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Determinants of the onset of disability in old age

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DETERMINANTS OF THE ONSET OF DISABILITY IN OLD AGE

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ABSTRACT

With a rapidly aging population, maximizing independent living among the elderly is a growing concern. The inability to perform normal basic care activities interferes with an older individual's ability to live independently. In this study, I examine the onset of disability among elderly Americans using the 2002 and 2004 waves of the Health and Retirement Survey (HRS). In examining the explanatory power of both the life course perspective and the medical model, I find that the medical model is better able to explain onset of disability for males while the life course perspective prevails when explaining onset of disability among females. I find little support that living arrangements among the elderly have an impact on the probability of experiencing onset of disability. Finally, I find that differences exist in the precursors of individual activities of daily living (ADLs) disability, which suggests that using an aggregate measure of ADL disability may be masking more effective preventive measures and treatments.

INTRODUCTION

Disability, often defined as the inability to perform activities of daily living (ADLs) such as bathing, dressing, and feeding oneself, interferes with older adults' ability to living independently (Jagger et al, 2001). Disablement is considered to be a roughly hierarchical process which typically begins with the onset of a chronic disease or morbidity (Verbrugge and Jette, 1994). This morbidity may lead to a loss of physical function or restriction in performing normal daily routines. If the physical impairment progresses to the point where an individual has difficulty performing normal basic care, disability results (Verbrugge and Jette, 1994).

Disability is not an irreversible event (Crimmins, Saito, and Reynolds, 1997). For example, medical care, medications, external support (e.g., personal assistance, special equipment), or modifications to the environment can impact the pathway by preventing, delaying or reversing the transition from being able to function independently to being disabled (Peres et al., 2005).

Disabled elderly individuals often require substantial medical and social service needs and are at risk for institutionalization if they are unable to meet those needs (Li, 2005). Identifying factors that predict the onset of ADL disability among older individuals is important for developing treatments or interventions that will delay the onset of disability which will, in turn, lead to elderly adults being able to live a greater span of their lives independently.

The purpose of this thesis is threefold. First, I aim to provide a better understanding of the precursors of the onset of ADL disability. While medical

conditions such as hypertension, lung disease, and arthritis constitute the proximate determinants of disability, evidence is beginning to emerge that points to chronic morbidity in later life being a result of a cumulative process that may even begin in utero (Blackwell, Hayward, and Crimmins, 2001). Therefore, in this thesis I will examine the explanatory power of both the life course perspective and the medical model (described later) in predicting ADL disability.

Second, I explore the possibility that different types of living arrangements have an effect on the onset of ADL disability among elderly adults. Most studies conducted on the living arrangements of older individuals focus on poverty or other demographic characteristics, while providing no information about the health impact that living arrangements have on the older person (United Nations, 2001). As such, very little is known about the effects of different types of living arrangements on older person's health and how these effects interact with socio-demographic variables (Rogers, Hummer, and Nam, 2000).

Finally, in order to gain a better understanding of the precursors of the onset of disability, I examine ADL disability both in the aggregate (disabled on at least one of the ADLs) and each specific ADL disability (bathing, dressing, eating, walking, transfer, and toileting). Most research conducted on disability as the outcome measure has looked at ADL disability in the aggregate; however, this assumes similar etiologies and outcomes for each of these disabilities which may be masking differences that could lead to more effective preventive measures and treatments (Reynolds and Silverstein, 2003).

THEORETICAL RATIONALE

Life Course Perspective vs Medical Model

Several conceptual models have been put forth to explain the transition from a condition of health to one of disability (Jette, 2006). The medical model views disability as the direct result of disease, trauma, or other health conditions (Jette, 2006). In this model, no consideration is given to exogenous factors such as socioeconomic status (Verbrugge and Jette, 1994). In other words, the medical model is strictly concerned with the proximate determinants of disability, without considering the causes or choices that lead to the proximate determinants.

The life course perspective builds upon the medical model by including not only the proximate determinants of disability, but also the factors that lead up to and influence the proximate determinants of disability. According to the life course perspective, there are biological, behavioral and psychosocial pathways that interact throughout an individual's life span that influence health in later life (Kuh and Ben-Shlomo, 1997). Proponents of the life course perspective do not deny the importance of chronic disease risk factors, such as smoking, hypertension, and arthritis in contributing to disability in later life; rather, they focus on the combined effect that conditions in early life and later life have on disability among the elderly (Lynch and Davey Smith, 2005). Therefore, the life course perspective recognizes that the proximate determinants of disability are influenced by conditions and events occurring throughout an individual's life.

In this thesis, I run a series of nested models to test the life course perspective versus the medical model. The proximate determinants of ADL disability that make up the medical model are added in the final model. This

allows for a comparison between the two, even though the life course perspective is a predictor of both health conditions and disability. In other words, the full model is a test of the life course perspective combined with the medical model. When I incorporate health conditions in the final model, I am including the medical model in the analyses.

Recent research supports the life course approach to studying disability in older ages. For example, Blackwell, Hayward, and Crimmins (2001) conducted a study examining the relationship between childhood health experiences and chronic disease in adulthood and found that individuals who reported having experienced a major childhood illness were more likely to report having cancer, chronic lung conditions, arthritis, and cardiovascular conditions. This relationship persisted even after controlling for childhood and adult socioeconomic status (SES). Costa (2000) found that infectious disease during childhood was related to respiratory problems, heart problems and back problems in adulthood. Lung conditions in adulthood have also been linked to respiratory infections during childhood (Barker, 1998). Research has also found that maternal attachment and parent-child interactions during early childhood have wide-ranging and lasting effects on health behaviors and outcomes in adulthood (Felitti et al., 1998).

