Home health care for persons with cognitive impairment: The influence of home health care agency characteristics on the relationship between consumer cognitive impairment status and service volume and cost

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ABSTRACT

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The elderly population is rapidly growing in all nations. With advanced age comes the risk for age-associated illnesses, such as disorders of dementia. People with neurocognitive disorders of dementia experience impaired cognition and require increasing support and care. They also experience numerous behavioral and psychiatric syndromes as these disorders progress. Their care needs are complex and multidimensional, causing great difficulty and high rates of burnout among informal and formal caregivers and subsequent premature institutionalization. Yet research aiming to discover methods for delaying costly institutional care of people with neurocognitive disorders has focused primarily on bolstering family caregiver capacities.

Knowledge gaps pertaining to the use of formal services raise serious concerns. The capacity of the home health care service industry to adequately meet the needs of people living with cognitive impairment is highly questionable. This study adapts the Anderson-Newman Health Services Utilization Model and uses newly available health services survey data to make novel comparisons of service use and cost between consumers with moderate-to-severe cognitive impairment and those with little-to-no cognitive impairment. Previously unstudied agency characteristics are also examined in relation to service utilization, and multilevel analyses examine agency characteristics that influence the relationship between consumer cognitive impairment status and service use.

The findings of this study demonstrate that home health care consumers with moderate-to-severe cognitive impairment, as compared to consumers with little-to-no cognitive impairment, are less likely to have a spouse, their informal caregivers are more likely to be other family members, and they are more likely to be enrolled in health insurance programs for people living in poverty. They typically have more needs for care, more co-occurring illnesses, greater medical needs, and disabilities that are more severe and long-lasting. Home health care consumers with moderate-to-severe cognitive impairment receive services for many more days, including more medical and non-medical service visits, and are more likely to be readmitted to home health care as compared to their less impaired peers. Excess costs of service associated with significantly higher durations and intensities of service are more likely to be expended on multiple occasions because of readmission.

This study also identifies compelling factors that significantly influence the relationship between cognitive impairment and service volume and cost. The most influential factor in determining service costs is the insurance program used to pay for services. Several other characteristics of provider agencies found to significantly influence the relationship between consumer cognitive status and service volume include the number of annual admissions, the size of the array of referral sources, the number of years in business, the provision of care, counseling, health, and social services, the number of full-time employees providing care services and health services, entry-level wages for home health aides, instrumental incentives offered to direct care workers, and retention rates for home health aides and personal care aides. These findings are used to inform recommendations for future research and policy efforts.

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1 Introduction

An estimated 5.4 million people live with Alzheimer's disease in the United States (U.S.), and the condition afflicts one in eight older adults nationwide (Alzheimer's Association [AA], 2011). Alzheimer's disease accounts for, at most, 70 percent of all cases of dementia, and many additional older adults experience dementia because of other diseases and conditions (AA, 2011). The capacity of the home health care service industry to adequately meet the current and future needs of people living with cognitive impairment is highly questionable. There is a striking paucity of empirical evidence related to critical dimensions of home health care for this population of consumers, such as access, costs, quality, and acceptable outcomes (Institute of Medicine, 2001; National Institute for Nursing Research, 1993). This study adapts the Behavioral Model of Health Services Utilization to frame a multi-level analysis of data from the 2007 National Home and Hospice Care Survey in order to assess the relationships between cognitive impairment and the volume, type and cost of home health care services and examines how these relationships are influenced by home health care agency characteristics.

2 Background

This section begins with a review of the implications of a rapidly aging population in the United States and across the globe, followed by a description of the age-associated dementia syndrome. Dementia is a central focus of this study, and considerations for the informal care provided to individuals with dementia are reviewed. Lastly, critiques of the formal services provided through home and community-based care organizations are used to highlight the importance of the research described in this report.

2.10 *An Aging Population*

The absolute numbers and relative population proportions of adults in old age are rapidly increasing in the United States and across the globe (Federal Interagency Forum on Aging-Related Statistics, 2008; U.S. Census Bureau, 2008). In the most recent international population report by the U.S. Census Bureau, based on global population data from 2008, it is estimated that for the first time in human history the number of people age 65 and older will surpass the number of children under age five (Kinsella & He, 2009). In 2008, approximately 7% of the world's population was age 65 or older, accounting for approximately 506 million people, and this proportion is expected to double by the year 2040 (Kinsella & He, 2009).

The United States has the third largest older adult population of all countries in the world (Kinsella & He, 2009). Throughout the 20th century, the number of older adults in the United States has grown from three million to 37 million, and the number of people aged 85 and older grew from 100,000 in 1900 to 5.3 million in 2006 and will continue to grow to a staggering 21 million by 2050 (Federal Interagency Forum on Aging-Related Statistics, 2008). Over 78 million Baby Boomers were born in the U.S. between 1946 and 1964 (U.S. Census Bureau, 2006), and the eldest members of this cohort turned 65 in the year 2011. These growth trends predict that one in five Americans will be over age 65 by 2030 (U.S. Census Bureau, 2008).

The overall growth of the older adult population over the prior century, and the continued growth in the coming decades, raises serious concerns among health providers, economists, and policy makers in every nation, especially for developing countries where the increase in the proportion of the older adult population is even greater. However, a more noteworthy trend related to global population aging is the rapid growth of a subgroup of older adults, the *oldest-old*. Within the first four decades of the 21st century, the global population across all age groups is predicted to increase by 33%, whereas for people age 65 and older there will be an increase of 160%, and those age 80 and above will increase by 233% (Kinsella & He, 2009).

There are several reasons why these global aging trends are troubling. These trends suggest that very large proportions of working-age adults will reach a life stage that for most people involves retirement from the workforce, thus reducing financial contributions through taxed earnings and simultaneously increasing the demands for public programs of income support. Additionally, the likelihood of living with multiple chronic illnesses and disabilities rises dramatically in old age (Wenger, 2008), and the rapid and dramatic growth in the older adult population suggests sharp increases in healthcare expenditures. The contemporary cohort of people age 65 and older have more than double the number of medical office visits and more than three times the number of hospitalizations than are seen in the cohort of people ages 18 to 44 (Wenger, 2008). In the United States, the combined spending on Social Security and Medicare programs is currently equal to 8.4% of the Gross Domestic Product, but is projected to reach 14.5% by the year 2050 (Population Reference Bureau, 2010).

2.20 *Dementia on the Rise*

The rapid aging of the human population has resulted in corresponding increases in the incidence of age-associated illnesses of dementia, and this trend will continue as the proportion of older adults rises dramatically in the coming decades (Alzheimer's Association [AA], 2011). Globally, there are already 35.6 million people living with dementia today, and this number is expected to almost double to 65.7 million people by 2030 and then nearly double again to 115.4 million people by 2050 (Prince et al., 2013). By the year 2050, the projected rate of Alzheimer's disease diagnoses will reach about 1,000,000 new cases per year, which if evenly distributed over time translates to one new case of Alzheimer's disease diagnosed every 33 seconds (AA, 2011). In the United States, 13% of people age 65 and older have dementia, owing in larger part to their longevity, and nearly two-thirds of these older adults with dementia are women (AA, 2011). Among those with Alzheimer's disease, the condition for which the prevalence statistics are most reliable, it is clear that advanced age is a primary risk factor—with only 10% of Alzheimer's patients under age 75, 45% between the ages of 85 and 94, and another 45% over age 95 (AA, 2011). Thus, the extraordinary growth of the older adult population, especially among the oldest-old, supports projections of substantial increases in the incidence and prevalence of dementia.

Since dementia is the leading chronic disease contributor to disability among older adults (Wimo, Jönsson, Bond, Prince & Winblad, 2013), health systems in every country will be significantly impacted by the extreme escalation in the number of older people living with dementia and will need to dedicate vast amounts of resources toward the support and care of these patients and their families. People with dementia not only need an extraordinary level of care and supervision, but are also known to: 1) have hospital and nursing home stays that are twice as long as their non-demented peers; 2) suffer from repeated health care crises related to malnutrition, accidental injury, and exposure to the elements; 3) experience twice the rate of fractures; and 4) require far more hospitalizations (Riggs, 2001). In addition, people with dementia are typically unable to effectively manage comorbid chronic conditions (Riggs, 2001). These medical complications lead to significantly elevated costs to health insurance programs, such as Medicare and Medicaid (Newcomer, Fox & Harrington, 2001), as well as much higher out-of-pocket healthcare expenses incurred by older adults with dementia and their families (Langa et al., 2004).

The estimated current annual global cost of dementia is $604 billion, or the equivalent of about 1% of the world's Gross Domestic Product (Wimo, Jönsson, Bond, Prince & Winblad, 2013). However, 60% of all people with dementia lived in developing countries as of the year 2001, and this proportion is expected to rise at three times the rate of increase projected for developed nations, resulting in more than 71% of dementia cases living in developing countries by the year 2040 (Ferri et al., 2005). This suggests that countries with the fewest resources will increasingly bear the majority of the global dementia care burden.

2.30 *Dementia Defined*

It is important to distinguish the dementia syndrome from its causes. Dementia is not the name of a disease—it is a broadly defined clinical term used to describe a cluster of symptoms that are common to many diseases. More than 60 different diseases and conditions can cause the dementia syndrome (American Psychiatric Association [APA], 1994). These conditions include Alzheimer's disease (AD), diffuse Lewy Body disease and Parkinson's disease, strokes and transient ischemic attacks, Normal Pressure Hydrocephalus, Huntington's disease, AIDS, long-term alcohol abuse, traumatic brain injury, and Creutzfeldt-Jakob disease, to name just a few

(Weiner & Lipton, 2009). Some of these diseases are progressive, causing symptoms to appear and then intensify over time as the disease pathology spreads throughout the brain, while other conditions are stable and do not worsen over time. Most people with dementia are found to have multiple co-occurring causal conditions, such as vascular dementia and Alzheimer's disease (Weiner & Lipton, 2009). Alzheimer's disease is the most common cause of dementia, with pure Alzheimer's disease accounting for 50% to 70% of dementia cases and combinations of AD and other brain diseases responsible for up to 90% of cases (Weiner & Lipton, 2009).

Dementia is an acquired disease-related clinical syndrome involving multiple cognitive impairments that result in dysfunction and disability (Qui, de Ronchi, & Fratiglioni, 2007), dependence upon assistance from others for activities of daily living (Neundorfer et al.., 2001), depression (Stroud, Steiner, & Iwuagwu, 2008), and premature institutionalization and death (McClendon, Smythe, & Neundorfer, 2006). The term "dementia" comes from the Latin phrase "de mens," which means *out of mind*. The most current conceptualization of dementia names the syndrome "Neurocognitive Disorder" (Sibersky, 2012). A more formal definition of neurocognitive disorder is the acquired and persistent loss of multiple cognitive functions (Zarit & Zarit, 2007), and people with this disorder experience sufficient damage to the brain to create ongoing, and often worsening, troubles with different aspects of thinking and functioning. The symptoms of neurocognitive disorder always result from damaged or dysfunctional neurons, either located in just a few discrete brain regions or diffusely located throughout the brain's cortical and subcortical regions as well as in the brain stem (Weiner & Lipton, 2009). Each disease that can cause neurocognitive disorder has a distinct profile of pathology, pattern of brain damage, and array of symptoms. For any person with this disorder, their own unique constellation of symptoms is directly linked to the particular neurons that are damaged in the brain as well as to their baseline levels of ability (Weiner & Lipton, 2009).

General categories of symptoms of neurocognitive disorder include difficulty remembering (amnesia), difficulty performing routine activities (apraxia), difficulty perceiving the environment (agnosia), and difficulty communicating (aphasia). However, as a result of these cognitive impairments, people with neurocognitive disorder also experience significant functional impairment, unpredictable personality changes, psychiatric features like hallucinations and delusions, and emotional irregularities like depression and anxiety (Zarit & Zarit, 2007). In addition, the presence of neurocognitive disorder is known to complicate the treatment of co-occurring illnesses, such as cancer, diabetes, congestive heart failure, and chronic obstructive pulmonary disease- all of which are common among older adults (Riggs, 2001).

Neurocognitive disorder is the most current clinical label for dementia, but the term dementia is still commonly used in the care and service industry and is less burdensome to use in written reports and discussions about the syndrome. Since the formal definitions of the syndrome always refer to multiple cognitive impairments, the phrase “cognitive impairment” is another commonly used label for the broad array of intellectual deficits caused by neurocognitive disorder. In this study, accurate diagnostic data are not available in the dataset and the best available measure of intellectual disability is a cognitive impairment scale that is used in the home health care data reporting system, described in detail below. Thus, the terms “dementia,” “neurocognitive disorder,” and “cognitive impairment” are used interchangeably in this report.

2.40 *Informal Dementia Care*

Biomedical interventions are currently able to provide only minimal symptomatic relief and cannot effectively prevent, halt, or reverse the progression of dementia symptoms (National Institute on Aging, 2007). The vast majority of dementia cases are caused by terminal, neurodegenerative conditions such as Alzheimer's disease, and the inability to cure these diseases or to provide patients with meaningful relief from symptoms, means that people with dementia must live the abbreviated remainder of their lives with worsening symptoms and increasing dependence upon others. The impact of dementia is increasingly devastating during the progression of symptoms from earliest signs through the end of life, as are the effects on an individual's loved ones, family members, and friends—especially those involved in his or her care (Toseland & Parker, 2006).

Approximately 70% of all the care for people with dementia is provided informally in private homes by family and friends (Alzheimer's Study Group [ASG], 2008). Informal care is the 'backbone' of dementia care, and the significance of this informal care is even greater in developing nations where formal care systems for mental and neurological disorders are minimal or nonexistent altogether (World Health Organization, 2008) and where there is a severe lack of an elder care infrastructure (Shetty, 2012). In the year 2010, informal caregivers in the United States provided 17 billion hours of care to loved ones with dementia, which is a contribution valued at $202 billion (AA, 2011). The routine tasks of an informal caregiver vary greatly based on the particular needs and remaining abilities of the person with dementia at any particular point in the progression of symptoms, but may include those listed in **Figure 1**.

Figure 1: Typical Tasks of Informal Care Providers

Grocery shopping
Housekeeping
Meal preparation
Bathing and dressing
Feeding
Toileting
Transferring from sitting to standing
Providing local transportation
Overseeing finances and paying bills
Managing legal affairs
Identifying/coordinating care services
Helping with medications/treatments
Assuring personal safety and supervision
Responding to difficult behaviors

(Alzheimer's Association, 2011)

High quality care from a loving and dedicated care partner is tremendously beneficial to people with dementia. Furthermore, the attentiveness, patience, and familiarity with personal histories and preferences of spouses, adult children, and close friends are rarely matched by hired workers. Thus, many family members and friends volunteer to provide various levels of care to their loved ones living with dementia. However, the long-term negative impacts of caring for people with dementia are well documented. More than 40 percent of unpaid caregivers experience very high levels of emotional stress, and nearly one-third develop clinical depression (AA, 2011). They also experience many more medical problems than their non-caregiving peers, as well as measurably reduced life expectancies (ASG, 2008). These negative impacts of dementia caregiving, especially caregiver burden, have been linked to unmet service needs in patients (Li, Kyrouac, McManus, Cranston & Hughes, 2012).

The provision of care is likely made more difficult by any number of personal challenges, including: 1) the competing demands of other family members, especially dependents such as young children; 2) the responsibilities of employment or the financial hardships of unemployment; 3) conflicting views among family members about care-related decisions; and 4) medical problems of the caregiver. For dementia caregivers in particular, all of these potential difficulties are likely to be further complicated by the progressive nature of the disorder, which potentially prevents caregivers from gaining sufficient mastery over caregiving tasks and instills heavy emotional tolls associated with watching loved ones decline over time because of the progress of terminal brain disease.

