

Analysis of Husband's Retirement Excluding Waves 1 & 2 for More Consistent Questions about RHI

Model: Probit, DV: Husband Retires Fully or Partially before the Next Wave (Mean = 0.168)

		1	2		3	4
	Original Risk Definition			Risk Definition including Insurance from a "Former Employer" as RHI		
	Mean	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories	Mean	Husband's Risk and Wife's Non-shared Risk	Fully Exclusive Risk Categories
Husband At Risk of Losing Health Insurance if He Retires	0.221	-0.069*** [0.015]		0.219	-0.077*** [0.015]	
Both At Risk of Losing Health Insurance if Husband Retires	0.189		-0.066*** [0.016]	0.186		-0.074*** [0.016]
Only Husband At Risk of Losing Health Insurance if He Retires	0.032		-0.093*** [0.027]	0.033		-0.099*** [0.027]
Only Wife At Risk of Losing Health Insurance if Husband Retires	0.034	-0.041 [0.029]	-0.04 [0.029]	0.031	-0.041 [0.030]	-0.04 [0.030]
Additional Covariates		Yes	Yes		Yes	Yes
Observations	5082	5082	5082	5082	5082	5082
Wald Test Probability that:						
Husband's Risk MME equals Wife's Only Risk MME		0.38			0.27	
Husband Only Risk MME equals Wife Only Risk MME			0.19			0.15
All Three HI Risk MMEs are equal			0.42			0.35

Standard errors in brackets. Clustered by Household. * significant at 10%; ** significant at 5%; *** significant at 1%.

Note: Values are weighted based on HRS sampling weights. Wave dummies are included in all specifications. Additional covariates include whether a husband has a pension, household wealth, and each spouse's age, age category, self-reported health and education level.

Sample: Husband or Wife had EPHI in the previous wave, Husband has not previously retired, Husband is not self-employed, and one spouse is age eligible for Initial or War Baby cohort of the HRS, Households where EPHI can be identified as from the current or former employer.

CHAPTER III

The Lasting Effects of Crime: The Relationship of Methamphetamine Laboratory Discoveries and Home Values

3.1 Chapter Abstract

Following the lead of recent research, this study estimates a household's willingness to pay to avoid crime while minimizing concerns of omitted variable bias. By assuming methamphetamine producers locate approximately at random within a narrowly defined neighborhood, this study has been able to use hedonic estimation methods to estimate the impact of the discovery of that lab on the home values near that location. Though more evidence is necessary, one interpretation is that the impact on property values reflects the valuation of the perceived risk of crime. Specifically, the analysis designates those closest to the site as the treated, while those slightly farther away act as the comparison group. The discovery of a methamphetamine laboratory has a significant effect on the property values of those homes close to the location that peaks from six to 12 months after each lab's discovery. The estimates found in this study range from a decrease in sale prices of six to ten percent in the year following a laboratory's discovery compared to the prices for homes that are slightly farther away.

3.2 Introduction

The effects of crime on property values have been a long-standing focus of economic research because it is one of the best measures available for the value people put on safety. The accuracy of high valuations found in early studies using cross-sectional data is questionable because of the problem of omitted variable bias. Specifically, crime is not randomly assigned to neighborhoods and it is likely correlated with unobservable qualities that may also be correlated with home values. In an attempt to minimize this source of bias, recent research on a number of localized events has begun identifying the difference in responses between those affected most and those who also live nearby but are not affected as intensely by the event in question.[1] Using a similar approach, I will examine the difference in the effects of the discovery of a methamphetamine laboratory in a neighborhood between those closest to the location and those slightly farther away. Though the discovery of the laboratory implies its closure, the discovery indicates the existence of crime in the neighborhood and may be a signal both to current and future residents that the neighborhood is less safe than others. By comparing the change in home sale prices after the discovery of a nearby laboratory to the changes in prices to other homes in the neighborhood that are slightly farther away, any difference in the changes can be interpreted as the value of avoiding the signal of crime, if not the valuation of crime itself.

This study will use a new proxy for crime to assess an individual's willingness to pay to avoid a neighborhood that has been publicly associated with crime. The discovery of methamphetamine labs has not been used in this way in previous literature and offers a unique opportunity to examine the impact of a sudden change

[1] This approach has been identified in some studies as a "quasi-experimental approach" because of the assumed random assignment of the location of an event within a narrowly defined neighborhood, even though the selection of the neighborhood is not assumed to be random.

in the perceived level of crime in a neighborhood. Though a home that is being used for drug use (a "crack house" or "drug den") or for prostitution might be seen as a similar disamenity to neighbors, they also create a great deal of traffic that is likely to inform neighbors of its existence before the police act. Two recent studies by Linden and Rockoff (2008) and Pope (2008) have focused on similar sudden increases in the perceived risk of crime by examining the arrival of a sex offender to a neighborhood. As with the approach used in this study in regards to the location of methamphetamine labs, the arrival of a sex offender is not considered globally random as offenders tend to locate in lower cost areas. Instead, the actual residence of the offender is considered random only within a small area (defined as 3/10 of a mile in Linden and Rockoff (2008), 2/10 of a mile in Pope (2008)). In other words, though it may not be random that the sex offender moved into a particular neighborhood, his location within that neighborhood can be considered a random choice in that it is made based on availability rather than qualities of the location (which are assumed to be similar throughout the neighborhood).

I find that the discovery of a methamphetamine laboratory has a significant impact on the property values of those homes close to the location that peaks between six to 12 months after the lab's discovery. In this study, the estimated decreases in sale prices ranges from six to ten percent in the year following a laboratory's discovery compared to the prices for homes that are "slightly farther" (here between an eighth and a quarter of a mile) away. Studies on the willingness of individuals to pay to avoid crime have found a range of values that are hard to compare based on the differences in types of crimes and the comparison groups being used. In an early work, Thaler (1978) found that areas with one standard deviation lower crime rate have three percent higher property values. A more recent study by Gibbons (2004) found that the same drop in the crime rate was associated with a ten percent increase in property values.[2] In the research on sex-offender locations, Linden and Rockoff (2008) found that homes closest to the location of an arriving sex offender sell for four percent less than those homes slightly farther away. Pope (2008) finds a similar 2.3 percent drop for those closest to the location where a sex offender chooses to locate but an immediate recovery to pre-offender levels once the offender moves out of the area.

Less explored in the previous literature is how individuals respond to the gradation of risk. In this study, I examine whether the discovery of multiple labs in the vicinity of a home has an additional adverse effect on its sale price. Surprisingly, I find that it does not, which supports the theory that individuals either consider their neighborhood risky or not and do not differentiate based on the level of risk. Similarly, Pope (2008) found that the degree of a sex offenders crime (that is, some sex offenders were identified as “Predators” because of the severity of the crimes they committed) did not influence the level of the response.

In the next section, I will provide a basic overview of methamphetamine and its production in the United States. In Section 3.4, I will briefly look at previous literature focused on evaluating communities' willingness to pay to avoid crime as well as other research localized responses to particular events. In Section 3.5, I will discuss the data used in this study while Section 3.6 describes the empirical methodology in greater detail. Section 3.7 presents the results in four subsections. The first, Subsection 3.7.1, examines the comparability of the treated (those homes closest to the laboratory site) and the control group (those slightly farther away) for the proposed analysis. The second subsection, 3.7.2, discusses the graphical evidence

[2]Other research on the value of crime reduction includes Cullen and Levitt (1999), Katz et al. (2001), and Kuziemko and Levitt (2004)

and subsection 3.7.3 presents the results of the analysis described in Section 3.6. Section 3.8 concludes.

3.3 Overview

The Office of National Drug Control Policy describes methamphetamine ("meth") as a "highly addictive central nervous system stimulant that can be injected, snorted, smoked, or ingested orally."[3] Methamphetamine is different from other drugs in that it can be produced using easily accessible household goods and equipment. As a result, methamphetamine production sites are the most common clandestine drug laboratories found in the United States today. Large-scale domestic production has decreased in recent years due to restrictions on the sales of bulk amounts of the over-the-counter products that are precursors (i.e. raw materials) to methamphetamine production.[4][5] Nationally, methamphetamine laboratory seizures peaked in the years 2003 and 2004.[6]

Methamphetamine laboratories ("meth labs") pose great risks to those who enter the premises and those who live nearbyScott (n.d.). The mixing of the chemical precursors to meth is a highly volatile process and creates a risk of chemical burns, fires, toxic fumes and even explosions. In fact, about twenty percent of all labs are found as a result of a fire or explosion. Environmentally, meth production creates large quantities of toxic materials. Specifically, producing one pound of meth creates five pounds of hazardous waste.[7] When a laboratory is seized, the governmental

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[3] http://www.whitehousedrugpolicy.gov/drugfact/methamphetamine/methamphetamine_ff.html

[4] Specifically, cold remedies that include ephedrine or pseudoephedrine are now kept behind pharmacist's counters and require the names and license numbers of purchasers to be recorded when making a large purchase.

[5] Work by Dobkin and Nicosia (2009) found that government efforts to reduce the supply of meth precursors had only temporary effects on the price and quality of methamphetamine available in the United States. The event they study was a large, 1995 DEA action that severely limited the distribution of wholesale amounts of meth precursors to large-scale clandestine labs. Though the authors are uncertain of the reason for the quick rebound of meth's purity and price, one reason may have been a shift to decentralized production that required less massive amounts of precursor drugs, such as home lab production that is examined in this paper.

[6] Based on statistics published by the U.S. drug enforcement agency on their website, http://www.usdoj.gov/dea/concern/map_lab_seizures.html.

[7] The production at a small, "Mom and Pop" lab is quite small. A normal production cycle produces only one to

officials are responsible for neutralizing the immediate threats to public safety, such as the risk of explosion or chemical contamination of the environment. In many cases, this includes a period of evacuation of the neighborhood until the scene is surveyed and the largest risks are neutralized. The period of evacuation usually ranges from as little as a few hours to as much as a couple of days. Any non-flammable hazardous contaminants in the interior of the building are often the responsibility of the property owner rather than government officials. Specifically, toxic residue may be present on the walls, floors and other surfaces as well as absorbed in any carpeting. About twenty states mandate the decontamination of the interior of former meth homes before it can be sold or rented (Dewan and Brown, 2009).[8] No definitive conclusions have been drawn by public health and environmental impact experts about the short and long run threats the residual contaminants may pose. Once a laboratory is discovered, it is included in a national registry (discussed below) and in many individual state registries. This implies that home buyers can find information about meth lab locations before purchasing a home.

There are some external signs that may alert neighbors to the existence of a methamphetamine laboratory. The most pronounced sign is odor PDFA (n.d.). Meth labs are associated with unusually strong smells similar to ammonia, cat urine, or nail polish. Additionally, neighbors may notice excessive amounts of trash and signs of chemical dumping in a yard. Other warning indicators, such as specific apparatuses and interior markings, can be easily hidden from neighbors. Though there is not data on how labs are usually discovered, anecdotal evidence suggests that most

four ounces of methaphetamine. This is usually only enough for personal use with just enough left over to sell to purchase the precursors for another cycle. Large labs (which are usually limited to Mexico or California) can produce a minimum of ten pounds per production cycle (Scott, n.d.).

[8] Ohio is not one of the states that have such a mandate (Armon, 2009). That said, the state does require a home seller to disclosure the “presence of hazardous materials,” specifically asking “Do you know of the previous or current presence of any of the below identified hazardous materials?” Included in the list is an item for “Other toxic or hazardous substances” (Ohio Department of Commerce, 2008).

are discovered not because of neighbors' suspicions, but when government officials are investigating complaints unrelated to the drug production (such as domestic disturbances or child welfare concerns) (Crissey, 2004). The uncertainty over when neighbors become aware of the meth lab complicates the interpretation of the results in this study. Though not suggested anecdotally, if neighbors do know about the lab before the police, one might expect housing prices to fall before the lab is found and thus mute the observed impact of the labs discovery by police. If that is the case, the results presented below would be lower bounds on the real impact of the discovery of a methamphetamine lab in a neighborhood though there is no evidence that there is a pre-discovery effect.

3.4 Related Literature

Rosen (1974) hedonic price models have been widely used to analyze the value that individuals put on neighborhood qualities. The characteristics studied in the past have included quality of education, crime, and environmental amenities. Much of the early research focused on cross-sectional differences in property values but these studies have the potential problem of omitted variable bias related to neighborhood qualities that are not observed by the researcher and may be correlated with both the characteristic being studied and property values.[9] More recently, research has focused on alternative identification strategies that minimize the concerns over omitted variable bias. This study will build on this literature by using the discovery of a methamphetamine laboratory as a quasi-random event to explore the impact of the perceived increase in the risk of crime on local home values.

In the literature, the subjects studied using discontinuity designs and hedonic price

[9]For example, Thaler (1978) estimated the difference in property values based on per capita crime rates across census tracts in Rochester, N.Y.

models vary greatly. In the area of education, Black (1999) used households close to school attendance boundaries to assess the value of school quality on otherwise similar neighborhoods. In regards to environmental concerns, Chay and Greenstone (2005) examined the value of air-quality by using localized pollution restrictions. A more recent paper by Greenstone and Gallagher (2008) compared the home value impact of hazardous waste sites cleaned-up under the Superfund program to home sales near sites that just missed the programs cut-offs and found no significant change. Davis (2004) compared neighboring counties to examine the financial impact of localized health risks. Teh (2007) examined the impact on home prices (and crime) of the liquor stores openings by comparing differences in the sale prices within one tenth of a mile of the new location to those between one tenth and a quarter of a mile and those between a quarter and a half mile. Using a hedonic price model, Teh identifies a negative impact of the opening of liquor stores for those homes closest to the new location compared to those that are slightly farther away in low socioeconomic status neighborhoods but a positive effect in high socioeconomic status neighborhoods.