I run the analyses separately for men and women to examine if the explanatory power of the life course perspective and the medical model vary by gender. Since males throughout the life course experience higher rates of mortality than females for most major causes of death (Newman and Brach, 2001), I expect to see more support for the life course perspective for females

than males. If males experience adverse conditions throughout the life course that lead to early mortality, they will not be included in the analyses. Therefore, I expect that the medical model, which includes the health conditions that occur in adulthood and old age, will be better able to explain the probability of experiencing onset of disability for males.

Living Arrangements

Increasingly, researchers are beginning to examine the impact that spatial environments such as neighborhoods and cities have on the health of individuals (e.g., Robert, 1998; Waitzman and Smith, 1998). In contrast, little research has been done on the impact that the household, the most immediate social environment, has on the health of individuals, particularly elderly individuals (Rogers, Hummer, and Nam, 2000). However, the type of household in which an elderly individual resides may have a positive or negative impact on his/her health. Recognizing this, the United Nations identified living arrangements of the elderly and possible government responses as one of the most pressing issues related to population aging (United Nations, 2001).

An extensive amount of research has shown the health benefits of having a spouse present; however, most of the research conducted on the relationship between marital status and health has compared married-couple households with unmarried households, without considering other household members (Hughes and Waite, 2002; Goldman, Korenman, and Weinstein, 1995). This does not take into consideration the positive or deleterious impact that having children or other individuals in the household may have on the health of the married couple.

The limited body of research that has specifically examined the relationship between different types of living arrangements and health tends to support the possibility that living arrangements do have an impact on health. For example, Hughes and Waite (2002) conducted a study on the impact of living arrangements on the health of individuals in their late middle age (ages 51-61). Theirs was a longitudinal study in which living arrangements were measured at baseline and self-rated health assessed two years later. This was done to reduce the possibility that any relationship seen was due to the impact of health on living arrangements rather than living arrangements on health. They found that married women living with non-spouse others, single women living alone and single women living with children rated their health more poorly than women living only with their husband or with their husband and children. These relationships were found even after controlling for employment status and household income.

Denton and Walters (1999) conducted an investigation on the importance of social, structural (including living arrangements) and behavioral determinants of health and whether or not there were gender differences in the determinants of health. They found that males living alone and females living with children have poorer health compared to married couples living with children. Waite and Hughes (1999) also found that married couples living alone or with children showed the highest levels of functioning, whereas single adults living in complex households showed the lowest levels.

A few studies have also examined the relationship between living arrangements and mortality. Lillard and Waite (1995) found that single women

living with children experienced higher mortality than married women living with a spouse and children. Rogers, Hummer and Nam (2000) found that single adults living with one child faced risks of dying identical to single adults living alone; however, the chances of dying increased substantially for single adults with increasing numbers of children.

Researchers are only now beginning to examine the possible impact of different types of living arrangements specifically on disability among elderly individuals (Rogers, Hummer, and Nam, 2000). Li (2005) conducted an investigation of the relationship between living arrangements and disability for low income individuals age 65 and older. She found that the risk for experiencing the onset of ADL disability was larger for those individuals living with non-spouse others (living arrangements were classified as living alone, living with spouse, and living with non-spouse others).

In light of previous research findings suggesting that males living alone and females living with children have poorer health compared to married couples living with children (Denton and Walters, 1999; Hughes and Waite, 2002), I expect to find differences both among females and males and between females and males in the different types of living arrangements and the probability of experiencing onset of disability.

I expect that married individuals living alone will have the best outcome since having a spouse present provides individuals with someone who monitors their health; therefore, if a health problem arises, treatment may be started earlier when treatments are usually the most effective. However, the addition of children and others living in the household may lead to increased strain which

would have a deleterious impact on an individual's health that the benefits of having a spouse present may not overcome. I expect that this will be more pertinent for females as females typically experience more demands than males in households with children present (Hughes and Waite, 2002).

While individuals living alone do not have demands placed on them by other individuals co-residing in the household, they also have no one monitoring their health and curtailing any potential risk behaviors. Therefore, I expect that single individuals living alone will have a higher likelihood of experiencing the onset of disability than married persons, but a lower likelihood than single persons living with children or others.

Aggregate ADL Disability vs Specific Disabilities

As stated previously, most research conducted on disability as the outcome measure has looked at ADL disability in the aggregate. However, the few studies that have been conducted on individual ADL disabilities have shown that differences do exist in the outcomes and precursors of the individual disabilities. For example, Jagger et al. (2001) conducted a study to investigate the pattern in which ADL disability occurred in the elderly. Their study found that bathing, walking, and toileting disabilities (those requiring lower-extremity strength) occurred first, followed by dressing and eating disabilities (those requiring upper-extremity strength). They also found that women had a higher risk of onset of bathing and toileting disabilities compared to men. Gill, Guo, and Allore (2006) also found that elderly women were more prone to experiencing bathing disability compared to men. Their study revealed that nearly half who

experienced the onset of bathing disability were not accompanied at onset by any of the other ADL disabilities.

Reynolds and Silverstein (2003) conducted an investigation into the precursors of ADL disability both in the aggregate and individually and found considerable differences in the precursors of the individual disabilities. For example, hypertension was found to increase the probability of experiencing the onset of dressing and eating disabilities, while diabetes and stroke predicted an increased probability of the onset of bathing and transfer disabilities. Diabetes also increased the probability of walking disability, while dressing disability was increased by having experienced arthritis.