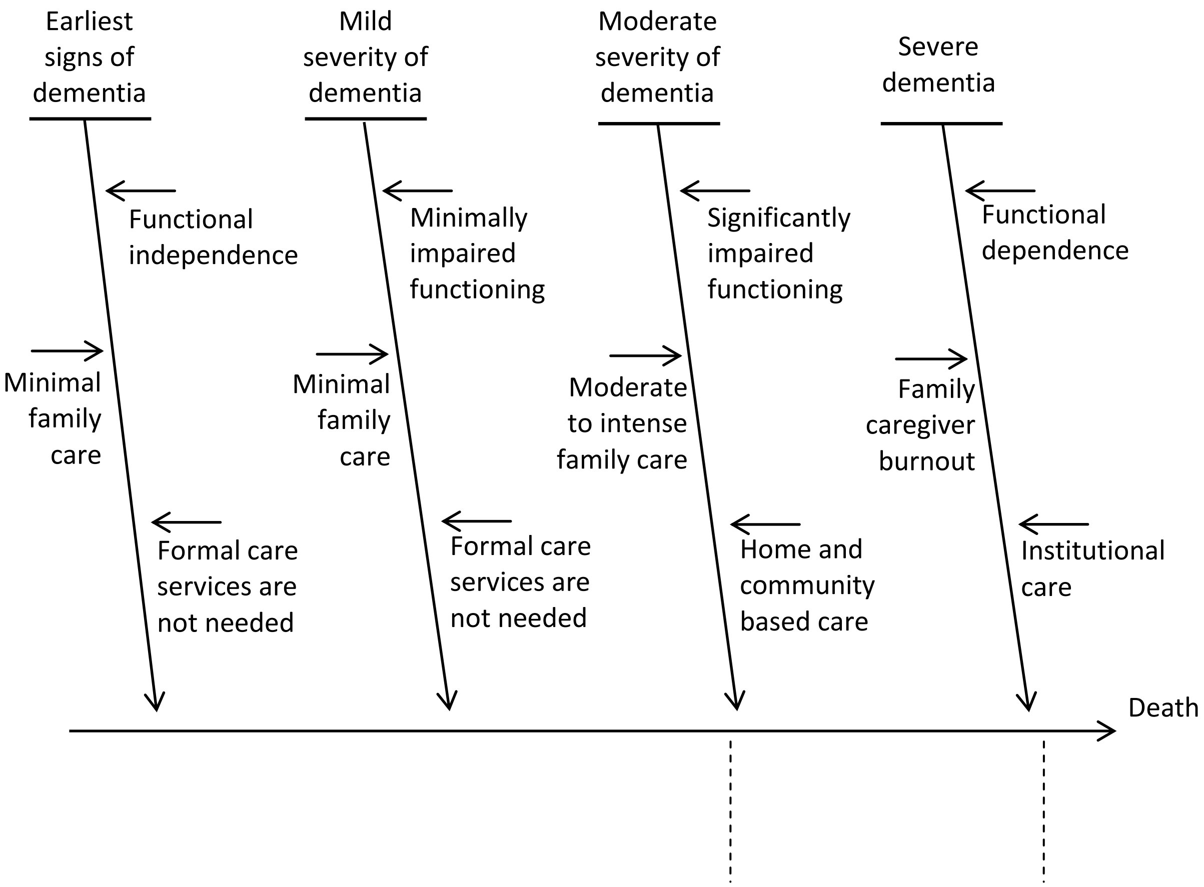
2.50 *Formal Dementia Care*

The personal, familial, social, and economic costs of informal in-home care cannot be ignored. At the same time, a continuum of health, mental health, and aging services programs in both community and institutional settings provides formal care services for older adults and those living with disabilities (Alkema, Wilber, & Enguidanos, 2007). Formal, paid care services are a vital resource in the broad dementia care arena because some people with dementia do not have any opportunities for informal care whatsoever, and even those with informal care providers may benefit from formal services when the burdens of care become too excessive for the informal providers to manage without help. Thus, formal providers may be brought into the home of the person with dementia, or may work at local day care centers or residential facilities. This study examines service use in the home health care industry, recognizing that workers from this service sector provide the majority of hands-on care and supervision for community-dwelling older adults and people living with disabilities in the U.S. (Kelly, Morgan & Jason, 2012).

The home health care industry is comprised of licensed and unlicensed agencies offering health-oriented services, such as skilled nursing, wound care, medication administration, and social services. Alternatively, agencies in the personal care sector operate within a discrete industry and provide only homemaker services or housekeeping services, assistance with instrumental activities of daily living (IADLs), or durable medical equipment and supplies. Many home health care agencies provide both levels of care, but personal care agencies are not permitted to do so. Home health care agencies provide both short-term, post-acute care and ongoing support for people with functional disabilities. These services often allow people to remain living at home after they acquire a disability or chronic illness as well as during their rehabilitation after hospital procedures (Kelly, Morgan & Jason, 2012). Within the domain of home health care, which is the focus of this study, agencies may differ considerably in terms of size, staffing, experience, and employee work-life satisfaction.

The location of formal care for older adults, and for individuals living with dementia and cognitive impairment, has been shifting out of institutions and into private homes since the passage of Medicare and Medicaid legislation in the Social Security Act of 1965 (National Institute for Nursing Research [NINR], 1993). This trend has created a substantial need for community-based health services. The growth of the home care sector has outpaced every other part of the long-term care industry and represents the third fastest growing health care profession overall, with the agency-based home care workforce increasing by more than 210% between the years 2000 and 2008 (Kelly, Morgan & Jason, 2012). In addition, policymakers have prioritized greater reliance on community-based care as a primary goal in recent years (Doty, 2010) because when people with moderate-to-severe dementia remain at home, informal and formal providers share in the provision of care (see **Figure 2**).

Figure 2: Progression of Symptoms and Care Provision in Dementia



The period of shared care presents an opportunity to address patient and family health and quality of life through supportive and effective home-based assistance. Part-time home-based care is not only the preferred mode of service for most consumers (Gibson et al.., 2003), but it is also significantly less expensive than full-time institutional care (Dale & Brown, 2006). Delayed institutionalization for people living with dementia is thought to contribute to significant savings in the overall societal costs of dementia because the daily costs of home care are much lower than daily costs for nursing home care and the average nursing home stay for people with dementia has been found to be as much as twice as long on average than the length of stay of nursing home residents without dementia (Riggs, 2001).

Efforts to delay institutionalization have historically focused exclusively on bolstering family caregiver capacity, whereas studies of formal home-based services for the cognitively impaired have primarily attempted to identify predictors of service use (Pot, Zarit, Twisk, & Townsend, 2005). However, there are several factors which contribute to the length of time people with dementia can be cared for at home with the assistance of both family members and hired workers (see **Figure 3**).

Figure 3: Potential Determinants of the Duration of Shared Care

- Family caregiver characteristics (i.e. burden, finances, caregiving skill, conflicting demands)
- Patient characteristics (i.e. health, disabilities, behavioral challenges, psychiatric problems)
- Home health care service characteristics:
    - Appropriateness of level and type of care
    - Worker skill, knowledge, motivation
    - Supervisory support, guidance, availability
    - Collaboration of aides and family caregivers
    - Agency management of workers, finances, caseloads, etc.

When the burdens of dementia care become excessive, family caregivers typically supplement their own caregiving efforts by coordinating professional services in the home. This supplemental care is not arranged by family caregivers in order to surrender all of their own roles, but to off-load some of the more basic care tasks and thereby alleviate their feelings of worry and strain (Stoller, 1989; Pot, Zarit, Twisk & Townsend, 2005). However, people living with dementia are known to use less formal care than their disability-matched peers because: 1) the costs are high; 2) the family caregivers feel embarrassed about needing help; and 3) caregivers are concerned about turning over their roles to strangers and possibly causing disruption for the person with dementia (Grunfeld, Glossop, McDowell & Danbrook, 1997). Thus, formal care services are often hired by families only after prolonged delays and with great reluctance. Unfortunately, home care services in their current form do very little to diminish caregiver burden, and can instead introduce additional service-related stress (Sussman & Regehr, 2009). Numerous and sizeable problems in the home health care industry, described below, are in particular need of attention from research scholars and policymakers. The quality of community-based formal care services must be assured if we are to effectively extend the shared care period.

The vast majority of formal dementia care is provided by direct-care workers, many of whom find the work to be difficult or overwhelming (Karantzas et al., 2012). Furthermore, these workers are known to be the lowest paid and least trained members of the healthcare workforce (AA, 2011, Newcomer, Fox & Harrington, 2001). High levels of employee turnover are typical in the home health care industry, with the rate of turnover ranging from an estimated 50% to 100% (Brannon, Barry, Kemper, Schreiner & Vasey, 2007). In addition, the frequency of worker supervision and the duration and content of required training for workers employed by home health care agencies varies dramatically from state to state (Kelly, Morgan & Jason, 2012). Low salaries, high rates of turnover, and inadequate worker incentives, training, and social support are indicators of poor work-life satisfaction among direct care workers (Ejaz, Noelker, Menne & Bagaka's, 2008; Yan, Kwok, Tang & Ho, 2007).

Although all states are required to comply with minimum education and supervision standards dictated at the federal level by the Omnibus Budget Reconciliation Act of 1987, many states require only these minimum standards—which industry experts agree are generally too low (NINR, 1993). In addition, poor regulatory oversight of whether or not these personnel, educational, and supervisory standards are being met by agencies, coupled with insufficient evaluations of care quality and related health outcomes in patients, inadequate assessment instruments, and underfunded reimbursements for non-acute services are significant documented problems which threaten the quality of care and the accountability of providers (ASG, 2008; IOM, 2001; National Research Council, 2011). The size and scope of the challenges faced in the home health care industry, as listed above, cannot be overstated. Yet, when considering the additional complexities of responding to the multidimensional disabilities associated with disorders of dementia, it seems the quality of home health care for this particular population of vulnerable older adults is highly suspect.

Improvements in the general training of this workforce and in the overall delivery of home health services should be accompanied by dementia-specific models of care. Even in primary community medical care, where resources for physician education and training far surpass those in the home health care arena, providers have demonstrated challenges in offering appropriate dementia-related diagnoses, patient and family education, or basic disease management (Boustani, Schubert & Sennour, 2007). Thus, the home health care system in the United States is in need of up-scaling in order to appropriately manage the current levels of need.

Furthermore, without improvements in care quality the industry will likely remain unable to assure adequate care for the future older adult population that is expected to double in size in just three decades. In order to begin improving the quality of these health services, knowledge about consumers and service providers is required.

3 Purpose of the Study

In this section, shortcomings of prior research are highlighted and the purpose of the current study is described. This study is presented as an essential step in filling the current knowledge gaps and providing important information for guiding the social work profession in its work with home health care consumers and providers. The specific research aims and questions guiding this study are also defined below.

3.10 *Knowledge Gaps*

Previous studies of home health care utilization have focused primarily on: 1) individual determinants of the use of different kinds of formal care services (Li, 2006; Peng, Navaie-Waliser & Feldman, 2003; Weber, Pirraglia & Kunik, 2011); 2) influences on the timing of nursing home placement (Jette, Tennstedt & Crawford, 1995; Wattmo, Wallin, Londos & Minthon, 2010); or 3) caregiver correlates of formal help-seeking (Beeber, Thorpe & Clipp, 2008; Pot, Zarit, Twisk & Townsend, 2005; Sussman & Regehr, 2009). Several studies have examined the association of cognitive impairment with types of in-home services used (Hawranik & Strain, 2001; Toseland et al.., 1999) or service use in general (Morgan, Semchuck, Stewart & D’Arcy, 2002; Murman et al.., 2003). A recent systematic review of services used by community-dwelling individuals with dementia found that home health care is the community resource most often used among people with dementia, yet it is used by fewer than half of dementia patients overall (Weber, Pirraglia & Kunik, 2011).

To date, there have been no studies describing the population of home health care consumers with cognitive impairment as compared to consumers without cognitive impairment in the United States. It is reasonable to expect that these groups of consumers differ in meaningful ways, with particular distinctions in their levels of informal support, severity of disability, and particular types of need that could be addressed by home health care providers. There have been no studies documenting the unique profiles of home health care service use for consumers with cognitive impairment. It is likely that differences exist in the frequency and periodicity of services provided, the particular types of services provided, the health insurance programs used to pay for services, and the overall costs of care. Additionally, there have been no studies examining home health care services that take into account the considerable variability among provider agencies and their workforces. Variability in agency characteristics likely impacts the quality of care provided by agency personnel, especially in the complex care for individuals with cognitive impairment. In a recent systematic review of 74 intervention studies from the past 20 years aimed at improving any aspect of dementia care workforce capacity, not a single intervention was found for the community setting (Elliott, Scott, Stirling, Martin & Robinson, 2012).

3.20 *Research Goals*

An important first step to improving the quality, efficacy and efficiency of home-based dementia care is to understand the unique dimensions of home care service provision for persons with cognitive impairment. These dimensions include both consumer-level features (e.g., population characteristics, distinct levels of functional impairment and need for care, insurance programs providing payment for services, patterns of service use, and costs of care) and organization-level factors (e.g., agency size and experience, services offered, and wages and incentives for workers). This study is the first to examine the characteristics of home health care consumers with cognitive impairment, the profiles of service use in this population, and the influences of provider agency characteristics on the relationship between consumer cognitive impairment status and service utilization. Incorporating multiple domains of a modified Behavioral Model of Health Services Utilization, described below, data analyses in this study generate distinct profiles of formal service need and home health care service usage for people with cognitive impairment while accounting for and examining the variability among provider agencies. Thus, this study serves as the first in a series of research endeavors intended to foster innovations in home health care that will benefit individuals with cognitive impairment.

Findings from this study contribute significantly to the social work profession and other health and mental health professions, where practitioners must understand the capacity of agencies to provide services for clients who are referred. Additionally, such providers operate within practice and policy arenas directly related to community-based services for the elderly, and gaining knowledge of client needs and factors affecting service use is a critical component of any effort to improve the effectiveness and efficiency of care for clients. The rapid aging of the population, coupled with the considerable complications associated with dementia care, lends particular urgency to the need for intervention, program development, and policy change in this arena.

3.30 *Research Aims and Questions*

***Aim 1*: To examine the association between cognitive impairment and home health care service volume, type and cost**

Question 1a:	Is there a significant relationship between the volume and type of home care service visits and consumer cognitive impairment?
Question 1b:	Is there a significant relationship between the readmission status of home care consumers and consumer cognitive impairment?
Question 1c:	Is there a significant relationship between the duration of home care services and consumer cognitive impairment?
Question 1d:	Is there a significant relationship between the average daily cost of service and consumer cognitive impairment?

***Aim 2*: To examine the association between home health care agency characteristics (e.g., services offered, wages and incentives for workers, agency size and experience) and consumer home health care service volume, type and cost**

Question 2a: Is there a significant relationship between the characteristics of home health care agencies and the volume and type of home care service visits?

Question 2b: Is there a significant relationship between the characteristics of home health care agencies and the readmission status of home care consumers?

Question 2c: Is there a significant relationship between the characteristics of home health care agencies and the duration of home care services?

Question 2d: Is there a significant relationship between the characteristics of home health care agencies and the average daily cost of service?

***Aim 3*: To examine the influence of home health care agency characteristics on the association between consumers' cognitive impairment status and home health care service volume, type and cost**

Question 3a: Do the characteristics of home health care agencies moderate the relationship between consumers’ cognitive impairment status and the volume and type of home care service visits?

Question 3b: Do the characteristics of home health care agencies moderate the relationship between consumers’ cognitive impairment status and the readmission status of home care consumers?

Question 3c: Do the characteristics of home health care agencies moderate the relationship between consumers' cognitive impairment status and the duration of home care services?

Question 3d: Do the characteristics of home health care agencies moderate the relationship between consumers' cognitive impairment status and the average daily cost of service?

4 Theoretical Framework

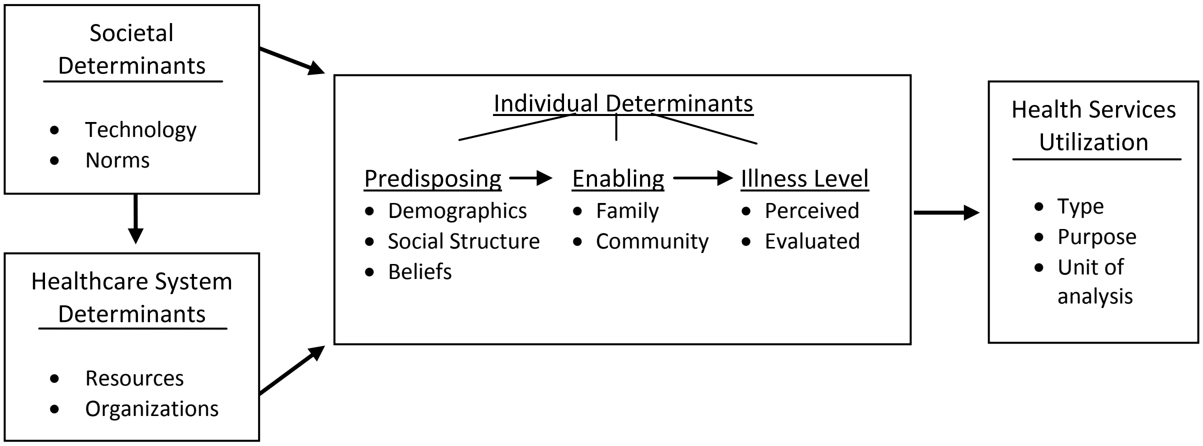
The research aims and specific questions listed above are built upon a conceptual framework which requires an adaptation of the behavioral model of health services utilization created by Andersen and Newman in 1973. The modification of this model is described in this section, along with the organizational and individual determinants of home health care service utilization relevant to this study.

4.10 *Behavioral Model of Health Services Utilization*

The original behavioral model of health services utilization details the interrelation of societal factors, health service system factors, and individual attributes in determining utilization of health services (Andersen & Newman, 1973). This conceptual model has been used widely in its original and modified forms in recent decades to structure studies demonstrating the association of such factors with the utilization of many types of health services (Andersen, 1995; Choi, Rozario, Morrow-Howell & Proctor, 2009; Gelberg, Andersen & Leake, 2000). In its original form, the Andersen-Newman framework suggests that societal determinants of utilization, such as technology and social norms, have both a direct and an indirect effect on individual determinants of utilization.

In the Andersen-Newman conceptual framework, individual determinants include predisposing factors (e.g., demographics and beliefs about health care), enabling factors, (e.g., family and community resources), and levels of illness (e.g., perceived and evaluated levels of illness and need for care). Societal determinants of service utilization, such as the development of new health technologies, indirectly affect individual determinants through mediating effects on the healthcare service systems. Health service system determinants include resource factors, such as the volume and distribution of resources, as well as organization factors such as organizational structure and the accessibility of goods and services (see **Figure 4**).