3.5 The Data

This study will examine the impact of methamphetamine laboratory discoveries using data from Summit County, Ohio. This county has been selected because it contains the city of Akron which has the largest number of methamphetamine laboratory discoveries in the state and one of the largest in the country. The laboratory discoveries occur in a broad range of geographical locations which provide a diverse and large sample of homes that are within a quarter of a mile of a discovered meth laboratory. It is not clear how the relative frequency of methamphetamine labs in Akron might effect the generalizability of the findings in this study. I suspect that it may dampen the magnitude of the measured effects as both the community becomes desensitized to this type of crime and as the number of alternatives diminishes.

Data on meth laboratory seizures comes from the United States Drug Enforcement Agency (DEA) maintained "National Clandestine Laboratory Register," though entries rely on reports from state and local officials.[10] The registry includes the address and seizure date, but not details about the seizure. Local officials determine whether a site is a clandestine laboratory, but presumably homes would need to have equipment associated with meth production (though the site may be active or inactive at the time of discovery). This registry is freely accessible to the public on the internet and gives home buyers an easy reference to consult before purchasing a home. Real estate sales and dwelling data come from the Summit County Fiscal Office and were made available for this project. These records include the sale price, the transaction date, and the address of the home. Also available from this office are dwelling characteristics such as the square footage of the living area, the age of the structure, number of bedrooms, number of plumbing fixtures, number of stories, the style of the home, and a rating of the condition of the building.[11] The distance between each home sold and the clandestine laboratories has been computed using Geographic Information Systems (GIS) software and geocoded street data from the Ohio Department of Transportation.

This study will examine single family home sale data beginning in January 2002 and running through March 2009. The earlier date represents two years before the first meth lab in the dataset is discovered and the later date is the most recent data available. At various points in the analysis, the sample will be limited to different subsets of this data. After an initial analysis with the entire dataset, the sample will

[10] http://www.usdoj.gov/dea/seizures/index.html

[11] Some of this data is also available at the Fiscal Office's website, http://www.co.summit.oh.us/fiscaloffice/defaultwebapps.htm

be reduced to include just those homes within a quarter of a mile of a discovered methamphetamine laboratory and sales within one or two years of each lab's discovery. Table 3.1 presents the number of sales and the number of unique parcels.[12] In total, there are 80,397 home sales in Summit County that were successfully geocoded for use with GIS in the full period of study.[13] Among these sales there are 52,551 unique parcels.

Table 3.1 further separates the dataset by the number of methamphetamine labs around each parcel and by whether the sale date is within certain ranges of the labs' discovery dates. The bulk of the homes sold are not within a quarter mile of any labs. That said, 8,417 sales are within a quarter mile of exactly one past or future laboratory. Amongst those, 2,537 sales occur within one year of the discovery and 4,877 within two years (split almost evenly before and after the discovery in both cases). There is a smaller group of sales that are within a quarter mile of more than one laboratory. Because of the difficulty in parsing out the various effects the discovery of multiple labs within a given distance of a sold home might have on the sale price of a home, these sales will generally be omitted. An exception to this is made when the second lab's discovery does not occur until after the period of examination of the first discovery.[14] Relaxing this restriction, I will take advantage of the discovery of a second laboratory near a sold home to measure the response to the degree of severity of the perceived level of crime.

[12]The sample used here excludes non-single family homes, homes whose sale price is in the top or bottom one percent, and homes missing the full set of dwelling data. Limiting the sample to single family homes is traditional in this literature. Sales in the top and bottom one percent are eliminated to exclude outliers which can skew the results. The number of homes missing a full set of dwelling data is less than one-tenth of one percent.

[13]This represents about 85 percent of all single family homes in the Summit County Fiscal Office's dataset. The inability to match data can occur for a number of reasons. In some cases, it is because data in the files (like zipcode or street direction) does not match with the street data provided by the Ohio Department of Transportation. If there is a close alternative, the location was mapped to that but otherwise went unmatched. Some of these can be manually corrected if it is a simple case of an alternative street name or zipcode, which will be done before this paper is finalized.

[14]For example, if the first discovery is January 1st, 2005, it will be included in the sample for an examination with a one year window around each lab's discovery if the second discovery is after January 1st, 2006. This group is relatively small (425 sales for within one year and 209 for within two years) and its inclusion does not have a substantive impact on the findings.

The DEA's registry lists 101 clandestine laboratory sites for the period from January 2004 through July 2007. Just over 25 labs were discovered in each of 2004, 2005, and 2006. Through July of 2007, 21 labs had been discovered. Thirteen additional labs were discovered in the remainder of 2007 but including those lab discoveries would not allow for a full examination of sales following the lab's discovery. This pattern is slightly different from the national trend which showed a peak in clandestine laboratory discoveries in 2003 and 2004.

3.6 Empirical Methodology

For this analysis, I will employ a technique similar to that used in recent work studying the effect of pollution and crime on housing prices discussed above. That literature has identified the possible faults of cross-sectional comparisons of different neighborhoods with potential unobserved differences that cannot be controlled for in a traditional hedonic home price model. To that end, these studies have taken a difference-in-difference approach comparing changes to similar areas before and after an event. Specifically for this study, I will compare sale prices for homes in the same neighborhood but at varying distances from a discovered methamphetamine laboratory. By narrowly defining the neighborhood area, I hope to limit any divergent, unobserved differences that may be driving the varying trends in the treated and the comparison groups but unrelated to the lab's discovery. The following analysis will include indicators for those properties that are very close to the address of the discovered lab (defined here as within an eighth of a mile) and those who are slightly farther away (between an eighth and a quarter of a mile).[15] Section 3.7.1 will compare the observable qualities of each of the comparison groups.

[15] Though discretized distance identifiers are used in the primary analysis, other specifications will included a continuous distance term to examine patterns within these distance categories.

Similar to the estimation framework of Linden and Rockoff (2008), the analysis of this paper will focus on two primary specifications. The differences between the two specifications reflects a difference in the sample being used. The first specification examines all single-family home sales in Summit County, Ohio and uses all homes not within a quarter mile of any methamphetamine labs as the comparison group. The second specification limits the sample to only homes within a quarter mile of the meth lab, and the comparison group includes homes between an eighth of a mile and a quarter of a mile sold before the lab is discovered. The specifications can be represented as follows:

$$\log(P_i) = \theta_0 + \beta \mathrm{X}_i + (\theta_1 \mathrm{D}_i^{\mathrm{cl}} + \theta_2 \mathrm{D}_i^{\mathrm{sf}}) + (\theta_3 \mathrm{D}_i^{\mathrm{cl}} + \theta_4 \mathrm{D}_i^{\mathrm{sf}}) * \mathrm{Post}_i + \varepsilon_i \tag{3.1}$$

$$\log(P_i) = \pi_0 + \gamma \mathrm{X}_i + \pi_1 \mathrm{D}_i^{\mathrm{cl}} + (\pi_2 \mathrm{D}_i^{\mathrm{cl}} + \pi_3 \mathrm{D}_i^{\mathrm{sf}}) * \mathrm{Post}_i + \varepsilon_i \tag{3.2}$$

where $\log(P_i)$ is the log of price for each sale i;[16] X is a series of home characteristics including age, square footage, number of bedrooms, number of plumbing fixtures, number of stories, condition of the dwelling, locational controls (zipcode or meth lab dummy) and a time trend (monthly); $\mathrm{D}_i^{\mathrm{cl}}$ is an indicator for a home within an eighth of a mile of past or future methamphetamine laboratory and $\mathrm{D}_i^{\mathrm{sf}}$ is an indicator for a home that is within a quarter of a mile; and Post_i is an indicator for whether the home was sold after the nearby meth lab was discovered. The definition of the D_i indicators allows for a simple difference-in-difference interpretation of the results. The coefficients and standard errors of θ_3 and π_2 represent the additional change in the home values for those nearest to the meth home after its discovery compared to those who are slightly farther away. The sample for specification (3.2)

[16] In past studies, the Consumer Price Index has been used to adjust home prices, but I have instead included a monthly trend variable that should capture price trends in the data. Using a home price index to normalize prices has no substantive effects on the results presented below.

is limited to only those homes identified as either "close" or "slightly farther away." Specification (3.1) will use all home sales within the specified time period. The coefficients θ_1, θ_2, and π_1 represent any underlying price differences for those homes within certain distances of the methamphetamine lab. If I have appropriately picked our comparison group to be otherwise similar to the treated group, π_1 should be zero in specification (3.2) and θ_1 and θ_2 should be equal in specification (3.1).

3.7 Evidence

3.7.1 Validity of the Comparison Group

Tables 3.2 and 3.3 present the differences in sale prices and characteristics by various distance ranges from discovered methamphetamine laboratories. Table 3.2 presents the differences based on the number of laboratories within a quarter mile. Average sale prices are more than twice as large if the home is not within a quarter mile of any discovered laboratory than those within a quarter mile of at least one.[17] Additionally, homes more than a quarter mile from the nearest discovered methamphetamine laboratory are on average larger, younger, have more bedrooms and bathrooms, more likely to be a single floor, and more often rated as "average" to "excellent" condition. The differences between homes that are within a quarter mile of just one future or past laboratory and those within the same distance of more than one are substantially less. Those within a quarter mile of more than one lab tend to have lower sales prices and are slightly smaller, but are less likely to be a multi-leveled and to be rated as "fair" or "poor." When looking at the style of the homes, the main difference between the groupings is that "Colonial" homes are more

[17] Housing prices are shown at their nominal level, adjusted for the Consumer Price Index, and adjusted for a home price index. In the third case, the sale price has been adjusted to reflect local housing trends as measured by the Case-Schiller Home Price Index for nearby Cleveland, Ohio. I have used the Case-Schiller Index to more accurately make home prices comparable across time since the CPI has not been a good reflection of trends in home prices over the last 10 years. Cleveland, Ohio is 40 miles to the north of Akron and has very similar economic conditions.

common in the areas where meth labs are found and “Ranch” homes make up almost thirty percent of the homes sold in areas without a meth lab discovery.

Table 3.3 examines the differences between the pre-discovery home sale prices of homes that are “close” to the discovered laboratory and those that are “slightly farther” away.[18] Home prices one year prior to the discovery are not significantly different. Homes between one-eighth and one-quarter of a mile from the discovered lab tend to be smaller and younger than those within one-eighth of a mile, significantly so when including homes sold within 2 years of the discovery. Homes that are slightly farther away from the discovered laboratory also tend to have fewer plumbing fixtures and are less likely to be rated as being in “fair” or “poor” condition, though not statistically significantly. Farther away homes are also significantly less likely to be “Colonial” style than those that are closer to the discovered laboratory. Overall, these homes appear to be generally comparable.

3.7.2 Graphical Analysis

If there is a negative impact of the discovery of a methamphetamine laboratory on local home prices, one would expect there to be effects in two dimensions: time since the discovery and distance from the lab. In the figures that follow, this paper will present evidence that there is an effect in both dimensions. Figure 3.1 presents the smoothed plots of the difference between the actual sale price and a predicted home price based on the dwellings characteristics (living area; age; number of bedrooms, plumbing fixtures, and stories; condition; and home style), quarter in which the home is sold, and zipcode. The predicted values are based on regression results using the entire sample which can be found in Appendix Table 3.9. Smoothed sale price graphs

[18] Though the area that is between and eighth and a fourth of a mile from the lab is 3 times larger than the area within an eighth of a mile, the sample size of the former is only 2.5 times larger than latter. This is most likely due to the higher probability of non-residential property in the larger area due purely to its size and distance from the known residential property.

are produced using a locally weighted least squares technique, producing a "lowess curve." This method offers increased flexibility in the graphical form (as compared to a single global model) by fitting functional forms to only localized subsets of the data that are then compiled to generate the overall pattern. The entire sample is used for the smoothing process with close points more heavily weighted than those farther away.[19]

The sales data in Figure 3.1 is presented in four groups that are divided by their distance from the discovered lab (either within an eighth of a mile or between an eighth and a quarter of a mile) and by whether the sale takes place before or after the lab is discovered. As one would expect, based on the evidence presented in 3.7.1, the figure shows that sale prices are generally similar across distance groupings before the meth lab is discovered. After the lab is discovered, there is a large drop in sales prices for those homes within an eighth of a mile of the discovered lab while there is only a small immediate drop in the more distant group. The gap between the two groups persists for over a year but begins to narrow around 300 days following the discovery. Figure 3.2 summarizes the difference between the two groups in Figure 3.1 and presents the fifth and 95th percentiles of the difference between the two plots when the lowess estimation is repeated 100 times with bootstrapped samples. Though this figure illustrates the break in trend at the time of meth lab's discovery, the confidence intervals show how noisy the lowess estimation is especially near the ends of its estimation range.[20]

To examine the pattern in sales prices based on the distance from the metham-

[19] Using a smaller portion of the sample as the bandwidth for the smoothing has only modest effects on the pattern and does not substantially change the pattern at the discontinuity.

[20] The confidence interval in Figure 3.2 widens near the discontinuity due to the smoothing method (local linear smooth) used. When near the censoring point of the data, fewer points are given heavy weights when estimating the smoothed values. When those points are randomly omitted from a bootstrap sample, it can have a large impact on the smoothed value.