In view of these precedents, I expect to find that there are differences in the precursors of the specific disabilities, particularly between those requiring upper-extremity and lower-extremity strength. I expand on Reynolds and Silverstein's study by differentiating between males and females, following my expectations that there are differences in the precursors of disability for men and women.

METHODS

I focus on non-institutionalized individuals aged 65 years and older living in the United States. I run binary logistic regressions to predict the probability of experiencing the onset of ADL disability, bathing disability, dressing disability, eating disability, walking disability, transfer (in and out of bed) disability, and toileting disability in 2004.

I examine the onset of disability in the elderly longitudinally, using the 2002 and 2004 waves of the Health and Retirement Survey (HRS). I use longitudinal data for two reasons. First, using longitudinal data allows me to exclude disabled individuals in 2002 and predict the onset of disability over the two year time period. Second, longitudinal data are essential to reduce the possibility of reverse causation when examining the impact of living arrangements on disability (Hughes and Waite, 2002). Assessing a non-disabled individual's living arrangements in 2002 and predicting the probability of having experienced the onset of disability two years later reduces the possibility that any relationship seen is a result of an individual's disability influencing or dictating his/her living arrangements rather than the impact of his/her living arrangements on disability.

In order to get a detailed portrayal of the precursors of ADL disability in the elderly, I estimate a series of nested models, separately by gender. The baseline model estimates the effect of living arrangements on disability without any controls. Characteristics such as age, race/ethnicity, childhood conditions, education, and assets are associated with both living arrangements and disability

and therefore must be controlled for in order to determine the true impact of living arrangements on disability. While these variables occur causally prior to living arrangements, in this thesis I present them following the baseline model which includes only living arrangements. I do this so that if there is limited or no impact of living arrangements on disability in the final model, a comparison of the series of models can identify what factors mediate the impact of living arrangements on disability.

In Model 2, demographic control variables such as race/ethnicity and age are added. Research has shown that older blacks have higher rates of co-residence with family members than whites (Himes, Hogan, and Eggebeen, 1996). Black elderly adults have also been shown, on average, to have lower levels of physical functioning than white adults (Schoenbaum and Waidman, 1997). Therefore, I expect that the effects seen in Model 1 will be reduced after controlling for these demographic variables.

Childhood conditions, including self-rated childhood health and childhood SES, are added in Model 3 to test the hypothesis that conditions in childhood have a lingering impact on disability in old age. I expect that this will be more salient for females than males. Females experience a survival advantage that results in a much larger number of women than men living to old age (Newman and Brach, 2001). Therefore, I expect that males who were disadvantaged over the life course will have experienced higher rates of early mortality than females and will therefore not be included in the analyses. This is also true for racial differences. According to Hayward et al. (2000), most of the difference in

mortality rates for blacks and whites occurs prior to age 65. If blacks survive to old age, their mortality rates become similar to whites (Elo and Preston, 1994).

For example, blacks have higher rates of cardiovascular mortality than whites as a result of differential rates of hypertension (National Center for Health Statistics, 1999); hypertension has been found to increase the probability of experiencing the onset of dressing and eating disabilities (Reynolds and Silverstein, 2003); therefore, the differential impact of race on disability that may have been seen if blacks had the same mortality as whites will be diminished.

In Model 4, education and asset complexity are added. Since these individuals are in the post-retirement phase of their lives, asset complexity is used in conjunction with education as an indicator of adult-obtained SES. Asset complexity is a count of assets acquired over the life course and is therefore a better indicator of an individual's status in the retirement phase of his/her life than using a measure such as income. Adult-obtained SES is important to include because adulthood is the stage in the life course that may continue or reverse effects from childhood, depending, among other things, on adult-obtained SES. For example, individuals raised in poverty may increase their SES through education and therefore experience better health outcomes.

In the full model, the proximate determinants of disability are added. Stuck et al. (1999) conducted an extensive literature review in which they identified 10 or more studies that reported a significant association between having hypertension, stroke, diabetes, and arthritis and subsequent decline in physical functioning (which precedes disability in the disablement pathway).

Heart disease and cancer were also frequently cited as being associated with a decline in physical functioning.

Data

Data for these analyses were obtained from the Health and Retirement Study (HRS) provided by the University of Michigan's Institute for Social Research. The HRS is a longitudinal survey of a nationally representative sample derived from a stratified, multistage area probability design in which blacks, Hispanics, and Floridians are over sampled.

The HRS was initially designed to follow individuals and their spouses as they made the transition from active worker into retirement. In 1998, the HRS was merged with the Asset and Health Dynamics among the Oldest Old (AHEAD) study which was initially created as a separate study to supplement the HRS. The AHEAD study was designed to follow individuals and their spouses in the post-retirement period until the end of life.

Two additional cohorts were added to the study in 1998: War Baby (WB) and Children of the Depression (CODA). With these additions, the HRS in 1998 represented all cohorts born between 1890 and 1947. This was done so that all persons over 50 years of age in the United States could be studied concomitantly. Since 1998, respondents have been re-interviewed at two-year intervals. The study plans to maintain a representative sample of individuals age 50 and over by continuing to add cohorts at six-year intervals.

Data used in this analysis were obtained from the 2002 and 2004 waves of the HRS which included these four sub-samples: the original HRS and AHEAD samples and the WB and CODA samples. Members of the WB sub-sample were

born between 1942 and 1947 and were ineligible for inclusion in the analyses because they were younger than age 65 in 2002; therefore, this sub-sample will not be described here.