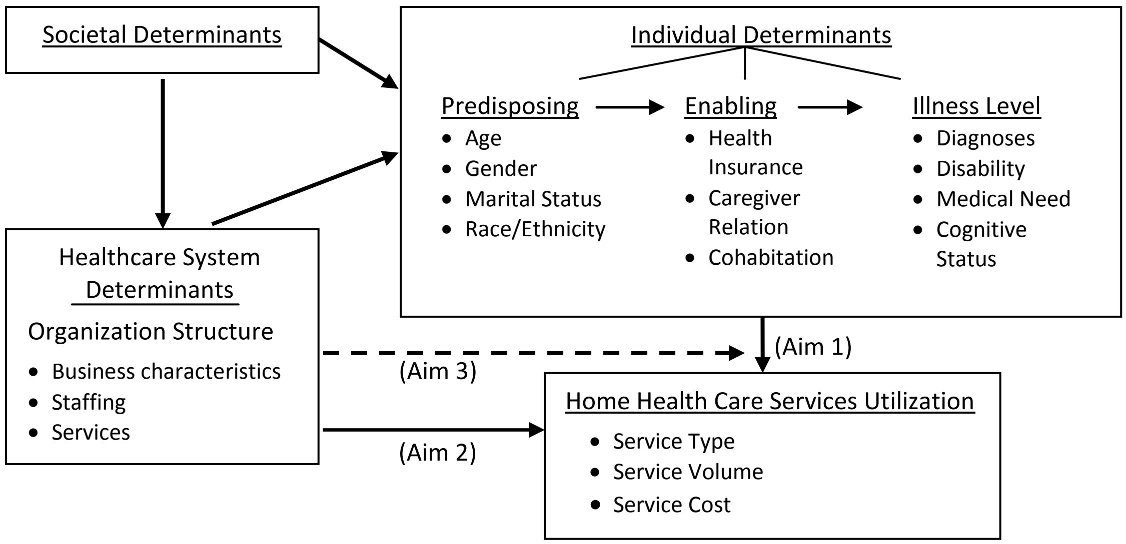
Figure 4: Original Andersen-Newman Health Services Utilization Model



Utilization of health services is often examined by researchers in a dichotomous (use/non-use) context for a specific type of service (Gaugler et al.., 2003; Toseland et al.., 1999).

Alternatively, the Andersen-Newman framework offers richer discovery when societal-, service systems-, and individual-determinants are incorporated into the examination of *patterns* of amount, type, or duration of service among consumers (Beeber, Thorpe & Clipp, 2008; Phillips, Morrison, Andersen & Aday, 1998). Additionally, Andersen and Newman (1973) specifically recommend paying careful attention to the purpose of the service being studied when applying their framework to utilization research. The framework should thus be tailored to distinct service settings and patient populations in order to explore the most salient determinants of utilization. For the purposes of this study, several modifications have been made to the Andersen-Newman framework, outlined below, to account for factors specific to the home health care industry, the challenge of cognitive impairment, recent methodological research innovations, and the constructs available for study in the survey data used in this study (see **Figure 5**).

Figure 5: Modified Andersen-Newman Health Services Utilization Model



The societal determinants related to home health care use and the care of persons with cognitive impairment may include new technologies, such as innovative dementia-care models, as well as shifting societal norms which embrace private homes as the preferred location of care receipt. However, the modified framework in this study does not list specific societal determinants. An exploration of societal determinants for home health care utilization is beyond the scope of this study, but should be addressed in future studies using alternative sources of data. Similarly, national and regional resources for the home health care service system are not reviewed because these domains of influence are factors associated with organizational access, whereas this study focuses on service use and costs once admitted to the care of an agency.

4.20 *Individual Determinants*

For a complete list of individual-level determinants, see **Appendix A- Table 1**. Predisposing components of the service utilization framework are individual characteristics which exist before the onset of illness but contribute to a person's propensity to use services (Andersen & Newman, 1973). Demographic factors such as gender, age, and marital status have been critical to health service utilization in prior studies (Andersen & Newman, 1973; Han, Tiggle & Remsburg, 2008). Race and ethnicity have also demonstrated strong associations with variation in supportive services and health outcomes at the time of discharge from home care (Peng, Navaie-Waliser & Feldman, 2003) and differences in overall costs of care among people with Alzheimer's disease who have Medicaid insurance (Gilligan, Malone, Warholak & Armstrong, 2013).

Demographic and social-structural characteristics may predispose individuals to use health services, but there must also be some means available for them to do so (Andersen & Newman, 1973). Enabling factors include the purchasing power of health insurance (Han, Tiggle & Remsburg, 2008) and availability and relationships of informal supports (Nagatomo & Takigawa, 1998). These factors are suggested in the studies cited above to play a role in identifying the need for service and in facilitating access to service. However, health insurance programs also structure the services provided by dictating reimbursement approval for only select types of care. Medicare, Medicaid, and private insurance programs each have unique target populations and eligibility requirements, and therefore differ in the methods used to determine reimbursement guidelines and ceilings (NINR, 1993). As such, the profiles of service use among health care consumers may vary significantly based on the insurance program being billed, and even more so when compared to people who self-pay for home care services and are therefore free to choose the packages of care that best meet their needs and budgets.

Even within any particular insurance program, the unique needs of certain consumer populations should also dictate patterns of expenditure because of the constellations of need associated with common symptoms. For example, Medicare currently pays for more than half of all health care costs for people with dementia. Furthermore, this particular group of consumers costs nearly three times as much as non-demented peers enrolled in Medicare (Bentkover et al., 2012). In addition, Medicare beneficiaries with dementia account for one-third of Medicare spending but account for only 13% of all Medicare recipients (Boustani, Schubert & Sennour, 2007). Thus, the health insurance program designated as the primary source of payment for home health care services is a very important enabling factor. It is used in this study to frame the presentation of statistical findings that describe the sample and compare consumers with cognitive impairment to other consumers. Furthermore, it is incorporated into the more complex multivariate and multilevel statistical analyses used to answer the research questions of this study.

In more recent iterations of the health service utilization framework (Andersen, 1995), illness level has been described more accurately as need for service. This may be the most important level of influence on utilization as health services are typically designed to respond to illness-based needs. Several illness level factors have previously been shown to predict health service use for older adults, including physical frailty (Schneider et al.., 2003), ADL limitations and functional disabilities (Beeber, Thorpe & Clipp, 2008), incontinence (Hawranik & Strain, 2001), co-occurring chronic illnesses (Riggs, 2001), and severity of cognitive impairment and/or dementia (Hawranik & Strain, 2001). However, with regard to people with dementia the relationships between these illness-level factors and service utilization have been described as inconsistent. They are typically examined with regard to the use of different service types (Hawranik & Strain, 2001). This study examines different service use outcomes, such as the number of service visits and the span of days over which services are provided. While differences in such outcomes are expected, it would be inappropriate to hypothesize the direction or magnitude of differences based on the literature currently available.

4.30 *Organization Structure*

For a complete list of organization-level determinants, see **Appendix A- Table 2**. The focus of this study is what happens to consumers *after* they enter the service system. Which types of services do consumers receive and in what volume? This study examines the relationship between organizational contextual factors and consumer service volume and cost (see arrow for Aim 2 in **Figure 5**). However, an additional achievement of this study is the examination of the influences of organizational factors on the relationship between consumer cognitive impairment status and these outcomes (see arrow for Aim 3 in **Figure 5**). As such, within the service system domain of influence, organizational characteristics are proposed to be of relevance to the differential use of service types and variability in the volume of services used by consumers (Phillips, Morrison, Andersen & Aday, 1998).

The organizational context has tremendous importance in the provision of services due to influential organizational characteristics such as agency size and experience, work conditions, quality of supervision, managerial style, and policies (Yoo & Brooks, 2005). Basic agency functions determine the roles of workers (Nathanson & Tirrito, 1998), and therefore the array of services offered by home health care agencies should be examined. Furthermore, organizational characteristics have been shown to affect the adoption of innovations and evidence-based practices, the functioning and productivity within organizations, and the quality of outcomes (Aarons & Sawitzky, 2006; Holleran, 2006). Organizational contextual factors in this study include indicators of business experience and capacity, size and staffing, and employee work-life satisfaction as described below in the Measures section. In this study, the terms “organization” and “agency” are used interchangeably, recognizing the common vernacular of these industries.

5 Study Design

5.10 *Data Source*

This study will utilize existing data from a nationally representative sample survey conducted by the Long-term Care Statistics Branch of the Division of Health Care Statistics of the National Center for Health Statistics (NCHS). For this study, the National Center for Health Statistics agreed to link the public-use consumer-level and agency-level data files for the 2007 National Home and Hospice Care Survey. These survey elements were conducted through a single sampling frame, as described below. Thus, linked data are available for a random sample of consumers from each of the randomly sampled agencies.

The National Home and Hospice Care Survey (NHHCS) is part of a continuing series of repeated cross-section sample surveys of U.S. home health and hospice agencies which began in 1992. It was designed to gather information that describes home health and hospice agencies, staff members, services, and consumers. The 2007 survey is the seventh and most recent survey from this series, and is a redesigned and expanded version of its predecessors, with many new data items, larger sample sizes, and the use of a computer-assisted personal interviewing system. Participating agencies are either certified by Medicare and/or Medicaid or are licensed by a state, and all provide home health and/or hospice services.

5.20 *Sampling Frame*

More than one million older adults received home health care each day in the U.S. in 2007 (NCHS, 2012). It is not feasible to gather information about this many consumers. The 2007 wave of the National Home and Hospice Care Survey used a stratified two-stage probability sample design to gather information about a nationally-representative sample of home health and hospice care consumers. The first sampling stage involved the selection of home health and hospice agencies from the total sample frame, which was constructed using three sources: (1) The Centers for Medicare & Medicaid Services Provider of Services file of home health agencies and hospices, (2) State licensing lists of home health agencies compiled by a private organization, and (3) The National Hospice and Palliative Care Organization file of hospices. The primary sampling strata of agencies were defined by agency type and metropolitan statistical area (MSA) status. Within these strata, agencies were sorted by census region, ownership type, certification status, state, county, ZIP code, and size (number of employees).

Interviewers completed the second stage of sample selection during the agency interviews. Up to 10 current home health consumers and/or hospice discharges were randomly selected by a computer algorithm based on a census list provided by each agency. Current home health consumers were defined as consumers who were on the rolls of the agency as of midnight of the day immediately before the agency interview. For the 2007 wave of NHHCS, a total of 1,545 agencies were systematically and randomly sampled with probability proportional to size. A total of 1,036 home health and hospice care agencies chose to participate in the survey (a weighted response rate of 59%), and data are available on 9,416 current home health consumers and hospice discharges from these agencies (a weighted response rate of 96%). This study focuses exclusively on home health care agencies and consumers, and therefore uses a smaller subsample consisting of 4,683 home health care consumers nested within 677 agencies. This sample was further reduced to 3,309 consumers nested within 595 agencies because a considerable number of sampled consumers received no service visits from agencies and were excluded from this study, which examines patterns of service use and costs of care. There may be important findings to be discovered through an examination of the consumers who received no services, but that analysis is beyond the scope of this study.

5.30 *Data Collection*

Data were collected by the National Center for Health Statistics between August 2007 and February 2008 through in-person interviews with agency directors and their designated staffs who used agency records to answer survey questions. No interviews were conducted directly with consumers or their families. Interviews were facilitated by NCHS personnel with the aid of a computer-assisted personal interviewing (CAPI) instrument available on each interviewer's laptop. A self-administered questionnaire on agency staffing was also mailed to the agency directors to be completed before the in-person interview. Data collected on home health consumers were obtained from client medical records, and includes, for example, socio-demographic information, information about services received, medical information, and functional and cognitive impairments. The data collected on agency characteristics were obtained from administrative records and include information on the year an agency was established, the services an agency provides, client referral sources, specialty programs, and staffing characteristics.

Data collection was facilitated through the following steps: (1) An advance package of survey information, including a letter from the Director of the National Center for Health

Statistics, was mailed to the director of each sampled agency. This letter explained the purpose, content, and authorizing legislation of the survey; (2) Next, an interviewer telephoned the agency director to explain the survey in greater detail, address any concerns or questions about the survey and its procedures, and schedule an in-person interview; (3) Once an interview was scheduled with the agency director, a confirmation package was mailed, including a confirmation letter, details about the specific agency information the interviewer would be requesting, and a self-administered staffing questionnaire that the director was to complete before the interview; (4) During the scheduled interview, the interviewer collected the completed staffing questionnaire and administered the Agency Questionnaire module of CAPI. If the interviewer confirmed that the agency was eligible to participate in the survey, the interviewer then sampled up to 10 current home health patients/hospice discharges; and (5) The interviewer then met with designated staff members that were familiar with the sampled consumers and their care, and collected information for each sampled consumer using the Patient Health module and Patient Charges and Payments module. The agency staff members referred to patient medical records, administrative records, and medication administration records to answer the survey questions. No patients or families/friends were interviewed directly.

5.40 *Measures*

A. Consumer Variables

Categories of consumer data relevant for this study and fitting within the theoretical framework include predisposing factors, enabling factors, and illness level factors. Specific constructs relevant to describing home health care consumers are presented in **Appendix A-Table 1**, and corresponding operational definitions are offered below. Several consumer characteristics are reported in this study for the purpose of describing the sample, but not all are included in regression analyses because they are not specified in the modified behavioral model of health services utilization, described above. Sections of this report describing regression analyses will list all of the included variables.

Predisposing factors include age, gender, marital status, and race/ethnicity. Age is reported in years and gender options include male and female. Marital status is a categorical variable with options that include married, widowed, divorced, separated, never married, and living with a partner. Race/ethnicity is another categorical variable including the categories Caucasian, African-American, Latino/Hispanic, and Other.

Illness level factors consist of the presence of difficult behaviors, incontinence status for both bladder and bowels, medication problems, need for assistance with activities of daily living, need for recent emergency medical care, number of medical diagnoses and categories of diagnoses, use of assistive devices, and use of medical devices. Simple numerical counts were used to gather information on the number of medical diagnoses listed for the consumer, number of activities of daily living for which the consumer needs assistance, and number of activities of daily living for which staff provides assistance. A measure of the severity of co-occurring illnesses may be superior to a count of the number of diagnoses, but such data are not available in the NHHCS dataset and it is beyond the scope of this study to evaluate the differential interactions of particular diagnoses and cognitive impairment.

Dichotomous “Yes” or “No” responses were recorded for the presence of difficult behaviors, use of assistive devices, use of medical devices, bladder incontinence, bowels incontinence, the need for help with taking medications, use of any emergency care services during the current service period, inpatient care prior to admission, and whether the consumer received any surgical, diagnostic or therapeutic procedures prior to admission. The particular medical and assistive devices that may have been used by consumers are not provided in the NHHCS dataset. The use of emergency care services pertains to the current service period, the diagnostic/therapeutic procedures refer to interventions prior to admission, and the other variables do not specify a time frame. If consumers received in-patient care prior to admission into the home health care service, additional details are provided in a variable listing the options of hospital, nursing facility, rehabilitation center, assisted living facility, and other.

Primary diagnosis category options include several hundred possible codes organized under the classification system of the 9th iteration of diagnostic codes from The International Statistical Classification of Diseases and Related Health Problems (ICD-9). In this study, these individual codes are translated into 19 broad categories of illness, and procedures for this transformation are described in the *Data Preparation* section of this report. Cognitive impairment status is the other illness-level factor, and this construct is of primary importance for this study and the management of this variable is described in detail below.

Enabling factors include caregiver status, the relation of informal caregivers, co-habitation status, and both primary and secondary sources of payment for services. The caregiver status question simply asks if the consumer has an informal caregiver. Additional information is provided on the relation of that caregiver to the consumer, including the options of spouse, child, or other family member. Co-habilitation status refers to with whom the consumer lives, if anyone, and includes the categories alone, with family members, and with non-family members. The options for primary and secondary source of payment for services include Medicare, Medicaid, private insurance, and self-pay by the consumer or family.

The primary source of payment for services, considered an enabling factor in the health services utilization framework for this study, requires additional explanation. Medicaid is the joint Federal/state program that helps pay medical costs for people with limited income and resources. Medicare is the Federal program that pays medical costs for people who are age 65 and older or disabled. Each program limits the type and extent of healthcare coverage in different ways. In addition, distinct profiles of service use and associated costs of care have been documented in prior studies (Bentkover et al., 2012).

The Medicare home health benefit requires physician-ordered skilled nursing care on a part-time or intermittent basis, and can also provide home health aide services, social services, and physical and occupational therapy. Under this plan, home health aides can perform a full range of homemaker and personal care tasks so long as the home-bound consumer also requires skilled care. Regardless of cognitive impairment status, people need to have acute medical needs in order to get Medicare-funded home health services, and a diagnosis of dementia would not justify skilled nursing care on its own. Medicare-funded services are generally available for no more than three weeks per authorized episode. Thus, the Medicare home health package is medically focused and short-lived.

The Medicaid home health benefit is similar to the Medicare benefit, except the coverage is typically available on a long-term basis; it does not require consumers to be home-bound; and eligibility can be tied to the need for assistance with activities of daily living (ADLs). ADL-based coverage and long-term service provision make the Medicaid benefit more useful for supporting people with dementia over a period of several years. However, living at or below the poverty line, or spending down one's personal wealth to reach this level, is required to receive the benefit.

