

COMMUNITY-DWELLING OLDER ADULTS: SERVICES, COST, AND CHANGES

A Dissertation

by

SZU-HSUAN LIN

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Chair of Committee,	Darcy McMaughan
Committee Members,	Robert Ohsfeldt
	Bitu Kash
	Bethany DeSalvo
Head of Department,	Michael Morrisey

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ABSTRACT

With every generation living longer than the last, and the baby boomer generation (one of the largest generations in US history) starting to reach age 65, the demographics of the United States (U.S.) is aging. Older adults are one of the fastest growing segments of the United States population. In 2011, thirteen percent of all people in the U.S. were over the age of 65, and this population is projected to represent almost one quarter of the total US population by 2060. With advanced age and an increased prevalence of chronic illness and disabilities, the older adults' population will require routine health care services to improve and maintain optimal health. Enhancing and maintaining the health of older adults is key to reducing cost and disease burden in the United States.

Thus, with the goal of improving the health, function, and quality of life of older adults, the *Health People 2020* proposed numerous objectives targeting the use of preventive services and long-term services and supports. This dissertation consists of three related components; each of which will broaden the understanding of the use of health care services among community-dwelling older adults. The first study examines the association between psychological distress and the utilization of United States Preventive Services Task Force (USPSTF) recommendations on preventive care services among community-dwelling older adults. The study uses the 2011 Medical Expenditure Panel Survey (MEPS) for analysis, and the results show that community-dwelling older adults with psychological distress were less likely to use one, but not all, of the

recommended preventive health services. The second study examines the healthcare cost associated with sensory difficulties. Sensory difficulties are common among older adults, and the prevalence is shown to increase with age. Using five MEPS panel data, the results show that community-dwelling older adults with sensory difficulties have higher utilization of office-based visits, emergency room visits, and prescription medications, and higher spending on office-based visits. Using the two most recent 2000 and 2007 National Home and Hospice Care Survey (NHHCS) data, the third study investigates the change in home health care utilization among community-dwelling older adults since the Supreme Court's 1999 *Olmstead v. L.C.* ruling, which indicated that states should ensure that persons with disabilities are treated in the most integrated setting appropriate to their needs. The findings suggest significant changes in patient characteristics, functional status, and service utilized.

This research improves the understanding of the healthcare cost and health services utilization of community-dwelling older adults. The research findings suggest that there are still unmet health care needs that can be provided to older adults living in the community.

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TABLE OF CONTENTS

	Page
ABSTRACT	ii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF FIGURES.....	vii
LIST OF TABLES	viii
CHAPTER I INTRODUCTION	1
CHAPTER II THE EFFECTS OF PSYCHOLOGICAL DISTRESS ON THE USE OF PREVENTIVE HEALTH SERVICES BY COMMUNITY-DWELLING OLDER ADULTS	7
Background	7
Method	11
Results	16
Discussion	22
CHAPTER III THE IMPACT OF SENSORY DIFFICULTIES ON HEALTH SERVICES USE AND HEALTH CARE EXPENDITURES AMONG COMMUNITY-DWELLING OLDER ADULTS	27
Background	27
Methods.....	30
Results	35
Discussion	42
CHAPTER IV CHANGES IN HOME HEALTH PATIENT CHARACTERISTICS, ACTIVITY LIMITATIONS AND SERVICE UTILIZATION: USING THE 1998 AND 2007 NATIONAL HOME AND HOSPICE CARE SURVEY.....	46
Background	46
Method	51
Result.....	53
Discussion	59
CHAPTER V CONCLUSION	63

REFERENCES.....66

LIST OF FIGURES

	Page
Figure 1. Unweighted sample by sensory status among community-dwelling older adults.....	36
Figure 2. Historical and projected national expenditure on home health care	49

LIST OF TABLES

	Page
Table 1. Preventive care service recommendations by population by gender and age	17
Table 2. Weighted prevalence estimates of socio-demographic characteristics, by level of psychological distress. Older adults age 65+.....	19
Table 3. Unadjusted and adjusted estimates of effect of psychological distress on community-dwelling older adult’s utilization of various preventive care services	21
Table 4. Weighted prevalence estimates of sociodemographic characteristics in Y2 among community-dwelling older adults without sensory difficulties in Y1, by Y2 sensory status	37
Table 5. Percent utilization of health services by sensory status	39
Table 6. Two-part model of any healthcare expenditure and excess healthcare expenditure associated with sensory difficulties	41
Table 7. Incremental healthcare cost associated with sensory difficulties.....	42
Table 8. Population estimates and percent distribution of home health care recipients 65 years and older by selected sociodemographic characteristics, ADL assistance needed, and health status. NHHCS 1998 and 2007	53
Table 9. Home health care services utilization	58
Table 10. Types of home health agency that home health recipients received services from.....	59

CHAPTER I

INTRODUCTION

According to 2010 Census data, the total United States (U.S.) population consisted of over 308 million people, and 13% of the people in the population were over the age of 65 (U.S. Census Bureau, 2011a). With the baby boomer generation approaching the age of 65, the over 65 years of age segment of the U.S. population is increasing rapidly. It is estimated that by the 2060, those aged 65 and over will represent nearly a quarter of the total US population (U.S. Census Bureau, 2014). At the same time, the 18 to 64 years old population is projected to decrease from 63% in 2010 to 57% in 2060. With people living longer than those before, many older adults are living with age-related physical or mental health challenges that affect their ability to live autonomously. The country's healthcare programs and disability/aging programs struggle to meet the ever-growing demand for age related services due to the aging of the U.S. population. (Centers for Disease Control and Prevention, 2011a). These programs and services include, but not limited to, social safety nets programs (Supplemental Security Income (SSI), Medicare), home and community-based supports and services, long term supports and service, residential care, and geriatric specialty services.

Along with age-related health changes, chronic illness and related disabilities are an overwhelming concern among older adults. In 2012, more than 35 million (85.8%) community-dwelling older adults were living with at least one chronic condition, and over 25 million (60.8%) had multiple (≥ 2) chronic conditions (MCC) (Ward & Schiller, 2013). Heart disease and cancer are the two most common chronic conditions among the

older adults population (Centers for Disease Control and Prevention, 2015). Many of these chronic conditions are preventable through proper preventive measures.

A number of federal policies and action plans target the physical and mental health of older adults in the United States. Since 1984, The U.S. Preventive Services Task Force (USPSTF) has been working with prevention and evidence-based medicine to provide periodic clinical preventive services recommendations for people at different age groups (U.S. Preventive Services Task Force, 2014). These recommendations include screening, counseling, and preventive medications offered in primary care settings or services recommended by primary care providers (U.S. Preventive Services Task Force, 2014).

In the 1999 *Olmstead v. L.C.*, the U.S. Supreme Court ruled that the states violate Title II of the Americans with Disabilities Act when an individual with disabilities is treated in an institutional setting, when a least restrictive setting could appropriately serve the person ("*Olmstead v. L. C.*," 1999). The pressure from the ruling, along with the voices from consumers and providers, have reduced the utilization of nursing homes and psychiatric institutions and increases community-based care options and utilization, such as assisted living (Hawes & Phillips, 2007; Williams, 2000). With the speed at which the proportion of U.S. adults age 65 and older is increasing, the Centers for Disease Control and Prevention (CDC), the nation's leading public health agency, has developed five priorities to promote the well-being of older adults. These priorities include: 1) promote healthy lifestyle behaviors, 2) increase the use of clinical preventive services, 3) address cognitive impairment, 4) address mental health-related issues, and 5)

provide better education for serious illness preparation (Centers for Disease Control and Prevention, 2011a). These priorities are established to assist older adults to live “long, productive, and independent lives” (Centers for Disease Control and Prevention, 2011a, p. 3). Although a small percentage of older adults receive care and treatments for their illnesses or disabilities through residential care facilities, a majority of older adults are living in and prefer living in their own homes. In 2013, over 95% of older adults over the age of 65 resided in a non-institutional setting (Administration on Aging, 2014). With the passage of Patient Protection and Affordable Care Act (PPACA) in 2010, many preventive care services are now covered without cost-sharing (Department of Health & Human Services, 2012).

For older adults receiving long-term care services in the community, home health agencies provide formal and community-based long-term supports and services. In 2010, an estimated 12 million people in the US received some type of home health care service (National Association for Home Care & Hospice, 2010). A majority of the home health care recipients were older adults (over 68% in 2007), and many of them (about 16.0% in 2008) used home health care services to help with post-hospital care, chronic condition management or disabilities (Medicare Payment Advisory Commission, 2008; National Association for Home Care & Hospice, 2010). Home health is an essential part of the U.S. healthcare system. However, no previous research has investigated the change in patient characteristics among those older adults who used home health services after the Supreme Court’s 1999 *Olmstead v. L.C.* ruling, which indicated that states should ensure that persons with disabilities are treated in the most integrated setting appropriate to their

needs. The *Olmstead* decision changed the health care system in the U.S. by putting a focus on treating patients in their communities and not in a centralized residential care facility, resulting in an accelerating growth of community-based long-term care services.

To better understand the rapid change and needs of the older adult population in the U.S. and to provide necessary health care services tailored to this population, this dissertation examines the utilization of different health care services among community-dwelling older adults. Using the most up-to-date recommendations provided by the USPSTF, the first study of this dissertation examines the effects of psychological distress on the utilization of preventive care services among older, community-dwelling adults. The study uses the 2011 Medical Expenditure Panel Survey (MEPS) to examine the difference in receiving timely preventive care among community-dwelling older adults with and without psychological distress. We hypothesize that: Community-dwelling older adults with psychological distress are less likely to receive recommended preventive care services compared to those without psychological distress. The finding will provide information on whether psychological distress is a barrier to receiving timely preventative care services among community-dwelling older adults.

The second study examines health service utilization and healthcare costs associated with sensory difficulties. Sensory difficulties are common among older adults, and the prevalence of sensory difficulties increases with age (World Health Organization, 2011). Using five MEPS panel data, the study explores the differences in health services utilization and healthcare expenditures by community-dwelling older adults' sensory status. We hypothesize that 1) Community-dwelling older adults who

reported sensory difficulty in Year 2 used more healthcare services compared to those who did not report sensory difficulties in Year 2, and 2) Compared to community-dwelling older adults who did not report sensory difficulties in Year 2, older adults who reported sensory difficulties in Year 2 had higher healthcare expenditures.

The third study in this dissertation uses the 1998 and 2007 National Home and Hospice Care Survey (NHHCS) data to investigate the change in home health care utilization among community-dwelling older adults before and after the Supreme Court's 1999 *Olmstead v. L.C.* ruling, which indicated that states should ensure that persons with disabilities are treated in the most integrated setting appropriate to their needs. We hypothesize that there are demographic and services use changes among community-dwelling older adults who use home health care services between 1998 and 2007.

Andersen's health care utilization model was used as the framework for this dissertation to examine the utilization of different health care services among older adults. This health care utilization model suggested that "people's utilization of health services is a function of their predisposition to use services, factors, which enable or impede use, and their need for care" (Andersen, 1995, p. 1). For each paper we include the predisposing characteristics, enabling resources and health need variables to analyze the utilization of health care services.

The findings of this dissertation are expected to show health services utilized among community-dwelling older adults and also provide strategies for improving existing public health infrastructure and health care systems. The goals of this

dissertation are to suggest strategies for the improvement of the U.S. healthcare delivery system and to provide better healthcare services to community-dwelling older adults.