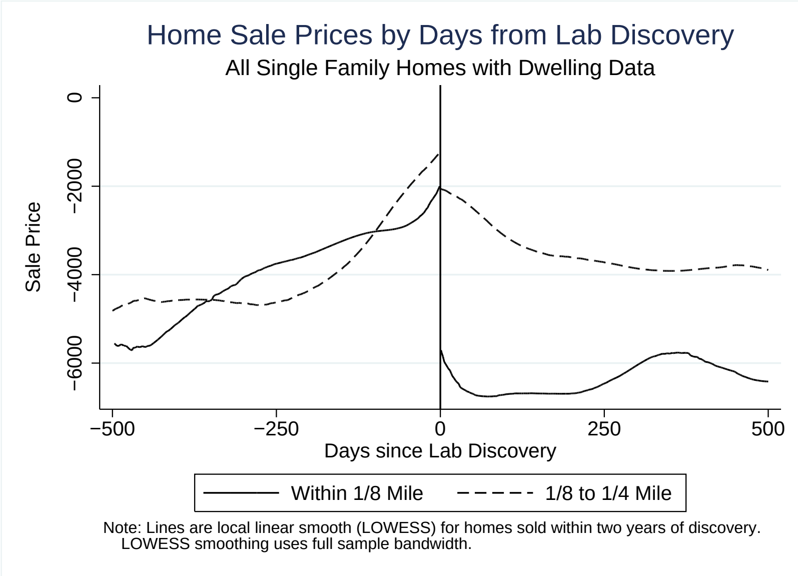

Figure 3.1

phetamine laboratory, Figure 3.3 presents the smoothed plot of the difference between actual and predicted sales price by distance from the discovered laboratory in the year before and after the discovery. Though sales prices are everywhere lower after the lab is discovered than before, the largest gap occurs amongst those homes that are closest. The two groups meet at about 800 feet from the meth lab (between an eighth and three-sixteenths of a mile) and are roughly the same after that point. These figures suggest that the impact of the methamphetamine lab discoveries is largest for those homes within an eighth of a mile and dissipates very quickly beyond that. The confidence intervals (again based on a 100 iteration of the lowess smoothing process) show that it is very difficult to draw any strong conclusions from this figure.

3.7.3 Regression Analysis

As a first step, Table 3.4 presents the results of the analysis using both sales within a quarter mile of a discovered methamphetamine laboratory and those further away. I employ specification (3.1), above, for the results in columns [1] and [2]. Because each

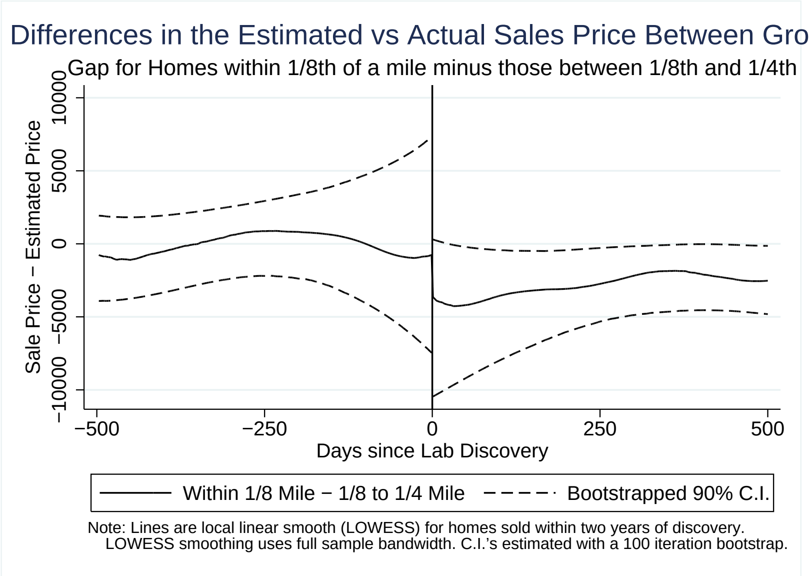

Figure 3.2

parcel may have idiosyncrasies not captured in the dwelling characteristic data, all regression analysis below will cluster the standard errors at the parcel level. Column [1] presents the results if all home sales not within a quarter of a mile of any future discovered labs and those sales within both a quarter of a mile and one year of a discovered lab are included. Column [2] widens the temporal window around the methamphetamine lab discovery to two years. As suggested in Table 3.2, sale prices for those homes within a quarter of a mile of a discovered laboratory are lower than those of the rest of the sample before the lab is discovered. Prices are 3.6 to 4.9 percent lower within a quarter mile of the future lab and this value doubles after the lab is discovered. For those homes that are also within an eighth of a mile of the laboratory, there is no difference in the prices relative to the quarter mile group before the discovery and a one percent additional decline after the discovery. The post-discovery difference is not statistically significant at the ten percent level. The fact that the sales price difference is almost identical for homes within an eighth of a mile and those between an eighth and a quarter of a mile supports the latter's use

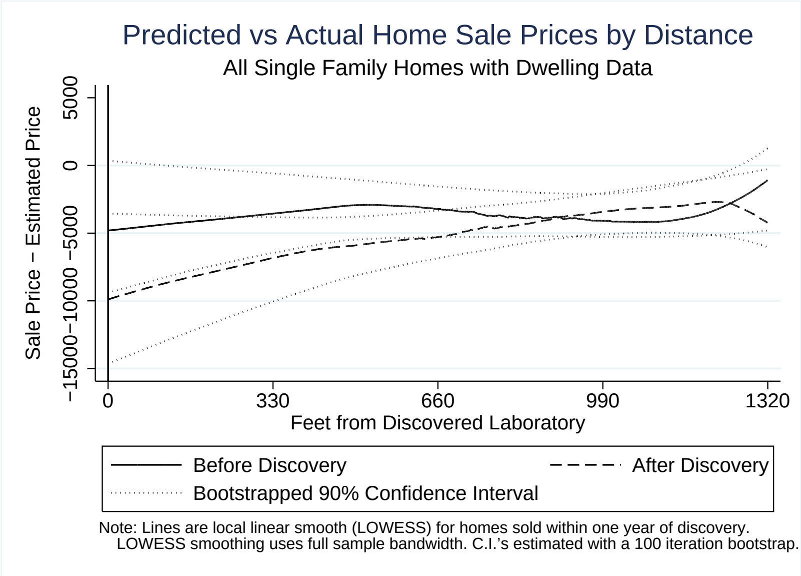

Figure 3.3

as a control group for the former.

Rather than comparing the trends of home sale prices around a methamphetamine laboratory to all home sales in Summit County, Table 3.5 examines only homes sold within a quarter of a mile from the lab site using various sample variations. The specification used here is based on specification (3.2), above, where the comparison group is homes between an eighth and a quarter of a mile from the discovered laboratory. Rather than clustering at the parcel levels, the standard errors presented here are clustered at the meth lab level (i.e. all home sales within a quarter mile of a discovered meth lab are clustered together). Again, the analysis is done both with a one and two year window around each laboratory's discovery date. Columns [1] and [2] represent the most complete sample including all single family home sales within a quarter of a mile of a single discovered meth lab in the time period examined,[21] within one or two years of the discovery, and not in the top or bottom one percent of sale prices. The small magnitude and lack of statistical significance of the coefficient

[21] In the case where a home is within a quarter of a mile of more than one past or future meth lab, only the first is included in the sample and only if there is not another discovered within the period of examination. This study will examine the impact of a second lab's discovery below.

on the term identifying homes within an eighth of a mile shows that the control and experimental groups are not substantively different before the meth lab is discovered. For homes sold less than one year after the laboratory's discovery, there is a 3.5 percent decline in sale prices within a quarter of a mile of the lab and an additional eight percent decline for homes also within an eighth of a mile, which is significantly different from zero at the ten percent level. When the window around each meth lab's discovery is extended to two years, the difference-in-difference estimate for the "close" group is reduced to a decline of 5.7 percent and to no effect for the control group. This suggests that the effect may be short-lived, which I will explore shortly.

The other columns of Table 3.5 omit other groupings of home sales from the sample described above. In columns [3] and [4], home sales between one and thirty days after each meth lab's discovery are excluded. The argument for this exclusion is that the usual lag period between the agreement of a contract to sell a home and the actual completion of the sale means that the prices for these homes were most likely agreed to before the discovery of the methamphetamine lab. Unfortunately, the actual date that the contract was agreed upon is not available and there is not one traditional "under contract" period. Thirty days has been chosen as a safe estimate of the minimum length of this contract period. The coefficients for the post-lab discovery interactions in columns [3] and [4] show that the exclusion of this group amplifies the negative impact and levels of significance for the key indicator variable, while only having a modest impact on other coefficient estimates.

One might also be concerned that the results are being driven by sales of the homes in which the meth labs were discovered. These homes should experience a particularly stark drop in value for a number of reasons, not least of which is the risk of toxic remnants left within the home since government officials have decontaminated the exterior of the property but not the interior. Columns [5] and [6] of Table 3.5 present results when the sample also excludes any sales of these homes (12 in the one year window and 20 in the two year window) in addition to excluding homes sold within 30 days of the discovery. The exclusion of the meth homes themselves does mute the strength of the results found in columns [3] and [4] slightly (by 0.4 percentage points for both one and two year windows) and reduces the significance level of both values. That said, it does not change the generally significant patterns found with other samples. For the remainder of the analysis presented below, the most restrictive sample, used in columns [5] and [6] will be employed.

When comparing one and two year windows around the discovery of a methamphetamine laboratory, the different magnitudes presented above suggest that the impact of that discovery decreases with time. When examining the timing of the impact of a discovery on home sale prices, Table 3.6 presents two approaches. In the first (columns [1] and [2]), the number of months since the meth lab discovery is included, as is its squared value. In the second approach, the post-discovery indicator is parsed into quarters (i.e. 91 day intervals) since the lab's discovery (columns [3] and [4]). The results in columns [1] and [2] show no statistically significant decline in home prices with each additional month for those homes within one eighth of a mile relative to those within a quarter mile. This is a surprise given the change in coefficients between the one and two year samples in Table 3.5. Based on the coefficient on the month squared term, the impact of each additional month does not appear to be increasing or decreasing. When using the second approach in columns [3] and [4] of Table 3.6, the coefficients for indicators of various lengths of time since each lab's discovery show an interesting pattern. For homes that are within a quarter mile, the negative impact from the lab's discovery peaks in the second quarter following the lab's discovery and quickly dissipates. For homes that are also within an eighth of a mile, there is a large and statistically significant, additional negative impact on home prices between six and 12 months after the labs discovery with prices over 15 percentage points lower in those quarters. This finding suggests a slightly longer period of recovery for home prices after the termination of perceived crime risk than was found by Pope (2008). Pope found that home prices close to the former location of a sex offender returned to the same level as those homes that were slightly farther away in the year following the sex offender's departure. The bottom two rows of Table 3.6 present the joint probability that the coefficients on the quarterly indicators are all equal to zero for each grouping. Because of the high variability in the results in each group, neither probability rises to the level such that the hypothesis could be rejected.[22]

To consider the distance dimension of impact variation, Table 3.7 takes a different approach than those summarized in specification (3.1) and (3.2). Specifically, this table shows the results for the following specification:

$$(3.3)\quad \log(P_i) = \alpha + \beta \mathrm{X}_i + \eta(\max(1-(\mathrm{d}_i/\mathrm{D}_1), 0)) + \lambda(\max(1-(\mathrm{d}_i/\mathrm{D}_2), 0)) * \mathrm{Post}_i + \varepsilon_i$$

In this specification, X_i and Post_i are as earlier defined and d_i is the distance of the sold home to a current or future meth lab. The variables D_1 and D_2 represent distance deflators. For example, $(1-(\mathrm{d}_i/\mathrm{D}_1), 0))$ will be zero if d_i is greater than D_1, almost zero when the home is just less than D_1 feet from the lab, and close to one when the home is close to the site of the lab. The coefficient η represents the effect of being close to the site of the lab generally and λ the effect after the lab's discovery. Table 3.7 presents the results for η and λ for nine combinations of values for D_1 and D_2, which can take the values of a sixteenth of a mile, an eighth

[22] The joint probabilities that the coefficients are all equal (but not necessarily equal to zero) are similar in magnitude.

of a mile, and three-sixteenths of a mile. For all values of D_1 and D_2, η is small and statistically insignificant. Though also generally insignificant, the magnitude of values for λ are substantially larger. The coefficients suggest the discovery of a meth lab in an adjacent property could result in a ten to 16 percent decline in the sale price of a home.

The above discussion shows that there is a negative effect on home prices when a methamphetamine laboratory is discovered in a neighborhood. What they do not show is why there is such an effect. As discussed earlier, the health risks associated with the lab after it is discovery are quite mild and short-lived for those not living in the home itself. The effects shown above tend to grow strongest starting in the sixth month and last until at least 12 months following the lab's discovery, possibly longer. If the effect is caused by the negative stigma for a neighborhood or area that the discovery of the lab creates, one might expect this to be a binary effect rather than a level of degree. This would be similar to the findings of Pope (2008) who found that there was not a significant difference in the impact of a sex offender's entry into a neighborhood based on the degree of the entrants offense (identified as a simple offender or a "predator").

The effect of a second laboratory being discovered within an eighth of a mile of the first discovered laboratory is examined in Table 3.8. Note that the sample has been expanded to include sales that are near more than one discovered laboratory in the time period of examination. Because of the difficulty in categorizing homes that are within an eighth of a mile of one discovered lab and between an eighth and a quarter of a mile of another lab, only those homes within an eighth of a mile of two or more discovered labs have been added. There are about 100 homes sold for which multiple labs are discovered within one year of the sale and 200 more homes if the time period is expanded to two years. Columns [1] and [2] of Table 3.8 show the results of specification (3.2) on the expanded sample. There is almost no difference in the results compared to those for the limited sample presented in Columns [1] and [2] of Table 3.5. The existence of a second laboratory within an eighth of a mile of the sold home appears in two ways in columns [3] and [4]. First, an indicator is used to identify homes that are within an eighth of a mile of two current or future discovered methamphetamine labs in the sample period (one or two year windows around the date of the first discovered lab). The second is an indicator for the whether the sale came after the second discovery. The results show that homes in the areas where two labs are discovered sell for significantly lower prices (seven to 20 percent less) than homes within an eighth of a mile of just one discovered lab, whether or not the first lab has been discovered. A more surprising result is that there is not a significantly negative impact of the discovery of a second laboratory but instead a positive effect. Because of the large difference within the treated group, it is difficult to know how much stock to put into this result, but it at least suggests that the discovery of a meth lab in a neighborhood has a negative effect that is not changed by additional labs, which suggests that this is simply a binary stigma that is not related to the degree of the negative mark on the neighborhood.