Home care consumers may be enrolled in any of a number of insurance programs that are paying for some or all of the home care service, or they may be paying for care out of pocket. For this study, the Medicaid and Medicare programs are likely to be most relevant to the analysis, and most directly impacted by the study's findings. Additional sources of payment for services reported in NHHCS include private insurance and self-pay. The National Home and Hospice Care Survey dataset offers sufficient cases of consumers insured by Medicare and/or Medicaid, as well as people enrolled in private insurance programs, to evaluate potentially meaningful differences in study outcomes between these groups of consumers. Controlling for the primary source of payment in the analyses is essential, as service profiles are directly shaped by insurance program coverage goals, such as Medicare's short-term, medically-focused home care benefit.

B. Key Predictor Variable

Cognitive impairment status is the primary consumer characteristic being evaluated in order to determine if the sampled consumers who have cognitive impairment differ significantly from those who do not have cognitive impairment in terms of illness-level factors and service utilization outcomes. Thus, this variable is included as an illness-level factor and treated as the primary predictor variable in the analyses described below. The National Home and Hospice Care Survey uses case records as documented sources of information for describing consumers' current health status, including levels of cognitive functioning. Agency administrators reported information from these case records to categorize consumer cognitive impairment status as either: 1) No cognitive impairment; 2) Requires only occasional reminders (in new situations); 3) Requires some assistance/direction in certain situations (is easily distracted); 4) Requires a great deal of assistance/ direction in routine situations; and 5) Severe cognitive impairment (constantly disoriented, comatose, delirium).

This 5-point scale is identical to the cognitive functioning measure (item M0560) used in the Outcome and Assessment Information Set (OASIS), which is the uniform data collection instrument use by certified home care providers at the time of service initiation, change, and discharge for all benefits-funded skilled-care consumers. It is very likely that agency administrators completing NHHCS questionnaires simply used these readily-available OASIS data to inform their answers regarding consumer cognitive impairment status. The use of this scale presents limitations for this study, since dementia is not clearly indicated by any category. This limitation is discussed further in the Limitations section of this report. However, a recent study of the validity of OASIS measures found the OASIS item for cognitive function to significantly correlate with a "gold standard" measure of cognitive impairment, the Short Portable Mental Status Questionnaire (r = .62, significant at p = .01) (Tullai-McGuinness, Madigan & Fortinsky, 2009).

For this study, consumers are considered cognitively impaired if they were reported to belong within any of the three moderate-to-severe categories, meaning a score of 3, 4, or 5 on the

5-point scale. The use of these three categories to define impaired cognition is consistent with most conceptual frameworks used to describe cognitive impairment associated with dementia (American Psychiatric Association, 1994; Tullai-McGuinness, Madigan & Fortinsky, 2009; Weiner & Lipton, 2009; Zarit & Zarit, 2007). When operationally defining the construct in this way, 32% of the home health care sample in the 2007 NHHCS dataset is found to have cognitive impairment. This rate of impairment is consistent with the expected range for this type of sample. This cognitive impairment predictor variable is not highly correlated with the length of service outcome variable ($r = 0.21$) or with any of the other dependent variables described below ($r \leq 0.1$), suggesting only minimal associations between the operational definition of cognitive impairment and the operational definitions of service cost and service volume in this study. These associations are explored further through bivariate analyses and multivariate regressions.

C. Dependent Variables

Home health care services utilization factors and costs of care are the central focus of this study, and these outcomes are listed in **Appendix A- Table 3** and described in greater detail below. These dependent variables include: the average daily charges for services, the total number of service visits during the 60 days prior to the date of the interview as well as the number of medical and non-medical service visits during this time frame; the overall length of the current episode of care from date of admission to date of interview; and whether or not the current enrollment is a readmission. Average daily charges are consumer-specific, and represent the total amount billed by the agency in the last complete billing cycle divided by the number of days that charges cover. The average daily charges variable captures both price and quantity of the total service array for each consumer, and is used to demonstrate meaningful associations between cognitive impairment and the overall cost of home health care. The service volume variables are used individually as outcomes (dependent variables) in the analyses to assess both the overall duration and intensity of service provision and the distinct array of medical and non-medical service visits for consumers with cognitive impairment as compared to consumers without cognitive impairment. Medical visits include visits for the provision of skilled nursing, occupational therapy, and physical therapy. Non-medical visits include Home Health Aide visits and visits for the provision of social services.

D. Agency Characteristics

Appendix A- Table 2 presents specific constructs relevant for describing agencies and their workforces, and corresponding operational definitions are offered below. *Business characteristics* consist of the number of annual admissions, the size of the array of referral sources, and the number of years in business. The number of annual admissions is a continuous variable reporting a count of the total number of consumers who initiated services during the year prior to the survey, 2006. Referral array size is a count of the total number of referral sources for an agency, with a range from 0 to 11, including hospitals, physician offices, patients/families, nursing homes, assisted living facilities, outpatient medical/surgical centers, rehabilitation center, other home health agency, insurance provider, community organization, and “other.”

Services profile factors are the agencies’ provision of care services, counseling services, health services, and social services. Each of these variables is a count of the number of services an agency offers in the category of service, and these count variables represent the comprehensiveness of agency service offerings in each category. For care services, there are seven possible services an agency may provide, including companion services, continuous homecare, homemaker services, meals on wheels, assistance with Activities of Daily Living, transportation services, and respite care. For counseling services, there are four possible services an agency may provide, including pastoral services, mental health services, ethical issues counseling, and grief/bereavement counseling. For health services, there are 15 possible services an agency may provide, including complementary/alternative medicine, dietary/nutritional services, enterostomal therapy, IV therapy, physician services, podiatry services, skilled nursing services, wound care, durable medical equipment, pharmacy services, occupational therapy, physical therapy, respiratory therapy, speech therapy/audiology, and other therapy. For social services, there are just two possible services an agency may provide, including social services and referral services.

Staffing-related constructs include the number of full-time employees providing care services and health services, entry-level wages for home health aides and personal care aides, instrumental incentives offered to direct care workers, and retention rates. The number of full-time employees is calculated by determining the sum of full-time employees (each equal to 1) and part-time employees (each equal to 0.5) in each category. Employees providing care services include certified home health aides and non-certified aides. Employees providing health services include Registered Nurses and Licensed Practical Nurses. Entry-level wages for direct care workers are the calculated average of entry-level wages for both certified home health aides and non-certified personal care aides. The instrumental incentives variable is a count of incentives and benefits agencies make available to direct care workers. There are 16 possible incentives an agency may provide to its care aides, including full insurance for the worker, full insurance for the worker’s family, partial insurance for the worker, partial insurance for the family, other employee insurance plans (dental, vision, disability, life), retirement pension plan, 401K retirement plan, paid vacation days, paid sick days, paid personal days, other paid bonuses, transportation/mileage reimbursement, uniforms, cell phones/reimbursement, career promotion/development, and reimbursement for education. Retention rates are determined by averaging the percentage of all certified home health aides and non-certified personal care aides who have worked at the agency for one year or longer.

5.50 *Human Subjects Protections*

Federal policy requiring research study review by an Institutional Review Board [CRF 46.101(b)(4)] states that exemptions may be made if the research involves the collection or study of existing data, documents, or records if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. This study is therefore exempt from required human subjects review by the IRB at Columbia University because it utilizes publicly available, de-identified datasets. However, for added assurance the research proposal for this study was submitted to the IRB at Columbia University and exemption status was confirmed.

6 Data Analysis Methods

6.10 *Data Access*

With the exception of the single variable that links consumers to agencies, every variable used in this study is available in the public domain. The consumer-agency linking variable, however, is restricted in order to protect the anonymity of consumers and agencies. Gaining access to this restricted variable, which is critical to the multilevel analyses in this study, required prior project approval from the National Center for Health Statistics, which was obtained for this study. In addition, restricted data of this nature can only be examined in the protected environment of a secure Census Research Data Center (RDC). Columbia University is a member of a consortium of universities in New York which have access to the New York Census Research Data Center. Gaining individual access to this center required the further step of gaining Special Sworn Status and undergoing a series of trainings on data stewardship and data management. With all of these approvals in place, the remaining restrictions on the research done for this study included the prohibition of removing any printouts or notes from the RDC and the requirement of requesting review and release of any and all statistical output log files by an assigned statistical analyst from the Center for Disease Control's Office of Surveillance, Epidemiology, and Laboratory Services. These initial and ongoing review and approval requirements impacted the start date of the project and the speed of research progress, but otherwise did not interfere with the integrity of the research design in any way and at no point were any output files rejected for release. These protective procedures confirm that the analyses of survey data performed in this study did not violate the confidentiality assured to survey participants at the time of enrollment.

6.20 *Data Preparation*

A. Variable Recoding and New Variable Creation

The National Home and Hospice Care Survey variables used to describe the sample and/or answer the research questions in this study required preliminary preparation. The 2007 NHHCS datasets include thousands of variables, only some of which were requested for this study. Since some survey questions pertain only to hospice services, some to home care services only, and some to either type of service, great care has been exercised in identifying and using the appropriate variables relevant to this study on home health care consumers.

Nearly every variable has been given new value labels to correspond with the data dictionary provided by the National Center for Health Statistics. In addition, many variables contained values used to designate instances when respondents reported that they did not know the answer, refused to give the answer, or for which an answer was not ascertained for any other reason, and these valued have been recoded into a single *Missing Data* value. Dichotomous constructs are represented by categorical variables that have been recoded into a 0,1 binomial framework where the value of 1 always represents the affirmative or positive option (e.g., the answer “Yes” or the presence of a particular characteristic such as female gender).

Many of the categorical variables used in this study were duplicated under new names and converted into indicator variables where particular values became the factor around which the new variable is dichotomously represented (e.g., the categorical variable of race/ethnicity which originally contained 5 possible values is transformed into 5 new indicator variables dichotomously representing each race/ethnicity category). Conversely, a number of dichotomous variables were combined into new count variables when a tally of positive values was required (e.g., creating a count variable for the total number of referral sources for an agency by calculating the sum of positive values across several dichotomous referral source variables). The generation of entirely new variables was conducted after the data preparation stage of multiple imputation, described below, and care was exercised to ensure that the new variables were created properly and registered in STATA as *MI data* (a requirement for conducting analyses of multiply imputed data).

An important construct in this study is the presence of illness, because the use of home health services is related directly to the care needs created by illness and disability. The NHHCS dataset for consumer-level survey data contains diagnostic codes for up to 16 medical diagnoses. Attempting to utilize these diagnostic codes in their original form would be unnecessarily tedious for the purposes of this study. A simplified approach to working with these important data is to examine categories of similar diagnoses to determine if particular consumers were diagnosed with conditions in particular categories (e.g., "Diseases of the Blood"). The raw data in NHHCS report diagnostic codes structured by the 9th iteration of diagnostic codes from The International Statistical Classification of Diseases and Related Health Problems (ICD-9). ICD codes are uniformly utilized by providers throughout all sectors of the healthcare arena. There are well over 1,000 specific diagnostic codes in this framework, but they are organized within 19 broad categories. For this study, consumer data representing ICD-9 codes were recoded to fit within this 19-category model. STATA 12 has the capacity to manage ICD-9 codes in this way, thus creating 19 diagnostic category variables. The variable used in analyses answering the research questions of this study is a tally of how many diagnoses are listed for each consumer, but descriptive statistics using these 19 diagnostic categories are reported as well in order to further define the sample population.

B. Techniques for Addressing Survey Data and Complex Sample Design

NHHCS is a sample survey designed to produce national estimates for agencies and current home health care patients. As stated above, the 2007 National Home and Hospice Care Survey employed a stratified two-stage probability sample design. Data analyses must therefore include survey weights to inflate the sample numbers to represent accurate national estimates. Sample weights exist for both consumers and agencies, and take into account all sampling stages while adjusting for non-response. Consumer weights are the products of the inverse of the probability of selection and a non-response adjustment. There are two agency-level survey weight variables, one for estimates not correlated with agency size and one for estimates correlated with agency size (e.g., estimates of total staff across all agencies). These variables include weight adjustments for agencies found multiple times in the sampling frame, a non-response adjustment, and ratio adjustments made within the groups used for the probability proportional to size selection strategy (Census region, agency type).

The administrators of the NHHCS datasets caution that the use of sample weights in multilevel statistical models requires careful attention. When using both levels of weight variables in statistical analyses, the part of the weight that accounts for the adjustment based on the size of the agency fails. As a result, smaller agencies end up having the same weight as larger agencies due to overweighting. To address this risk, caution has been used when identifying the appropriate weight variables designated for the registration of these data as survey data. This study uses STATA 12 software, which has the capacity to register the weights for complex survey designs and then apply that weighting structure to any analysis. The selection of these weight variables was done in consultation with the NHHCS data administrators who designed the survey and resulting datasets. The additional steps required to address the complex sampling design of the NHHCS survey are registering the dataset as Survey Data, which involves designating the proper sampling frame variables, and then using the SVY command for all analyses. This approach has been used in this study and all of the results reported in subsequent sections of this report, including the evaluation of both original and imputed data, present the findings of SVY analyses.

C. Estimation Procedures

The National Home and Hospice Care Survey (NHHCS) is a sample survey designed to produce national estimates for agencies and consumers. Statistics from this survey are based on samples, and will differ somewhat from the data that would be obtained through a complete population census using the same definitions, instructions, and procedures. As mentioned above, the analysis of data from this survey must include sampling weights in order to inflate sample numbers to national estimates. The probability design of the survey allows for the calculation of sampling errors. According to NHHCS materials (NCHS, 2009), the chances are about 95 in 100 that an estimate from the sample differs from the value that would be obtained from a complete census by less than twice the standard error.

Standard errors can be calculated for agency and consumer estimates using any statistical software package as long as clustering within agencies and other aspects of the complex sample design are taken into account. This study uses STATA 12 software, which has this capability. All of the NHHCS public-use files (i.e., agency and patient data files) include design variables that designate each record's stratum marker and the first-stage unit (or cluster) to which the record belongs. The primary sample unit in each file is the agency, and the secondary sample unit is the observation (i.e., consumer/individual). There is no finite population correction in the second stage with the public-use files; thus the second stage is treated as sampling with replacement.

The National Center for Health Statistics (NCHS) bases publication of reliable estimates for NHHCS on the relative standard error (RSE) of the estimate and the number of sampled records on which the estimate is based. Guidelines used by NCHS authors suggest that if the estimate is based on 60 or more sample cases and the RSE is less than 30%, then the estimate is considered reliable. In this study, sample sizes far exceed this minimal threshold for reliability, and RSEs for all analyses fall well below the 30% maximum.

D. Missing Data

With the number of consumers and agencies sampled in the NHHCS dataset, it is not surprising that many variables associated with each level of analysis contain cases with missing data, or that data are missing for up to several variables for many individual consumers and agencies. Analysis of the variables used to answer the research questions of this study reveals that data are missing on one or more variables for nearly half of all home care consumers (see

Appendix B- Table 1). None of the variables in this dataset are missing data in more than 10% of cases. Additionally, 29% of home care cases are missing data for just one key variable, 13% are missing data for two key variables, and only 7% are missing data for three or more of these variables. These findings suggest that missing data are a considerable problem in this study.

The simple fact of missing data in these proportions suggests that the study will be stronger if missing data are addressed. Missing data are problematic because statistical analyses assume that each case in the dataset has information available for each variable (Allison, 2002). The alternative to addressing missing data is to utilize case-wise deletion of cases with any missing data on key variables. However, by excluding the cases with missing data the researcher not only loses a potentially large portion of the survey sample, but also runs the risk of eliminating cases that have something in common with one another that somehow relates to their failure to provide valid data—thus biasing the analyses by giving undue weight to the responses of those respondents who are similar in their successful provision of these data. Multiple, model-based imputation procedures are suggested to be a satisfactory solution to this problem (Allison, 2002; Raudenbush & Bryk, 2002). As this study culminates in multilevel models of analysis, retaining cases to as great an extent as possible is important in order to bolster the number of individual consumers within each service agency. In the analysis of large datasets, it is recommended that missing data be addressed through the use of multiple imputation (Allison, 2002).

Multiple imputation procedures generate complete data sets from the available data, analyze each set with Ordinary Least Squares (OLS) regression techniques, pool the results to create point estimates for each regression coefficient, and compute appropriate sampling variances. This procedure incorporates random error by requiring random variation in the imputation process (Patrician, 2002), and generates realistic standard errors and unbiased inferences about the parameters used to complete the data (Allison, 2002). There are numerous approaches for multiply imputing data in a large dataset, and the process of selecting the most appropriate approach is informed by knowledge of the types of variables to be used in the study and knowledge of the nature of "missingness" among the variables and cases. To this end, a small selection of consumer-level and agency-level variables intended for use in answering the research questions in this study were transformed into indicator variables, with the value 1 assigned for any instances of valid data and the value 0 assigned for instances of missing data. These indicator variables where then analyzed with five relevant independent variables from this study (in their original form) using T-tests for the continuous variables and Tests of Proportions for the categorical variables. The results of these analyses are provided in **Appendix B- Table 2**, and show that the relationship between the key variables and the missing data in the selected indicator variables is often statistically significant. For additional investigation of the patterns of missing data, logistic regression models of the individual relevant independent variables on *all* of the selected indicator "missingness" variables reveals that most, but not all, of the independent variables have statistically significant relationships with these "missingness" variables (see **Appendix B- Table 3**). These findings suggest that the data cannot be considered "Missing Completely at Random." Instead it can be concluded that the data are "Missing at Random" but that the patterns of "missingness" are generally ignorable and that conducting multiple imputation procedures to address the missing data in this dataset is fully appropriate (Allison, 2002).