CHAPTER II

THE EFFECTS OF PSYCHOLOGICAL DISTRESS ON THE USE OF PREVENTIVE HEALTH SERVICES BY COMMUNITY-DWELLING OLDER ADULTS

Background

On March 23, 2010, President Barack Obama signed the Patient Protection and Affordable Care Act (PPACA) into law. The PPACA was designed to expand health coverage, lower medical cost, and improve the health care delivery system (The Henry J. Kaiser Family Foundation, 2013). One of the major provisions of the PPACA is the coverage of preventive health care (PPACA HR3590, Title I, Sec. 2713: Coverage of preventive health). The PPACA requires *new* health plans to provide a minimum coverage for preventive services without cost-sharing, these services includes shots and screening tests. It also requires Medicare and state Medicaid programs to eliminate cost-sharing of preventive services with a grade A or B from the U.S. Preventive Services Task Force (HealthCare.gov, n.d.; The Henry J. Kaiser Family Foundation, 2013).

Preventive services attempt to prevent and detect diseases at early stages when treatment can be more effective (Centers for Diseases Control and Prevention, 2012). Studies indicate that early detection of preventable diseases, such as colorectal cancer and high blood pressure, can reduce risk of major harm and reduce mortality (U.S. Preventive Services Task Force, 2007, 2008). To promote the overall health of Americans and increase the utilization of preventive services, the United States Preventive Services Task Force (USPSTF) recommends a range of evidence-based

preventive services for children, adolescents, and adults (U.S. Preventive Services Task Force, 2014). Recommended preventive services that are shown to have substantial net benefits receive a grade “A” recommendation, and those with moderate to substantial benefits receive a “B” recommendation (U.S. Preventive Services Task Force, 2013b). Utilization of grade “A” and grade “B” recommendations by older persons are critically important due to the expected rapid increase in the elderly population in the U.S. In 2010, 13 percent of the total US population was aged 65 and over, and this number is expected to reach almost 25 percent by year 2060 (U.S. Census Bureau, 2011a, 2014). Compared to their younger counterparts, adults aged 65 and older have higher risk of developing chronic conditions and disabilities, and many disease risk factors, such as blood pressure and blood cholesterol, increase with age (Villareal et al., 2006).

To maintain the health of this rapidly increasing segment of the U.S. population, the USPSTF has provided specific recommendations on the use of preventive care for adults aged 65 and older (U.S. Preventive Services Task Force, 2013a). Such services include, but are not limited to, lipid disorders screening, blood pressure screening, colorectal cancer screening, breast cancer screening and adult immunizations (U.S. Preventive Services Task Force, 2013a). These services have been recommended by experts and have significant effects on health as well as health care costs (Centers for Disease Control and Prevention, Administrative on Aging, Agency for Healthcare Research and Quality, and Centers for Medicare and Medicaid Services, 2011; Woolf & Campos-Outcalt, 2013).

Increasing current rates of preventive health services use can potentially save the country valuable resources, as well as preventing many causes of premature deaths in the future. In a 2006 study, investigators found that increased use of proven clinical preventive services could have saved more than two million lives in the United States in 2006, and the increased use of these preventive services could have result in cost-savings of almost 4 billion US dollars in health care cost (Maciosek, Coffield, Flottemesch, Edwards, & Solberg, 2010). However, despite evidence suggesting that preventive health care can prevent diseases and prolong life, utilization of many of these preventive services are low among older adults (Centers for Disease Control and Prevention, Administrative on Aging, Agency for Healthcare Research and Quality, and Centers for Medicare and Medicaid Services, 2011). Several factors are shown to affect people's receipt of preventive care services. Previous research indicates that language (Woloshin, Schwartz, Katz, & Welch, 1997), insurance coverage (Powell-Griner, Bolen, & Bland, 1999), financial status (Ross, Bradley, & Busch, 2006), living arrangement (Lau & Kirby, 2009), and health comorbidities (Wee, McCarthy, Davis, & Phillips, 2000) can play a role in determining the difference in the use of preventive service care.

Psychological distress is another potential barrier to people's receipt of preventive care services. The term "psychological distress" is often used to describe the "unpleasant subjective states of depression and anxiety, which have both emotional and physiological manifestations" (Mirowsky & Ross, 2012, p. 8). Researchers have also identified mental illness as a significant public health concern in the United States (Centers for Disease Control and Prevention, 2011b). About 20% of older adults over the

age of 55 have mental illness, with the most common conditions being anxiety and mood disorders (American Psychological Association, n.d.; Centers for Disease Control and Prevention, 2008b). Previous studies have found negative association between psychological distress and receipt of some preventive health services among non-elderly population (Carney & Jones, 2006; Kodl et al., 2010; Pirraglia, Sanyal, Singer, & Ferris, 2004). However, the relationship between psychological distress and preventive health services among older adults has not been fully studied.

Few studies have focused on the utilizations of preventive care services among older adults. Previous studies found that older adults with psychological distress were less likely to receive an influenza vaccination, dental checkup, and clinical breast examination (for women) when compared to older adults without psychological distress (Thorpe, Kalinowski, Patterson, & Sleath, 2006), and older adults with mental health problem were less likely than those without mental health problem to use high number of preventive services (Ozminkowski et al., 2006). Both studies used data from 2001, and since then, the U.S. Preventive Services Task Force has included new or updated evidence-based recommendations in the *Guide to Clinical Preventive Services, 2012* (U.S. Preventive Services Task Force, 2012a).

This study uses the newly updated clinical preventive services guidelines to examine the effects of psychological distress on the utilization of preventive care services among older, community-dwelling adults in 2011. This study includes preventive services recommended for older adults with specific age specification, as well as the national estimates of older adults using each preventive care service.

Method

Sample

The sample included respondents 65 years of age or older who participated in the Medical Expenditure Panel Survey (MEPS) in 2011. MEPS is a panel survey of a representative sample of the noninstitutionalized US population from age 0 and above. MEPS collects data from a nationally representative sample of households on the use of specific health services, frequency of use, cost of services, and other information. MEPS contains two major component: the Household Component (HC) and the Insurance Component (IC), and the samples in the HC dataset are drawn from a nationally representative subsample of households that participated in the prior year's National Health Interview Survey (NHIS) (Agency for Healthcare Research and Quality, 2009). The HC dataset includes core MEPS survey and the medical conditions file which includes household-reported medical conditions. We extracted data from the 2011 consolidated Household Component (HC) and Medical Conditions (MC) data files of the MEPS. The 2011 MEPS consisted of a total of 35,313 individuals, and 4,035 individuals (11.4%) were over the age of 65.

Measurement

This study uses Andersen's (1968) health care utilization model to examine older persons' utilization of preventive care services. This health care utilization model suggested that "people's utilization of health services is a function of their predisposition to use services, factors, which enable or impede use, and their need for care" (Andersen, 1995, p. 1). Predisposing characteristics include a person's demographic characteristics

(age, gender), social structure (occupation, education, ethnicity) and health beliefs factors (knowledge and attitude toward health services). Enabling factors encourage or impede a person's use of health services; such factors include income, health insurance, and regular source of care. Need-based characteristics include a person's perceived needs for health services and clinically evaluated need. Such characteristics include a person's Charlson Comorbidity Index, physical health status, body mass index (BMI), and smoking status.

Dependent variables

Respondents were asked "how long since last X?", "when was your last X?", or similar questions for five preventive services, and the responses were re-coded into "within the recommended time period" or "not within the recommended time period", according to USPSTF's recommendation. The five preventive care services included in this study are:

1. Breast cancer screening using mammogram for women,
2. Colorectal cancer screening using fecal occult blood test (FOBT), sigmoidoscopy, or colonoscopy,
3. Adult immunization (influenza vaccination),
4. Blood pressure screening, and
5. Blood cholesterol

The first three preventive care services are specifically recommended for adults age 65 and older by the USPSTF, while the last two screening are recommended due to the high prevalence of the conditions and the high likelihood the conditions could cause

significant adverse health outcomes. Since the study aims to analyze the effect of psychological distress on primary and secondary prevention, older adults who have previous history of breast cancer, colorectal cancer, high blood pressure, or high cholesterol were excluded from each of the specific analysis of the preventive care services that the tests were intended to screen for (e.g. for breast cancer screening, all male, older female over age of 75, and older women with history of breast cancer were excluded from the study).

Independent variables

The primary independent variable in this study was the presence of psychological distress. The Mental Component Summary (MCS) of the Short Form 12 (SF-12) in the MEPS was used to measure the level of psychological distress. The SF-12 is the shorter version of the SF-36, and it has been found to have good reliability and internal consistency when used in older adults population (Resnick & Nahm, 2001). The MCS score ranges from 0 to 100, with higher scores corresponding to better mental health. The cut-off score of 42 or below indicates the presence of psychological distress and symptoms of depression (Baum et al., 2000; Clark et al., 2009; O'Connell, Heslop, & Fennessy, 2010). The cut-off point of 42 has 74% sensitivity and 81% specificity in correctly identifying individuals with depression disorder (Ware, Kosinski, & Keller, 1994).

Covariates included in this analysis were measures of predisposing, enabling and need-based characteristics. Predisposing characteristic variables included age, gender, race (non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, non-Hispanic

others, and Hispanic), marital status (married, not married), education (less than high school, high school graduate/GED, greater than high school), and respondents' health belief in overcoming illness without help from a medically trained person (from strongly disagree to strongly agree). Enabling characteristic variables included in the analysis are employment status (employed, not employed), poverty status (poor, near poor, low income, middle income, high income), usual source of care (yes, no), health insurance (have any private insurance, have public insurance only, and uninsured), region (Northeast, Midwest, South, and West), and residence in a metropolitan statistical area (MSA) (In an MSA, not in an MSA). Need-based characteristics included respondents' health status and level of impairment, such as respondents' Charlson Comorbidity Index, SF-12 Physical Component Summary Score, body mass index (underweight, normal, overweight, and obese), and respondents' smoking status (yes, no).

The D'Hoore adaptation of the Charlson Comorbidity Index (D'Hoore, Bouckaert, & Tilquin, 1996) was used to measure risk adjustment and disease burden. The Medical Conditions (MC) data file of MEPS provides household-reported medical conditions, and to ensure confidentiality, the fully-specified ICD-9-CM codes were collapsed to the first 3 digits of the ICD-9-CM code (Agency for Healthcare Research and Quality, 2013b). To calculate the Charlson comorbidity score, the 3-digits ICD-9-CM code was used for analysis and different weights are applied to different comorbid conditions (D'Hoore et al., 1996). The 17 comorbid conditions included in the Charlson Comorbidity Index were 1) myocardial infarction, 2) congestive heart failure, 3) peripheral vascular disease, 4) dementia, 5) cerebrovascular disease, 6) chronic

pulmonary disease, 7) connective tissue disease, 8) ulcer disease, 9) mild liver disease, 10) diabetes, 11) hemiplegia, 12) moderate or severe renal disease, 13) any tumor, 14) leukemia, 15) lymphoma, 16) moderate or severe liver disease, and 17) metastatic tumor.

Data analysis

Descriptive analyses were conducted using chi-square analysis to provide a summary of the characteristics of community-dwelling older adults in 2011, followed by bivariate analyses to examine the relationship between psychological distress and each preventive care service. Multivariate logistic regression analyses on each preventive service were conducted separately to evaluate the association between psychological distress and each preventive care service after adjusting for confounders. Data were analyzed using the Stata's "svy" procedure and incorporate survey sampling weight, primary sampling units and strata variables. Standard errors were adjusted, using Taylor linearization, to account for the effects of the complex sampling design. Responses such as "not ascertained", "don't know", and "refused" were coded as missing values.