The HRS sub-sample consists of individuals born between 1931 and 1941 and their spouses or partners. The first wave was conducted in 1992 with a total of 12,654 individuals interviewed. Of these, 10,142 were re-interviewed in 2002 and 9,759 were re-interviewed in 2004, for a response rate between the 2002 and 2004 waves of 96.2%.

The first wave of the AHEAD study was conducted in 1993 and included 8,222 individuals 70 years of age or older (born in 1923 or earlier) and their spouses or partners. A total of 5,004 were re-interviewed in 2002; of these, 4,438 were again interviewed in 2004 (88.7% response rate from 2002).

The CODA sub-sample consists of people who were born in 1924 through 1930, and who, in 1998, did not have a spouse or partner who was born before 1924 or between 1931 and 1947. The CODA sub-sample also includes the spouses or partners of the respondents. Of the original 2,320 in the CODA sub-sample, 2,106 were re-interviewed in 2002 and 1,970 were again interviewed in 2004 (93.5% response rate from 2002).

Respondent attrition and deletion of respondents younger than age 65 in 2002 reduced the sample size to 9,182. Cases were also excluded if data were missing for key variables. This left a baseline sample size of 5,737.

Dependent Variables

Respondents were asked a series of questions in 2002 and 2004 to determine if they had difficulty performing any of the ADLs (bathing, dressing,

eating, walking, transfer and toileting). Respondents who indicated that they could not perform at least one of the ADLs without assistance, or that they did not perform them for health reasons, were coded as ADL disabled. Respondents who indicated no difficulty in performing any of the ADLs were coded as not disabled. Respondents were further identified as being disabled in specific ADLs (e.g., bathing disabled, dressing disabled).

Table 1 shows the number of respondents who were disabled in 2002, 2004, and the percent that recovered between the two waves. The high variability in the rates of recovery among the individual ADL disabilities lends support to the hypothesis that using an aggregate measure of ADL disability may be masking more effective, targeted treatments for disability is old age.

For the aggregate analyses of ADL disability (being disabled on at least one of the ADLs), individuals who were coded as ADL disabled in 2002 were dropped from the analyses predicting ADL disability in 2004. This was also done for the analyses predicting individual ADL disability (e.g., individuals coded as being bathing disabled in 2002 were dropped from the models predicting bathing disability in 2004); therefore, the sample size will vary depending on the analysis being undertaken.

Table 1: Prevalence of Aggregate and Specific ADL Disabilities in 2002 and 2004 and Percent Recovery for the Baseline Sample (n = 5,737)

	Disabled in 2002	Still Disabled in 2004	Percent Recovery
ADL Disabled*	1,309	856	34.61
Bathing	442	270	38.91
Dressing	647	341	47.30
Eating	171	90	47.37
Walking	447	250	44.07
Transfer	350	142	59.43
Toileting	376	151	59.73

*Disabled on at least one of the ADL disabilities

Independent Variables

In Table 2, I describe how the independent variables are coded. Living arrangements are determined in 2002 and classified according to marital status. Separate analyses could not be undertaken for non-married elderly couples living together due to the scarcity of this type of living arrangement in the sample. Therefore, in accordance with previous research (Hughes and Waite, 2002; Liang et al., 2005), I treat cohabiting couples as married in the analyses.

For the aggregate analyses predicting ADL disability, I classify married individuals as living with spouse only, living with spouse and children or living with spouse and others. I also classified single individuals into three categories: living alone, living with children or living with others. Single individuals included individuals who were single as a result of never marrying, divorce/separation or being widowed. Due to the relative infrequency of married couples and single individuals living with others, these categories were combined for analyses predicting individual ADL disabilities. I distinguish between married/single individuals living with children and married/single individuals living with others following my expectation that living with children places additional strain on individuals that may increase the probability of experiencing the onset of disability.

I coded race and ethnicity using three variables: non-Hispanic whites (omitted category), non-Hispanic blacks and Hispanics. Age was continuous, with individuals younger than age 65 dropped from the analyses. Respondents were asked to rate both their health as a child and whether their family was financially pretty well off, about average, or poor, from birth to age 16. Childhood

health was coded as a continuous variable ranging from excellent to poor on a five-point scale; higher values indicate poorer health. Childhood SES was coded using three dummy variables with average used as the reference category.

Respondent's education and asset complexity are included in the analyses as indicators of adult-obtained SES. I coded the level of education obtained by the respondent as a continuous count of the number of years of education (range: 0 – 17 years). Asset complexity is also continuous and is a count of how many assets the respondent owned in 2002. Assets include real estate (including own home), business or farm, IRA, stocks, bonds, savings accounts, certificates of deposit, transportation (including cars, trucks, trailers, motor homes, boats, or airplane), or other assets.

Respondents were also asked to rate their health in 2002 from excellent to poor on a five-point scale. This self-rated health variable indicates the respondent's own assessment of his/her health and is coded so that higher values indicate poorer health. I also include variables of self-reported medical conditions in 2002 such as hypertension, diabetes, cancer (excluding skin), lung disease, heart condition, psychiatric problem, arthritis and stroke. A dummy variable indicating depression for most of the week preceding the interview in 2002 is also included. While this may not adequately capture long-term depression, the prohibitive number of individuals that were questioned in 2002 regarding long-term depression disallowed for the inclusion of a more accurate measure. Respondents were asked the first time they entered the survey if they had ever experienced depression for longer than a two week period; therefore, only individuals entering the survey in 2002 were asked this question, which

would have resulted in a sample size of approximately 100 respondents due to missing values on this variable.

In the analyses, I included a continuous variable measuring weight in 2002, as well as a dummy variable indicating if the respondent was a current smoker in 2002.