In this study, missing data have been addressed through the use of Multiple Imputation by Chained Equations (MICE). The advantages of this commonly used approach are that it can easily accommodate complex patterns of missing data and different types of data structures, and it accounts for model uncertainty as well as sampling uncertainty (Hill, 2009). Ten complete imputed datasets were generated using the MICE approach to address any potential non-response bias in this study. Pooled analyses of all ten imputed datasets have been used to describe the survey sample and to answer the research questions of this study. For all findings reported in this study, the analyses using both original and imputed data are made available for comparison.

After multiple imputation procedures are executed, it is prudent to examine the variance between imputed datasets and the original dataset. Measures of imputation variance inform researchers if the imputation procedures resulted in efficient estimates that can be relied upon during analyses. One method of confirming appropriate imputation is to examine the mean value for select continuous variables in both the original data and across all imputed datasets. This examination was conducted for a small subset of relevant variables, including four consumer-level variables and three agency-level variables, and reveals that the values in each imputed dataset, as well as the pooled estimated value across all imputed datasets are very similar to one another and within reasonable proximity to the value in the original dataset (see **Appendix B- Table 4**). This preliminary assessment is a good way to find obvious errors, but additional assessments of imputation variance are needed in order to proceed with confidence in conducting complex statistical analyses. The calculation of imputation variance statistics is achieved through most statistical software programs, and STATA 12 was used for these purposes in this study. The findings in **Appendix B- Table 5** reveal that statistical estimates made with only the finite number of 10 imputations available in the imputed dataset, rather than a hypothetically infinite number of imputations, is done with perfect or near-perfect relative efficiency. It is therefore safe to proceed with other complex analyses of these variables, and likely all of the other variables in the study, with confidence that the imputation procedures used in this study were appropriately chosen and successfully executed.

6.30 *Data Analysis Procedures*

The research aims of this study are to first test for significant differences in the volume and costs of services provided between home health care consumers with cognitive impairment and those without, and secondly to test for significant influences of agency characteristics as selected by guiding theories and prior studies. The research goals and specific aims of this study are achieved through the analyses listed here and further described below.

- Bivariate analyses of cognitive impairment status and multiple consumer characteristics are used to explore the differences between moderately-to-severely cognitively impaired consumers and consumers with little or no cognitive impairment, with specific regard to predisposing factors, enabling factors, and illness-level factors identified in the modified behavioral model of health services utilization that guides this study.

- Level-1 models (below, Stage 2) are used to answer the research questions of Aim 1 (To examine the association of cognitive impairment with home health care service volume and cost).
- Level-2 models (below, Stage 3) are used to answer the research questions of Aim 2 (To examine the association of home health care agency characteristics with consumer home health care service volume and cost).
- Cross-level mixed-effects models (below, Stage 4) are used to answer the research questions of Aim 3 (To examine the influence of home health care agency characteristics on the association of consumers' cognitive impairment status with home health care service volume and cost).

A. Univariate and Bivariate Analyses of Consumer Cognitive Impairment Status and other Characteristics

One of the primary goals of this research is to determine if the characteristics of home health care consumers vary in relation to cognitive impairment. The relationships between cognitive impairment and other consumer characteristics are assessed through univariate and bivariate descriptive statistics, including measures of dispersion, correlational analyses, chi-square tests and independent sample T-tests. Home health care agency characteristics are also evaluated through correlation analyses and univariate descriptive statistics.

As the insurance programs which pay for home health care services vary greatly in terms of the types and extent of coverage, the bivariate descriptive statistics, and the chi-square and T-test analyses of relationships between cognitive impairment and other consumer characteristics, are also examined and presented separately within each of the main four primary payor categories: Medicare, Medicaid, Private Insurance, and Self-Pay.

B. Multivariate Regression Analyses

Whereas Ordinary Least Squares regression (OLS) assumes independence of observations and error terms, the use of available nested data in the proposed study may violate these assumptions and, as a result, error terms and significance will be biased if OLS regression is employed. Alternatively, linear mixed-effects models are used for data where observations are not independent. Random coefficients models, also called multi-level models, are a type of mixed-effects model with hierarchical data. Slopes-as-outcomes models are a type of random coefficients model in which the level-1 slopes are modeled by the level-2 variables as a random effect.

This study tests multilevel research hypotheses that examine provider agency influences on home health care utilization by consumers. It is highly unlikely that home health care consumers nested within the same provider agencies are truly independent, as they would be if randomly assigned to agencies throughout the country. The multilevel nature of the research questions and the use of nested data in this study warrant the use of hierarchical linear modeling (Burstein, 1980; Raudenbush & Bryk, 2002). Multilevel analysis in this study employs Bayesian estimates to account for similarities associated with consumer clustering within agencies. Multilevel models can simultaneously model multiple levels of predictors with error terms at each level. The slopes-as-outcomes models will estimate the associations of cognitive impairment with home health care service volume and cost as a function of agency characteristics.

The multilevel models in this study use consumer data nested in home health care agencies data. Level-1 components of these models focus on individual consumers within each agency, where service volume and cost are adjusted for cognitive impairment status and the predisposing, enabling, and illness-level characteristics of consumer peers in each agency. Level-2 components focus on the effects of agency-level factors. A staged analytical approach is applied to the building of level-1models. Since six of the level-1 variables (average daily charges, readmission status, days of service, number of visits, number of medical visits, and number of non-medical visits) are important as outcomes, each is alternately substituted into the dependent variable position, Y_{ij}, and the others are omitted from the equations.

C. Fully Unconditional Models

In the hierarchical analyses in this study the presence of variance in home care consumer outcomes between agencies is essential. An important indicator of such variance is the Intraclass Correlation Coefficient (ICC). This statistic measures the extent to which individuals within the same group are more similar to each other than they are to individuals in different groups. Before building models to answer the research questions of this study, the use of Fully Unconditional Models partitions the variance in each outcome into its within- and between-agency components, thus demonstrating the proportion of variance in the outcomes that exists between agencies—the ICC. The Fully Unconditional Model includes no level-1 variables other than the outcome (dependent variable) and no level-2 variables other than the agency identification variable (the grouping variable). This model includes only intercepts and error, as follows:

Level 1: $Y_{ij} = ß_{0j} + r_{ij}$
Level 2: $ß_{0j} = \gamma_{00} + u_{0j}$

If the ICCs resulting from these Fully Unconditional Models reveal that less than 10% of the variance in outcomes exists between agencies, multilevel models may not be appropriate in this study (Lee, 2000).

D. Stage 1: Unadjusted Models

The first stage of analysis assesses the unadjusted relationship between consumer cognitive impairment status and service volume and cost without controlling for any other variables, by examining the i^{th} consumer within the j^{th} agency with the following equation:

$Y_{ij} = \beta_{0j} + \beta_{1j}(\text{cognitive impairment status})_{ij} + r_{ij}$

… where Y_{ij} represents each alternate dependent variable, β_{0j} is the intercept, β_{1j} is the slope for cognitive impairment status for the i^{th} consumer within the j^{th} agency, and r_{ij} is the consumer-specific random error. Cognitive impairment status, as the slope being modeled, is group-mean centered.

E. Stage 2: Adjusted Level-1 Models

The next stage of analysis assesses the relationship between consumer cognitive impairment status and service volume and cost while controlling for theoretically and statistically significant consumer characteristics (refer to individual determinants in theoretical model) and without consideration for any agency characteristics. Stepwise analyses are used to create models which introduce sets of consumer characteristics in order to explain variations in the association of cognitive impairment status on service volume and cost. These sets of consumer characteristics are organized as predisposing, enabling, and illness-level factors in accordance with the modified behavioral model of health services utilization described above and depicted in **Figure 5**. This stage of the analysis is used to answer Research Questions 1a – 1d by examining the i^{th} consumer within the j^{th} agency with the following equation:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(\text{cognitive impairment status})_{ij} + \beta_{2j}\,(\text{L1Var}_{02})_{ij} \ldots + \beta_{kj}(\text{L1Var}_{k})_{ij} + r_{ij}$$

…where Y_{ij} represents each alternate dependent variable, β_{0j} is the intercept, β_{1j} is the slope for the cognitive impairment status variable, $\beta_{2j}\ldots\beta_{kj}$ are slopes for all other level-1 variables representing individual determinants of service volume and cost (See **Appendix A- Table 1**), and r_{ij} is the consumer-specific random error. Cognitive impairment status remains group-mean centered, and all other level-1 variables are group-mean centered. The analyses in this stage begin with cognitive impairment status as the key predictor variable with clusters of consumer-level variables introduced in blocks in order to further examine the modified theoretical framework, beginning with variables associated with predisposing factors, followed by enabling factors and then illness-level factors.

F. Stage 3: Level-2 Models

In this analysis, the level-1 equation remains the same as in Stage 2, Y_{ij} represents each alternate dependent variable, and the intercept β_{0j} is specified as a function of the level-2 variables with the following equation:

$$\beta_{0j} = \gamma_{00} + \gamma_1(\text{L2Var}_1)_j + \gamma_2(\text{L2Var}_2)_j \ldots + \gamma_k(\text{L2Var}_k)_j + \mu_{0j}$$

This analysis assesses the influences of agency characteristics directly on the consumer-level dependent variables while controlling for all other level-1 covariates. This analysis is used to answer Research Questions 2a – 2b, which ask if there is a significant relationship between agency characteristics and service volume and cost. Cognitive impairment status and other level-1 variables remain group-mean centered, while at level-2 the continuous variables are grand-mean centered. This model also allows for comparisons of the *average influence* of agency characteristics to the *agency specific* influences examined in Stage 4.

G. Stage 4: Cross-level Mixed-effects Models

The final analysis is the ‘slopes-as-outcome’ model, testing for significant influences of agency characteristics. The slope for cognitive impairment status in the level-1 model is set to be a function of the variables in level 2. This analysis assesses the influence of home health care agency characteristics on the relationship between cognitive impairment status and the six outcomes related to service volume and cost, addressing Research Aim 3.

$$\beta_{1j} = \gamma_{00} + \gamma_1(\text{L2Var}_1)_j + \gamma_2(\text{L2Var}_2)_j \ldots + \gamma_k(\text{L2Var}_k)_j + \mu_{1j}$$

The level-1 equation remains the same as in Stages 2 and 3, Y_{ij} represents each alternate dependent variable, and the slope for the cognitive impairment status variable, β_{1j}, is specified as a function of the level-2 variables. The level-2 variables represent agency business characteristics, agency services profiles, and agency staffing profiles. The variables in these models follow the same centering approach as in Stage 3 described above. In this model, μ_{0j} and μ_{1j} are the only two level-2 random effects.

7 Findings

In this section, the characteristics of home health care consumers and provider agencies are described, as are the differences between cognitively impaired consumers and other consumers. The implications of these findings will be presented in the subsequent Discussion section of this report. For every set of analyses described below, the tables presenting findings based on imputed data are each followed by tables showing the findings of the same analysis using original data. The results of analyses in this study are generally similar between the imputed and original datasets. Since multiple imputation procedures are designed to give point estimates only, certain statistics that require nonlinear operations, such as calculating standard deviations from the mean and precise frequencies that are represented by sample proportions, are only available for the analyses using original data. Thus, to examine the standard deviations or frequencies relevant to reported descriptive statistics, if not described below, the reader must refer to the attached tables presenting results of analyses based on original data.

7.10 *Univariate Analysis Results*

The sampled home health care consumers and provider agencies are described in this section, including consumer predisposing factors, enabling factors, illness-level factors, and service cost and utilization profiles. The descriptive statistics discussed in this section are presented in the attached tables alongside bivariate analyses comparing consumers with and without cognitive impairment which will be discussed in a subsequent section of this report.

7.11 Consumer Characteristics

Findings which describe consumer *Predisposing Factors* are presented in **Appendix C- Table 1** for the imputed data, and in **Appendix C-Table 2** for the original data. The average age of home health care consumers is 68.28. Additional information regarding the age of consumers is found in **Appendix C- Table 5**. The median age is approximately 75. Less than 20% of consumers are under age 55, and nearly 70% of consumers are over age 65.

Of the 3,309 home health care consumers in the sample, 65% are female and 35% are male. Approximately one-third of consumers are married, one-third are widowed, and the remaining one-third are either divorced, separated, living with a partner, or were never married. With regard to race/ethnicity, 73% of the sample is comprised of Caucasians, 16% are African American, 8% are Latino, and a very small number are classified in the “other” category (2%).

Consumer *Enabling Factors* are presented in **Appendix C- Table 7** for the imputed data, and in **Appendix C- Table 8** for the original data. Approximately ⅔ of consumers live with family members, while only 8% live with people who are not family. Another 31% live alone. Overall, 82% of consumers have an informal caregiver, which includes those living alone as well as those living with family members or other people. The relationship of the informal caregiver to the consumer includes spouse or significant other (27%), child (23%), and other family member (50%). The relationships of these "other family members" are unknown due to the design of the NHHCS survey.

An important enabling factor in the theoretical model guiding this study is the insurance program used to pay for the services being utilized by home health care consumers. This includes the insurance program considered to be the primary source of payment as well as, for a small percentage of consumers, the program that serves as a secondary source of payment. The leading primary source of payment for home care services among consumers in the NHHCS sample is Medicare (63%). Medicaid is the second leading source of payments (26%), followed by private health insurance programs (10%). The primary payment source is listed as "patient and/or family" for only 2% of the sample. Of all consumers in the sample, only 10% have a secondary source of payment listed in agency files, and among these consumers the leading source of supplemental payments is Medicaid (43%), followed by private insurance programs (27%), Medicare (17%), and self-pay (14%).

Consumer *Illness-level Factors* are presented in **Appendix C- Table 11** for the imputed data, and in **Appendix C- Table 12** for the original data. On average, sampled consumers require assistance with 2.78 activities of daily living (S.D. = 1.61 in original data), and receive help from home care personnel with 1.5 activities of daily living (S.D. = 1.72 in original data). Nearly three-fifths of consumers use assistive devices of some kind, and 45% use medical devices. Almost half of the sample is incontinent of bladder, and one-fifth of consumers are incontinent of bowels. About two-fifths of consumers need routine help with taking their medications. Half of the consumers in the sample were receiving inpatient care prior to their admission to home health care, three-quarters of whom were in the hospital, and around one-quarter of the sample had some sort of medical procedure that was related to their admission to home health care. While receiving home health care services, 14% of consumers experienced some acute medical need that required emergency care on at least one occasion. Only 8% of the sample is described in agency records as having difficult behaviors.

Medical diagnoses are another important illness-level factor, and the sampled consumers have an average 4.24 diagnoses (S.D. = 2.11 in original data). The proportions of consumers with diagnoses in each of the 19 ICD-9 categories are displayed in **Appendix C- Table 19** for imputed data, and in **Appendix C- Table 20** for original data. The categories featuring disorders afflicting at least 5% of sampled consumers include: "Diseases of the Circulatory System" (19%) ; "Endocrine, Nutritional and Metabolic Disorders, and Immunity Disorders" (14%); "Diseases of the Musculoskeletal System and Connective Tissue" (9%); "Symptoms, Signs, and Ill-Defined Conditions" (9%); "Supplementary Classification of Factors Influencing Health Status and Contact with Health Services" (9%); "Diseases of the Nervous System" (7%); "Diseases of the Respiratory System" (5%); "Diseases of the Skin and Subcutaneous Tissue" (5%); and "Mental Disorders" (5%).

Of particular interest for this study is the cognitive impairment status of home health care consumers. This is measured with the 5-point scale described previously, and a score between 3 and 5 on this scale is considered an indicator of moderate-to-severe cognitive impairment. The cognitive impairment status of consumers in the NHHCS sample is summarized in **Appendix C- Table 15** for imputed data, and in **Appendix C- Table 16** for original data. Forty-five percent of consumers have a score of 1 ("No cognitive impairment"); 23% have a score of 2 ("Requires occasional reminders"); 17% have a score of 3 ("Requires some direction in certain situations"); 12% have a score of 4 ("Requires a great deal of direction in routine situations"); and 3% have a score of 5 ("Severe cognitive impairment"). Thus, those consumers with scores ranging from 3 to 5 on this scale, considered to have moderate-to-severe cognitive impairment, represent 32% of the sample. The other 68% of consumers have mild cognitive impairment or are unimpaired. In subsequent sections of this report, these two groups will be compared and contrasted with regard to the predisposing, enabling, and illness-level factors described above as well as the service cost and utilization measures listed below.