Missing values rates were less than 5%. Although there is no established cut-off point for acceptable missing data in the dataset to provide valid statistical inferences, research suggests that analyses with data missing more than 10% are likely to be biased (Bennett, 2001). In this analysis, we are being conservative and use Schafer's (1999) suggested limit for missing values in the dataset (5%). Respondents with answer "inapplicable" were usually due to age or gender requirement (for example, question regarding use of mammogram was asked to women over age of 29 and female only. Male gender is coded

“inapplicable” for that particular question). All analyses were conducted using Stata 12 statistical analysis software (StataCorp, 2011).

Results

The 2011 MEPS data contained 3,658 older adults with valid responses, representing 41.8 million older adults age 65 and older living in the United States in 2011. Table 1 summarizes the five preventive care services included in this study and their population estimates. The USPSTF provides specific gender, age, and frequency of screening recommendations for each of the preventive health service.

Table 1. Preventive care service recommendations by population by gender and age

Preventive Health Service	Gender	Age	Suggested frequency of screening	Exclusion criteria	n included in analysis*	Weighted N
Breast cancer screening (B) using mammogram	F	65-74	Every two years	Male Female with history of breast cancer	920	10,286,912
Colorectal cancer screening (A) using FOBT, sigmoidoscopy, or colonoscopy	M,F	65-74	FOBT: every year Sigmoidoscopy: Every 5 years Colonoscopy: Every 10 years	History of colorectal cancer	1,955	22,678,674
Influenza vaccination (B)	M,F	65+	Every year		3,218	37,349,016
Blood pressure screening(A)	M,F	65+	Every year	History of high blood pressure	973	11,940,257
Blood Cholesterol screening (A)	M,F	65+	Every 5 years	History of high blood cholesterol	1,226	13,795,746

*A total of 3,658 older adults were included in the analysis. For each preventive health services, older adults who met the exclusion criteria were excluded in that particular analysis of preventive health service.

Table 2 summarizes predisposing, enabling and need-based covariates of the study population, stratified by psychological status. We used chi-square test to compare those with psychological distress to those without. Compared to older adults without psychological distress, older adults with psychological distress were older, less likely to be White, not married, and had only some high school education. Older adults with psychological distress were also more likely to be unemployed and be in the middle income or less categories (less than 400% poverty guideline), and less likely to have any private insurance. Additionally, older adults experiencing psychological distress had higher Charlson Comorbidity Index scores, had worse physical summary scores from the Short-Form 12, less likely to be in the overweight category, and more likely to be a smoker. There were no significant differences in having usual source of care, respondents' residential locations, and their health belief when we compared older adults with psychological distress to the older adults without psychological distress. There was no statistically significant difference in gender composition between the psychological distressed and non-psychological distressed groups.

Table 2. Weighted prevalence estimates of socio-demographic characteristics, by level of psychological distress. Older adults age 65+ (n=3,658)

	Total (n=3,658) %	No psychological distress (n=2,972) %	Psychological distress (n=686) %	p-value*
Predisposing Characteristics				
<i>Age</i>				
Mean	74.0	73.9	74.8	0.007
<i>Gender</i>				
Female	55.6	55.2	57.5	0.410
Male	44.4	44.8	42.5	
<i>Race</i>				
White, non-Hispanic	79.4	80.4	74.0	0.001
Black, non-Hispanic	8.5	8.2	9.8	
Asian, non-Hispanic	3.6	3.6	3.6	
Other, non-Hispanic	1.2	1.1	1.9	
Hispanic	7.3	6.7	10.8	
<i>Marital Status</i>				
Married	56.1	57.6	48.7	0.002
Not married	43.9	42.4	51.5	
<i>Education Level</i>				
Some high school	17.6	15.6	28.4	0.000
High school graduate	49.3	49.4	48.6	
Greater than high school	33.1	35.1	23.0	
<i>Health Belief: Can overcome illness without medical help</i>				
Disagree strongly	64.2	63.5	68.2	0.076
Disagree somewhat	16.4	17.0	13.3	
Uncertain	7.0	6.7	8.2	
Agree somewhat	9.6	10.0	7.3	
Agree strongly	2.8	2.8	3.0	
Enabling Characteristics				
<i>Employment status</i>				
Employed	20.4	22.1	12.0	0.000
Not employed	79.6	77.9	88.0	
<i>Poverty Level</i>				
Poor	8.6	7.8	12.8	0.000
Near poor	5.9	5.2	9.7	
Low income	17.6	16.9	20.9	
Middle income	31.2	31.0	32.3	
High income	36.7	39.1	24.3	

Table 2 (continued)

	Total (n=3,658) %	Psychological Status		p-value*
		No psychological distress (n=2,972) %	Psychological distress (n=686) %	
<i>Have a usual source of care</i>				0.492
Yes	93.4	93.6	92.6	
No	6.6	6.4	7.4	
<i>Have health insurance</i>				0.000
Have any private insurance	54.8	56.9	44.3	
Have public insurance only	44.7	42.7	54.7	
Uninsured	0.5	0.4	1.0	
<i>Region</i>				0.374
Northeast	19.2	19.5	17.2	
Midwest	22.1	22.6	19.8	
South	37.2	36.7	39.7	
West	21.5	21.2	23.3	
<i>Metropolitan Statistical Area (MSA)</i>				0.364
In an MSA	80.9	81.2	79.2	
Not in an MSA	19.1	18.8	20.8	
<i>Need-based Characteristics</i>				
<i>Charlson Comorbidity Index</i>				0.000
Mean	1.4	1.3	1.8	
<i>SF-12 Physical Component Summary Score</i>				0.000
Mean	42.3	43.2	37.4	
<i>BMI</i>				0.026
Underweight	2.0	1.7	3.3	
Normal	33.2	32.8	35.6	
Overweight	37.6	38.9	30.5	
Obese	27.2	26.6	30.6	
<i>Smoking status</i>				0.010
Yes	9.8	9.2	13.2	
No	90.2	90.8	86.8	

* Psychological distressed versus no psychological distresses using χ^2 .

Table 3 shows the unadjusted proportions of older adult using each preventive care service and adjusted odds ratio for each prevent care service. In both models, there were significant differences in the use of mammography for breast cancer screening, but not other preventive care services. The rate of utilization for the overall population ranged from almost 70% for influenza vaccination to nearly 94% in blood

cholesterol screening. Although older adults with psychological distress used less preventive care services, their rate of use ranged from 69% in influenza vaccination to 90% in blood cholesterol screening.

Table 3. Unadjusted and adjusted estimates of effect of psychological distress on community-dwelling older adult’s utilization of various preventive care services

Preventive Health Services	Unadjusted Estimates				Adjusted Estimates†	
	Overall sample	Percent older adults using the service			Odds Ratio	(95% CI)
		Not distressed sample	Distressed sample	p-value*		
Breast cancer screening	79.6	81.4	70.0	0.00	0.57‡	(0.34-0.95)
Colorectal cancer screening	75.7	76.6	70.4	0.07	0.80	(0.57-1.14)
Influenza vaccination	69.2	69.3	68.8	0.85	0.98	(0.75-1.30)
Blood pressure screening	90.2	90.7	86.5	0.25	0.67	(0.31-1.46)
Blood cholesterol screening	93.7	94.3	90.1	0.06	0.50	(0.24-1.05)

*Psychological distressed versus no psychological distresses using χ^2 .

† Adjusted odds ratios are weighted population estimates adjusted for predisposing, enabling, and need-based characteristics.

‡ Significant at $p < 0.01$

Due to potential multiple comparisons issues in our analyses, we applied the Bonferroni correction and reduced our significance level to 0.01. After adjusting for potential confounders, there was a statistically significant negative association between psychological distress and use of mammography for breast cancer screening (Table 3).

Older women with psychological distress were less likely than older women without psychological distress to have a biennial mammography for breast cancer screening.

Discussion

One of the important goals of the HealthyPeople 2020 is to “improve the health, function, and quality of life of older adults” (U.S. Department of Health and Human Services, 2013, para. 1). To improve the wellness and quality of life of older adults, the USPSTF has made special recommendations for older adults, and the PPACA has included provisions to cover minimum recommended preventive services and eliminate cost-sharing to encourage the utilization of preventive care services.

Previous studies found mental illness as a barrier to access to health care services (Kodl et al., 2010; Koroukian, Bakaki, Golchin, Tyler, & Loue, 2012; Pirraglia et al., 2004; Thorpe et al., 2006). Using a large, nationally representative sample of community-dwelling older adults, our results indicate statistically significant differences for older females in the utilization of mammogram for breast cancer screening. Older women who experience psychological distress are less likely to receive timely mammogram screening than those who are not distressed.

Our results show that older women with psychological distress were 43% less likely than those without psychological distress to receive biennial mammography. Women with depressive symptoms are more likely to be self-negligent, have self-defeating attitudes, lack of sense of control, and feelings of hopelessness, and these are some of the factor that shown to affect their use of breast cancer screening (Pirraglia et al., 2004). Our result is consistent with previous research that indicated psychological

distress predicates lower use of mammography for breast cancer screening (Carney & Jones, 2006; Husaini et al., 2001; Koroukian et al., 2012).

Utilization of mammography for breast cancer screening for older women should be improved in order to promote a longer life and reduce potential medical expenses. Studies recommended that strengthening physician-patient relationships (Friedman, Neff, Webb, & Latham, 1996) and using direct contact, such as telephone calls and letters of invitations (Friedman et al., 1996), may increase participation rate in use of mammography for breast cancer screening. Primary care physicians are often the point of contact for people with mental health issues (Masterson, Hopenhayn, & Christian, 2010; Unützer, Schoenbaum, Druss, & Katon, 2006), remind and encourage patients to receive regular mammography during their time of appointments, or create referral appointment for patients and follow up with their preventive care service schedule might increase the use of mammography for older women with psychological distress. Outreach services and culturally sensitive health promotion activities should also be considered when working with cultural diverse groups (Waites, 2012).

Although we hypothesized older adults with psychological distress received less recommended preventive care services compared to those without psychological distress, and our analysis results also shown the same patterns, our results show no statistically significant differences in the use of colorectal cancer screening, influenza vaccination, blood cholesterol screening, and blood pressure screening. These results differ from those found in previous studies (Kodl et al., 2010; Thorpe et al., 2006; Xiong, Iosif, Bermudes, McCarron, & Hales, 2010). One possible explanation for our

finding could be that the majority of older adults, regardless of mental health status, report having a usual source of care (93.7% among no psychological distress older adults vs. 92.5% among psychological distressed older adults) and have health insurance. Previous studies have found that having a usual source of care is significantly associated with receipt of preventive services (Blewett, Johnson, Lee, & Scal, 2008; DeVoe, Fryer, Phillips, & Green, 2003).