3.8 Conclusion

By assuming that methamphetamine producers locate approximately at random within narrowly defined neighborhoods, this study has been able to employ hedonic estimation methods to estimate the impact of the meth laboratory's discovery, and thus perceived risk of crime, on the home values near its location. I find an eight to ten percent decline in home values for those closest to the lab site after it is discovered relative to the value of homes slightly farther away which presumably have similar immeasurable neighborhood attributes. As with the findings in other studies, this finding suggests that individuals are willing to pay a large amount of money to avoid being near the site of a defunct meth laboratory, and by extension to avoid areas associated with prior crime. Additionally, the findings here support previous research (Pope, 2008) that the negative impact of perceived risk of crime is binary and not a matter of degrees since the discovery of a second laboratory does not have a amplifying effect on the negative impact. From a policy perspective, this finding suggests that government initiatives that would reduce the number of methamphetamine labs should be well funded.

3.9 Appendix

As a specification test, the analysis presented above is repeated with the date of the methamphetamine laboratory's discovery date falsely set to one year earlier than the actual date. In order not to overlap with the impact of the true event, the analysis examines only the year before and after the false discovery date. Table 3.10 presents the empirical results using specification (3.2) with the labs discovery date moved forward 365 days. Column [1] in this table shows no significant impact on home prices in the year following the false discovery date. When compared to the strong negative impact seen in the same column of Table 3.5 (since the window around the discovery date has been limited to one year), the results support the choice of those sales between an eighth and a quarter of a mile of a discovered meth lab as a control group for those within an eighth of a mile (the treated group). Column [2] of Table 3.10 similarly shows little evidence of a post discovery effect for the false discovery date when a distance variable is included. The coefficient on the post false discovery distance variable shows that there is further evidence that the homes closest to the future site of the methamphetamine lab are selling for less than those slightly farther away but still within an eighth of a mile.

Table 3.1

Summary of Summit County Home Sales Data by Number of Discovered Labs in Proximity to Sold Parcel

	Meth Labs Discovered within 1/4th Mile		
	None	Exactly One	More than One
Total Number of Single-Family Home Sales	68070	8417	3910
Number of Unique Parcels	45568	4760	2190
Number of Sales Within 1 Year of the First Discovery		2537	1093
After the Only/First Discovery		1241	567
2nd Discovered Lab is More than 1 Year Later			425
2nd Discovered Lab is Less than 1 Year Later			668
Number of Sales Within 2 Years of the First Discovery		4877	2224
After the Only/First Discovery		2406	1138
2nd Discovered Lab is More than 2 Years Later			209
2nd Discovered Lab is Less than 2 Years Later			2015

Note: Excludes non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Table 3.2

Comparing All Sales Data by Number of Meth Labs within 1/4th Mile

	Within 1/4th mile of No Discovered Meth Labs		Within 1/4th mile of Exactly 1 Discovered Meth Lab		Within 1/4th mile of More than 1 Discovered Meth Lab	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Nominal Sales Price	131469	92946	55528	30962	51415	24655
Sale Price Deflated for Inflation	119636	84808	51626	28957	47731	23241
Sale Price Deflated by Housing Market Index	117641	82790	50827	28026	47111	22434
Square Footage of Living Area	1700.8	783.7	1277.7	380.6	1167.0	312.8
Age of Home	44.8	32.7	75.1	23.7	74.5	20.6
Number of Bedrooms	3.12	0.76	2.96	0.79	2.82	0.78
Number of Full Baths	1.52	0.64	1.18	0.43	1.12	0.35
Number of Plumbing Fixtures	7.55	2.51	5.92	1.51	5.63	1.29
Proportion with More than One Story	0.477	0.499	0.611	0.488	0.542	0.498
Proportion where Condition of Home is Rated as Fair or Poor	0.064	0.244	0.181	0.385	0.160	0.366
Style: Unidentified	0.026	0.160	0.072	0.258	0.052	0.222
Style: Colonial	0.444	0.497	0.545	0.498	0.512	0.500
Style: Ranch	0.287	0.453	0.186	0.389	0.204	0.403
Style: Bungalow	0.040	0.196	0.075	0.263	0.129	0.335
Style: Cape Cod	0.121	0.326	0.099	0.299	0.089	0.285
Style: Other	0.081	0.273	0.023	0.150	0.015	0.120
Number of Sales	68124		10574		4760	

Note: Excludes non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Table 3.3

Comparing Pre-Discovery Means of the Treatment and Comparison Groups

	Within 1/8th of a Mile	Between 1/8th and 1/4th of a Mile	t-stat
Nominal Sales Price	59762	58647	-0.61
Sale Price Deflated for Inflation	54863	53484	-0.82
Sale Price Deflated by Housing Market Index	52155	50998	-0.73
Square Footage of Living Area	1295	1261	-1.61
Age of Home	76.10	74.07	-1.47
Number of Bedrooms	2.96	2.99	0.77
Number of Full Baths	1.17	1.17	0.03
Number of Plumbing Fixtures	5.96	5.86	-1.09
Proportion with More than 1 Story	0.659	0.581	-2.84
Proportion where Condition of Home is Rated as 'Fair' or 'Poor'	0.183	0.163	-0.94
Style: Unidentified	0.058	0.057	-0.06
Style: Colonial	0.597	0.529	-2.43
Style: Ranch	0.171	0.207	1.59
Style: Bungalow	0.073	0.092	1.16
Style: Cape Cod	0.067	0.090	1.49
Style: Other	0.033	0.025	-0.89
Number of Sales	449	1033	

Note: Excludes non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Table 3.4

Analysis Comparing Sales within 1/4th of a Mile of a Discovered Lab to All Sales

	Means: Within 1 Year	Means: Within 2 Years	[1] Sales within 1 Year of Lab Discovery	[2] Sales within 2 Years of Lab Discovery
Within 1/8th of a mile (660 ft) of first meth lab discovery	0.016	0.021	0.000 [0.033]	-0.001 [0.026]
Within 1/8th of a mile and post-discovery	0.008	0.010	-0.013 [0.047]	-0.013 [0.037]
Within 1/4th of a mile (1320 ft) of first meth lab discovery	0.036	0.049	-0.032* [0.018]	-0.047*** [0.014]
Within 1/4th of a mile and post-discovery	0.018	0.024	-0.044* [0.025]	-0.046** [0.020]
Other included variables:				
Home Characteristics			x	x
Calender Month-Year Dummies			x	x
Zipcode Dummies			x	x
Observations	56843	73232	56793	73177
R-squared			0.54	0.54

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: robust standard errors clustered at the parcel level

Note: Excludes non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Table 3.5

Estimation of Primary Specification on Sales within 1/4th of a Mile of Discovered Lab using Various Sample Restrictions

	[1]	[2]	[3]	[4]	[5]	[6]
	Full Sample Within 1/4 of a Mile of Discovered Lab		Excluding Sales in First 30 Days after Discovery		Excluding Sales in First 30 Days after Discovery and Sales of Lab Property	
	Sales within 1 Year	Sales within 2 Years	Sales within 1 Year	Sales within 2 Years	Sales within 1 Year	Sales within 2 Years
Within 1/8th of a mile (660 ft) of first meth lab discovery	0.024	-0.002	0.024	-0.002	0.025	0.001
	[0.044]	[0.032]	[0.044]	[0.032]	[0.044]	[0.032]
Within 1/8th of a mile and post-discovery	-0.082*	-0.057	-0.101**	-0.064	-0.097*	-0.060
	[0.046]	[0.039]	[0.051]	[0.040]	[0.051]	[0.041]
Within 1/4th of a mile and post-discovery	-0.035	-0.002	-0.053	-0.009	-0.055	-0.010
	[0.045]	[0.038]	[0.047]	[0.039]	[0.047]	[0.038]
Other included variables:						
Home Characteristics	x	x	x	x	x	x
Calender Month-Year Dummies	x	x	x	x	x	x
Lab Discovery Dummies	x	x	x	x	x	x
Observations	2962	5086	2827	4970	2815	4950
R-squared	0.39	0.39	0.39	0.39	0.39	0.39

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: robust standard errors clustered by the meth lab in close proximity

Note: Excludes non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Table 3.6

Analysis Using Time since Meth Lab Discovery

	Means: Within 1 Year	Means: Within 2 Years	[1] Sales within 1 Year of Discovery	[2] Sales within 2 Years of Discovery	[3] Sales within 1 Year of Discovery	[4] Sales within 2 Years of Discovery
Within 1/8th of a mile (660 ft) of first meth lab discovery	0.302	0.292	0.025 [0.044]	0.000 [0.032]	0.026 [0.044]	0.000 [0.032]
Within 1/8th of a mile and post-discovery	0.142	0.143	-0.085 [0.118]	-0.023 [0.092]		
Months since discovery (1=30 days) if w/n 1/8 mile of meth lab	0.92	1.76	0.015 [0.047]	-0.015 [0.015]		
Square of Months since Discovery (1=30 days) if w/n 1/8 mile	7.43	28.16	-0.002 [0.004]	0.001 [0.001]		
Home is w/n 1/8 mile of lab and w/n 91 days after discovery	0.028	0.014			-0.079 [0.068]	-0.074 [0.074]
Home is w/n 1/8 mile of lab and b/w 92 & 182 days after discovery	0.038	0.020			0.003 [0.079]	0.023 [0.078]
Home is w/n 1/8 mile of lab and b/w 183 & 273 days after discovery	0.038	0.019			-0.152* [0.084]	-0.150* [0.088]
Home is w/n 1/8 mile of lab and b/w 274 & 365 days after discovery	0.038	0.018			-0.157** [0.078]	-0.188** [0.085]
Home is w/n 1/8 mile of 1st lab and b/w 366 & 456 days after discovery		0.019				-0.089 [0.080]
Home is w/n 1/8 mile of 1st lab and b/w 457 & 547 days after discovery		0.017				0.043 [0.061]
Home is w/n 1/8 mile of 1st lab and b/w 548 & 638 days after discovery		0.018				-0.072 [0.087]
Home is w/n 1/8 mile of 1st lab and b/w 639 & 730 days after discovery		0.017				0.048 [0.091]
Within 1/4th of a mile and post-discovery	0.473	0.483	-0.048 [0.088]	-0.045 [0.061]		
Months since discovery (1=30 days) if w/n 1/4 mile of meth lab	3.08	5.97	-0.012 [0.029]	0.009 [0.011]		
Square of Months since discovery if w/n 1/4 mile of meth lab	25.07	95.11	0.001 [0.002]	0.000 [0.000]		
Home is w/n 1/4 mile of lab and w/n 91 days after discovery	0.091	0.046			-0.052 [0.059]	-0.008 [0.052]
Home is w/n 1/4 mile of lab and b/w 92 & 182 days after discovery	0.126	0.063			-0.104* [0.057]	-0.057 [0.055]
Home is w/n 1/4 mile of lab and b/w 183 & 273 days after discovery	0.133	0.069			-0.083 [0.070]	0.002 [0.052]
Home is w/n 1/4 mile of lab and b/w 274 & 365 days after discovery	0.123	0.060			-0.067 [0.077]	0.045 [0.061]
Home is w/n 1/4 mile of lab and b/w 366 & 456 days after discovery		0.066				-0.059 [0.061]
Home is w/n 1/4 mile of lab and b/w 457 & 547 days after discovery		0.062				-0.007 [0.060]
Home is w/n 1/4 mile of lab and b/w 548 & 638 days after discovery		0.064				-0.066 [0.075]
Home is w/n 1/4 mile of lab and b/w 639 & 730 days after discovery		0.053				-0.100 [0.075]
Other included variables:						
Home Characteristics			x	x	x	x
Calender Month-Year Dummies			x	x	x	x
Buffer Dummies			x	x	x	x
Observations	2815	4950	2815	4950	2815	4950
R-squared			0.39	0.39	0.39	0.39
Joint Probability that All Quarter Values Within 1/8th are Equal to Zero					0.128	0.369
Joint Probability that All Quarter Values Within 1/4th are Equal to Zero					0.463	0.683

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Note: Robust standard errors clustered by the meth lab in close proximity

Sample: Sales within 1/4th mile, excluding sales in first 30 days after discovery and sales of meth lab property excluding non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Table 3.7

Analysis by Linear Distance from Meth Lab Site

	[1] $D_2 = 1/16$th	[2] $D_2 = 2/16$th	[3] $D_2 = 3/16$th
$D_1 = 1/16$th of a Mile	-0.032 [0.107]	0.026 [0.095]	0.007 [0.094]
$D_1 = 1/16$th, Post-Discovery	-0.069 [0.202]	-0.157 [0.115]	-0.135 [0.092]
$D_1 = 2/16$th	-0.062 [0.084]	-0.004 [0.081]	-0.004 [0.074]
$D_1 = 2/16$th, Post-Discovery	-0.028 [0.188]	-0.142 [0.118]	-0.13 [0.092]
$D_1 = 3/16$th	-0.03 [0.074]	0.012 [0.077]	0.035 [0.074]
$D_1 = 3/16$th, Post-Discovery	-0.068 [0.183]	-0.158 [0.120]	-0.164* [0.096]

Robust standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%
Note: Results based on specification 3.3.
Full output is omitted. R^2 for all values calculations equals 0.38.
Sample: 2815 sales within one year of discovery and within 1/4th of a mile.