7.12 Dependent Variables Distribution

The six dependent variables in this study represent home health care service cost and utilization constructs. **Appendix C- Table 23** provides results of statistical analyses using imputed data to describe the sample of home health care consumers in these cost and utilization domains, and **Appendix C- Table 24** offers the same results drawn from the analysis of original data. The mean value for average daily charges for service is \$69.67 (or \$64.41 in original data, with S.D. = \$71.70). These consumers received care for an average period of 267.3 days of service (S.D. = 343.8 days in original data). In terms of service utilization, the mean number of total service visits is 20.3 (S.D. = 21.8 visits in original data), which includes an average 11.7 visits for medical services (S.D. = 12.1 visits in original data) and 5.4 visits for non-medical services (S.D. = 8.8 visits in original data). Additionally, 29% of sampled consumers are readmissions, meaning they previously received services from the same agency as is providing services at the time of the survey.

In order to inform the selection of regression techniques for this study, histograms were created to portray the distributions of values for each truncated dependent variable across the sample of home health care consumers. These histograms are presented in **Appendix C, Figures 1-6**. The continuous dependent variables, in their raw form, each demonstrated long right-side tails with very few cases (typically 0-10) found at each regular interval of values. These do not "tail off" asymptotically, but continue only until reaching the maximum values artificially imposed on survey responses by the managers of the NHHCS data at the National Center for Health Statistics. To decrease the magnitude of the skewness of distribution, lower maximum values have been imposed on these continuous dependent variables to consolidate the large span of high values from which less than 5% of all cases are represented. The total number of service visits has been set at a maximum value of 100 visits. The total number of visits is comprised of service visits designated as both medical and non-medical due to the particular services provided (described in an earlier section above). The medical visits variable is capped at 50, and the non-medical visits variable is capped at 25. The variable describing total days enrolled in care is set at a maximum of 1100 days, and the average daily cost of care is capped at $300. All five of these continuous dependent variables remain skewed toward zero with right-side tails, but the magnitude of skewness is reduced.

These patterns do not demonstrate the normality of distribution that is assumed for Ordinary Least Squares regression. Poisson regression is preferable for the continuous variables and logistic regression is preferable for the binary measure of readmission status. However, the restricted access to the NHHCS data requires the use of statistical software made available through the Census Research Data Centers. STATA software is used for the analyses described in this report, and STATA does not allow the use of sample weights with certain mixed effects models, including poisson and logistic regression. The decision to use OLS regression in order to retain the capacity for incorporating sample weights into the analyses of this study creates problems related to the interpretation of certain study findings. For example, using linear probability models to examine the binary measure of readmission status is problematic for several reasons, including the presence of heteroskedasticity, errors that are not normally distributed, an unreliable magnitude of effects, and the possibility that predicted probabilities will reach implausible values. However, despite the effects of incorrect linearity assumption, OLS regression on a binary dependent variable will likely give the correct direction of the effect of the predictor on the outcome (Aldrich & Nelson, 1984).

7.13 Agency Characteristics

The characteristics of home health care agencies included in the sample are thoroughly documented in the NHHCS dataset. For this study, only those characteristics deemed relevant to the research have been evaluated. These select characteristics were chosen because of their suspected fit with the guiding theoretical framework, and their precise influence on consumer service utilization will be described in subsequent sections of this report. Characteristics of provider agencies are naturally grouped into three domains, including general Business Characteristics, Services Profile, and Staffing. In this section, the profile of sampled agencies is presented in terms of these select characteristics. These statistics are presented in **Appendix C- Table 27** for imputed data, and in **Appendix C- Table 28** for original data

On average, the sampled agencies have been in business for nearly 20 years, admitted over 1,000 consumers into service in the prior year (2006), and received referrals from an average 7.2 different types of sources. These agencies provide an array of services, including an average 2.3 care services (out of a possible 7, including companion services, continuous homecare, homemaker services, meals on wheels, assistance with Activities of Daily Living, transportation services, and respite care), 1.2 counseling services (out of a possible 4, including pastoral services, mental health services, ethical issues counseling, and grief/bereavement counseling), 1.4 social services (out of a possible 2, including social services and referral services), and 7.6 health services (out of a possible 15, including complementary/alternative medicine, dietary/nutritional services, enterostomal therapy, IV therapy, physician services, podiatry services, skilled nursing services, wound care, durable medical equipment, pharmacy services, occupational therapy, physical therapy, respiratory therapy, speech therapy/audiology, and other therapy). In terms of staffing, agencies employ and average 25.5 Home Health Aides and 15.4 Personal Care Aides. Less than half of these direct-care workers have been employed at the agency for more than one year, and they earn an average $9.87 per hour. Agencies reported providing an average 7.8 instrumental incentives for their employees.

7.20 *Bivariate Analysis Results: Significantly Different Characteristics of Consumers with Cognitive Impairment*

The consumer characteristics described above often differ significantly between the subsample of consumers without cognitive impairment or with only mild cognitive impairment and the subsample of consumers with moderate-to-severe cognitive impairment. This section describes those significant differences. In addition, the various primary sources of payment for home health care services can be used to structure further analyses of the characteristics of subpopulations of consumers. The grouping of consumers by cognitive impairment is imposed on each of the primary payment categories in order to identify significantly different characteristics of those consumers in each payment category who have moderate-to-severe cognitive impairment. While differences are seen between consumers with and without cognitive impairment in all of these categories, as depicted in the tables of Appendix C, only the differences with statistical significance ($p < 0.05$) are described below.

7.21 Predisposing and Enabling Factors

The only significant differences in *Predisposing Factors* among consumers with moderate-to-severe cognitive impairment are in marital status (see **Appendix C-Table 1** for imputed data and **Appendix C-Table 2** for original data). A smaller proportion of consumers with cognitive impairment are married (23%, compared to 36% for those with little-to-no cognitive impairment) and a larger proportion of consumers with cognitive impairment were never married (30%, compared to 17% for those with little-to-no cognitive impairment).

While the difference in age is not statistically significant, the mean age for consumers with moderate-to-severe cognitive impairment is 65 as compared to a mean age of 70 among consumers with little-to-no cognitive impairment. The median age of consumers with moderate-to-severe cognitive impairment is approximately 78 as compared to a median age of approximately 74 among their less impaired peers, as shown in **Appendix C- Table 6**. For consumers with moderate-to-severe cognitive impairment, the interquartile range is larger, and there are fewer young-age outliers, as compared to consumers with little-to-no cognitive impairment.

For the *Enabling Factors* (see **Appendix C, Table 7** for imputed data and **Appendix C-Table 8** for original data), significant differences are found for the relationship of informal caregiver to the consumer and for the primary source of payment. A smaller proportion of consumers with cognitive impairment are cared for by spouses (17%, compared to 32% for those with little-to-no cognitive impairment) and a larger proportion of consumers with cognitive impairment are cared for by their adult children (30%, compared to 19% for those with little-to-no cognitive impairment). As for the source of payment for service, a larger proportion of consumers with cognitive impairment pay for services with Medicaid (34%, compared to 22% for those with little-to-no cognitive impairment) and a smaller proportion of consumers with cognitive impairment pay for services with private insurance (6%, compared to 12% for those with little-to-no cognitive impairment).

7.22 Illness-level Factors

For the consumer characteristics identified as *Illness-level Factors* in the guiding theoretical framework, there are several statistically meaningful differences between consumers with and without cognitive impairment. Consumers with moderate-to-severe cognitive impairment are generally more ill than their peers (see **Appendix C, Table 11** for imputed data and **Appendix C-Table 12** for original data). Those with cognitive impairment require assistance with more activities of daily living (3.14, as compared to 2.61 for those with little-to-no cognitive impairment), receive assistance for more activities of daily living (1.84, as compared to 1.33), and have higher numbers of co-occurring medical diagnoses (4.54, as compared to 4.09). In addition, a larger percentage of consumers with moderate-to-severe cognitive impairment are found to exhibit difficult behaviors (14%, as compared to 5% for less impaired peers), use assistive devices (64%, as compared to 55%), use medical devices (51%, as compared to 43%), experience bladder incontinence (67%, as compared to 39%), experience bowels incontinence (37%, as compared to 12%), require help with taking medications (53%, as compared to 30%), and have required emergency medical care during the current service period (18%, as compared to 12%). However, a smaller proportion of consumers with moderate-to-severe cognitive impairment have received care on an in-patient basis prior to the current service period (42%, as compared to 55% for peers with little-to-no cognitive impairment) and a smaller percentage had a medical procedure that was related to their enrollment in home care services (16%, as compared to 27%).

Appendix C, Table 19 displays the differences between cognitively impaired consumers and their peers in terms of the ICD-9 categories containing primary medical diagnosis listed in agency records (using imputed data, see **Appendix C-Table 20** for original data). Two disease categories with statistically different proportions of consumers with moderate-to-severe cognitive impairment include Mental Disorders (10%, as compared to 2% for peers with little-to-no cognitive impairment) and Diseases of the Nervous System (12%, as compared to 5%). While other significant differences are found on Table 5a, these two are the most dramatic examples of higher proportions among the cognitively impaired population, as well as the simplest to conceptualize due to the specificity of the category label (as opposed to the broad catch-all category of "Symptoms, Signs, and Ill-defined Conditions," for example).

7.23 Services Cost and Utilization

The *Service Utilization* differences between cognitively impaired consumers and their peers are of critical importance to this study because these variables serve as the dependent variables in subsequent multivariate analyses. In all six utilization measures, consumers with moderate-to-severe cognitive impairment have higher mean values and proportions, on average, than their peers (see **Appendix C, Table 23** for imputed data and **Appendix C-Table 24** for original data). Despite a conceptually-meaningful difference in the average daily cost of care ($76.16, as compared to $66.62), consumers with moderate-to-severe cognitive impairment do not have statistically significant differences in costs of care from their less impaired peers. The volume of service, however, is statistically different between these two groups. Consumers with moderate-to-severe cognitive impairment average more than 114 additional days of service than their peers (344.9, as compared to 230.7). A similarly high number of additional service visits are seen among consumers with moderate-to-severe cognitive impairment, with 24.9 visits, on average, as compared to 18.2 visits among their less impaired peers. Statistically significant differences are seen in medical service visits (13.4, as compared to 10.8 among those with little-to-no cognitive impairment) as well as non-medical service visits (6.71, as compared to 4.73 among those with little-to-no cognitive impairment). The remaining indicator of home health care service use is the rate of readmission among consumers. Those with moderate-to-severe cognitive impairment have a significantly higher readmission rate than their less impaired peers (34%, as compared to 27%).

7.30 *Bivariate Analysis Results: Significantly Different Characteristics of Consumers with Cognitive Impairment in each Insurance Category*

7.31 Predisposing and Enabling Factors

The results of analyses of consumer *Predisposing Factors* by Primary Payor category are presented in **Appendix C- Table 3** for imputed data and **Appendix C- Table 4** for original data. The only statistically significant difference in predisposing factors is found among the consumers who use Medicaid as the primary payor for home health care services. In this subpopulation, consumers with moderate-to-severe cognitive impairment are younger, on average, at the time of admission than their Medicaid peers (45.7 years, as compared to 57.9 years).

The results of analyses of consumer *Enabling Factors* by Primary Payor category are presented in **Appendix C- Table 9** for imputed data and **Appendix C- Table 10** for original data. In both the Medicare and Medicaid subpopulations, the relationship of the informal caregiver to the consumer is statistically different for those with cognitive impairment. In the Medicare group, a smaller proportion of consumers with moderate-to-severe cognitive impairment are cared for by their spouses (21%, as compared to 34% among those with little-to-no cognitive impairment) and a larger proportion is cared for by other family members (64%, as compared to 53%). In the Medicaid group, a smaller proportion of consumers with cognitive impairment are cared for by spouses (7%, as compared to 16% of less impaired peers) and a larger proportion is cared for by adult children (54%, as compared to 38%).

7.32 Illness-level Factors

The results of analyses of consumer *Illness-level Factors* by Primary Payor category are presented in **Appendix C- Table 13** for imputed data and **Appendix C- Table 14** for original data. Consumers with moderate-to-severe cognitive impairment need help with significantly more activities of daily living than their less impaired peers in the Medicare subpopulation (3.4, as compared to 2.8). In the Medicare group, consumers with cognitive impairment also receive help with more activities of daily living (1.7, as compared to 1.2) and are shown to have significantly more medical diagnoses (5.1, as compared to 4.4) than those with little-to-no cognitive impairment. Compared to consumers with less cognitive impairment, significantly larger proportions of Medicare consumers with moderate-to-severe cognitive impairment exhibit difficult behaviors (17%, as compared to 6%), use assistive devices (72%, as compared to 57%), are incontinent to bladder or bowels (73%, as compared to 45%; and 33%, as compared to 12% respectively), and need help taking medications (52%, as compared to 31%). As is found with the general home care population of consumers with cognitive impairment, smaller proportions of those in the Medicare subpopulation were receiving in-patient care prior to home care (46%, as compared to 57% of Medicare consumers with little-to-no cognitive impairment) and smaller proportions had some sort of medical procedure that precipitated home care admissions (17%, as compared to 26%).

Similar, yet more dramatic, proportional differences are found in the Private Insurance subpopulation. Consumers with moderate-to-severe cognitive impairment in this insurance group need help with more activities of daily living than their less impaired peers (3.1, as compared to 2.2), and much greater proportions exhibit difficult behaviors (19%, as compared to 3%), use assistive devices (65%, as compared to 39%), use medical devices (77%, as compared to 36%), experience bladder and bowel incontinence (63%, as compared to 13%; and 58%, as compared to 7% respectively), and need help taking medications (47%, as compared to 22%).

Among consumers primarily paying for services with Medicaid, the only significant differences between those with moderate-to-severe cognitive impairment and their peers are found in the proportions who have bladder and bowel incontinence (59%, as compared to 36%; and 40%, as compared to 14% respectively) and who need help taking medications (56%, as compared to 35%). For the subpopulation of home health care consumers who pay for services out of pocket, the only significant difference between those with moderate-to-severe cognitive impairment and those with little-to-no cognitive impairment is in the proportion with bladder incontinence (70%, as compared to 24%).

The results of analyses of consumer *Cognitive Impairment Status* by Primary Payor category are presented in **Appendix C- Table 17** for imputed data and **Appendix C- Table 18** for original data. The proportion of consumers with cognitive impairment varies by insurance category, with moderate-to-severe cognitive impairment in 30% of those who pay for services with Medicare, 42% of those using Medicaid, 19% among those using private insurance, and 33% of consumers paying out of pocket.

The results of analyses of consumer *Primary Diagnosis Category* by Primary Payor category are presented in **Appendix C- Table 21** for imputed data and **Appendix C- Table 22** for original data. The disease categories featuring disorders afflicting at least 5% of sampled consumers across all four primary payor subpopulations include “Endocrine, Nutritional and Metabolic Disease, and Immunity Disorders,” “Diseases of the Nervous System,” “Diseases of the Circulatory System,” “Diseases of the Musculoskeletal System and Connective Tissue,” and “Symptoms, Signs, and Ill-Defined Conditions.” The largest or second-largest proportion of home health care consumers in any of the four primary payor groups is found in the “Diseases of the Circulatory System” category of primary diagnosis.

Within two of the primary payor groups there are a few examples of categories of illness for which the proportions of primary diagnoses are relatively unique as compared to consumers in the other three primary payor groups. In the self-pay group, only 5% of the consumers have a primary diagnosis categorized as “Endocrine, Nutritional and Metabolic Diseases, and Immunity Disorders,” as compared to 16%, 11% and 9% in Medicare, Medicaid, and self-pay groups respectively, whereas 12% have a primary diagnosis listed under “Diseases of the Respiratory System,” as compared to 5%, 6% and 3% in Medicare, Medicaid, and self-pay groups respectively. In the Private Insurance group, 10% of the consumers have a primary diagnosis categorized as “Diseases of the skin and Subcutaneous Tissue,” as compared to 5%, 2% and 0% in Medicare, Medicaid, and self-pay groups respectively. Also in the Private Insurance group, 19% of consumers have a primary diagnosis categorized as “Supplementary Classification of Factors Influencing Health Status and Contact with Health Services,” as compared to 9%, 6% and 3% in Medicare, Medicaid, and self-pay groups respectively. This ambiguous classification deals with circumstances other than a disease or injury that is classifiable under the 18 main disease categories, including: when a person who is not currently sick encounters health services for some specific purpose, such as to receive prophylactic vaccination; when a person with a known disease or injury encounters the health care system for a specific treatment, such as dialysis or chemotherapy, or; when some problem influences the person's health status but is not itself an illness or injury.

7.33 Services Cost and Utilization

The results of analyses of consumer *Services Cost and Utilization* by Primary Payor category are presented in **Appendix C- Table 25** for imputed data and **Appendix C- Table 26** for original data. There were no statistically significant differences in the average daily cost of care between cognitively impaired consumers and their peers in any of the four primary payor categories, although conceptually meaningful differences are present. The readmission rate only differs significantly by cognitive impairment status among the Medicare subpopulation, with readmissions for 43% of consumers with moderate-to-severe cognitive impairment as compared to 29% of consumers with little-to-no cognitive impairment.

In terms of the volume of service, the overall length of service for consumers with moderate-to-severe cognitive impairment differs significantly from those with little-to-no cognitive impairment in both the private insurance subpopulation (340.8 days, as compared to 130 days) and the subpopulation of people paying out of pocket (706.5 days, as compared to 277.3 days). Significant differences by cognitive impairment status in the total number of service visits and subset of non-medical visits are found only in the subpopulation of consumers primarily paying for service with Medicare. The average number of visits for Medicare consumers with moderate-to-severe cognitive impairment is greater than the number of visits for their less impaired peers (21.8 visits, as compared to 16.1 visits), as is the number of non-medical visits (6 visits, as compared to 3.4 visits). The number of medical visits only differs significantly in the Medicaid subpopulation, with 13.5 visits for Medicaid consumers with cognitive impairment as compared to 7.8 visits for their less impaired peers.