Another explanation for the non-significant differences in the use of preventive services among older adults with and without psychological distress can be attributed to the PPACA. The PPACA mandates health insurance plans to eliminate cost-sharing on some preventive care services, such as colonoscopy, flu shots, mammography, as well as provide a no-cost Annual Wellness Visit (AWV) for beneficiaries with Medicare (U.S. Department of Health & Human Services, 2012a). Starting on January 1, 2011, eligible Medicare beneficiaries are able to receive free (no copayment, no deductibles) AWV which could have played a positive role in the uptake of preventative services analyzed in our model. With an AWV, patients can create or update a personalized prevention plan service (PPPS) with a healthcare professional (U.S. Department of Health & Human Services, 2015). During the wellness visit, healthcare professionals review beneficiaries' health risk assessment (HRA), develop and review beneficiary's medical and family history, and conduct basic health assessment, such as measuring blood pressure, body mass index, and other routine health measurements. Health professionals also perform depression screening assessments and establish a written schedule following recommendations from the USPSTF and the Advisory Committee on

Immunizations Practices (ACIP) based on their age and medical/family history (U.S. Department of Health & Human Services, 2015).

Patient-physician relationships are an important factor in the use of recommended preventive services (O'Malley, Sheppard, Schwartz, & Mandelblatt, 2004). Have a usual source of care and insurance coverage can improve the willingness of individuals to seek regular medical services. According to the US Department of Health and Human Services, more than 30 million Medicare beneficiaries have received at least one or more preventive care services free of charge since the introduction of the PPACA (U.S. Department of Health & Human Services, 2012b), and older adults no longer have to worry about cost-sharing the recommended preventive care services. Future studies that employ a time series approach are needed to accurately elucidate trends in the uptake of preventive services resulting from this new benefit.

Our study's findings should be considered in light of several limitations. First, recall bias can be an issue in any retrospective study of health care utilization. Responses for both utilization of each preventive care services and respondents' psychological distress are self-reported. Older adults may not remember all the services that they have received in the past, especially when services have different recommended frequency of screening. For example, for colorectal cancer screening, the response options range from "within past year" to "more than 10 years". Psychological distress is measured using SF-12, and the score is generated based on respondent's responses to a series of questions. The questions require respondents to recall feelings and health conditions in the past four weeks. Second, high blood pressure and high cholesterol are conditions that are common

among the older population. We excluded older adults with history of high blood pressure and history of high blood cholesterol when analyze utilization of their relative screening services. The remaining population was relatively healthy compare to the excluded population. This may contributed to the non-significance results observed in our analysis for screening of blood pressure and blood cholesterol. Third, this study only includes five preventive care services that are recommended for older adult over the age of 65 by the USPSTF and mandated by PPACA without cost-sharing. Thus, the research finding should not be used in explaining of other preventive care services nor apply to other age groups. Forth, we used the recommendation provided by the USPSTF in this study, other organization, such as American Cancer Society, may have different guidelines and screening frequencies for different types of cancer. Individual should discuss with their health care providers to assess the need of screening and consider the benefits and harms of screening.

Despite these limitations, our research has several strengths. First, MEPS is a large national representative data set that provides national estimates of health care use, and our findings are generalizable to the community-dwelling older adults living in the United States. Second, the research applied the most updated recommendations from the USPSTF for older adults, with specific age range for each of the preventive care services and screening test intervals for each service. Future studies are needed to examine the long-term effect of the PPACA and the Annual Wellness Visit in promoting the routine utilization of USPSTF recommended preventive care services. Other types of preventive care services should also be examined in the future studies.

CHAPTER III
THE IMPACT OF SENSORY DIFFICULTIES ON HEALTH SERVICES USE AND
HEALTH CARE EXPENDITURES AMONG COMMUNITY-DWELLING OLDER
ADULTS

Background

Sensory difficulties are common among older adults, and the prevalence is shown to increase with age (World Health Organization, 2011). Hearing and vision difficulties are the two most common sensory difficulties. Approximately one in four older adults between the ages of 60-69 experience hearing difficulties (about 5.7 million people) and the about two-thirds of older adults over age 75 have difficulty hearing (about 16.1 million people) (Lin, Niparko, & Ferrucci, 2011; National Institutes of Health, 2013). Similarly, the prevalence of vision difficulties increases with age. Over 2.6 million older adults over the age of 65 (about 6.4%) have difficulties with vision in 2010 (National Eye Institute, n.d.).

There is no single cause of age-related hearing and vision difficulties. Factors such as family history, repeated exposure to loud noises, comorbid conditions (such as diabetes), and use of certain medications can cause age-related hearing difficulties (Schwartz, 2015). Macular degeneration, glaucoma, cataract and diabetics retinopathy are common contributors to vision impairment in older adults (American Optometric Association, n.d.; Quillen, 1999). Sensory difficulties can lead to significant effects on a person's quality of life as they age. In the United States, older adults with sensory

difficulties often report lower levels of health-related quality of life (HRQoL) (Brown & Barrett, 2011; Dalton et al., 2003), show decreased ability in performing activities of daily living (ADLs) (Bainbridge & Wallhagen, 2014), have higher prevalence of fall and accidental injury (Freeman, Muñoz, Rubin, & West, 2007; Lin & Ferrucci, 2012), and increased risk of depression and dementia (Lin & Albert, 2014; Rogers & Langa, 2010) when compared to older adults without sensory difficulties.

With the increasing number of older adults experiencing sensory difficulties, understanding how much older adults with sensory difficulties spend on health care services is important to better plan for future care of this demographic. With 13% of US population composed of adults over age of 65, this group of people accounted for 34 % of total US personal health care spending in 2010 (Centers for Medicare & Medicaid Services, 2014a). On average, older adults spend much more on health care services compared to their younger counterparts. In 2010, older persons between the ages of 65 and 84 spent \$5,887 (\$10,405 among those over age 85) on hospital care, \$3,281 (\$4,342 among those over age 85) on physician and clinical services, and \$1,886 (\$1,935 among those over age 85) on prescription drugs (Centers for Medicare & Medicaid Services, 2014a).

Older adults who experience sensory difficulties may develop other health-related problems that require additional health care services, and despite this, few studies have focused on the healthcare expenditures of older adults with different sensory difficulties in the United States. Foley and colleagues (2014) examined health care expenditures among older adults with hearing loss and found that older adults with

hearing loss had higher office-based, outpatient, and ER visit expenditures compared to those without hearing loss. Although not focused on adults over the age of 65, Frick and colleagues (2007) and Wittenborn and colleagues (2013) also found that people with vision difficulties had higher healthcare expenditures.

Currently, it is unknown how healthcare expenditures change among people with newly reported sensory difficulties, especially among a nationally representative sample of older adults. This information is especially valuable for older adults since no recommendations were issued by the US Preventive Services Task Force (USPSTF) on screening for hearing loss and vision acuity in older adults due to insufficient evidence to determine the benefits or harms of the services (U.S. Preventive Services Task Force, 2009, 2012b). This study attempts to investigate the health service utilization among older adults with newly developed sensory difficulties and also examines the change in healthcare expenditures in seven categories using national representative samples. We tested the following two hypotheses:

Hypothesis 1: Community-dwelling older adults who reported sensory difficulty in Year 2 used more healthcare services compared to those who did not report sensory difficulties in Year 2.

Hypothesis 2: Compared to community-dwelling older adults who did not report sensory difficulties in Year 2, older adults who reported sensory difficulties in Year 2 had higher healthcare expenditures.

Methods

Data and sample

Medical Expenditure Panel Survey (MEPS) is a subsample of previous years of the National Health Interview Survey (NHIS), yielding a nationally representative sample of non-institutionalized US populations (Agency for Healthcare Research and Quality, 2009). NHIS followed a multistage probability design and oversampled households with Black, Hispanic, Asian, and low-income households. The detailed sampling design of NHIS can be found elsewhere (Centers for Disease Control and Prevention, 2012). MEPS has an overlapping panel structure with a new panel started each year. The two-year longitudinal data assesses individual-level changes in health, healthcare utilization, and healthcare expenditure. Selected households were interviewed five times (rounds) over a two and half year period (Agency for Healthcare Research and Quality, n.d.). MEPS asked sensory related questions in Round 2 (Year 1) and Round 4 (Year 2). This study included five MEPS panels for years 2007 through 2012 in order to attain an adequate sample size of older adults over age of 65 who had no sensory difficulties in Year 1, and with and without sensory difficulties in Year 2. This study included a total of 5,856 people.

Measures

Andersen's behavioral model of health services use (Andersen, 1995) provides a framework for examining factors related to health care utilization and outcome. Individual factors affecting the use of health services can be categorized into predisposing factors (e.g., demographic and social structure), enabling factors (e.g.,

income, health insurance, and regular source of care), and need factors (e.g., person's perceived health status).

Dependent variables

Utilization of health services and healthcare expenditures were examined separately as the main dependent variables in this study. Seven health services categories were selected for this study: 1) office-based visits; 2) hospital outpatient visits; 3) emergency room visits; 4) inpatient hospital stays (including zero-night stays); 5) prescription medication; 6) Other medical equipment/ supplies, and 7) any health services used or total healthcare expenditure. Utilization of health services was categorized into dichotomous groups for no use or absent (0) or presence of one or more visits/refills/discharges (1). *Any healthcare service used* was used to analyze whether the respondent had used any health services by examining whether the respondent had greater than \$0 healthcare expenditures.

Two types of expenditures were used in this study to analyze each service category: the sum of two-year healthcare expenditures and incremental cost. Incremental costs for each of the healthcare services is derived by subtracting Year 1 expenditures by Year 2 expenditures (Year 2 – Year 1). MEPS defines expenditure as payments paid for health care services during the year, including out of pocket payment, and payments by private insurance, Medicaid, Medicare, and other sources. Indirect payments not related to specific medical events were not included in the dataset. Office-based visits included medical provider visits (physician and non-physician) that occurred in office-based settings and clinics. Hospital outpatient visits included physician visits, non-physician

visits, and unspecified visits in the hospital setting. Inpatient hospital stays included zero-night stays. Prescription medications included prescription medications with valid national drug code (NDC), medication name, the strength of the medication, quantity, and payment source. For the purpose of this study, the other medical expenses category includes vision aids and other medical equipment and services. The last category of expenditure, total healthcare expenditure, included all services detailed above, as well as dental visits and home health care, which were not included in the analysis.

All expenditure amounts were adjusted for inflation and converted to constant 2012 dollars with the use of the Consumer Price Index for All Urban Consumers (CPI-U) (U.S. Department of Labor, n.d.). The logarithmic transformation of sum of two-year health expenditures was performed to reduce right-skewed due to large number of people with zero expenditure in the distribution of expenditures.

Independent variables

The main independent variable of interest is an individual's sensory status. Following AHRQ (2013a) and Altman and Bernstein's (2008) classification of core areas of functioning, which was drawn from the International Classification of Functioning, Disability and Health (ICF) (World Health Organization, 2011), sensory difficulties is measured by an individual's seeing and hearing abilities. Questions used to assess individuals seeing abilities included "difficulty seeing with glasses or contacts?" and "is the person blind?" If the person answered yes to either question, they are counted as having difficulty seeing. To measure individual hearing abilities, three questions were used to measure hearing difficulties: "is the person wearing a hearing aid?", "any

difficulty hearing with hearing aid?” and “is the person deaf?” If the person answered yes to any of the three questions, then the person is considered as having hearing difficulties. Individuals who responded to having either hearing or seeing difficulties were considered as having sensory difficulties. All older adults included in the analysis reported not having sensory difficulties in Year 1. Those who reported not having sensory difficulties in Year 2 were coded as 0 while those who reported sensory difficulties in Year 2 were coded as 1.