Sample

Table 2 also shows the sample size and descriptive statistics measured in 2002 based on the aggregate measure of ADL disability. Therefore, all respondents who are coded as ADL disabled in 2002 are not included in these characteristics. This leaves a sample size of 4,428 for the aggregate analysis of ADL disability (females = 2,623; males = 1,805).

The majority of the respondents were non-Hispanic whites, with females being more prevalent (59.24%). Less than half of females were married (47.23%); the majority of married females lived alone with spouse only (40.37%). The sample includes 5.26% of married females living with spouse and children and 1.6% living with spouse and others. Among single females, 37.59% lived alone, 11.44% lived with children and 3.74% lived with others.

Living arrangements for males ranged from a high of 65.04% who were married and living with a spouse only to 1.16% who were single living with others. The average for self-reported childhood health was 1.84 for females and 1.81 for males, indicating between excellent and very good health during childhood. The majority of respondents reported that financially s/he was 'about average' during childhood (62.79% and 56.79%, respectively). The average female respondent in the sample had 11.98 years of education (s.d. 2.94) and an average of 3.02 assets

(s.d. 1.71). Male respondents reported an average of 12.48 years of education (s.d. 3.50) and an average of 3.48 assets (s.d. 1.68).

Self-reported health in 2002 averaged 2.76 for females and 2.70 for males, indicating a self-assessment of good health. Medical conditions for females ranged from a low of 6.82% (stroke) to a high of 69.5% (arthritis). Males reported a similar range with 6.54% having experienced a stroke and 55.07% having seen a doctor for arthritis. More females than males reported having experienced depression for most of the week preceding the interview (17.12% and 11.63%, respectively). Females on average weighed 152.84 (s.d. 31.93), and 7.12% were current smokers. The average male respondent weighed 186.94 (s.d. 31.65), and 8.86% reported that they were current smokers.

Table 2: Description of Predictor Variables, Percents and Means

Variables	Description/coding	Female Mean/ Percent	Male Mean/ Percent
Living Arrangements			
Married, Alone	1—yes; 0—no	40.37	65.04
Married, Children	1—yes; 0—no	5.26	10.14
Married, Others	1—yes; 0—no	1.60	3.49
Single, Alone	1—yes; 0—no	37.59	16.90
Single, Children	1—yes; 0—no	11.44	3.27
Single, Others	1—yes; 0—no	3.74	1.16
Demographic Characteristics			
Black	1—yes; 0—no	12.73	11.25
Hispanic	1—yes; 0—no	6.52	5.98
Age	Continuous, range 65–101	74.07	73.34
Childhood Characteristics			
Self-Rated Health	1—Excellent; 2—very good; 3—good; 4—fair; 5—poor	1.84	1.81
High SES	1—yes; 0—no	5.11	6.48
Average SES	1—yes; 0—no	62.79	56.79
Low SES	1—yes; 0—no	32.10	36.73
Adult Characteristics			
Respondent's education	Continuous, years of education (range 0-17)	11.98	12.48
Asset complexity	Continuous, count of type of assets owned: real estate, business or farm, IRA, Stocks, Bonds, Savings Accounts, Certificates of Deposit, Transportation, or Other Assets, range 0–9	3.02	3.48
Health in 2002			
Self-Rated Health	1—Excellent; 2—very good; 3—good; 4—fair; 5—poor	2.76	2.70
Hypertension	Has a doctor ever told you you have high blood pressure? 1—yes; 0—no	59.59	53.74
Diabetes	Do you have diabetes now? 1—yes; 0—no	15.44	18.73
Cancer (excluding skin)	Has a doctor ever told you you had cancer? 1—yes; 0—no	15.06	18.39
Lung Disease	Except for asthma, has a doctor ever told you you have lung disease, such as chronic bronchitis or emphysema? 1—yes; 0—no	9.11	9.25
Heart Condition	Has a doctor ever told you you've had coronary heart disease, a heart attack, angina, congestive heart failure, or other heart condition? 1—yes;0—no	24.48	32.63
Psychiatric Condition	Have you ever seen a doctor for emotional, nervous, or psychiatric problems? 1—yes; 0—no	14.94	7.53
Arthritis	During the last 12 months, have you seen a doctor for arthritis or rheumatism? 1—yes; 0—no	69.65	55.07

(CONTINUED)

Table 2

Variables	Description/coding	Female Mean/ Percent	Male Mean/ Percent
Stroke	Has a doctor ever told you that you had a stroke; 1—yes; 0—no	6.82	6.54
Depression	Much of the time during the past week, you felt depressed. 1—yes; 0—no	17.12	11.63
Weight	Continuous, range 80-337	152.84	186.94
Current Smoker	Do you smoke cigarettes now? 1—yes; 0—no	7.12	8.86

Note: Percents/means based on the aggregate measure of ADL Disability (disabled on at least one of the activities of daily living (ADLs)) female n = 2623; male n = 1805

RESULTS

Table 3 presents Models 1 – 5 estimated coefficients from binary logistic regressions on the probability of experiencing aggregate ADL disability between 2002 and 2004, for females. The first column of the Table presents the results of Model 1. The relationship between living arrangements in 2002 and ADL disability in 2004 is significant for all three types of living arrangements for single females, as compared to married females living alone. In contrast, no significant relationship is found between females who were married and living with their children or with others and married females living only with their spouse on ADL disability in 2004. In other words, marriage significantly lowers the likelihood of females experiencing the onset of ADL disability regardless of who else lives in the home.