7.40 Correlational Analysis Results

The consumer-level and agency-level variables used in this study are evaluated through correlational analyses in order to identify any pairs of variables that are highly correlated, which would suggest the need for an adjustment to the analytical strategy of using all of the variables. The Correlation Coefficient (r) represents the degree of linear relationship between two variables. A correlation matrix offers a convenient presentation of a large number of correlation coefficients. The correlation matrix of consumer-level variables is shown in **Appendix C- Table 29** for imputed data and in **Appendix C- Table 30** for original data. The correlation matrix of agency-level variables is shown in **Appendix C- Table 31** for imputed data and in **Appendix C- Table 32** for original data.

7.41 Correlations among Consumer-level Variables

The analysis of the consumer-level correlation matrix indicates that few of the observed relationships were very strong (typically with r less than 0.4). Looking first at the relationships among consumer characteristics in the categories of predisposing, enabling, and illness-level factors, the strongest correlations are between bladder and bowels incontinence (r = 0.41) and between the number of activities of daily living (ADLs) for which the consumer needs assistance and the number of ADLs for which home care personnel provide assistance (r = 0.39). These moderate correlation coefficients are as expected because of the conceptual similarity of the constructs in each pair, and this finding suggests it is important to consider the possibility of removing one of the variables from each pair in the subsequent multivariate regression analyses of this study. Thus, only the variable related to the *need* for help with ADLs is included in further analyses. However, bladder and bowels incontinence, while moderately correlated, represent meaningfully distinct areas of need for professional intervention from home health care personnel and both variables are used in subsequent analyses.

Among the six variables used in this study as dependent variables, the strongest correlations are found between the total number of visits and the number of ADLs for which home care personnel provide assistance (r = 0.39), and, as would be expected, between the total number of visits and both subsets of medical and non-medical visits (r = 0.59 and r = 0.60 respectively). These larger correlation coefficients are not of concern in this study because each of the dependent variables are used separately and never within the same regression models. The key predictor variable in this study is cognitive impairment, and this variable was not highly correlated with any other consumer-level variable. The strongest relationships are found between cognitive impairment status and both bladder and bowels incontinence (r = 0.31and r = 0.35 respectively), and these variables are not so highly correlated that their use in the multivariate analyses of this study are of concern.

7.42 Correlations among Agency-level Variables

The analysis of the agency-level correlation matrix indicates that few of the observed relationships were very strong (typically with r less than 0.5). Exceptions to this finding include larger correlations for the relationships between the number of care services and health services (r = 0.55), and between the number of health services and social services (r = 0.50). The highest correlation is found between the average hourly wages for Personal Care Aides and for Home Health Aides (r = 0.79). Since these two variables are so highly correlated and represent nearly identical constructs, only the measure of average Home Health Aide wages are included in the multivariate analyses of this study. The moderately high correlations between the numbers of different types of services offered are expected because agencies with greater capacity for offering a diversity of types of service would logically provide a multitude of services that span categories. These four categories are included in the analyses of this study because they represent distinct profiles of service that are relevant to the research questions exploring differential use of medical and non-medical services among consumers with varying degrees of cognitive impairment.

7.50 *Multivariate Regression Results*

In this section, the results of the seven multivariate models for each of the six dependent variables are described. These results are concisely presented in Appendix D, and described below in narrative form. The Fully Unconditional Models, and corresponding ICC values, for all six dependent variables are described first. Then for each dependent variable, a series of increasingly larger models are presented, including: A) unadjusted models that demonstrate the relationship between consumer cognitive impairment status and service volume and cost without controlling for any other variables; B) adjusted level-1 models which assess the relationship between consumer cognitive impairment status and service volume and cost while controlling for theoretically and statistically significant consumer characteristics; C) multilevel models which assess the influences of agency characteristics directly on the consumer-level dependent variables while controlling for all other level-1 covariates; and D) cross-level models demonstrating the influence of home health care agency characteristics on the relationship between cognitive impairment status and each of the five outcomes related to service volume and cost.

7.51 Fully Unconditional Models Results

The results of analyses of the extent to which outcomes vary across agencies are presented in **Appendix D- Table 1** for imputed data and **Appendix D- Table 2** for original data.

The utility of the Fully Unconditional Model is in generating Intraclass Correlation Coefficients (ICCs), which measure the extent to which consumers enrolled in the service of the same agency are more similar to each other than they are to consumers being served by different agencies. Fully Unconditional Models generate ICC values that demonstrate the proportion of variance in each dependent variable that exists between agencies. For the models using imputed data, STATA statistical software cannot generate ICC values as it can for non-imputed data. However, random effects parameters are provided by STATA for analyses of both imputed and original data, and these statistics are used to calculate Variance Partition Coefficients, which is simply another phrase describing ICCs. In **Appendix D- Table 2**, where non-imputed Fully Unconditional Model results are presented, both the calculated Variance Partition Coefficients and the STATA-generated ICCs are provided to demonstrate their equivalence.

The ICC values for the Fully Unconditional Models of each dependent variable ranges from 0.34 (Readmission Status) to 0.47 (Non-Medical Service Visits). Thus, between 34% and 47% of the variance in each dependent variable exists between agencies. An ICC demonstrating between-group variance higher than 10% suggests that enough between-group variability exists to model as a function of group characteristics. Thus, for each of the dependent variables in this study, the high ICC values support further examination of the influences of agency-level characteristics on these consumer-level outcomes.

7.52 Multilevel Model Results for Average Daily Charges

The results of multilevel analyses of Average Daily Charges for home health care services are presented in **Appendix D- Table 3** for imputed data and **Appendix D- Table 4** for original data. These six analyses begin with the fixed effects of the key predictor variable, Cognitive Impairment Status, on the outcome. This is followed by three increasingly larger models where consumer predisposing factors, enabling factors, and illness-level factors are added sequentially to examine the relationship between cognitive impairment and the dependent variable while controlling for these other consumer characteristics. The fifth model builds upon the prior four models by introducing the fixed effects of agency characteristics while still controlling for consumer characteristics. The sixth and final model is the only model to examine cross-level mixed effects, assessing the influence of home health care agency characteristics on the relationship between cognitive impairment status and the dependent variable. This 'slopes-as-outcome' model tests for any moderating effects of agency characteristics by setting the slope for cognitive impairment status in the level-1 model as a function of the variables in level 2. The staged analyses described here are repeated for the other five dependent variables, and these procedures will not be restated below.

Accounting for no other consumer characteristics, the cognitive impairment status of consumers has a small, moderately significant ($p \leq .05$) relationship with average daily charge. On average, a one-point increase in cognitive impairment score is associated with a \$3.95 increase in average daily charges above the average value of about \$68. When consumer predisposing factors are introduced in Model 2, the size of the "cognitive impairment effect" is slightly reduced to \$3.72 and cognitive impairment is no longer statistically significant. The diminished influence and a lack of significance of consumers' cognitive impairment score continues to be demonstrated throughout the remaining four models examining average daily charges for home health care services. Since consumer attributes are group-mean centered, the cognitive impairment score coefficient refers to the estimated cognitive impairment score for a consumer of within-agency average attributes. Two consumer characteristics are found to have significant relationships with average daily charges. Age has a small, moderately significant relationship ($p \leq .05$), with a \$0.22 higher charge for each additional year of age, on average. African American ethnicity has a large and very significant influence, with an average \$12.28 *lower* average daily charge than Caucasian ethnicity ($p \leq .001$). The strong, negative, significant influence of African American ethnicity remains in the subsequent models examining average daily charges for home health care services, with the size of influence ranging from \$11.37 to \$14.20 lower daily charges.

As suspected, when consumer enabling factors are introduced, the influence of primary sources of payment for home care services is both significant and sizeable. In all of the multilevel models in this study, self-pay is the omitted referent primary payor category, thus comparing consumers enrolled in each insurance program to those who pay out of pocket. While the Medicare category does not have a statistically significant relationship with average daily charges, it consistently presents a positive influence ranging from \$12 to \$15 as compared to the self-pay category. Private insurance is associated with an average \$41.90 increase in average daily charges, on average, above the rate for consumers paying out of pocket ($p \leq .001$), and Medicaid has an ever greater influence with an average \$49.73 higher daily charge for service as compared to self-pay. Similar results are found in each subsequent model, with large, positive, significant relationships between Medicaid and private insurance, with average daily charges ranging from \$39.44 to \$38.70 for private insurance and \$42.23 to \$43.82 for Medicaid.

In the fourth Model[1], when consumer illness-level factors are added as level-1 covariates, the two significant variables which demonstrate significant relationships with average daily charges are: A) the need for help with medications ($p \leq .05$), and B) the number of activities of daily living for which help is required ($p \leq .01$). Consumers who need help with medications, on average, accrue daily charges for home health care services that are \$11.64 higher than those who do not need help with medications. For each additional activity of daily living that a consumer requires help in performing, there is an average \$6.12 increase in the average daily charges for home health care services.

The first of two multilevel models evaluating Average Daily Charges maintains all of the level-1 variables and model designs from Model 4, but adds the fixed effects of agency characteristics deemed relevant for this study. This analysis examines the influences of these agency characteristics *directly* on consumer-level average daily charges while controlling for all other level-1 covariates. This analysis is used to determine if there is a significant relationship between agency characteristics and service cost. Five of the 13 continuous agency-level variables are found to have statistically significant relationships with consumer-level average daily charges for home health care service. These include: A) the number of admissions in 2006

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[1] In this study's regression analyses of imputed data, the larger models are shown to have slightly reduced sample sizes (64 fewer cases). STATA's `mi estimate` command issues a warning if the estimation sample varies across imputations. In this study, all variables used in regression models are included in the imputation procedures. The varied estimation sample is merely a characteristic of the estimator when combined with more than one imputed dataset. For example, imputation procedures may identify a case where no datum is available for marital status and STATA imputes values for this variable in each of ten imputed datasets. As a result of different imputed values for this variable in this particular case across datasets, the particular cases that are divorced or single or married can vary from dataset to dataset. Using the `esampvaryok` command allows estimation to continue even when the estimation sample varies across imputations, and results from all imputations are used to compute MI estimates. However, the estimation sample is thus reduced by the number of cases with non-comparable observations. This solution is used in Models 4-6 for the analyses of each dependent variable in this study.

(\$0.01, $p \leq .001$); B) the number of personal care aides employed by the agency (-\$0.22, $p \leq .05$); C) the number of home health aides employed by the agency (\$0.59, $p \leq .001$); D) the agency's personal care aide retention rate (-\$0.17, $p \leq .05$); and E) the agency's home health aide retention rate (-\$0.24, $p \leq .05$). The influence of each of these agency characteristics is relatively small in magnitude, with less than 60 cents difference in average daily charges for home health care, and these factors remain similarly influential in the next model.

The final multilevel model examines cross-level effects by maintaining all of the fixed effects of consumer- and agency-level covariates, introducing interactions between agency-level characteristics with the slope of the relationship between cognitive impairment status and the dependent variable, and setting this slope as the only random effect in the model. Thus, this final model tests for moderating effects of agency characteristics, with the slope for cognitive impairment status in the level-1 model as a function of the variables in level 2. Therefore, this slope is now considered the "outcome" in the final analysis, which is designed to assess the influence of home health care agency characteristics on the relationship between cognitive impairment status and service cost. The only agency-level variable found to have a statistically significant influence on the slope is the number of years an agency has been in business (-0.41, $p \leq .05$). Thus greater agency longevity is shown to significantly reduce the effect of cognitive impairment on average daily costs of care even while controlling for other relevant consumer characteristics. As these six models were developed, the ICC value did not change dramatically. It stayed at 0.39 for Models 1 through 3, increased slightly to 0.40 in Model 4, and then decreased to 0.38 in Models 5 and 6. Thus, in these models between 38% and 40% of the variance in average daily charges exists between agencies and the inclusion of relevant agency factors in these models did not result in any meaningful reductions in this proportion.

7.53 Multilevel Model Results for Days of Service

The results of multilevel analyses of Days of Service for home health care services are presented in **Appendix D- Table 5** for imputed data and **Appendix D- Table 6** for original data. Accounting for no other consumer characteristics, the cognitive impairment status of consumers has a large, highly significant ($p \leq .001$) relationship with the number of continuous days of home health care service. On average, a one-point increase in cognitive impairment score is associated with a 19.92 day increase in the duration of service above the average 291.55 days, which is an increase of nearly 7% in the duration of service. When consumer predisposing factors are introduced in Model 2, cognitive impairment remains statistically significant ($p \leq .001$) but the size of the "cognitive impairment effect" is slightly reduced to 18.27 additional days of service. Nearly all the consumer predisposing factors, with the exception of a single ethnicity category, are found to have significant relationships with days of service. Age has a small but highly significant relationship ($p \leq .001$), with 0.72 additional days of service, on average, for each additional year of age. Thus, for every 10 years of additional age above the within-agency average age, there are 7.2 additional days of service. Males receive 16.10 fewer days of service than females ($p \leq .001$). African American and Hispanic ethnicities have a large and very significant influence on days of service, with an average 41.45 ($p \leq .001$) and 25.59 ($p \leq .01$) additional days of service, respectively, as compared to Caucasian ethnicity. Marital status also has a highly significant relationship with days of service ($p \leq .001$), with an average 38.31 fewer days of service for those consumers with a spouse or partner.

When consumer enabling factors are introduced in Model 3, the consumer characteristics discussed above remain similarly influential and significant with a few minor differences. Each higher cognitive impairment score above the within-agency mean score is now associated with fewer additional days of service as compared to Model 2 (17.55 additional days, as compared to 18.27 days in the prior model). Each year of age above the within-agency mean age is now associated with nearly twice as many additional days of service as in the prior model (1.36 additional days, as compared with 0.72 days). Gender and marital status are associated with fewer days of service, but the degree of influence is somewhat reduced in this model as compared to Model 2. Males are now shown to receive services for 12.39 fewer days than females ($p \leq .001$), on average, and consumers with a spouse or partner receive services for 32.34 fewer days than their unwed peers ($p \leq .001$). The significance of particular ethnicity categories has changed in this model as compared to Model 2. Hispanic ethnicity is no longer statistically significant, while the “Other Race/Ethnicity” category is now moderately significant with an average 27.24 fewer days of service as compared to Caucasian ethnicity ($p \leq .05$). African American ethnicity remains highly significant, with 36.03 additional days of service, on average, as compared to Caucasian ethnicity ($p \leq .001$). The changes seen in the influence of the key predictor variable and consumer predisposing factors from Model 2 to Model 3 are the result of the enabling factors introduced in Model 3, which demonstrate statistical significance and a large magnitude of association with the number of days of home health care service.

Primary source of payment is both significant and sizeable in influence on the number of days of home health care service. The Medicare and Private Insurance categories have a statistically significant relationship with days of service, demonstrating a negative influence of 92.07 fewer days and 93.25 fewer days, respectively, as compared to the self-pay category ($p \leq .01$). Conversely, Medicaid has a positive influence on days of service, with an average 63.40 additional days of service as compared to self-pay ($p \leq .05$). The most significantly influential enabling factors are living with non-family and having an informal caregiver ($p \leq .001$), both demonstrating negative associations with days of service. As compared to consumers who live alone, those who live with non-family are found to receive home health care services for an average 34.85 fewer days. Consumers with an informal caregiver receive services for 27.27 fewer days, on average, than those who do not have informal caregiver.

In the fourth Model, when consumer illness-level factors are added as level-1 covariates, the magnitude and significance of some of the influential variables from Model 3 are altered. Cognitive impairment score remains highly significant ($p \leq .001$), but the magnitude of influence is further reduced to 12.58 additional days of service for each point above and beyond the within-agency mean score. The influence of age is nearly identical to that found in Model 3, but somewhat reduced in magnitude for gender, ethnicity, and marital status variables, whereas the influence of having an informal caregiver is somewhat increased in magnitude. For the primary payor categories, however, there are considerable changes from Model 3 to Model 4. Medicare and private insurance categories are now non-significant and dramatically reduced in the magnitude of influence, whereas Medicaid is now more significant and more influential. As compared to consumers paying out of pocket, those paying for service with Medicaid are shown to receive services for 99.33 ($p \leq .01$) additional days of service, as compared to 63.4 additional days in Model 3. The changes seen in the influence of the key predictor variable and consumer predisposing and enabling factors from Model 3 to Model 4 are the result of the illness-level factors introduced in Model 4, which demonstrate statistical significance and a large magnitude of association with the number of days of home health care service.

Urinary incontinence is associated with an average 40.54 ($p \leq .05$) additional days of service; needing help with medications is associated with an average 41.96 ($p \leq .001$) additional days of service; and the use of assistive devices is associated with an average 27.55 ($p \leq .001$) additional days of service. Fewer days of service are found be related to the number of activities of daily living for which assistance is required (-3.23 days, $p \leq .05$) and any recent episodes of emergency medical care (-44.95 days, $p \leq .001$).