Covariates included in this analysis were measures of predisposing, enabling and need-based factors, following Andersen’s behavioral model of health services (Andersen, 1995). Predisposing factor variables included age, gender, race (non-Hispanic White, non-Hispanic Black, non-Hispanic others, Hispanic), marital status (married, not married (include widowed, divorced, separated, never married)), and education level (less than 12 years of education, 12 years of education or more). Enabling factors included poverty status (poor or near poor, low income, middle income, high income), having usual source of care (yes, no), and health insurance (have any private insurance, have public insurance only). Need-based factor variables included individual’s change in Charlson Comorbidity Index score (higher scores indicate higher levels of comorbid conditions in Year 2), changes in Short Form-12 Physical Component Summary (PCS) (higher scores indicate better physical health in Year 2), and change in Short Form-12 Mental Component Summary (MCS) scores (higher scores indicate better mental health in Year 2). The D’Hoore’s adaptation of the Charlson Comorbidity Index was used to calculate respondents’ comorbidity index scores (D’Hoore et al., 1996).

Data analysis

Sample characteristics of community-dwelling older adults over the age of 65 were compared by respondents' sensory status using descriptive analysis. Bivariate analyses were conducted to examine the relationship between sensory difficulties and health services utilization. Three sets of multivariate analyses were performed in this study: 1) Two-part models were fit for the sum of two-year healthcare expenditures. The first part of the two-part model used logistic regression to calculate the probability of having positive expenditures while the second part of the two-part model used OLS regression models to estimate healthcare expenditures conditional on having positive expenditures. The first part of the two-part model determined the likelihood of having nonzero expenditures, while the second part of the two-part model estimated the impact of sensory difficulties on health care expenditures among those with positive natural logarithm healthcare expenditures. 2) An incremental cost approach was used to estimate the excess expenditures associated with sensory difficulties by comparing the difference between expenditures associated with older adults with sensory difficulties to those without sensory difficulties. The incremental cost method measured expenditures attributed to sensory difficulties, adjusted for predisposing, enabling and needs factors. 3) Quantile regression models were estimated to measure sensory difficulties at different quantiles, testing for differences over the distribution of health care expenditures (Koenker & Hallock, 2001). In quantile regression, coefficients at a given quantile reflected the impact of a one unit change in the change in healthcare expenditures on sensory difficulties, holding other covariates constant. To obtain robust standard errors,

the bootstrap technique with 100 repetitions was used to get alternative sampling weight without assumptions (Rogers, 1992).

Seven categories of healthcare expenditures (total healthcare, office-based visits, hospital outpatient visits, inpatient hospital stays, emergency room visits, prescription medications, and other medical supplies and equipment) were analyzed in all models. All analyses were conducted using Stata 14 statistical analysis software and accounted for the complex survey design of MEPS (StataCorp, 2015).

Results

Five MEPS panel data for years 2007 through 2012 were used in the analysis. Figure 1 shows the samples included in the analysis: a total of 5,856 older adults over the age of 65 were included in the study, and all individuals responded no sensory difficulties in Year 1. Of these, 734 (12.5%) individuals reported sensory difficulties in Year 2, which represented 16 million community-dwelling older adults who reported newly occurring sensory difficulties in the US between year 2007 and 2012.

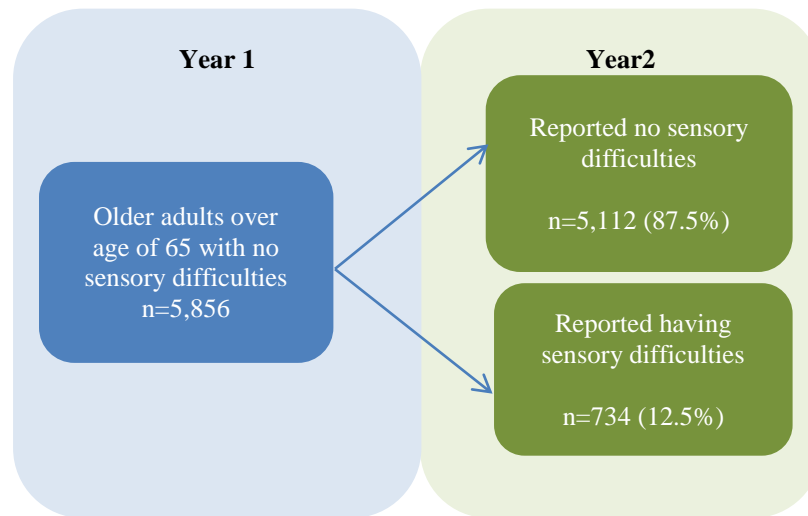


Figure 1. Unweighted sample by sensory status among community-dwelling older adults (n=5,856)

Table 4 presents descriptive information on the study sample and stratifies by sensory status. Respondents who reported having sensory difficulties in Year 2 were significantly older compared to those who did not report having sensory difficulties in Year 2. Compared to older adults reporting no sensory difficulties in Year 2, those whom reported having sensory difficulties in Year 2 were more likely to be not married, have family income levels between near poor and middle income (100% federal poverty level to 400% federal poverty level), have private health insurance, have greater decreases in SF-12 physical health composite scores (PCS), and have increased Charlson Comorbidity Index scores. No statistically significant differences were observed in gender composition, years of education, having usual source of care, and SF-12 mental health composite scores (MCS), when compared to older adults who did not report having sensory difficulties in Year 2.

Table 4. Weighted prevalence estimates of sociodemographic characteristics in Y2 among community-dwelling older adults without sensory difficulties in Y1, by Y2 sensory status

	Total (n=5,856)	No sensory difficulties in Y2 (n=5,112)	Have sensory difficulties in Y2 (n=734)	p-value*
	%	%	%	
Predisposing Characteristics				
<i>Age</i>				0.000
mean	73.6	73.4	75.0	
<i>Gender</i>				0.100
Female	60.8	61.3	57.7	
Male	39.2	38.7	42.3	
<i>Race</i>				0.008
White, non-Hispanic	76.5	75.8	81.2	
Black, non-Hispanic	10.0	10.2	8.6	
Other, non-Hispanic	5.5	5.5	4.2	
Hispanic	8.1	8.4	6.0	
<i>Marital Status</i>				0.020
Married	56.1	56.8	51.1	
Not married	43.9	43.2	48.9	
<i>Year of Education</i>				0.927
Less than 12 years	21.6	21.6	21.4	
12 years and more	78.4	78.4	78.6	
Enabling Characteristics				
<i>Poverty Level</i>				0.031
Poor or near poor	21.8	22.4	17.2	
Low income	17.1	16.8	18.9	
Middle income	28.3	27.8	31.3	
High income	32.9	33.0	32.7	
<i>Have a usual source of care</i>				0.954
Yes	92.1	92.2	92.1	
No	7.9	7.8	7.9	
<i>Have health insurance</i>				0.048
Have any private insurance	49.5	49.0	53.2	
Have public insurance only	49.8	50.2	46.6	
Uninsured	0.7	0.8	0.2	
Need Characteristics				
<i>Change in PSC score</i>				0.028
Mean	-0.43	-0.31	-1.21	

Table 4 (continued)

	Total (n=5,856)	No sensory difficulties in Y2 (n=5,112)	Have sensory difficulties in Y2 (n=734)	
	%	%	%	p-value*
<i>Change in MSC score</i>				0.633
Mean	-0.18	-0.15	-0.35	
<i>Change in Charlson Comorbidity Index</i>				0.001
Mean	-0.02	-0.05	0.15	

* Psychological distressed versus no psychological distresses using χ^2 .

Utilizations of healthcare services

Table 5 displays the proportion of older adults who used each type of health service by sensory status. Percent utilization of different types of health services was similar between Year 1 and Year 2. Almost all respondents used some type of health services (95.4% in Year 1 and 96.0% in Year 2). However, the patterns of services used were different depending on the respondents' sensory status. Older adults reporting sensory difficulties in Year 2 were more likely to use outpatient care, emergency room visits, and prescription medications compared with their non-sensory difficulties counterparts. No significant differences were observed in inpatient hospital stay.

Table 5. Percent utilization of health services by sensory status

	Year 1	Year2		
	All (n=5,846) %	All (n=5,846) %	Reported no sensory difficulties in Y2 (n=5,112) %	Reported sensory difficulties in Y2 (n=734) %
Any healthcare services (have greater than \$0 expenditure)	95.4	96.0	95.7	98.3**
Outpatient care	89.5	90.2	89.6	94.0***
Office-based visits	88.9	89.9	89.3	93.7***
Hospital outpatient visits	26.7	28.3	27.8	31.3
Emergency room visits	15.7	17.1	16.5	21.0**
Inpatient hospital stays	15.8	15.4	15.3	16.2
Prescription medicine	88.5	90.1	89.7	93.1**
Other medical equipment/supplies	N/A	N/A	N/A	N/A

*p<0.05, **p<0.01, ***p<0.001

Cross-sectional two-part model

Table 6 shows the impact of sensory difficulties in Year 2 on each type of healthcare expenditure, using two-part models and quantile regression models and with the sum of two-year healthcare expenditures as the dependent variable. Findings from

the first part of the model indicated that older adults reporting sensory difficulties in Year 2 were almost 4.5 times more likely to have non-zero total healthcare expenditure ($p=0.004$), nearly three times more likely to have non-zero outpatient care expenditure ($p=0.003$), and 1.2 times (24%) more likely to have non-zero expenditure in other medical equipment or supplies ($p=0.047$).

Among those who have non-zero healthcare expenditure, older adults who reported sensory difficulties in Year 2 have 17% ($\exp(0.154)=1.166$) higher total healthcare expenditures ($p=0.011$), 20% ($\exp(0.182)=1.200$) higher in outpatient visits expenditure ($p=0.004$), and 33% ($\exp(0.285)=1.330$) higher in other medical equipment or supplies ($p=0.004$) compared to those who did not report sensory difficulties in Year 2. The results from the quantile regression models (not shown in paper) were not significantly different from the OLS regression models, except for 95% quantile of other medical equipment or supplies expenditures. At the 95% quantile, older adults who reported sensory difficulties in Year 2 had 72% ($\exp(0.545)=1.72$) higher expenditures in other medical equipment and supplies compared to those who did not report sensory difficulties in Year 2. The result is significantly different from the OLS regression coefficients (outside of the OLS 95% CI).

Table 6. Two-part model of any healthcare expenditure and excess healthcare expenditure associated with sensory difficulties^a

Expenses	Positive Expenditures OR (95% CI)	Excess Expenditures Log \$ (95% CI)^b
Total health expenditure	4.51 (1.60-12.70)**	0.15 (0.04-0.27)*
Outpatient expenditure	2.57 (1.38-4.80)**	0.18 (0.06-0.30)**
Office-based visits	2.08 (1.18-3.68)*	0.20 (0.08-0.32)***
Hospital-based visits	1.02 (0.83-1.26)	0.09 (-0.16-0.35)
Inpatient stays	1.01 (0.78-1.31)	-0.01 (-0.24-0.21)
Emergency department visits	1.18 (0.93-1.49)	0.08 (-0.13-0.29)
Prescription medication	1.73 (0.98-3.05)	0.08 (-0.12-0.29)
Other medical supplies and equipment	1.24 (1.00-1.52)*	0.29 (0.09-0.48)**

^aCompares community-dwelling older adults reporting sensory difficulties in Year 2 with those without sensory difficulties in Year 2

^bLogarithm scale of expenditure. Expenditure adjusted for inflation to 2012 dollars using the Consumer Price Index for All Urban Consumers (CPI-U)

*, ** and *** indicate significance at p<0.05, p<0.01, p<0.001, respectively.