Table 3.8

Analysis Using Second Lab Discovery in Period of Examination

	Means: Within 1 Year	Means: Within 2 Years	[1] Sales Within 1 Year	[2] Sales Within 2 Years	[3] Sales Within 1 Year	[4] Sales Within 2 Years
Within 1/8th of a mile (660 ft) of at least one meth lab discovery	0.330	0.321	0.020	0.001	0.027	0.005
			[0.043]	[0.030]	[0.043]	[0.031]
Within 1/8th of a mile of a second lab discovery	0.040	0.041			-0.208**	-0.065
					[0.084]	[0.115]
Within 1/8th of a mile and post-discovery of at least one lab	0.156	0.158	-0.096*	-0.066*	-0.103**	-0.069*
			[0.049]	[0.038]	[0.050]	[0.039]
Within 1/8th of a second lab and post-discovery of a second lab	0.009	0.014			0.127**	0.027
					[0.061]	[0.077]
Within 1/4th of a mile and post-discovery of at least one lab	0.474	0.484	-0.059	-0.008	-0.057	-0.007
			[0.046]	[0.038]	[0.047]	[0.038]
Other included variables:						
Home Characteristics			x	x	x	x
Calender Month-Year Dummies			x	x	x	x
Buffer Dummies			x	x	x	x
Observations	3086	5303	2933	5283	2933	5283
R-squared			0.39	0.39	0.39	0.39

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Note: robust standard errors clustered by the meth lab in close proximity

Sample: Sales within 1/4th mile, excluding sales in first 30 days after discovery and sales of meth lab property

Excluding non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Appendix Table 3.9

Estimates Used to Predict Sale Price

	Coefficients
Total Living Area in Thousands	34,713.32***
	[1,023.77]
Age of Dwelling in 10s	-3,152.74***
	[122.04]
Number of Bedrooms	875.35**
	[362.63]
Number of Plumbing Fixtures	3,765.78***
	[232.22]
Dwelling is Taller than 1 Story	-14,978.40***
	[1,782.87]
Condition of Home is rated as 'Fair' or 'Poor'	-17,800.87***
	[504.49]
Home Style: Unidentified Single Family Home	-19,797.14***
	[1,145.21]
Home Style: 'Ranch' or Home	-14,945.08***
	[1,829.44]
Home Style: 'Bungalow' Home	-13,166.37***
	[1,877.71]
Home Style: 'Cape Cod' Home	-11,037.78***
	[1,843.47]
Home Style: Other	-17,337.09***
	[1,929.68]
Calender Month-Year Dummies	x
Zipcode	x
Sale-Year	x
Zipcode X Sale-Year	x
Observations	80390
R-squared	0.6

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: robust standard errors clustered clustered at the parcel level

Note: Excludes non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

Appendix Table 3.10

Analysis Using a False Date of Discovery

	[1]	[2]
	Sales within 1 Year of False Lab Discovery	
Within 1/8th of a mile (660 ft) of first meth lab discovery	-0.003 [0.042]	-0.004 [0.042]
Within 1/8th of a mile and post-discovery	0.022 [0.060]	-0.085 [0.115]
Distance if within 1/8th of a mile and post-discovery (1=.1 miles)		0.146 [0.095]
Within 1/4th of a mile and post-discovery	-0.011 [0.033]	-0.026 [0.107]
Distance if within 1/4th and post-discovery (1=.1 miles)		0.008 [0.049]
Other included variables:		
Home Characteristics	x	x
Calender Month-Year Dummies	x	x
Buffer Dummies	x	x
Observations	2873	2873
R-squared	0.41	0.41

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Note 1: Robust standard errors clustered by the meth lab in close proximity

Note 2: Excludes non-single family homes, homes whose sale price is in the top or bottom 1%, and homes missing a full set of dwelling data

CHAPTER IV

The Impact of Health Insurance Availability on Retirement Decision Reversals

4.1 Chapter Abstract

This paper uses the longitudinal aspect of the Health and Retirement Study to explore the characteristics associated with reversals in retirement (referred to here as "unretirement"). Through the use of survival time analysis, this paper shows that health insurance plays a significant role in unretirement decisions. This role is underestimated when a static probit analysis is used with characteristics at an individual's retirement. The results are robust to various definitions of retirement prompted by the difficult question of how to classify partial retirements. The importance of health insurance provision in a retiree's decision also remains significant when other "shocks" and the prospect of planned unretirement are introduced.

4.2 Introduction

Most research in the area of retirement has focused on an individual's binary choice to retire or to continue working, with much of the debate among economists centered on which model best fits retirement decision behavior. This line of research often neglects the fact that an individual's working career does not always end with retirement. A non-trivial share of retirees choose to return to work either on a part-time or full-time basis after fully retiring, or return to full-time work after partially retiring (collectively referred to in this paper as "unretiring"). Based on estimates using the Health and Retirement Study (HRS), 25 to 35 percent of retirees later reverse their retirement decisions, which is similar to previous findings by Ruhm (1990) using the 1970's Retirement History Longitudinal Survey (RHLS).[1] Ruhm (1990) found that those with pensions and higher levels of education were less likely to unretire than others when controlling for income, age, and gender but health care costs or insurance provision were not incorporated into the analysis. While a pair of recent studies have examined unretirement patterns, they have either rejected outright or not explored the role of health insurance provision in retirement reversals. Specifically, Maestas (2007) identified pre-retirement expectations as the primary predictor of unretirement and found that health insurance provision at the time of retirement (as measured by examining offers of retiree health insurance) was not a significant indicator. Maestas and Li (2007) employed a hazard model approach and found a statistically significant role for health insurance sources, but did not examine this result in detail as it is an ancillary finding to the main focus of their study.[2] This study more carefully examines the role of health insurance provision and sources in the pattern of unretirement behavior.

Early influential models of retirement behavior incorporated retirement decisions as a consuming state and did not allow for retirees to reverse their decisions (Gustman and Steinmeier (1986), Stock and Wise (1990), and Lumsdaine and Mitchell (1999), most prominently). Other models recognized unretirement but usually did not attempt to predict reversals with their models due to the complexity and as-

[1]The RHLS followed a random sample of individuals aged 58-63 in 1969 until the survey ended in 1979.

[2]The focus of their examination was "psychological burnout" caused by employment stress and measured by survey questions regarding exhaustion. As retirees' "burnout" level dissipates after leaving their employer, their theory suggests unretirement may become optimal.

sumed relative infrequency of the event (Berkovec and Stern (1991) and Rust and Phelan (1997), for example). Maestas and Li (2007) have begun refining a model specifically focused on explaining unretirement and the role of "burnout," but not directly addressing for the role of health insurance.

Though unretirement has only been briefly examined in the economic literature, the importance of health insurance coverage has been an area of interest in many empirical studies that analyze retirement decisions and has been incorporated into many retirement models. Many studies have found that the availability of health insurance benefits for early retirees encourages workers to leave the work force. Similarly, the spike in the retirement hazard rate at the age of 65, when individuals become eligible for Medicare, is well documented. Previous research has found that potential retirees are from 30 to almost 70 percent more likely to retire if their employer offers retiree health insurance (RHI) than if they do not.[3] In contrast, Gustman and Steinmeier (1994) concluded that though having current employer-provided insurance may delay retirement slightly, ignoring such benefits in retirement models only introduces slight bias. The difference between the findings in these studies is likely the result of the time period of the data. Gustman and Steinmeier used data from the 1970's and 1980's while studies using data from the late-1980's and beyond (when RHI became less common) find larger estimates of the importance of health insurance.

A separate and more in-depth examination of the role of health insurance in unretirement is important for a number of reasons. First and foremost, this study finds that the importance of health insurance sources in predicting unretirement is similar to financial concerns (such as household wealth and pensions) and retirement

[3]Karoly and Rogowski (1994) find a retirement rate increase of about 50 percent for those with RHI using the Survey of Income and Program Participation (SIPP) and an increase of 68 percent using the first three waves of the HRS (2000). Gruber and Madrian (1995) find a 30 percent increase in the retirement hazard rate associated with a one-year continuation of employer provided health insurance benefits. Johnson et al. (2003) found a 26 percent and 31 percent higher retirement rate for men and women, respectively, if they have retiree health insurance.

expectations. The importance of health insurance provision is different from other financial measures due to the uncertainty and high variability of health care costs if an individual is uninsured combined with the difficulties faced by retirement-aged individuals seeking affordable health insurance that is not provided by an employer or the government. This finding suggests that health insurance needs to be separately considered in models of unretirement as it often is in retirement models. Second, current public debate over changes to the health care payment system could benefit from more information about the impact of health insurance on unretirement behavior both from a welfare point of view and in consideration of the fiscal impact of legislation. Though the methodology used here does not have the capability to make forward-looking predictions, it can be used to illuminate current decision-making factors and give credence to the inclusion of health insurance availability to models of unretirement behavior.

The HRS, produced by the Institute for Social Research at the University of Michigan, provides a unique opportunity to study the role of health insurance in unretirement decisions. Due to the longitudinal nature of the survey, individuals can be followed and examined over a fourteen-year period. I have used a survival time model (often referred to as a hazard model) to show the relative importance of the provision of health insurance and other characteristics in a retiree's decision to unretire. This approach allows fluid characteristics such as a spouse's retirement status, health, health insurance, and wealth to vary with time. With the recent exception of Maestas and Li (2007), most previous studies on retirement reversals have used stationary models and characteristics at the time of retirement. I find that static models underestimate the influence of some health insurance sources in the decision to unretire.

Section 4.3 describes recent trends in health insurance premium costs and employer provision of insurance as a retirement benefit. Section 4.4 describes the HRS and the sample used. Section 4.5 defines retirement and unretirement. Section 4.6 discusses the general methodology used. Section 4.7 presents the main results and compares them to past research. Section 4.8 examines the differences between respondents' jobs prior to retirement and after unretirement. Section 4.9 concludes.

4.3 Background

Health insurance provision for working-aged Americans is centered around employer provided health insurance (EPHI). The majority of workers receive health insurance from either their own or their spouses' employers. When Americans reach 65 years of age, they become eligible for the federal government's health insurance program, called Medicare, as long as they have worked ten years in a qualifying job (which most do). Medicare is available prior to age 65 only for those with a qualifying disability. If workers choose to retire before they reach 65 years of age, a number of insurance options exist in addition to the choice to go uninsured. Some employers offer to continue to provide health insurance to retirees who have worked for the employer for a certain number of years. I refer to this as an offer of retiree health insurance (RHI). The level of premium subsidization depends on the employer's specific benefits, but these programs tend to be a retiree's least expensive option due to the risk pooling over all of an employer's employees. Unfortunately for retirees, RHI benefits received at retirement are not guaranteed to continue throughout retirement (unlike pension benefits which are insured through the federal government). A Labor Department report stated that 2 percent of 1994 retirees lost their promised retirement health insurance benefits in the previous year (Government Accountability Office, 1998). Though this number is small, that report was issued at a time of economic expansion; more recent, anecdotal evidence suggests that an increasing number of firms are eliminating health insurance benefits to currently retired individuals.

Those who retire before they reach Medicare eligibility age and do not have an offer of RHI may still have access to health insurance, though it is usually more expensive than employee benefit plans. One option is to remain on their former employers' health insurance plans for 18 months following separation of employment but they must pay the full cost of the insurance to the employer plus a two percent administration fee. These are commonly referred to as "COBRA" benefits (after the federal Consolidated Omnibus Budget Reconciliation Act of 1986 that granted this benefit).[4] A second option these retirees have is private, non-group health insurance. It is hard to estimate the average cost of such plans because of the high variability in the terms of each policy. Non-group insurance policies tend to have higher deductibles and co-payments for services than employer provided plans. Additionally, insurance companies in most states retain the option to limit benefits for pre-existing conditions and to deny coverage to individuals whom they deem too risky. Examination of insurance companies' offer rates have found that companies reject 10 to 14 percent of all applicants (Pauly and Nichols, 2002; Merlis, 2005) and up to 37 percent of those with pre-existing conditions (Pollitz et al., 2001). The Congressional Budget Office (2005) estimated that the average annual premium for a private, non-group plan was $4,109 in 2002. This estimated premium is a third higher than the average total

[4] A few states have extended the benefits beyond 18 months for all employees in the state (CT, MA, NH, NJ, NY, TX, MN, ND, SD, CA, and NV extend health insurance benefits to 36 months, FL to 29 months, and IL to 24 months). Six states have addressed the concerns of retirees specifically by requiring former employers of retirees who are near Medicare eligible age to offer continuation coverage until they reach the age of 65 (IL, LA, MD, MO, NH, and OR) (Kaiser Family Foundation, 2007). Unfortunately, the unrestricted HRS data does not include information on respondents' state of residence.

premium cost for EPHI that year despite the fact that this estimate does not control for the level of coverage (copayments and deductibles) (Kaiser Family Foundation and Health Research and Education Trust, 2007).

If near-retirement aged individuals choose to go without insurance, they face higher medical costs on average than younger Americans, with much higher variability. Gruber and Madrian (1996) found that average medical expenditures for individuals between the ages of 55 and 64 were just over 50 percent higher than those between 45 and 54 while the standard deviation was almost 65 percent higher.[5] This relationship has continued in more recent data. Tabulations from the Medical Expenditure Panel Survey (MEPS) show that the 2005 mean medical expenditure for individuals between 55 and 64 years of age to be over fifty percent higher than for individuals between the ages of 45 and 54 at $5923 and $3775, respectively.[6] Medical expenditures are also growing faster than inflation. Using the MEPS data, the average medical expenditures between 1996 and 2005 increased at an annualized rate of six percent per year for individuals between 55 and 66 years of age, while annual inflation ranged between 1.6 and 4.1 percent in the same period. Data for 2006 showed medical costs increasing at twice the rate of inflation (Poisal, 2007).

Recent evidence suggests that the current dependence on EPHI and RHI is changing as fewer employers offer these benefits to their employees than did a decade ago. According to a 2007 survey of employers, the percentage of employers offering EPHI is down from 69 percent in 2000 to 60 percent in 2007 (Kaiser Family Foundation and Health Research and Education Trust, 2007). The decline in RHI offers has also been dramatic. Among large employers offering EPHI, the rate of RHI offers is down

[5]Gruber and Madrian (1996) calculated that the average medical expense in the 1992 HRS was $1395 with a standard deviation of $4001 for respondents between 45 and 54 and $2144 and $6532 for those between 55 and 64.

[6]MEPS is available through the U.S. Department of Human Services' Agency for Healthcare Research and Quality at http://www.meps.ahrq.gov/mepsweb/index.jsp

over 50 percent since 1988 and 17.5 percent since 1999 (with 33 percent offering RHI in 2007, down from 66 in 1988 and 40 percent in 1999). A larger study using MEPS found that only one-quarter of private-sector employees were working at firms that offered retiree health benefits in 2003 compared to 32 percent in 1997 (Buchmueller et al., 2006).