The addition of demographic variables added in Model 2 diminishes most of the effects of living arrangements on ADL disability for females. However, being single and living with children still significantly increases the probability of onset of ADL disability between the two waves. The probability also significantly increases with age. Other things being equal, the likelihood of experiencing the onset of ADL disability is higher among blacks, and lower among Hispanics, compared to non-Hispanic whites.

Model 3 introduces the childhood variables, none of which are shown to be significant in predicting the probability of onset of ADL disability. The results are similar to those found in Model 2, except that including these variables accounts for some of the effect observed for blacks.

In Model 4, indicators of adult-obtained SES are added. While education has no significant effect, asset complexity is highly significant in decreasing the probability of onset of ADL disability for females, other things being equal. With the addition of these variables, the significant effect of being single and living with children on ADL disability disappears. In other words, adult-obtained SES accounts for the marginally significant effects of being single and living with children, net of demographic controls.

Adult health conditions in 2002 are added in Model 5, as well as weight and a variable indicating if the respondent was a smoker in 2002. The addition of these variables results in little change from the previous model, with the exception of assets now being only marginally significant. In Model 5, age, self-rated adult health, arthritis, stroke and weight all increase the probability of onset of ADL disability for females, other things being equal. The likelihood of experiencing the onset of ADL disability is lower among Hispanics compared to whites, and asset complexity decreases the probability of onset.

Table 4 presents Models 1 – 5 estimated coefficients from binary logistic regressions on the probability of experiencing aggregate ADL disability between 2002 and 2004, for males. Model 1 shows that unlike females, no significant effects exist among males in different types of living arrangements in 2002 on ADL disability in 2004. Among the demographic variables added in Model 2, only age is significant in predicting onset of ADL disability in 2004. The addition of childhood characteristics in Model 3 and of respondent education and assets in Model 4 has no significant effect, only age remains significant in predicting ADL

Table 3: Results of Logistic Regression on the Probability of Onset of any ADL Disability between 2002 and 2004 for Females

	Model 1		Model 2		Model 3		Model 4		Model 5	
Living Arrangements[a]										
Married, Children	-0.198		-0.013		-0.002		-0.051		-0.156	
Married, Others	-0.095		0.096		0.086		0.041		0.113	
Single, Alone	0.441	***	0.102		0.100		-0.025		-0.022	
Single, Children	0.641	***	0.404	*	0.402	*	0.196		0.205	
Single, Others	0.546	*	0.383		0.415		0.228		0.196	
Demographic Characteristics										
Black[b]			0.396	**	0.356	*	0.113		0.046	
Hispanic[b]			-0.512	*	-0.531	*	-0.784	**	-0.739	**
Age			0.066	***	0.066	***	0.062	***	0.069	***
Childhood Characteristics										
Self-Rated Health[c]					0.096		0.073		0.010	
High SES[d]					-0.203		-0.164		-0.061	
Low SES[d]					0.079		0.044		-0.055	
Adult Characteristics										
Adult Education							-0.006		0.014	
Assets							-0.159	***	-0.090	*
Health in 2002										
Self-Rated Health[e]									0.422	***
Hypertension									0.106	
Diabetes									0.053	
Cancer									-0.001	
Lung disease									0.324	
Heart Condition									-0.043	
Psychiatric Condition									0.174	
Arthritis									0.688	***
Stroke									0.485	**
Depression									0.168	
Weight									0.005	**
Current Smoker									0.001	
N	2623		2623		2623		2623		2623	
Pseudo R^2	0.011		0.044		0.046		0.053		0.115	

*p<0.05; **p<0.01; ***p<0.001.

[a] Reference category is married females living only with spouse.

[b] Reference category is whites.

[c] Higher values indicate poorer health.

[d] Reference category is average SES.

[e] Higher values indicate poorer health.

disability in 2004. In Model 5, age, self-rated adult health, lung disease, psychiatric condition, stroke and weight significantly increase the probability of experiencing onset of ADL disability. Hypertension and cancer significantly decrease the probability of experiencing onset in 2004. I speculate that this reduced probability in experiencing the onset of disability may be due to medical intervention. Individuals diagnosed with hypertension or cancer may receive medication and other treatments that decrease the likelihood of experiencing onset of disability.

Table 5 presents the estimated coefficients from binary logistic regressions on the probability of experiencing the onset of specific ADL disabilities between 2002 and 2004. For the sake of brevity, only the full model for each dependent variable is shown, separately by gender. Age and self-rated health in 2002 are the only consistently significant predictors of onset of any ADL disability among males and females. Asset complexity decreases the probability of onset of bathing, eating, walking, and transfer disabilities for females, but has no effect on males. The probability of single females living with children experiencing onset of dressing disability is significantly greater than the probability of married females living only with a spouse, while married females living with children have a greater likelihood of experiencing the onset of eating disability. These relationships are not present among males.

Among the medical conditions, hypertension, lung disease, heart condition, and depression are not significant in predicting the probability of onset of any ADL disability for females. Comparing Table 5 results for females with the results presented in Table 3 of the aggregate measure ADL disability, it

Table 4: Results of Logistic Regression on the Probability of Onset of any ADL Disability between 2002 and 2004 for Males