Model adjusted for predisposing, enabling and need factors described in method section

Incremental cost models

Table 7 presents the additional healthcare expenditures attributed to reports of sensory difficulties in Year 2, adjusted for predisposing, enabling and need factors. Reported sensory difficulties in Year 2 is associated with incremental increases in office-based visits expenditures of \$460 per person annually at 10% significance level (p=0.095). There was no significant difference observed with other types of healthcare expenditures. Quantile regression methods showed consistent results as OLS regression; no statistical significant result was observed (Table not shown). However, the effect size is bigger at higher quantile compared to lower quantile.

Table 7. Incremental healthcare cost associated with sensory difficulties

	<i>Coef.</i>	<i>95 % CI</i>	<i>p-value</i>
Total healthcare expenditures	477.92	(-982.18 – 1938.03)	0.520
Total Outpatient visit expenditures	425.95	(-262.68 – 1114.59)	0.224
Office-based visits	459.77	(-81.17 – 1000.72)	0.095*
Hospital outpatient	-33.82	(-469.85 – 402.22)	0.879
Inpatient stay expenditures	-112.96	(-1155.68 – 929.76)	0.831
Emergency room visit expenditure	-102.54	(-271.30 – 66.23)	0.232
Prescription expenditure	-66.18	(-319.36 – 187.00)	0.607
Other medical equipment/supplies expenditure	18.76	(-93.89 – 131.40)	0.743

*indicate significance at $p < 0.10$.

Discussion

Sensory difficulties are widespread, but under-recognized health issues in older adults (Bainbridge & Wallhagen, 2014; Brown & Barrett, 2011; Reuben, Walsh, Moore, Damesyn, & Greendale, 1998). Prevalence of sensory difficulties, especially hearing and vision difficulties, increases dramatically with age, and they are among the ten most common causes of disability in the United States (Centers for Disease Control and Prevention, 2009). Many factors are associated with age-related hearing and vision difficulties, such as comorbid conditions (e.g., cardiovascular disease, diabetes mellitus), noise exposure, and genetic predisposition (Helzner et al., 2005). Using a national representative panel data, the findings provide evidence of increased health services utilization and healthcare expenditure of community-dwelling older adults with sensory difficulties.

There are no current population-based studies describing healthcare expenditures associated with older adults with newly reported sensory difficulties, which makes the

comparison to our study challenging. Previous studies have found excess costs associated with hearing and vision loss (Foley et al., 2014; Frick et al., 2007), however, these studies either examined the hearing and vision difficulties separately or included different age groups. By looking at sensory functioning, we get a better understanding of older adults who have reported newly developed sensory difficulties and their healthcare expenditures associated with sensory difficulties.

Using a more common approach, the two-part model, results showed that community-dwelling older adults who reported sensory difficulties in Year 2 had significantly higher total healthcare expenditures, office-based visit expenditures, and other medical supplies or equipment expenditures. The two-part method was unable to control all potential risk factors therefore the incremental cost model provided the most robust result. However, when using a robust incremental cost method and using the Year 1 expenditures as baseline of each respondent, only the office-based visit expenditures showed significant differences when comparing older adults who reported sensory difficulties to their non-sensory difficulties reporting counterparts. Applying our results to the population of older adults who reported sensory difficulties, it indicates that sensory difficulties can be associated with over \$7.65 billion in total medical expenditure in the US.

Previous studies have found positive relationships between sensory difficulties and falls, cognitive declines, depression and social isolation (Brown & Barrett, 2011; Crews & Campbell, 2004; Dalton et al., 2003; Freeman et al., 2007; Lin & Albert, 2014; Lin & Ferrucci, 2012). Although the U.S. Preventive Services Task Force (USPSTF)

does not have sensory functioning guidelines available for asymptomatic adults over age of 50, routine screening should be encouraged for older adults over the age of 65 to detect any difficulties at earlier stages. In 2010, only 41% of older adults over the age of 70 had hearing exams in the past 5 years (National Center for Health Statistics, 2012), and about 80% of older adults had eye exam within the past year (Centers for Disease Control and Prevention, 2011b). Nearly one-quarter of older adults who reported sensory difficulties indicated that cost or insurance concerns were the reason why they did not seek medical care (Centers for Disease Control and Prevention, 2011b). Early detection of sensory difficulties and use of correct treatment can prevent high economic costs associated with negative consequences caused by sensory difficulties, gradually improve older adult's sensory abilities, and ultimately improve health-related quality of life and promote independence (Bainbridge & Wallhagen, 2014; Brown & Barrett, 2011; Dalton et al., 2003).

Limitations

Although important, our analysis should be interpreted in light of several limitations. First, according to MEPS Household Component panel design and data collection process (Agency for Healthcare Research and Quality, n.d.), each MEPS panel data covers a two-year period and questions regarding sensory difficulties are asked in round 2 (Year 1) and round 4 (Year 2), and healthcare expenditures are accumulated at the end of each year. Round 4 of each panel occurs shortly after the beginning of the first quarter of the year and ends shortly before the end of the fourth quarter. If a respondent who reported sensory difficulty in Year 2 was interviewed at the end of round 4, the

person might not have enough time to seek medical attention regarding their health issues and accumulate healthcare expenditures, which may result low healthcare expenditures. Second, older adults may feel worsening sensory abilities are part of the aging process, which can cause them to ignore the conditions and not report the difficulties (Wiley, Cruickshanks, Nondahl, & Tweed, 2000). Previous studies found that older adults are less likely than their younger counterpart to report health conditions (Dalton et al., 2003; Idler, 1993; Wiley et al., 2000). Third, this study focuses on healthcare expenditure of older adults who reported no sensory difficulties in Year 1, and with or without sensory difficulties in Year 2. The results should not be applied to other age groups and for other types of disabilities.

Future study

This study served as the introduction of a series of investigations to better understand older adults with sensory difficulties. Future studies should examine different types of sensory difficulties separately, assess the quality of life associated with sensory difficulties, and gather longitudinal data to examine the pattern of health services utilization and healthcare expenditure.

CHAPTER IV
CHANGES IN HOME HEALTH PATIENT CHARACTERISTICS, ACTIVITY
LIMITATIONS AND SERVICE UTILIZATION: USING THE 1998 AND 2007
NATIONAL HOME AND HOSPICE CARE SURVEY

Background

Home health care, sometime called home care or home and community-based services (HCBS), is an important sector of the U.S. healthcare system. Home health agencies provide a wide range of healthcare services to individuals living in the community who need assistance to manage their illness or disabilities, and depending on the health insurance coverage, patients can choose to use different services. In 2010, approximately 12 million people in the US received some type of home health care services (National Association for Home Care & Hospice, 2010), and majority of the people who received home health services were older, White, and women (Caffrey, Sengupta, Moss, Harris-Kojetin, & Valverde, 2011). People prefer receiving long term care in a community setting rather in a residential facility setting (such as a nursing home) (Ng, Harrington, & Kitchener, 2010; Ruttner & Irvin, 2013; Scotch, 2011), and some patients choose to transfer their post-hospitalization care, such as rehabilitation and therapy, to a community setting (Medicare Payment Advisory Commission, 2008; National Association for Home Care & Hospice, 2010). People's preference for receiving long term care through home and community based services was explicitly expressed through the Olmstead v. L.C. court case.

In the 1999 *Olmstead v. L.C.*, the U.S. Supreme Court ruled that the states may violate Title II of the Americans with Disabilities Act when an individual with disabilities is treated in an institutional setting, when a least restrictive setting could appropriately serve the person ("*Olmstead v. L. C.*," 1999). The pressure from the ruling, along with the voices from consumers and providers, have reduced the utilization of nursing homes and psychiatric institutions and increases community-based care options and utilization (Hawes & Phillips, 2007; Williams, 2000). There was an increase in the number of home health care recipients per day between 2000 and 2007, from almost 1.4 million individuals in 2000 to almost 1.5 million individual in 2007 (Caffrey et al., 2011), and the number of patients who use home health care for post-acute care also contributed to the increased number of home health users. Between 1997 and 2008, patients who were discharged from hospital to home health care for post-acute care increased by almost 70 percent, from 2.3 million to almost 4 million (Healthcare Cost and Utilization Project (HCUP), 2010).

Home health care services, is the fastest-growing segment of the healthcare industry (Freeman, 1995; Silver, Keefer, & Rosenfeld, 2011), and this growth can be observed in an increase in home health industry's compound annual rate of change in employment. According to the Bureau of Labor Statistics' employment projection, the number of jobs within the home health industry increased from 0.6 million jobs in 2002 to almost 1.2 million jobs in 2012, which is equivalent to a 5.8 increased in the compound annual rate of change (U.S. Department of Labor, 2013). The Bureau of

Labor Statistics also projected a 4.8 increase in compound annual rate of change for home health industry between year 2012 and 2022 (U.S. Department of Labor, 2013).

With the growth of the home health industry, the national health expenditures for home health care is also increasing. In 2012, the total home health care spending in the U.S. was over \$77.8 billion dollars, accounted for almost three percent of the total national health care expenditure, and the spending is projected to double to over \$162 billion dollars in 2023 (Centers for Medicare & Medicaid Services, 2014c; Martin, Lassman, Washington, Catlin, & National Health Expenditure Accounts Team, 2012). Medicare and Medicaid accounted for approximate 80% of the total home health care expenditures in 2013 (Centers for Medicare & Medicaid Services, 2014b), and Medicare is currently the major payer of the home health services. In 2012, Medicare spent 33.7 billion dollars in home health care, which accounted for 43 percent of total home health expenditure in the same year (Centers for Medicare & Medicaid Services, 2014c). In the same year, Medicaid contributed 37 percent of the total home health expenditure, which equals to 29 billion dollars (Centers for Medicare & Medicaid Services, 2014c). **Figure 2** shows the historical and projected national expenditure on home health care, in total expenditure, Medicare only, and Medicaid only. With the expansion of the Medicaid home-and community-based services (HCBS), Medicaid is projected to spend more in home health care and become the major payer of home health services by year 2016 (Centers for Medicare & Medicaid Services, 2014c) .