4.4 Data

The analysis that follows uses detailed longitudinal data on a nationally representative sample of American households from the University of Michigan's Health and Retirement Study. The initial cohort of the HRS included households where at least one member was between the ages of 51 and 61 in 1992. A new cohort, labeled the War Baby Cohort, was added in 1998 and included households in which one spouse was between the ages of 51 and 56 at the time of their first interview.[7] The HRS includes data from re-interviews of respondents that occur every two years, with the most recent interview "wave" analyzed here occurring in 2006. Much of the primary data used here comes from the RAND Center for the Study of Aging which provides a more user-friendly version of the raw HRS data (St. Clair, 2008). I have supplemented this data source with important variables from the raw files (mostly detailed health insurance variables) that are not available in the RAND HRS data files.

Table 4.1 presents the sample restrictions that were made to arrive at the final sample used for this analysis. After eliminating those who were not age eligible for either cohort (respondents who are younger or older than their age-eligible spouses, for example), I next excluded those who become deceased or otherwise attrited during the sample period in order to have a full set of observations for those remaining in

[7] An additional retirement age cohort was added in 2004 to examine the patterns of baby boomers but there has not yet been enough data accumulated to include this cohort in the following analysis.

the sample.[8] Because this study uses employment information from the wave prior to retirement, individuals were also required to be working in the first wave that their cohort was surveyed. Finally, respondents must have been observed to retire and have appeared in at least one proceeding wave. With this restriction, each respondent had at least one opportunity to be observed to unretire. Upon unretirement, respondents are removed from the sample and they are not reintroduced if they retire again. Table 4.1 presents two final sample sizes based on the two definitions of retirement and unretirement I will use in this paper (which are discussed in the next section). Briefly, the number of respondents included in the final sample is slightly larger if full and partial retirement are both considered "retired" states than it is if only full retirement is considered a "retired" state. This is easily explained by the number of respondents who transitioned from traditional work to partial retirement and thus were more likely to be observed for at least one wave following that "retirement." The final sample is predominantly made up of respondents from the Initial HRS cohort both due to its larger initial sample size and the fact that a larger portion of the Initial HRS respondents have entered their prime retirement ages.

4.5 Defining Retirement and Unretirement

In the HRS, individuals are given multiple opportunities to identify themselves as "retired." Following the methodology used in the RAND data files and many other studies, this study defines full and partial retirement based on both the amount worked by a respondent and these self-reports (which will be referred to as the "amalgamated" identifier). Those who work full-time (defined as 35 hours or more per week and at least 36 weeks in the last year) are not considered retired regardless

[8] Appendix Table 4.14 presents some of the results below when this standard is relaxed to require simply four waves of observation.

of their self-designation. Those working part-time are identified as partially retired or simply working based on their self-identified retirement status. Finally, anyone not working and reporting being retired is considered "fully retired" while those not working and not identifying themselves as retired (the unemployed, disabled, and those not in the labor force but not retired) will be excluded from the sample. The alternative would be to simply use self-reports of retirement. Table 4.2 compares the agreement between these two retirement identifiers among all responses for individuals observed to retire and appearing in all of the waves of the HRS. In 87 percent of the cases, the two identifiers produce the same classification. Of those cases where there is not a match, 7.5 percent report working an amount of hours that disqualify them from the retirement category in which they have classified themselves. This may be because of an interpretation of retirement that is not based on hours worked but instead on whether they have left their career employer. Those few cases (1.5 percent of the total) where the self-reported retirement status is not retired but the amalgamated status is fully or partially retired are based on a second question in the HRS wherein respondents could identify "retired" as their labor force status. Using self-reported identifiers alone has very little impact on the results that are presented below and those results can be seen in Appendix Table 4.15.

When considering how to define retirement and unretirement, one must consider how to treat partial retirement.[9] Partial retirement could be considered a form of retirement in that it is the first step in the traditional retirement progression where the worker reduces his or her hours in a current or different job. Alternatively, one might consider partial retirement as just another form of continuing one's working life before he or she stops working entirely in full retirement. This study runs separate

[9]Past literature has used many definitions of retirement, including (1) leaving the labor force, (2) a significant reduction in hours worked, (3) leaving a career job, (4) start receiving a pension or Social Security benefits, or simply (5) self-identification as retired (Karoly and Rogowski, 1994).

analyses for each interpretation. Where a response of partial retirement is used to identify the onset of retirement, a "directional definition" of unretirement is used. A respondent would have to move from a higher to a lower state of retirement to be considered unretired. The highest state of retirement for these purposes would be full retirement, followed by partial retirement and not retired. For example, if a respondent was fully retired in the previous wave, she would be considered unretired if she moved to either a partially retired or not retired state, but only a movement to a "not retired" state would be considered unretiring for a respondent who was previously partially retired.[10] A "full-retirement only" definition of retirement, then, allows for a more straight-forward definition of unretirement. In this case, any change from full-retirement to partial-retirement or not retired is considered unretirement.

Table 4.3 presents the unretirement hazard rates by the number of waves following retirement using both the directional definition of unretirement and the full-retirement only definition.[11] For both definitions, the hazard rate is highest between the first observed retirement wave and the second wave (a period of two years) with each at about 18 percent. Both fall dramatically following the first wave after retirement with the full-retirement definition falling more quickly. This suggests that after the first two years, those in full retirement are more likely to remain retired than those who transition from working to partial retirement. In total, over 31 percent of those in the sample were observed to unretire in some wave using the directional retirement definition and 27 percent under the full-retirement only definition. Both values are similar to the rates found by Ruhm (1990) (25 to 35 percent using the 1970's RHLS) and Maestas (2007) (24 percent using the HRS but limiting the ob-

[10] A weakness of this definition is that an individual working part-time and classified as partially retired can unretire without changing their work level by simply changing their self-reported retirement status. The same is not true for a full-time worker since the definition does not allow a full-time worker to be classified as retired.

[11] Hazard rates are defined as the rate that an event occurs (here unretirement) in a time period given that it has not occurred prior to that time period.

servation period to five years following retirement). The number of observations not unretiring or attriting (due to end of observation period) is also included in Table 4.3 to provide a sense of the attrition rate.

4.6 Empirical Methodology

To allow for changes in key variables across time, this study will primarily use a survival time analysis to identify the impact of key static and dynamic characteristics on the unretirement hazard rate. The survival time methodology accounts for censoring (in this case from the end of survey) and for varying lengths of observation. It is also better equipped than static models to evaluate the effects of shocks and other changes to a respondent's maximization problem since the values can change with time. This design element is one of the reasons survival time models are commonly used in studies of unemployment and welfare spell duration as many individuals do not become employed or do not exit welfare before the time of observation ends. This study assumes a parametric hazard function and uses the Weibull distribution as the form of the baseline hazard, which will allow for negative duration dependence (Wooldridge, 2002).[12]

As evidence of the importance of allowing key indicators to vary with time, Table 4.4 summarizes the changes in health insurance sources between each respondent's retirement wave and her unretirement wave or attrition. Of the nine percent of respondents who report no health insurance at their retirement wave, only 36 percent report being uninsured in a subsequent wave. Among those who report private, non-group health insurance at their retirement wave, ten percent later report

[12] Other parametric forms were also evaluated based on their goodness of fit. The Weibull distribution had the best fit among proportional hazard metrics as evaluated by their Akaike Information Criteria (AIC) values. The log-normal and log-logistic distributions had slightly better fits but are limited to the harder to interpret accelerated failure-time metric. Calculating the mean marginal effects for each type of distribution suggests that the difference in results are minimal with no large changes in magnitudes and no changes in statistical significance. Semi-parametric forms are not used because of the large number of duration ties in the 2 year periodic data here.

being uninsured as do four percent of those with EPHI at retirement that is not subsidized by an employer or union. Though 72 percent of respondents report employer subsidized EPHI or insurance through a government program at retirement, three percent later report being uninsured, four percent report having private, non-group insurance, and six percent report having EPHI that is not subsidized by an employer.[13]

The survival time analysis employed in this study examines the unretirement hazard between the current wave and the following wave, given that a respondent has not unretired prior to the current wave. Current conditions are used in the analysis except when examining changes in levels between waves (changes in characteristics such as health or wealth for example), which are measured between the previous wave and the current wave. Though survival time analysis results are traditionally presented as hazard or failure time ratios, results in this study represent the mean marginal effect (MME) on the predicted hazard for a one unit change in each characteristic.[14]

Though the key focus for this study is the role of health insurance sources in regard to unretirement behavior, Table 4.5 first looks at the role of demographic (age, gender, race, marital status, and educational attainment), health (own and spouse's self-rated health), and financial (total wealth at retirement) factors. The table compares the mean values of these factors at the time of retirement for those who are permanent retirees (at least within the period of observation) and future unretirees. At retirement, future unretirees were statistically significantly younger

[13]Note these are not exclusive categories since different categories can be reported at different waves between retirement and unretirement or attrition.

[14]The results for the key table are presented as hazard ratios in Appendix Table 4.16. The numerator of the ratio is the value of the hazard if an observation has the associated characteristic and the denominator is the value of the hazard if that characteristic is not present if the value is binary. If the variable is instead continuously valued, the ratio is that of the hazard with and without single unit changes around the mean.

and male. There was no statistical difference between the two groups based on marital status but respondents were less likely to unretire in the future if their spouses were also retired. Respondents were also less likely to unretire if they rated their own health as "poor" or "fair" but there was not a statistical difference based on their spouses' self-rated health.[15] The level of education and total wealth were higher for those respondents who unretired in the future than those who remained retired throughout the observation period (though the t-stat on the wealth level was under the traditional threshold for statistical significance). Racial and regional differences were mostly statistically negligible.

Since this study is focused primarily on the role of health insurance in the decision to unretire, I also examines a number of health insurance sources. While Maestas (2007) included only offers of retiree health insurance prior to retirement and Maestas and Li (2007) included a binary measure for whether a respondent would have group health insurance in the next wave if they were not working (where group health insurance included government health insurance, RHI, or insurance through a spouse's employer), this study separates health insurance sources and uses the current source to examine its influence on unretirement before the following wave. Health insurance sources are divided into four categories based on expected cost and risk of large health care expenditures: provision through a governmental program or though an employer or union subsidized program ("subsidized" EPHI tend to have the lowest premiums); provision through an employer or union based program in which the recipient pays the full cost ("unsubsidized" EPHI); provision through a private, non-group health insurer (highest premiums, some exposure to large health care expenditures if there is a pre-existing condition); and those without health insurance

[15]The other three possible responses in regards to self-rated health were "good," "very good," or "excellent."

(high exposure to large health care expenditures). Subsidized or unsubsidized EPHI could be provided by either the respondent's own current or former employer, or by his or her spouse's employer. Table 4.6 presents the share of respondents reporting each of these health insurance sources at the time they were first observed as retired. Future unretirees were significantly less likely to report subsidized EPHI or government provided health insurance and more likely to report having no health insurance or private, non-group health insurance than were permanent retirees. Statistically, there is not a significant difference in the rate that future unretirees and permanent retirees report having unsubsidized EPHI.

Table 4.6 also includes additional factors that are included in the following analysis to insure that the health insurance variables are not acting as a proxy for other retirement conditions or changes between waves. One of the biggest concerns might be that RHI is acting as a proxy for retiree pensions. To address that concern, this analysis includes whether the retiree reported receiving a pension. As shown in Table 4.6, permanent retirees were more likely to report receiving a pension at their retirement wave than were future unretirees but the difference was not as stark as many of the differences in health insurance sources.

Table 4.6 also contains the difference in means of various "shocks." In this context, the term "shocks" is used to mean changes in circumstances that may not be reflected in initial values at retirement. This study will measure shocks as the change between the current wave and the wave prior (i.e. wave t and $t-1$ when examining the unretirement hazard between waves t and t+1).[16] The shocks examined here include large, negative changes in wealth, health, or medical expenses and

[16]Changes between t and $t+1$ are not used because those changes may reflect the impact of returning to work rather than the cause. In the analysis that follows, the marginal effects associated with these shocks are different if changes between t and $t+1$ were used but the marginal effects on the health insurance measures are relatively unchanged.

increases in household size.[17] Future unretirees were more likely to have reported a dramatic drop in their total wealth between their retirement wave and their first post-retirement wave than permanent retirees. Permanent retirees were also more likely to have reported a decline in their self-reported health of two or more levels (on the five point scale described earlier). When examining an increase in household size or changes to out-of-pocket medical expenses, the differences between the groups were not large enough to draw a statistical distinction.[18]

Additional attention is paid in this study to a specific question in the initial HRS wave (1992) that asked respondents whether they planned to do "paid work in retirement." Though this does not directly refer to unretirement since a transition through partial retirement would also seem to be included in this expectation, it has been the focus of previous work on the subject of unretirement and has proven to be quite powerful in predicting retirement status reversals (Maestas, 2007). At least in comparison of means, this seems to hold true as future unretirees were significantly more likely to have reported plans to do paid work in retirement when asked in the 1992 wave.

4.7 Estimation Results

In order to give a general view of which characteristics are broadly associated with unretirement, Table 4.7 presents the results of a survival time analysis if only demographic, wealth, and health variables are included, where the dependent variable is whether a retiree unretires before the next wave given that he or she is still retired

[17] Shocks to wealth are defined as losing 50 percent of one's reported total wealth with a minimum change of at least $10,000. The amount of loss requirement is due to the fact that a loss of 50 percent of ones wealth is very different if a respondent begins with $1000 of wealth rather than $100,000.