	Model 1	Model 2		Model 3		Model 4		Model 5	
Living Arrangements[a]									
Married, Children	0.115	0.291		0.297		0.238		0.265	
Married, Others	-0.166	0.016		0.027		-0.021		0.282	
Single, Alone	0.284	-0.030		-0.047		-0.115		-0.040	
Single, Children	0.324	0.112		0.094		-0.027		-0.003	
Single, Others	0.121	0.151		0.175		0.147		0.563	
Demographic Characteristics									
Black[b]		0.391		0.330		0.114		0.190	
Hispanic[b]		0.222		0.170		-0.090		0.075	
Age		0.096	***	0.096	***	0.093	***	0.109	***
Childhood Characteristics									
Self-Rated Health[c]				0.061		0.037		-0.034	
High SES[d]				-0.328		-0.229		-0.208	
Low SES[d]				0.180		0.135		0.137	
Adult Characteristics									
Adult Education						-0.042		0.010	
Assets						-0.056		-0.007	
Health in 2002									
Self-Rated Health[e]								0.556	***
Hypertension								-0.323	*
Diabetes								0.062	
Cancer								-0.522	*
Lung disease								0.482	*
Heart Condition								-0.004	
Psychiatric Condition								0.507	*
Arthritis								0.188	
Stroke								0.741	**
Depression								0.171	
Weight								0.008	***
Current Smoker								0.016	
N	1805	1805		1805		1805		1805	
Pseudo R^2	0.002	0.063		0.066		0.070		0.148	

*p<0.05; **p<0.01; ***p<0.001.

[a] Reference category is married males living only with spouse.

[b] Reference category is whites.

[c] Higher values indicate poorer health.

[d] Reference category is average SES.

[e] Higher values indicate poorer health.

appears that the significant medical conditions found for predicting aggregate ADL disability (arthritis, stroke, and weight) operate by affecting an individual's ability to dress, walk, transfer, and toilet. Among the medical conditions for males, hypertension, psychiatric conditions, arthritis, depression, and being a current smoker (in 2002) do not significantly predict any of the ADL disabilities. It is difficult to distinguish which disabilities account for the significance seen in the aggregate measure of male ADL disability presented in Table 4.

Table 5: Results of Logistic Regression on the Probability of Onset of Specific ADL Disabilities between 2002 and 2004 for Females & Males

	Bathing				Dressing			
	Females		Males		Females		Males	
Living Arrangements[a]								
Married, Children	-0.002		0.589		0.092		0.211	
Single, Alone	0.032		0.076		0.110		-0.102	
Single, Children	-0.038		0.089		0.416	*	0.116	
Married/Single, Others	0.002		-0.509		0.309		0.476	
Demographic Characteristics								
Black[b]	0.002		0.375		0.286		0.061	
Hispanic[b]	-0.431		-0.127		-0.159		0.359	
Age	0.084	***	0.090	***	0.072	***	0.088	***
Childhood Characteristics								
Self-Rated Health[c]	0.012		0.003		-0.005		-0.021	
High SES[d]	0.321		-0.064		-0.080		-0.030	
Low SES[d]	-0.063		0.192		-0.038		-0.005	
Adult Characteristics								
Adult Education	-0.012		0.013		0.004		0.001	
Assets	-0.156	**	-0.086		-0.060		-0.007	
Health in 2002								
Self-Rated Health[e]	0.486	***	0.564	***	0.580	***	0.437	***
Hypertension	0.115		-0.065		0.054		-0.155	
Diabetes	0.368	*	0.683	**	0.321	*	0.187	
Cancer	-0.108		-0.554	*	0.033		-0.535	*
Lung disease	0.079		0.732	**	0.078		0.243	
Heart Condition	0.066		0.087		-0.121		-0.102	
Psychiatric Condition	0.197		-0.238		0.343	*	0.368	
Arthritis	0.131		-0.052		0.568	**	0.170	
Stroke	0.224		0.724	**	0.383	*	0.985	***
Depression	0.128		0.113		0.267		0.317	
Weight	0.003		0.000		0.006	**	0.006	*
Current Smoker	0.230		0.141		-0.136		0.339	
N	3193		2102		4287		2944	
Pseudo R^2	0.126		0.151		0.400		0.109	

*p<0.05; **p<0.01; ***p<0.001.

[a] Reference category is married females/males living only with spouse, respectively.

[b] Reference category is whites.

[c] Higher values indicate poorer health.

[d] Reference category is average SES.

[e] Higher values indicate poorer health.

(CONTINUED)

Table 5

	Eating				Walking			
	Females		Males		Females		Males	
Living Arrangements[a]								
Married, Children	0.901	*	0.114		-0.099		0.385	
Single, Alone	-0.264		-0.392		-0.071		0.440	
Single, Children	0.139		0.239		0.047		0.330	
Married/Single, Others	0.547		-1.215		-0.013		-0.741	
Demographic Characteristics								
Black[b]	-0.221		0.671		0.247		0.667	*
Hispanic[b]	-0.732		0.491		-0.453		-0.861	
Age	0.076	***	0.078	***	0.093	***	0.081	***
Childhood Characteristics								
Self-Rated Health[c]	0.127		0.048		-0.046		0.061	
High SES[d]	-0.328		0.591		0.500		0.060	
Low SES[d]	-0.118		0.356		0.037		-0.179	
Adult Characteristics								
Adult Education	-0.009		0.051		-0.003		0.027	
Assets	-0.201	**	-0.116		-0.121	*	-0.055	
Health in 2002								
Self-Rated Health[e]	0.424	***	0.579	***	0.584	***	0.389	***
Hypertension	-0.207		0.053		0.208		0.107	
Diabetes	0.138		0.460		0.219		0.224	
Cancer	-0.057		-0.576		0.140		-0.271	
Lung disease	-0.250		-0.021		0.017		0.281	
Heart Condition	-0.044		0.125		0.225		0.559	**
Psychiatric Condition	0.266		-0.055		0.043		-0.082	
Arthritis	0.118		0.055		0.693	**	0.401	
Stroke	0.567	*	1.189	***	0.607	**	0.853	**
Depression	0.379		-0.009		0.219		0.415	
Weight	-0.004		-0.008		0.006	**	-0.003	
Current Smoker	-0.414		0.112		0.618	*	0.277	
N	3410		2156		3205		2086	
Pseudo R^2	0.124		0.153		0.173		0.155	

*p<0.05; **p<0.01; ***p<0.001.