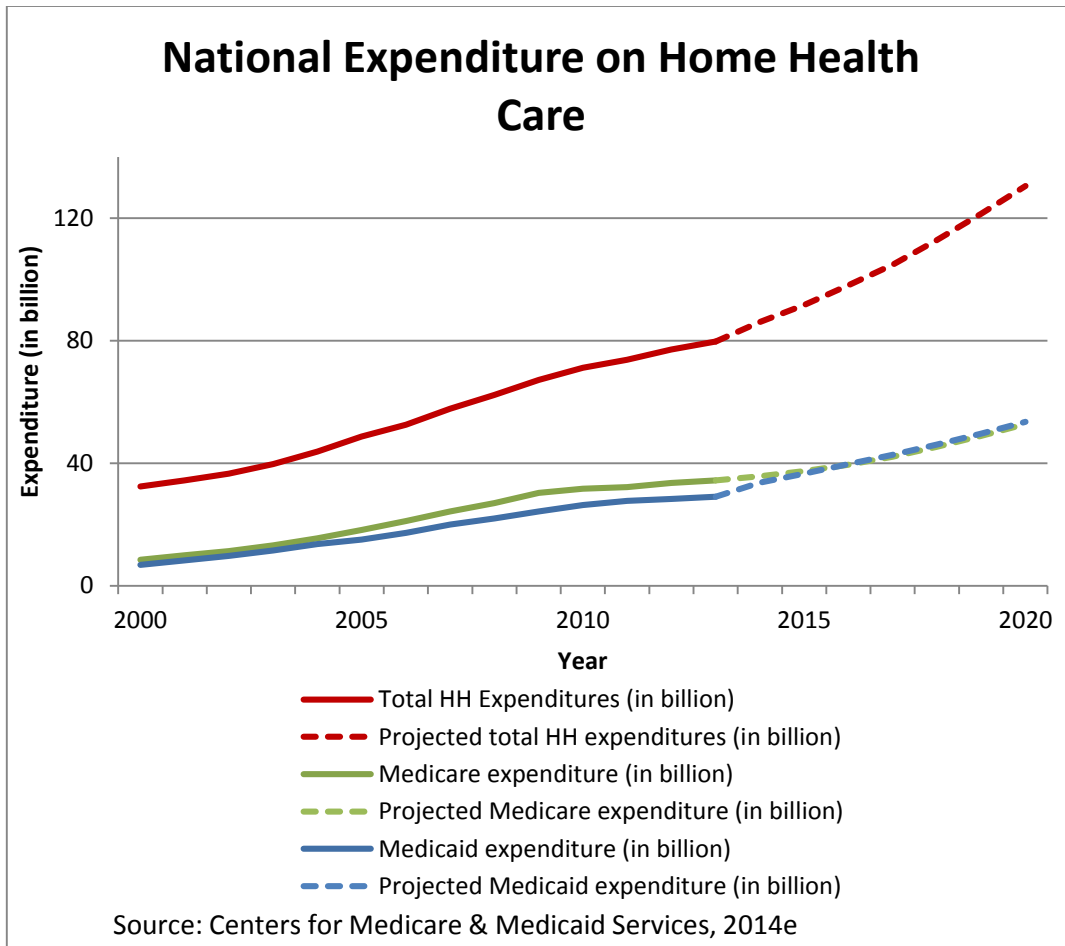


Figure 2. Historical and projected national expenditure on home health care

Home health coverages are different depending on the person’s health insurance. For example, Medicare, a federal health insurance program, covers skilled home health services such as skilled nursing care and therapy services, and Medicare eligible beneficiaries must require less than part-time or intermittent skilled nursing care and have doctor’s orders to receive care (Centers for Medicare & Medicaid Services, 2010). Medicaid, on the other hand, a joint federal and state program, provides a wider range of coverage to eligible beneficiaries. Traditional Medicaid covers mandatory nursing home

and home health services, while the home-and community-based services (HCBS) waivers and personal care services (PCS) are optional benefits for the individual state to provide and determine eligibilities (Centers for Medicare & Medicaid Services, n.d.). By 2012, 31 of the 50 states in the U.S. provide Medicaid PCS benefit (The Henry J. Kaiser Family Foundation, 2012). Each state has specific criteria for eligibility. Beneficiaries who meet the state eligibility requirement for the HCBS waiver services are eligible to receive services such as case management, personal care services, and other non-medical services (Harrington, Ng, Laplante, & Kaye, 2012).

With the increase in the number of people needing home health services and also an increase in home health care expenditures, it is important to understand how home health recipients utilize services provided by home health agencies. Previous studies have focused on prediction of home health utilization (Choi, Crist, McCarthy, & Woo, 2010; Goodridge, Hawranik, Duncan, & Turner, 2012; Kadushin, 2004), expenditure and cost containment of governmental programs (Amaral, 2010; Fortinsky, Fenster, & Judge, 2004), quality of home health agencies (Grabowski, Huskamp, Stevenson, & Keating, 2009; Han, McAuley, & Remsburg, 2007), or home health patient with specific health conditions, such as cardiovascular disease (Madigan, 2008; Scharpf & Madigan, 2010), depression (Pickett, Weissman, & Bruce, 2012; Shao, Peng, Bruce, & Bao, 2011), medication problems (Alkema, Wilber, Frey, Enguidanos, & Simmons, 2008; Alkema, Wilber, Simmons, Enguidanos, & Frey, 2007; Bao, Shao, Bishop, Schackman, & Bruce, 2012). While these studies provide great information on people using home health services, the change in the patient characteristic among older adults over 65 years of age

who use home health services after the implementation of *Olmstead* decision has not been fully explored, and none of the studies examined the change in the utilization of services provided by home health agencies. Understand how the political movement, court ruling and consumer opinion affected the composition of the home health population is critical in better understanding the population that utilizes these services, and how to improve the services to meet their needs. To address these knowledge gaps, this study uses the 1998 and 2007 National Home and Hospice Care Surveys to examine the home health patient characteristics and service utilization before and after the 1999 *Olmstead* decision.

Method

Data

This study uses data from the National Home and Hospice Care Survey (NHHCS), which is a survey of a nationally representative sample of home health and hospice recipients in the United States (Centers for Disease Control and Prevention, 2011a). The survey collects data on U. S. home health and hospice care agencies, their staff members, the services they provide, and the people they served. The survey has been conducted periodically since 1992, with 2007 being the most recent survey. The sampling strategy for the survey is explained in detail elsewhere (Centers for Disease Control and Prevention, 2008a). The 2007 NHHCS was redesigned from previous NHHCS and included some new data items, and the data was collected using a computer-assisted personal interviewing (CAPI) system. Although some differences were observed in the surveys, the core data are still the same.

The samples for this study are drawn from the 1998 and 2007 surveys, and only include home health care users who are over 65 years of age. There are 3,211 older adults in the 1998 survey and 3,226 older adults in 2007 who used home health services.

Analysis

The 1998 and 2007 NHHCS public use files were merged into one single file, using a binary dummy variable to identify different years. First, descriptive analyses of selected patient characteristics, home health services used, and type of home health agency they used for both years were provided to characterize the older adult population using home health services. Second, bivariate analyses using Pearson's chi-square statistical test were conducted to compare individual characteristics of persons using home health services in 2007 to 1998.

All analysis were performed using Stata 12 statistical software (StataCorp, 2011) survey techniques to account for sampling. Due to survey reporting differences in the 1998 NHHCS, the 1998 NHHCS public-use files only include the sample weight variable, but not the stratum variable nor the primary sample unit (psu) variable. The analyses only applied the sample weight variable for the 1998 and 2007 NHHCS datasets. Appropriate sampling weight was applied to the analyses, which yielded the original population from which the sample was drawn, thus the percentages of selected home health patient characteristics were not affected.

Result

Table 8 presents selected demographic characteristics of home health care recipients age 65 and older in years 1998 and 2007. The table shows the population estimates and the weighted percentage of patients fitting these characteristics. In 1998 an estimated 1,292,537 home health care recipients were over age of 65, and in 2007 about 1,003,390 home health recipients were over the age of 65. A majority of the older home health patients were women (72% in 1998 vs. 68% in 2007), with mean age of 80 in both years, and not married at the time of interview (53% in 1998 vs. 53% in 2007), which included widowed, divorced, separated, never married or single. Non-Hispanic whites represented the majority of home health care beneficiaries in both years. There are significant differences in the race composition when we compare 1998 to 2007.

Table 8. Population estimates and percent distribution of home health care recipients 65 years and older by selected sociodemographic characteristics, ADL assistance needed, and health status. NHHCS 1998 and 2007 (n=3,211 & 3226)

	<i>N</i> (%)	
	1998 (n=3,211)	2007 (n=3,226)
<i>Total home health care recipients</i>	1,292,537 (100)	1,003,390 (100)
Home Health Recipient Characteristics (%)		
<i>Age, mean (SE)</i>	79.7 (0.30)	80.1 (0.23)
Gender		
Female	72.0	68.4
Male	28.0	31.6
Race/Ethnicity***		
Non-Hispanic White	67.4	71.0
Non-Hispanic Black	12.8	13.4
Hispanic	3.0	7.7
Other or Unreported	16.9	7.8
Marital Status		
Married	31.5	33.7

Table 8 (continued)

	<i>N (%)</i>	
	1998 (n=3,211)	2007 (n=3,226)
Non-married	52.5	52.5
Unreported	16.0	13.8
<i>Living arrangement***</i>		
Alone	35.2	34.6
With family member(s)	51.2	57.0
With non-family member(s)	5.2	6.6
Both family & non-family member(s)	0.2	0.3
Unreported	8.2	1.5
<i>Have primary caregiver outside of the home health agency? ***</i>		
Yes	75.0	82.5
No	18.4	16.3
Unreported	6.6	1.2
<i>Among those who have caregiver outside of home health agency, who is the caregiver? **</i>		
Spouse	34.2	30.4
Child	41.3	42.4
Other family member	11.0	12.3
Non-family member	13.4	14.1
<i>Primary source of payment</i>		
Medicare	73.8	70.8
Medicaid	10.9	12.5
Private insurance	4.0	6.6
Self-pay	5.4	2.4
Other	2.6	7.7
Unreported	3.3	0.02
<i>ADL Assistance Received From Agency</i>		
<i>Bathing ***</i>	49.9	34.3
<i>Dressing***</i>	42.8	29.2
<i>Eating***</i>	8.9	6.6
<i>Transferring ***</i>	27.2	28.1
<i>Walking***</i>	26.0	31.6
<i>Toileting***</i>	20.8	18.9
<i>Average number of ADL assistance received from agency, mean (SE)**</i>	1.76 (0.08)	1.49 (0.06)

Table 8 (continued)

	N (%)	
	1998 (n=3,211)	2007 (n=3,226)
Incontinence		
<i>Difficulty with bladder control</i> ***	22.0	43.8
<i>Difficulty with bowel control</i> ***	12.2	15.8
<i>Using urinary catheter</i> ***	9.6	8.4
<i>Had ostomy</i> ***	2.4	2.4

*:p-value <0.05, **: p-value <0.01, ***: p-value <0.001

When looking at the living arrangement of home health recipients over the age of 65, the proportion of home health patients who lived with family member(s) statistically increased in 2007 (51% in 1998 vs 57% in 2007, $p=0.016$). There were slight increase in proportion of people living with non-family member(s) (5% in 1998 vs. 7% in 2007, $p=0.168$) and both family and non-family member(s) (0.2% in 1998 vs. 0.3 in 2007, $p=0.799$), but the difference were not significant. The proportion of those who lived alone has slightly decreased in 2007 (35% in 1998 vs. 34.6% in 2007, $p=0.774$).

Over 75% (75% in 1998 vs. 83% in 2007, $p=0.000$) of home health care recipients had primary caregivers outside of home health agencies, and many of these primary caregivers were the children (34% in 1998 vs. 30% in 2007, $p=0.058$), followed by a spouse (34% in 1998 and 31% in 2007, $p=0.021$). There were statistically significant changes in the proportion of older home health patients who chose to use a different source of payment as their primary source of payment occurred between 1998 and 2007. The majority of older home health patients used Medicare as their primary source of payment (74% in 1998 vs. 71% in 2007, $p=0.169$), followed by Medicaid (11% in 1998 vs. 13% in 2007, $p=0.307$). The proportion of home health patients who

use private insurance and other source (such as military insurance and other governmental supplement) as their primary source of payment has significantly increased in 2007 (4% in 1998 vs. 6.6% in 2007, $p=0.027$; 3% in 1998 vs. 8% in 2007, $p=0.000$). Those who used self-pay as primary source of payment had decreased significantly in 2007 (5% in 1998 vs. 2% in 2007, $p=0.000$).