[18] A shock in medical expenses is defined here as a 50 percent or more increase in out-of-pocket medical expenses with a minimum change of $2,000. Changes to household size are included due to anecdotal evidence that many retirees choose to return to work to support children or grandchildren who have been unexpectedly forced back into the retiree's home by financial hardships.

in the current wave. Column [1] presents the mean marginal effects if a directional definition of retirement and unretirement is used while column [2] presents the MMEs if retirement is defined only as full-retirement. With only a few exceptions, the results in each column are similar in regard to sign and statistical significance. Despite the significant difference in means reported in Table 4.5, a respondent's age at retirement does not appear to be a strong predictor of unretirement. Gender alone also does not appear to be a major factor when predicting unretirements but it is an important factor when interacted with marital status.[19] Men who are married are four to six percentage points more likely to unretire than the baseline group (unmarried women) depending on which definition of retirement is used. Among other demographic variables, only respondents reporting their race as black or living in the North Census Division have significantly different mean predicted hazard rates than the baseline group (non-hispanic, caucasians from the South Census Region).

Also in Table 4.7, self-reported health appears to have different associations with unretirement behavior depending on the respondent's gender and whether it is the respondent's or a spouse's health. Specifically, if a respondent rates his or her health as "poor" or "fair," he or she is on average eight percentage points less likely to unretire before the next wave. That value is cut in half if the respondent is also a male. The role of a spouse's health is one of the few instances where the results depend on which definition of retirement is used. If the "directional" definition is used (where retirement is identified by either full or partial retirement and unretirement is defined as an increase in work level), a spouse's health does not change the predicted hazard rate by a statistically significant amount. By contrast, if the "full retirement only" definition is used, a spouse's self-rated health has a significantly positive impact

[19] The MMEs and standard errors for interaction terms reported in all tables have been adjusted to reflect the true magnitude of the interaction effect described in Ai and Norton (2003).

on the mean hazard, though not if that spouse is a female. It would appear that men do not respond as sharply to their own or their spouse's health status as women do.

The results in Table 4.7 also suggest that wealth and educational attainment are not strong predictors of respondents' unretirement hazard rates. Wealth has surprisingly little importance when predicting unretirements, while those with an educational attainment of a high school diploma or more are not statistically different from one another in regards to their unretirement rates. Those who do not obtain a high school diploma or General Educational Development (GED) certification are two percentage points less likely to unretire than those with a high school diploma or GED (which is significantly different from zero at the one percent level).

Health insurance sources and pensions are introduced to the survival time analysis in Table 4.8. Though not reported in the table, the MMEs for demographic, health, and wealth factors do not change dramatically when health insurance sources are introduced. The three health insurance categories are all associated with a significantly higher mean hazard rate than those who receive subsidized health insurance from an employer or through a governmental program. When using the directional definition of retirement, those with no insurance show the largest increase in their hazard rate, which more than doubles in size (the hazard ratio for this indicator is 2.3 where 1 would be equality).[20] Respondents who purchase private, non-group health insurance or receive unsubsidized health insurance from an employer also have a ten to eleven percentage point decline in their average unretirement hazard (with hazard ratios of 1.9 and 1.8, respectively). The results are slightly different if the full-retirement only definition of retirement is used. The MME for those who are uninsured declines by over six percentage points but is still significant at the one percent level, while the

[20]Hazard rates for this specification are reported in the Appendix Table 4.16

MMEs for private, non-group health insurance and unsubsidized EPHI stay largely the same. Under either definition, the MME of the health insurance sources are almost three times larger than the MME of a respondent receiving a pension.

Tables 4.9 and 4.10 examine whether the addition of other factors plausibly related to unretirement change the relative importance of health insurance sources found in Table 4.8. In Table 4.9, the shocks discussed in Section 4.6 are included in the specification reported in Table 4.8. A 50 percent drop in total wealth since the past wave (with a minimum drop of $10,000) has a positive and statistically significant three percentage point effect on the predicted average hazard between the current wave and the next wave. The other included shocks (a decline in self-rated health by two levels, an increase in the household size, or a 50 percent increase in out-of-pocket medical expenses) shows no significant impact on the average hazard rate. More importantly for the focus of this paper, the inclusion of these shocks has almost no discernible effect on the magnitude or significance of the MME of the health insurance source indicators.

In response to the findings in Maestas (2007), Table 4.10 presents the results when responses to a 1992 question asking respondents for their work expectations in retirement are added to the above specifications. Maestas (2007) found this to be the most important predictor of future unretirement in a static model where characteristics were valued at their retirement wave level. Because this question was only asked in the 1992 wave of the HRS, the sample used is limited only to respondents in the Initial HRS cohort. Though the War Baby cohort made up only a small portion of the full sample, columns [1] and [3] of Table 4.10 shows that the exclusion of this group does have minor implications for the magnitude of the health insurance variables. Specifically, the MMEs of the hazard decline slightly in regard to the health insurance variables. When the expectation indicator is added (columns [2] and [4]), the key MMEs fall further but remain substantial and statistically significant at the one percent level. The expectation variable is also significant at the one percent level but has a smaller magnitude than the health insurance variables. This suggests that though expectations of work in retirement may more widely predict unretirement decisions (with over 70 percent of the sample reporting a positive response), indicators for expensive health insurance or being uninsurance are much stronger predictors of unretirement for those whom they apply.

Since the underlying data in both this study and Maestas (2007) is the same (with the exception of two additional waves of data used here), the differences in methodology probably are responsible for the difference in findings. Table 4.11 presents the results of the same specification as that used for Table 4.10 except that a probit analysis is used rather than a survival time analysis, factors are given static values at the time of retirement, and the dependent variable is whether the respondent is observed to unretire at any time during the observation period.[21] Dummy variables for the wave of retirement are also included to proxy for the length of observation. The results show that under this analysis method, the lack of health insurance at retirement and having unsubsidized EPHI are no longer statistically significant factors. As discussed earlier, this methodology does not capture changes in health insurance sources (which were shown to be moderately common in Table 4.4) or changes in other circumstances faced by retirees.

4.8 Comparing Pre- and Post-Retirement Jobs

The type of jobs that unretirees took following their unretirement may also help to identify the motivations behind unretirement. Tables 4.12 and 4.13 examine the

[21] The reported values are again MMEs.

differences between unretirees' pre- and post-retirement jobs. Table 4.12 shows that unretirement jobs were not as lucrative for unretirees as their pre-retirement jobs. Specifically, unretirement jobs had a median hourly wage 40 percent lower than the pre-retirement jobs. The median weekly wage was almost 65 percent lower due to dramatically lower weekly hours. The median number of weeks per year between the two groups were almost identical. Very few of the unretirement jobs included a pension (13 percent compared to 59 percent in the pre-retirement jobs). Compared to pre-retirement jobs, a higher percentage of unretirement jobs were self-employment. The shares of unretirees reporting employment in the management and construction occupations were smaller than before they retired, while those in the sales and services fields were higher. Similarly, a smaller share of jobs were in the manufacturing and transportation industries, while there were relative gains in the retail and wholesale sales and professional services industries. Together, this comparison suggest that the average unretiree took a part-time job in a service related field, which resulted in lower wages.

Despite the findings in the analysis in the prior section, the job profile discussed above is not one that would commonly offer employer provided health insurance as an additional benefit. Table 4.13 compares unretirees' reported health insurance sources prior to their retirement, in the wave prior to their unretirement, and in their unretirement wave. Columns [1] and [2] show a substantial increase after retirement in the share of future unretirees reporting their source of health insurance to be private, non-group health insurance, but very little change in the share that report being uninsured. After retirement, a large portion of those reporting EPHI identified their former employer as the source. Unfortunately, it is not possible in the HRS to differentiate between those receiving EPHI because they have a retiree health insurance plan and those using COBRA, since many still were in the 18 month window in which that benefit was available to them. Those reporting EPHI from their current employer could be partially retired and receiving benefits from their part-time employer. Column [3] (health insurance after unretirement) shows that there was a small increase in unretirees reporting EPHI when compared to their "in retirement" reports. Amongst those reporting EPHI, there was a large increase (13 percentage points) in the share of unretirees reporting their current employer as its source. This increase is mostly offset by a similar decrease in unretirees reporting EPHI from their former employer, supporting the possibility that the expiration of COBRA benefits may be related to unretirement. Comparing the cost sharing structure of EPHI in pre-retirement and unretirement jobs, Table 4.13 shows that post-retirement employers were more likely to shift the cost to the employees than were their pre-retirement employers. Generally, it appears that there is some evidence that unretirees are able to get health insurance from their current employer once they return to work, but the benefits are not as generous as the job they left when they retired.

4.9 Conclusion

Despite the fact that unretirement is an important and relatively common phenomenon among retirement-aged Americans, it has been largely ignored in existing retirement models. This paper has identified a number of traits that are linked to retirement reversals including gender roles, the influence of coordinated retirements, and health concerns. More significantly, I have shown that the relative importance of retirees' health insurance sources is similar to that of other purely financial measures such as pensions and total wealth. Retirees with no health insurance are more than twice as likely to unretire than those with subsidized employer provided health insurance or insurance through a government program. Similarly, though less stark, those who attain health insurance from the private, non-group source or purchase unsubsidized health insurance through their employer are also significantly more likely to reverse their retirement. The preeminent importance of health insurance coverage runs counter to the findings in some other unretirement work (Maestas, 2007), which found employer provided retiree health insurance to be statistically unrelated to unretirement in a static analysis of unretirement. More recent work, Maestas and Li (2007), finds a more important role of health insurance when it is defined more broadly. The dynamic analysis method used in this study has the advantage of capturing the effect of changes in health insurance coverage, which most likely explains the difference in the findings. The results are robust to various definitions of retirement and unretirement prompted by the difficult question of how to classify partial retirements.

The findings here suggest that previous retirement models should be modified to include the option of "unretirement" to truly capture retirement behavior. Models will need to include both the motivations behind anticipating a future return to work when current work is more lucrative (as done in Maestas and Li (2007)) and the role that health insurance plays in continued labor force decisions after retirement. Changes to the existing models will allow policy makers to better evaluate the impact of changes to the health care payment system in the United States. The implications of changes to the health care system have been studied in the context of the choice to retire, but not in the area of a retiree's decision to return to work. The results of this study suggest that creating a more accessible health insurance market (which would be most similar to an employer provided health plan not subsidized by the employer) would decrease the likelihood of unretirement, but not by as much as a government run program (similar to Medicare or subsidized employer provided plans) paid for by increased taxes.

Table 4.1

Sample Restrictions and the Size of the Final Samples

	Initial HRS Cohort	War Baby Cohort	Total
HRS Respondents	13434	2720	16154
Age Eligible for Either Cohort	11497	2131	13628
Alive during Full Survey Duration	9606	2000	11606
Observed in all 8 waves for the Initial HRS Cohort or for all 5 waves of the War Babies Cohort	6256	1546	7802
Report Working in the First Observed Wave	4256	1159	5415
Retired In Sample and Observed for at Least One Post-Retirement Wave using:			
Amalgamated Definition, Full- or Partial-Retirement	3132	289	3421
Full-Retirement Only Definition	2583	217	2800

Table 4.2

Comparing Amalgamated Retirement Values to Self-reported Retirement Responses

	Amalgamated Retirement Status			
Self-Reported Retirement Status	Not Retired	Fully Retired	Partially Retired	Observations
Not Retired	43.0%	1.1%	0.4%	11,779
Fully Retired	0.2%	34.1%	2.0%	9,642
Partially Retired	1.8%	3.5%	10.2%	4,113
Missing	2.5%	0.9%	0.2%	967
Observations	12,603	10,506	3,392	26,501

Note: Sample includes only those whose retirement is observed and appear in all waves of the HRS.

Table 4.3

Unretire Hazard Rate by Wave after Retirement

Waves after Retirement	Directional Definition of Retirement		Full-retirement Only Definition of Retirement	
	Observations	Hazard Rate	Observations	Hazard Rate
1	3421	0.185	2800	0.178
2	2336	0.107	1892	0.075
3	1611	0.068	1305	0.051
4	1083	0.050	879	0.034
5	665	0.035	525	0.013
6	261	0.023	204	0.010
Percent of Sample Observed to Unretire	0.314		0.266	

Table 4.4

Transitions in Health Insurance Status after Retirement

HI Source At Retirement	Portion in Each Category at Retirement	Percent of the Sample Reporting Each HI Status in at Least One Wave Between Retirement and Unretirement or Censoring		
		No Health Insurance	Private, Non-group Health Insurance	Unsubsid-ized EPHI
No Health Insurance	0.094	0.358	0.040	0.004
Private, Non-group Health Insurance	0.078	0.097	0.415	0.088
Unsubsidized EPHI	0.110	0.042	0.129	0.236
Subsidized EPHI or Governmental Program	0.719	0.030	0.044	0.058

Note: "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI).

Table 4.5

Comparison of Characteristics at Retirement

	Permanent Retirees	Future Unretirees	t-stat
Age in Years	61.6	60.8	5.7
Male	0.455	0.510	-2.98
Married or "Partnered", including Absent Spouse	0.759	0.776	-1.06
Respondent (R) and Spouse retired at R's Retirement Wave	0.402	0.339	3.54
Self-rated 'Poor' or 'Fair' Health	0.240	0.149	6.08
Spouse's Self-rated 'Poor' or 'Fair' Health	0.149	0.139	0.76
Total Wealth (in millions) in 2000 $'s	0.370	0.418	-1.73
R has less than High School Diploma or GED	0.199	0.165	2.37
R has Some College but No Degree	0.200	0.222	-1.46
R has College Degree or More	0.205	0.236	-2.05
R Reports Being "Other Race"	0.029	0.029	0.09
R Reports Being Black	0.141	0.154	-0.97
R Reports Being Hispanic	0.064	0.057	0.80
North Census Region	0.167	0.139	2.08
Midwest Census Region	0.265	0.285	-1.24
West Census Region	0.158	0.161	-0.22
Observations	2347	1074	

Table 4.6

Comparison of Key Characteristics at Retirement

	Permanent Retirees	Future Unretirees	t-stat
Subsidized EPHI or Governmental Program	0.735	0.683	3.12
Respondent (R) Has No Health Insurance	0.084	0.115	-2.89
R Buys Private Health Insurance	0.068	0.101	-3.41
Unsubsidized Employer Provided Health Insurance (EPHI)	0.114	0.101	1.14
R Receives Pension	0.364	0.332	1.83
Wealth Drops Over 50% and Over $10000 Between Retirement Wave (RW) and Next	0.115	0.142	-2.26
R's Health Declines by 2 Levels or More Between RW and Next	0.040	0.026	2.05
R's Household Size Increases Between RW and Next	0.085	0.101	-1.58
OOPM Expenses Rise 50% and Over $2,000 Between RW and Next	0.160	0.138	1.69
Respondent Plans to Do Paid Work in Retirement	0.707	0.805	-5.61
Observations	2347	1074	

Note: "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI). "OOPM" refers to out-of-pocket medical expenditures.