[a] Reference category is married females/males living only with spouse, respectively.

[b] Reference category is whites.

[c] Higher values indicate poorer health.

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[e] Higher values indicate poorer health.

(CONTINUED)

Table 5

	Transfer				Toileting			
	Females		Males		Females		Males	
Living Arrangements[a]								
Married, Children	0.261		0.586		0.138		-0.509	
Single, Alone	-0.075		0.024		0.105		-0.220	
Single, Children	0.262		-0.347		0.109		0.397	
Married/Single, Others	-0.318		-0.247		-0.303		-0.877	
Demographic Characteristics								
Black[b]	-0.053		0.326		0.281		0.382	
Hispanic[b]	-0.533		0.010		-0.320		0.155	
Age	0.066	***	0.060	***	0.051	***	0.063	***
Childhood Characteristics								
Self-Rated Health[c]	0.073		0.031		0.110		0.086	
High SES[d]	-0.111		-0.752		-0.222		-0.195	
Low SES[d]	-0.244		0.110		-0.160		-0.087	
Adult Characteristics								
Adult Education	-0.012		0.022		0.024		0.028	
Assets	-0.245	***	-0.078		-0.101		-0.117	
Health in 2002								
Self-Rated Health[e]	0.516	***	0.669	***	0.396	***	0.383	**
Hypertension	0.015		-0.074		-0.077		-0.180	
Diabetes	0.367	*	-0.194		-0.002		0.230	
Cancer	-0.068		-0.153		0.360	*	-0.242	
Lung disease	-0.102		0.445		0.022		0.020	
Heart Condition	-0.120		0.081		-0.075		0.295	
Psychiatric Condition	0.331		0.245		0.024		-0.201	
Arthritis	0.481	*	0.338		0.841	***	0.126	
Stroke	0.189		0.766	**	0.559	**	0.784	**
Depression	0.158		0.037		0.292		0.429	
Weight	0.007	**	0.003		0.003		0.002	
Current Smoker	0.196		-0.426		-0.040		-0.127	
N	3280		2107		3221		2139	
Pseudo R^2	0.141		0.136		0.099		0.097	

*p<0.05; **p<0.01; ***p<0.001.

[a] Reference category is married females/males living only with spouse, respectively.

[b] Reference category is whites.

[c] Higher values indicate poorer health.

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DISCUSSION

In this thesis, I provide insight to better understand the onset of disability in old age as a result of life course experiences and medical conditions. While the proximate determinants of disability are strictly health issues, these health issues are in part due to factors experienced over the life course. I incorporate the health conditions last in the models because I first look at the life course experiences, which lead to both health conditions and disability. In other words, in the full models I tested the life course perspective combined with the medical model, for men and women. I show that the explanatory power of the life course perspective is much more useful in explaining the onset of disability among women; for men, the medical model is better able to explain the onset of disability.

As reported in Table 2, the average respondent reported between excellent and very good health in childhood. Poor health in childhood may truncate the lives of individuals; if this is the case, these individuals would have experienced mortality prior to age 65 and would not be included in the analyses. This mortality selection may operate more strongly among men than women since males throughout the life course experience higher rates of mortality than females for most major causes of death (Newman and Brach, 2001). This would explain why the medical model works better for males than for females. My findings also suggest the need to study individuals prior to age 65 in order to fully incorporate a life course approach to studying the transition from a condition of health to one of disability.

In this thesis, I also explored the impact of different types of living arrangements on ADL disability among the elderly, both in the aggregate and individually. While no significant effect was found for the aggregate measure, single females living with children had an increased probability of experiencing the onset of dressing disability, and married females living with a spouse and children had an increased probability of experiencing the onset of eating disability. This, again, suggests the utility of using individual disabilities in research and policies designed to promote independent living among elderly individuals. However, the possibility that the significance seen is due to chance cannot be ruled out.

While the impact of living arrangements on disability is found to be only marginally significant in this thesis, it is important to note that all effects that are seen are for females. For example, the baseline model predicting ADL disability, which only included living arrangements, showed no significance for males. In contrast, single females in all three types of living arrangements showed an increased probability of experiencing onset of ADL disability compared to married females living only with a spouse. While this relationship was eliminated with the addition of controls, the importance of gender differences in different types of living arrangements on health, including disability, should be further explored.

The current trend of low fertility coupled with the aging population will result in a society in which smaller proportions will be available to care for or to financially support an increasing number of elderly individuals. As the burden of caring for the elderly shifts more towards the family (United Nations, 2001), the

importance of understanding the impact of family care-giving will increase. The impact of different types of living arrangements on elderly individual's health needs to be fully understood so that if there is a differential impact of living arrangements on health, policies may be implemented to promote the living arrangements that ensure optimal health for the elderly.

In this thesis, I also explored the possibility that using an aggregate measure of ADL disability may be masking important differences in the etiologies of the individual disabilities. My results suggest that it is important to distinguish between specific disabilities rather than using a summary measure of disability. Age and self-rated adult health are the only two variables that consistently predict each individual disability; therefore, programs designed to delay the onset of disability in the elderly that use an aggregate measure of ADL disability may be overlooking targeted treatments which could lead to more effective preventative measures.

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VITA

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