The proportions of home health patients over the age of 65 who received bathing, dressing, eating, and toileting assistance from home health agencies had statistically decreased in 2007 compared to 1998, while the proportions of home health patients over the age of 65 who received assistance in transferring and walking had statistically increased in 2007. Among home health recipients, bathing was the most common ADL for which they received assistance. In 1998, about half of the total home health recipients received assistance with bathing, and the proportion of those who receive bathing assistance from home health agencies had significantly decreased to one third in 2007 (50% in 1998 vs. 34% in 2007, $p=0.000$). The second most common ADL that home health recipients received assistance for in 1998 was dressing (43%) followed by transferring (27%), walking (26%), toileting (21%), and eating (9%). Assistance with walking is the second most common ADL that home health recipients received in 2007 (32%). It is followed by dressing (29%), transferring (28%), toileting (19%), and eating (7%). The average number of ADL assistances received had statistically decreased by 2007.

About 22% of home health recipients over the age of 65 had problem with bladder control in 1998. The number and proportion had statically increased in 2007, and

about 44% of older home health patients had problems with bladder control. The proportion of home health recipients over age of 65 who had difficulty with bowel control had also increased in 2007 (12% in 1998 vs. 16% in 2007, $p=0.000$). The proportion of those who use urinary catheters had decreased slightly (10% in 1998 vs. 8% in 2007, $p=0.000$), and those had ostomies had stayed the same.

Home health agencies provide a range of services for their patients. Table 9 shows the number of home health patients and percent utilization of selected home health services. Skilled nursing services were the most common service provided to home health patients in both 1998 and 2007. Seventy-nine percent of total older home health patients in 1998 received skilled nursing services, and the percentage of home health patients who receiving skilled nursing services demonstrated significant increases by 2007; about 84% of total older home health patients in 2007 received skilled nursing services ($p=0.005$). In 1998, the second most common home health service utilized was homemaker services. In 1998 about 24% of home health recipients received homemaker services, but the percentage decreased significantly by 2007; about 17% of home health care recipients used homemaker services ($p=0.000$). Physical therapy was the next most common home health care services received by home health care recipients. Compare to year 1998, the percentage of home health care recipients received physical therapy significantly increase in 2007 (22% in 1998 vs. 40% in 2007, $p=0.000$).

Table 9. Home health care services utilization

	%	
	1998	2007
Skilled nursing services **	78.6	83.9
Homemaker services***	24.2	16.7
Physical therapy***	21.5	39.6
Occupational therapy***	5.5	14.3
Referral services	5.0	4.2
Continuous home care	4.8	3.2
Dietary services***	3.8	7.9
Physician services***	2.2	6.4
Transportation services	1.3	1.6
Mental health services*	0.8	1.9
Pastoral/spiritual services	0.7	0.8
Meal-on-Wheels services	0.6	1.1
Respite services	0.4	0.9

*: p -value <0.05 , **: p -value <0.01 , ***: p -value <0.001

Table 10 shows the characteristics of home health agencies that patients chose in 1998 and 2007. In 1998 about 56% of total home health patients utilized home health agencies that were not proprietary, which could be operated by non-profit corporations, religious affiliated organizations, or government entities. In 2007, about 45% of home health patients used home health agencies that were operated by for-profit corporations. In 1998 about 55 percent of home health patients utilized home health agencies that were not part of a chain agency, and in 2007 the percentage of home health patients using non-chain home health agencies increased, and about 72 percent of home health patients utilized non-chained home health agencies. In both 1998 and 2007 the majority of home health patients utilized home health agencies that were located in a metropolitan statistical area (MSA).

Table 10. Types of home health agency that home health recipients received services from

	%	
	1998	2007
HH ownership ***		
Not-for-profit/ Other	55.5	44.7
For-profit	44.5	55.3
HH member of a group ***		
Chain	42.8	27.7
Non-Chain	57.2	72.3
MSA Status *		
MSA	77.4	81.2
Non-MSA	22.6	18.8

*: p<0.05, **: p<0.01.

Discussion

The Supreme Court’s 1999 *Olmstead v. L.C* ruling reshaped the U.S. long-term care delivery system. With the ruling decision, and voices from advocates for persons with disabilities, community-based long-term care industries started to grow. Many states expanded their state home and community-based services (HCBS) to provide care to those who are in need (Kaye, LaPlante, & Harrington, 2009). This study examined the difference in patient characteristics, pattern of services utilization, and agency characteristics in 1998, one year before the *Olmstead v.L.C.* ruling, and in 2007, eight years following the ruling and implementation of changes. The finding of the study has significant implications for the long-term health and health care of older adults who utilize home health services.

When examining the demographic characteristics of home health patients, the results indicate that there were significant differences in patient characteristics among

home health patients. First, the percentage of Hispanic white home health patients had significantly increased by 2007, while the other race/ethnicity groups maintained similar proportion. This change corresponded to the United States' changing racial and ethnic diversity (U.S. Census Bureau, 2011b). The proportions of older home health recipients who lived with family member(s) and have primary caregiver outside of the home health agency had also increased significantly in 2007. Due to age eligibility, Medicare remained the primary source of payment for most home health patients. There were also significant changes in percentage of people who use private insurance, self-pay and other as their primary source of payment.

Comparing 2007 to 1998, the number and percentage of ADLs assistance received from home health agencies had changed significantly. The changes may be contributed to the increase in the number of home health patients who had primary caregivers outside of the home health agencies care, as shown in Table 8. As discussed in Dellmann-Jenkins and colleagues' article, children and grandchildren are becoming the new population that serve as primary caregiver of their elderly relatives (Dellmann-Jenkins, Blankemeyer, & Pinkard, 2000).

There were also significant changes in incontinence. There was an increase in proportions of older adults who are urinary incontinent or bowel incontinent; these results correspond to the finding in Hung and colleagues (2011). Urinary incontinence is a measure of functional impairment, and the increase in urinary incontinence can be associated with increases in functional impairments among older adults (Hung et al., 2011). With the movement of placing older adults in the community and provide home

and community-based care to nursing home-eligible individuals in their home or community, we suspected that many of the older home health recipients who received home health care services 2007 would be in nursing homes, if not because of the *Olmstead* decision or other political movement. Our results also show significant decrease in the use of urinary catheters and had ostomy.

Home health care services provide a variety of services to their beneficiaries. Compared to 1998, more home health patients received “hands-on” or “skilled” services of care, such as skilled nursing services, physical therapy, occupational therapy, dietary service, physician services, and mental health services, in 2007. This can be attributed to several factors, such as the increase in age over 65 population, the increase in life expectancy, the increase risk of chronic diseases with age (Garrett & Martini, 2007), and the increase number of older adults using home health care services to maintain optimal health. This trend of increased utilization of services that require health care professionals may contribute to the increased national expenditure on home health care (see **Figure 2**)

This study provides a picture of the change in demographic and services used among home health patients over the age of 65 in the United States, before and after the *Olmstead* ruling. Findings on different patient characteristics provide useful information to policy makers, providers, researchers and consumers advocates as they plan to meet the needs of home health patients. Comparing the two time frames can help to understand how policies change the long-term care system, and consequently affect the

composition of home health patient populations over time as well as patients' utilization of home health care services.

Several limitations should be considered when interpreting the results. First, NHHCS data was collected through in-person interviews with agency directors and designated staff, and no patients or family members were interviewed. Patient information was collected from medical records, administrative records, and staff experiences while caring for patients. Second, this study focused on home health patients over the age of 65, thus the results are not generalizable to other populations. Third, the definition of services provided by the home health agencies were provided by the home health agencies, therefore, there might be some inconsistency in the actual services received from agencies. Fourth, this study compared two time points of home health services utilization of recipient characteristics. The authors cannot determine the changes were due to the 1999 *Olmstead* ruling. However, the results seem to follow the intension of the 1999 *Olmstead* decision.

Despite these limitations, this study, to the authors' knowledge, is the first of its kind to provide a deeper comparison of home health patient characteristics and service utilization at two different time frames, before and after the Supreme Court ruling that changed the picture of the long-term care system, using nationally representative sample surveys. Future studies are needed when more up-to-date data that focuses on home health patients is available.

CHAPTER V

CONCLUSION

With the number and proportion of older adults increasing at an unprecedented rate in the U.S., many will experience health challenges that affect their ability to live “long, productive, and independent lives” (Centers for Disease Control and Prevention, 2011a, p. 3). Utilization of health care services is an important part of the aging process. This dissertation used national representative sample survey data to provide an in-depth examination of utilization of different type of health care services among community-dwelling older adults.

The first study examined the utilization of preventive care services among community-dwelling older adults with and without psychological distress. Using the most up-to-date preventive care service recommendations from the USPSTF, the study analyzed the difference in receiving timely preventive care services among community-dwelling older adults with different psychological status. Among the five preventive care services analyzed in the study, the findings suggest that older women with psychological distress were less likely to receive biennial mammography, but no differences were observed in the utilization of colorectal cancer screening, adult immunization, blood pressure screening, and blood cholesterol screening among older adults with different psychological status. We found the majority of older adults in the study reported having a usual source of care, and previous studies have shown that having a usual source of care is associated with increased use of preventive care services (Blewett et al., 2008; DeVoe et al., 2003). With PPACA mandating health insurance plans to eliminate cost-

sharing on some preventive care services and provide a no-cost Annual Wellness Visit (AWV) for beneficiaries with Medicare (U.S. Department of Health & Human Services, 2012a), PPACA has the potential to increase utilization of preventive care services to 100% among older adults.

Although sensory difficulties are common among older adults, currently there is no recommendation issued by USPSTF for sensory difficulties for adults over age of 65. Paper 2 investigated the health care services utilization and healthcare expenditures of older adults who reported newly developed sensory difficulties. Results showed that community-dwelling older adults with sensory difficulties used significantly more outpatient care, emergency room visits, and prescription medications when compared with their counterparts with no sensory difficulties. Those whom reported having sensory difficulties also showed higher office-based visit expenditures compare to those without sensory difficulties. Although no recommendations are currently in place by USPSTF, sensory difficulties have shown to have negative impact in health and can cause falls, cognitive declines, depression and social isolation (Brown & Barrett, 2011; Crews & Campbell, 2004; Dalton et al., 2003; Freeman et al., 2007; Lin & Albert, 2014; Lin & Ferrucci, 2012). It is critical for community-dwelling older adults to receive routine sensory function screening to detect any changes in their sensory abilities. Early detection of sensory difficulties and use of correct treatment can prevent high economic costs associated with negative consequences caused by sensory difficulties, and ultimately improve health-related quality of life and promote independence (Bainbridge & Wallhagen, 2014; Brown & Barrett, 2011; Dalton et al., 2003).

With many community-dwelling older adults living with chronic illness and disabilities, home health agencies provide essential services to help them maintain their health. The third study examined the change in home health recipients' characteristics since the Supreme Court's 1999 *Olmstead v. L.C.* ruling. Significant changes in people who use home health services were found, and there were also significant changes in the home health care services that they used and the home health agencies that they chose. This study provided a most current picture of community-dwelling older adults who used home health care services.

This dissertation has provided new and updated information on the healthcare cost and utilization among community-dwelling older adults living in the U.S. The research findings suggest that there are still unmet health care needs that can be provided to older adults living in the community. Several strategies to improve the health of community-dwelling older adults who live with disabilities were suggested for improving the lives of the growing proportion of the U.S. population that is represented by older adults. Many people are now living with chronic conditions and disabilities and additional research is needed to focus preventive care services and community long term services and support on ways to serve this growing demographic.

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