Table 4.7

Survival Analysis of Unretirement Using Demographic, Wealth, and Health Controls

	[1] Directional Definition of Retirement	[2] Full-retirement Only Definition of Retirement
Age in Years at Retirement Wave	0.0002 [0.0008]	0.0006 [0.0007]
Male	-0.0116 [0.0138]	-0.0232 [0.0122]
Married or "Partnered"	0.0306** [0.0076]	0.0048 [0.0088]
Married and Male	0.0359** [0.0123]	0.0544** [0.0108]
Respondent (R) and Spouse Were Retired in Previous Wave	-0.0828** [0.0071]	-0.0685** [0.0054]
Self-rated 'Poor' or 'Fair' Health	-0.0756** [0.0092]	-0.0794** [0.0089]
Male and Self-rated 'Poor' or 'Fair' Health	0.0361** [0.0137]	0.0510** [0.0136]
Spouse's Self-rated 'Poor' or 'Fair' Health	0.0107 [0.0132]	0.0477** [0.0145]
Male and Spouse's Self-rated 'Poor' or 'Fair' Health	-0.0282 [0.0173]	-0.0703** [0.0209]
Total Wealth (in millions) at Retirement in 2000 Dollars	0.0061 [0.0033]	0.008 [0.0047]
R has Less than High School Diploma or GED Certificate	-0.0201** [0.0065]	-0.0299** [0.0078]
R has Some College but No Degree	0.0099 [0.0079]	0.0107 [0.0074]
R has College Degree or More	0.0105 [0.0076]	0.0083 [0.0071]
R Reports Being "Other Race"	0.0249 [0.0212]	-0.022 [0.0160]
R Reports Being Black	0.0354** [0.0100]	0.0329** [0.0110]
R Reports Being Hispanic	0.0155 [0.0125]	0.0071 [0.0148]
R from North Census Division	-0.0270** [0.0067]	-0.0258** [0.0079]
R from Midwest Census Division	0.0085 [0.0065]	0.0117 [0.0070]
R from West Census Division	-0.0072 [0.0080]	0.0033 [0.0081]
Observations	9253	7506
Mean Predicted Hazard	0.127	0.106

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: Values presented are the Mean Marginal Effect on the predicted hazard of a one unit change.

Table 4.8

Survival Analysis of Unretirement Including Health Insurance and Pension Status

	[1] Directional Definition of Retirement	[2] Full-retirement Only Definition of Retirement
Respondent (R) Has No Health Insurance	0.1614** [0.0360]	0.0987** [0.0344]
R Buys Private, Non-group Health Insurance	0.1104** [0.0281]	0.1114** [0.0253]
Unsubsidized Employer Provided Health Insurance	0.0984** [0.0259]	0.0828** [0.0207]
R Receives a Pension	-0.0385** [0.0064]	-0.0281** [0.0058]
Demographic, Health, and Wealth Controls	Yes	Yes
Observations	9115	7410
Mean Predicted Hazard	0.131	0.109

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: Values presented are the Mean Marginal Effect on the predicted hazard of a one unit change. "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI).

Table 4.9

Survival Analysis of Unretirement Including Previous Wave Shocks

	[1] Directional Definition of Retirement	[2] Full-retirement Only Definition of Retirement
Respondent (R) Has No Health Insurance	0.1607** [0.0285]	0.0992** [0.0289]
R Buys Private, Non-group Health Insurance	0.1089** [0.0248]	0.1091** [0.0249]
R Has Unsubsidized Employer Provided Health Insurance	0.0973** [0.0228]	0.0839** [0.0268]
R Receives a Pension	-0.0385** [0.0072]	-0.0282** [0.0061]
Wealth Dropped Over 50% and More Than $10000 Since the Previous Wave (PW)	0.0288** [0.0106]	0.0292* [0.0122]
R's Health Declined by 2 Levels or More Since the PW	0.0047 [0.0176]	0.0096 [0.0152]
R's Household Size Increased Since the PW	0.0101 [0.0128]	0.0135 [0.0133]
OOPM Expenses Rose at Least 50% and by Over $2,000 Since the PW	0.0109 [0.0089]	0.012 [0.0088]
Demographic, Health, and Wealth Controls	Yes	Yes
Observations	9112	7407
Mean Predicted Hazard	0.131	0.109

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: Values presented are the Mean Marginal Effect on the predicted hazard of a one unit change. "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI). "OOPM" refers to out-of-pocket medical expenditures.

Table 4.10

Survival Analysis of Unretirement Including Work Expectations in Wave 1

	[1]	[2]	[3]	[4]
	Directional Definition of Retirement		Full-retirement Only Definition of Retirement	
Respondent (R) Has No Health Insurance	0.1533**	0.1433**	0.0946**	0.0906**
	[0.0305]	[0.0310]	[0.0295]	[0.0343]
R Buys Private, Non-group Health Insurance	0.1062**	0.1036**	0.1059**	0.1060**
	[0.0229]	[0.0256]	[0.0279]	[0.0300]
R Has Unsubsidized Employer Provided Health Insurance	0.0994**	0.1078**	0.0848**	0.0979**
	[0.0270]	[0.0292]	[0.0264]	[0.0300]
R Receives a Pension	-0.0366**	-0.0364**	-0.0272**	-0.0277**
	[0.0059]	[0.0065]	[0.0067]	[0.0069]
Respondent Plans to do Paid Work in Retirement (Asked only in 1992 Wave)		0.0568**		0.0547**
		[0.0066]		[0.0058]
Demographic, Health, Wealth, and "Shocks" Controls	Yes	Yes	Yes	Yes
Observations	8668	8067	7084	6568
Mean Predicted Hazard	0.127	0.127	0.106	0.106

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: Values presented are the Mean Marginal Effect on the predicted hazard of a one unit change. "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI).

Table 4.11

Probit Analysis of Unretirement Based on Characteristics at Retirement

	[1] Directional Definition of Retirement	[2] Full-retirement Only Definition of Retirement
Respondent (R) Has No Health Insurance at Retirement Wave (RW)	0.0624 [0.0332]	0.0658 [0.0358]
R Buys Private Health Insurance at RW	0.1035** [0.0362]	0.1070** [0.0359]
Unsubsidized Employer Provide Health Insurance at RW	0.0221 [0.0337]	0.0348 [0.0327]
R Receives Pension at RW	-0.004 [0.0213]	-0.0086 [0.0199]
Respondent Plans to do Paid Work in Retirement (Asked only in 1992 Wave)	0.1145** [0.0198]	0.1042** [0.0188]
Demographic, Health, and Wealth Controls	Yes	Yes
Wave of Retirement Dummies	Yes	Yes
Observations	2313	2313
Mean Predicted Probability of Unretirement	0.316	0.269

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: In the probit analyses, "ever unretired" is the dependent variable. Reported values are MMEs. "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI).

Table 4.12

Comparing Job Characteristics Pre- and Post- Retirement among Unretirees

	Wave Prior to Retirement Wave	Wave of Unretirement
Hourly Wage (2000 Dollars), Median	14.37	8.55
Weekly Wage (2000 Dollars), Median	588.33	212.33
Weekly Hours, Median	40	25
Weeks per Year, Median	52	51.5
Pension Offered by Current Employer	59.3%	13.4%
Self-employed	17.5%	28.8%
Occupation:		
Management	34.4%	25.0%
Sales	8.7%	14.1%
Clerical	15.2%	15.3%
Service	15.1%	19.4%
Farming/Mining	2.9%	5.3%
Construction	10.2%	6.3%
Operator	13.6%	14.7%
Industry:		
Agriculture/Mining	10.3%	11.6%
Manufacturing	17.0%	7.9%
Transportation	9.3%	3.5%
Retail/Wholesale	13.1%	18.6%
Professional Services	43.7%	54.4%
Public Sector	5.9%	3.3%
Observations	1063	1063

Table 4.13

Comparing Health Insurance Sources Pre- and Post- Retirement Jobs among Unretirees

	[1] Wave Prior to Retirement Wave	[2] Wave Prior to Unretirement	[3] Wave of Unretirement
General Source of Health Insurance Coverage:			
Government Program	8.56%	46.85%	53.25%
Employer Provided Health Insurance	76.48%	27.94%	31.33%
Private Health Insurance	6.68%	15.33%	6.49%
Uninsured	8.18%	8.65%	5.74%
Source of EPHI:			
Current Employer	72.97%	12.28%	25.53%
Spouse's Current Employer	16.22%	20.80%	20.72%
Former Employer	6.24%	52.13%	40.84%
Spouse's Former Employer	4.57%	14.79%	12.91%
Cost Sharing among those with EPHI from Current Employer:			
Employee Pays Full Cost	8.06%		27.63%
Employee and Employer Share Costs	62.09%		40.79%
Employer Pays Full Cost	29.85%		31.58%

Appendix Table 4.14

Survival Analysis of Unretirement with Respondents Observed a Minimum of Four Waves

	[1] Directional Definition of Retirement	[2] Full-retirement Only Definition of Retirement
Respondent (R) Has No Health Insurance	0.1346** [0.0259]	0.0943** [0.0237]
R Buys Private, Non-group Health Insurance	0.1111** [0.0287]	0.1123** [0.0247]
R Has Unsubsidized Employer Provided Health Insurance	0.1146** [0.0230]	0.1018** [0.0297]
R Receives a Pension	-0.0355** [0.0063]	-0.0253** [0.0061]
Respondent Plans to do Paid Work in Retirement (Asked only in 1992 Wave)	0.0608** [0.0057]	0.0581** [0.0058]
Demographic, Health, Wealth, and "Shocks" Controls	Yes	Yes
Observations	9468	7702

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: Values presented are the Mean Marginal Effect on the predicted hazard of a one unit change. "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI).

Appendix Table 4.15

Survival Analysis of Unretirement Using Self-Reported Retirement Declarations

	[1] Directional Definition of Retirement	[2] Full-retirement Only Definition of Retirement
Respondent (R) Has No Health Insurance	0.1674** [0.0361]	0.1637** [0.0477]
R Buys Private, Non-group Health Insurance	0.1201** [0.0283]	0.1634** [0.0473]
R Has Unsubsidized Employer Provided Health Insurance	0.0898** [0.0293]	0.0812* [0.0322]
R Receives a Pension	-0.0317** [0.0071]	-0.0093 [0.0075]
Respondent Plans to do Paid Work in Retirement (Asked only in 1992 Wave)	0.0506** [0.0070]	0.0560** [0.0066]
Demographic, Health, Wealth, and "Shocks" Controls	Yes	Yes
Observations	7598	5691
Mean Predicted Hazard	0.130	0.106

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: Values presented are the Mean Marginal Effect on the predicted hazard of a one unit change. "Subsidized" and "unsubsidized" EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI).

Appendix Table 4.16

Survival Analysis of Unretirement with Results Expressed as Hazard Ratios

	[1] Directional Definition of Retirement	[2] Full-retirement Only Definition of Retirement
Respondent (R) Has No Health Insurance	2.301** [0.264]	1.939** [0.301]
R Buys Private, Non-group Health Insurance	1.879** [0.214]	2.070** [0.288]
R Has Unsubsidized Employer Provided Health Insurance	1.782** [0.196]	1.796** [0.232]
R Receives a Pension	0.740** [0.050]	0.770** [0.062]
Demographic, Health, and Wealth Controls	Yes	Yes
Observations	9115	7410

Robust standard errors in brackets; * significant at 5%; ** significant at 1%

Note: Values presented are the hazard ratios of a one unit change. “Subsidized” and “unsubsidized” EPHI refers to whether an employer contributes to the payment of the premiums for employer provided health insurance (EPHI).

CHAPTER V

Conclusion

The results of "Love, Toil, and Health Insurance: Why American Husbands Retire When They Do" suggest that households do consider the health insurance circumstances of both spouses when choosing the timing of a husband's retirement. Results discussed in Chapter II also show that the risk that a wife might lose the opportunity of low-cost health insurance has a similar impact on husbands' rate of retirement as the risk of a husband losing his own insurance and similar to findings that husbands are responsive to their wives' pension benefits when making individual labor force decisions. The findings in Chapter III, "The Lasting Effects of Crime: The Relationship of Methamphetamine Laboratory Discoveries and Home Values," suggest that individuals are willing to pay a large amount of money to avoid being near the site of a defunct meth laboratory, and by extension to avoid areas associated with prior crime. Additionally, the findings support previous research that the negative impact of perceived risk of crime is binary and not a matter of degrees since the discovery of a second laboratory does not have an amplifying effect on the negative impact. "The Impact of Health Insurance Availability on Retirement Decision Reversals," Chapter IV, identifies a number of traits that are linked to retirement reversals including gender roles, the influence of coordinated retirements, and health concerns. More significantly, it shows the relative importance of retirees' health insurance sources far exceeds other purely financial measures such as pensions and total wealth. Retirees with no health insurance are more than twice as likely to reverse their retirement than those with subsidized employer provided health insurance or insurance through a government program. Similarly though less stark, those who attain health insurance from the private, non-group or purchase unsubsidized health insurance through their employer are also significantly more likely to reverse their retirement. The preeminent importance of health insurance coverage runs counter to the findings in some other unretirement work which found retiree health insurance to be statistically unrelated to unretirement in a static analysis of unretirement. The dynamic analysis method used in this paper has the advantage of capturing the effect of changes in health insurance coverage which most likely explains the difference in the findings. The results are robust to various definitions of retirement and unretirement prompted by the difficult question of how to classify partial retirements.

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