The fifth Model adds the fixed effects of agency characteristics deemed relevant for this study and examines if there is a significant relationship between agency characteristics and the volume of continuous days of home health care service. Nearly all of the 13 agency-level variables are found to have statistically significant relationships with the number of days of home health care service. Moderate, positive influences are associated with agencies' years in business (4.06 days, $p \leq .001$); number of referral sources (7.91 days, $p \leq .001$); number of employed home health aides (2.47 days, $p \leq .001$); and personal care aide retention rate (0.46 days, $p \leq .05$). A large, positive influence is found for the number of care services offered by agencies, with each additional care service associated with 34.15 additional days of service for consumers, on average ($p \leq .001$). Moderate, negative influences are associated with agencies' number of admissions in 2006 (-0.05 days, $p \leq .001$), and number of employed personal care aides (-1.69 days, $p \leq .001$). Larger, negative influences are found for the number of counseling services offered (-18.46 days, $p \leq .001$), the number of health services offered (-11.42 days, $p \leq .001$), the number of social services offered (-65.16 days, $p \leq .001$), the number of instrumental incentives for employees (-11.23 days, $p \leq .001$), and the average entry-level wage for home health aides (-13.72 days, $p \leq .05$).

The final multilevel model examines cross-level effects and assesses the influence of home health care agency characteristics on the relationship between cognitive impairment status and days of service. The introduction of these cross-level effects impacts the influence of consumer characteristics discussed above. The most notable difference in this sixth model is the change in the magnitude and direction of the influence of cognitive impairment score. Whereas a moderate, positive influence is observed in Model 5 (12.19 additional days), in this final model the influence of each higher point above the within-agency mean score on the cognitive impairment scale is now associated with 1.92 fewer days of service. This small, negative influence represents the slope that will be magnified by the effects of agency characteristics. The significant consumer-level covariates with a slightly reduced magnitude of positive influence include: A) age, with 1.33 additional days as compared to 1.38 additional days in Model 5; B) African American ethnicity, with 27.7 additional days as compared to 32.16 additional days in Model 5; and C) paying for services primarily with Medicaid, with 90.29 additional days as compared to 97.66 additional days in Model 5. Covariates with a slightly reduced magnitude of negative influence include: A) male gender, with 7.86 fewer days compared to 11.14 fewer days in Model 5; B) living with non-family, with 24.92 fewer days as compared to 28.74 fewer days in Model 5; and C) a recent episode of emergency medical care, with 40.45 fewer days as compared to 44.22 fewer days in Model 5. The significance and magnitude of agency-level covariates are virtually unchanged (< 0.1 difference in coefficients).

Nine of the 13 agency-level variables have a statistically significant influence on the slope representing the relationship between cognitive impairment status and days of service. The variables with a significant positive influence on the slope include: the number of admissions in 2006 (0.01 additional days, $p \leq .001$); the number of care services offered (3.38 additional days, $p \leq .01$); the number of employed personal care aides (0.47 additional days, $p \leq .001$); the mean entry level wage for home health aides (3.98 additional days, $p \leq .05$); the retention rate for personal care aides (0.35 additional days, $p \leq .001$); and the retention rate for home health aides (0.28 additional days, $p \leq .001$). Variables with a significant negative influence on the slope include: the number of years in business (0.58 fewer days, $p \leq .001$); the number of health services offered (10.66 fewer days, $p \leq .001$); and the number of instrumental incentives provided to direct care personnel (2.78 fewer days, $p \leq .001$).

As these six models were developed, the ICC value was generally reduced. The ICC was 0.46 in Model 1. It then increased slightly and stayed at 0.47 for Models 2-4, and then decreased to 0.41 in Models 5 and 6. Thus, in these models between 41% and 47% of the variance in the number of days of service exists between agencies and the inclusion of potentially relevant agency factors in these models reduced this proportion.

7.54 Multilevel Model Results for Total Number of Service Visits

The results of multilevel analyses of the Total Number of Service Visits for home health care services are presented in **Appendix D- Table 7** for imputed data and **Appendix D- Table 8** for original data. Whereas the previously described dependent variable measures the number of days of continuous enrollment in home health care service, this dependent variable and the two that are described in subsequent sections of the report are simple counts of numbers of service visits provided during the current service period. While the number of service visits is correlated with the number of days of continuous service (r = .29), the duration of the service period at the time of survey is not used in calculating the service visits variables.

Accounting for no other consumer characteristics, the cognitive impairment status of consumers has a significant ($p \leq .01$) relationship with the total number of service visits. On average, a one-point increase in cognitive impairment score is associated with a 1.05 visit increase in the total number of service visits above the average 22.63 visits. When consumer predisposing factors are introduced in Model 2, cognitive impairment still demonstrates statistical significance ($p \leq .01$) but the size of the "cognitive impairment effect" is slightly reduced to 0.99 additional service visits. All the consumer predisposing factors have significant relationships with the total number of service visits. Age has a non-meaningful but highly statistically significant relationship ($p \leq .001$), with 0.07 additional visits, on average, for each additional year of age. Thus, for every 10 years of additional age above the within-agency average age, there are 0.7 additional service visits. Males receive 0.79 additional service visits, on average, as compared to females ($p \leq .001$). Hispanic and "Other" ethnicities have a very significant influence on service visits, with an average 3.16 ($p \leq .001$) and 14.55 ($p \leq .01$) additional service visits, respectively, as compared to Caucasian ethnicity. By contrast, African American ethnicity is associated with 1.05 ($p \leq .05$) fewer service visits as compared to Caucasian ethnicity, on average. Marital status also has a significant relationship with the number of visits ($p \leq .01$), with an average 0.98 additional service visits for those consumers with a spouse or partner.

When consumer enabling factors are introduced in Model 3, the consumer characteristics discussed above remain similarly influential and significant with a few minor differences. Each higher cognitive impairment score above the within-agency mean score is now associated with a greater number of additional service visits as compared to Model 2 (1.2 additional visits, as compared to 0.99 visits in the prior model). The influence of marital status increases in magnitude and significance in Model 3, with an average 1.52 additional service visits ($p \leq .001$) for consumers with a spouse or partner as compared to those without.

All three primary sources of payment have significant ($p \leq .001$) and sizeable influences on the total number of home health care service visits. Medicare is associated with 9.38 additional service visits, Medicaid is associated with 7.94 additional visits, and private insurance is associated with 8.81 additional visits, with each source of payment compared to the self-pay category. The other three enabling factors have a negative and highly significant influence on the number of service visits. Living with family is associated with 1.37 fewer visits, living with non-family is associated with 2.99 fewer visits, with both compared to consumers who live alone. Having an informal caregiver is associated with 1.7 fewer service visits as compared to not having an informal caregiver.

In the fourth Model, when consumer illness-level factors are added as level-1 covariates, the magnitude and significance of the influential variables from Model 3 are altered. Cognitive impairment score is less significant ($p \leq .05$), and the magnitude of influence is markedly reduced to just 0.22 additional service visits for each point above the within-agency mean score.

The influence of age is nearly identical to that found in Model 3 but somewhat reduced in magnitude for gender and marital status variables, which are no longer statistically significant. The significant and negative influences are increased in magnitude for living with family (-2.26 visits), living with non-family (-4.63 visits), and having an informal caregiver (-3.24 visits), all of which remain significant at the .001 level. The influence of each of the ethnicity categories also increases in Model 4 and maintains significance at the .001 level, with Hispanic ethnicity associated with 3.85 additional visits, African American ethnicity associated with 1.03 fewer visits, and the "Other" ethnicity category associated with 16.23 additional visits, all of which are compared to Caucasian ethnicity. For the primary payor categories, Medicare and private insurance categories have a diminished magnitude of influence, whereas Medicaid is now more influential, and all three categories remain statistically significant at the .001 level. Those paying for services with Medicaid are shown to receive 8.24 additional service visits as compared to 7.94 additional visits in Model 3. Consumers paying for services with Medicare receive 8.27 additional service visits as compared to 9.38 additional visits in Model 3, and those paying for services with private insurance receive 9.87 additional service visits as compared to 8.81 additional visits in Model 3. The changes seen in the influence of the key predictor variable and consumer predisposing and enabling factors from Model 3 to Model 4 are the result of the illness-level factors introduced in Model 4, which each demonstrate statistical significance in their association with the total number home health care service visits.

Urinary incontinence is the only illness-level factor with a negative influence on the number of service visits, and is associated with an average 2.17 ($p \leq .01$) fewer visits. Incontinence of bowels is associated with an average 2.72 ($p \leq .001$) additional visits; needing help with medications is associated with an additional 4.61 ($p \leq .001$) visits; the use of assistive devices is associated with an average 3.82 ($p \leq .001$) additional visits; the use of medical devises is associated with 1.69 ($p \leq .001$) additional visits; each additional activity of daily living for which assistance is required is associated with 2.19 ($p \leq .001$) additional visits; a recent episode of emergency medical care is associated with 0.52 ($p \leq .05$) additional visits; and each additional medical diagnosis is associated with 0.76 ($p \leq .001$) additional visits.

The fifth Model adds the fixed effects of agency characteristics and examines if there is a significant relationship between agency characteristics and the total number of home health care service visits. The key predictor variable and all of the consumer-level covariates described above remain nearly unchanged in the magnitude, direction, and significance of influence on the dependent variable as compared to Model 4 (<0.12 difference in coefficients). Eight of the 13 agency-level variables are found to have highly statistically significant ($p \leq .001$) relationships with the number of service visits, although the magnitude of influence for the number of admissions in 2006 is less than 0.01. Small, positive influences are associated with the number of referral sources (0.43 additional visits); number of care services offered (1.17 additional visits); number of employed personal care aides (0.11 additional visits); and number of employed home health aides (0.16 additional visits). Negative influences are associated with the number of counseling services offered (2.03 fewer visits), number of social services offered (2.65 fewer visits), and number of instrumental incentives for employees (1.10 fewer visits).

The final multilevel model examines cross-level effects and assesses the influence of home health care agency characteristics on the relationship between cognitive impairment status and the total number of service visits. The introduction of these cross-level effects impacts the influence of consumer characteristics discussed above. The magnitude of the influence of cognitive impairment score increases in Model 6 to 0.75 additional service visits for each higher point above the within-agency mean score on the cognitive impairment scale, as compared to just 0.22 additional visits in Models 4 and 5.

The significant consumer-level covariates with a slightly reduced magnitude of positive influence include: A) age, with 0.03 additional visits as compared to 0.06 additional visits in Model 5; B) Hispanic ethnicity, with 3.25 additional visits as compared to 3.90 additional visits in Model 5; C) "Other" ethnicity, with 7.76 additional visits as compared to 8.25 additional visits in Model 5; D) paying for services primarily with Medicaid, with 7.76 additional visits as compared to 8.25 additional visits in Model 5; E) the use of medical devices, with 3.05 additional visits as compared to 3.83 additional visits in Model 5; F) the number of activities of daily living for which assistance is required, with 1.62 additional visits as compared to 1.67 additional visits in Model 5; and G) the total number of medical diagnoses, with 0.61 additional visits as compared to 0.76 additional visits in Model 5. Significant covariates with a slightly reduced magnitude of negative influence include: A) African American ethnicity, with 2.33 fewer visits as compared to 2.64 fewer visits in Model 5; B) living with non-family, with 4.43 fewer visits as compared to 4.69 fewer visits in Model 5; C) having an informal caregiver, with 2.48 fewer visits as compared to 3.23 fewer visits in Model 5; and D) incontinence of bladder, with 1.52 fewer visits as compared to 2.19 fewer visits in Model 5.

The significant consumer-level covariates with a slightly increased magnitude of positive influence include: A) male gender, with 0.94 additional visits compared to a non-significant 0.12 additional visits in Model 5; B) paying for services primarily with Medicare, with 8.81 additional visits as compared to 8.28 additional visits in Model 5; C) paying for services primarily with private insurance, with 10.34 additional visits as compared to 9.75 additional visits in Model 5; D) incontinence of bowels, with 3.51 additional visits as compared to 2.74 additional visits in Model 5; E) needing help with medications, with 4.70 additional visits as compared to 4.61 additional visits in Model 5; and F) the number of activities of daily living for which assistance is required, with 2.29 additional visits as compared to 2.18 additional visits in Model 5. The only significant consumer-level covariate with a slightly increased magnitude of negative influence is living with family, with 2.30 fewer visits as compared to 2.27 fewer visits in Model 5, and the only covariate with a change of direction of influence is a recent episode of emergency medical care, with 0.78 fewer visit as compared to 0.54 additional visits in Model 5. The significance and magnitude of agency-level covariates are virtually unchanged (< 0.01 difference in coefficients).

Eight of the 13 agency-level variables have a statistically significant influence on the slope representing the relationship between cognitive impairment status and total number of visits. The variables with a significant positive influence on the slope include: the number of counseling services offered (1.07, $p \leq .001$); the number of health services offered (0.65, $p \leq .01$); and the number of instrumental incentives provided to direct care personnel (0.18, $p \leq .001$). Variables with a significant negative influence on the slope include: the number of years in business (-0.07, $p \leq .001$); the number of care services offered (-0.37, $p \leq .01$); the number of social services offered (-2.37, $p \leq .001$); the number of employed personal care aides (-0.03, $p \leq .01$); and the number of employed home health aides (-0.09, $p \leq .001$).

As these six models were developed, the ICC value did not change dramatically. It stayed at 0.45 for Models 1 through 3, went up to 0.46 in Model 4, then decreased to 0.41 in Model 5, and increased again to 0.43 in Model 6. Thus, in these models between 41% and 46% of the variance in the total number of service visits exists between agencies and the introduction of potentially relevant agency factors reduced this proportion.

7.55 Multilevel Model Results for Number of Medical Service Visits

The results of multilevel analyses of the Number of Medical Service Visits are presented in **Appendix D- Table 9** for imputed data and **Appendix D- Table 10** for original data. Whereas the previously described dependent variable measures the total number of service visits provided during the current service period, the dependent variable described here represents a subset of visits during which medically oriented services were provided to consumers. This includes visits for the provision of skilled nursing, occupational therapy, and physical therapy.

Accounting for no other consumer characteristics, the cognitive impairment status of consumers has a significant ($p \leq .01$) relationship with the number of medical service visits. On average, a one-point increase in cognitive impairment score is associated with a 0.3 visit increase in the number of medical service visits above the average 12.86 medical visits. When consumer predisposing factors are introduced in Model 2, cognitive impairment still demonstrates statistical significance ($p \leq .01$) but the size of the "cognitive impairment effect" is slightly increased to 0.32 additional medical service visits. Four consumer predisposing factors have significant relationships with the number of medical service visits. Age has a non-meaningful but highly statistically significant relationship ($p \leq .001$), with 0.01 additional medical visits, on average, for each additional year of age. Thus, for every 10 years of additional age above the within-agency average age, there are 0.1 additional medical visits. Males receive 0.39 additional medical service visits, on average, as compared to females ($p \leq .001$). Hispanic and African American ethnicity do not have statistically significant influence on this dependent variable, but the “Other” ethnicity category has a very significant influence on medical service visits, with an average 5.59 ($p \leq .001$) additional visits as compared to Caucasian ethnicity. Marital status also has a highly significant relationship with medical visits ($p \leq .001$), with an average 0.63 additional medical service visits for those consumers with a spouse or partner.

When consumer enabling factors are introduced in Model 3, the consumer characteristics discussed above remain similarly influential and significant with a few minor differences. Each higher cognitive impairment score above the within-agency mean score is now associated with a greater number of additional service visits as compared to Model 2 (0.45 additional medical visits, as compared to 0.32 in the prior model). The influence of age is now non-significant, and the influence of gender is now slightly reduced to 0.35 additional medical visits for males as compared to females. “Other” ethnicity increases slightly in the magnitude of influence to 5.85 additional medical visits as compared to Caucasian ethnicity. Marital status decreases slightly in magnitude and significance in Model 3, with an average 0.48 additional medical service visits ($p \leq .01$).

All three primary sources of payment have significant ($p \leq .001$) and sizeable influences on the number of medically oriented home health care service visits. Medicare is associated with 8.15 additional medical visits, Medicaid is associated with 3.67 additional medical visits, and private insurance is associated with 7.43 additional medical visits, with each source of payment compared to the self-pay category. Two enabling factors have a negative and highly significant influence on the number of medical service visits. Living with non-family is associated with 1.50 fewer medical service visits as compared to consumers who live alone, and having an informal caregiver is associated with 1.41 fewer medical service visits as compared to not having an informal caregiver.

In the fourth Model, when consumer illness-level factors are added as level-1 covariates, the magnitude and significance of the influential variables from Model 3 are altered. Cognitive impairment score is now non-significant, the direction of influence has changed to negative, and the magnitude is reduced to 0.04 fewer medical service visits for each point above the within-agency mean score. Gender and marital status are no longer statistically significant in Model 4. The influence of several covariates has increased in magnitude. On average, African American ethnicity is now associated with 1.68 fewer medical service visits as compared to Caucasian ethnicity; “Other” ethnicity is now associated with 6.16 additional medical service visits and living with non-family is now associated with 1.89 fewer medical service visits as compared to living alone; having an informal caregiver is now associated with 2.05 fewer medical service visits as compared to not having an informal caregiver; and using private insurance as the primary source of payment is now associated with 7.59 additional medical service visits as compared to paying out of pocket, all of which remain significant at the .001 level. The only covariate to decrease in the magnitude of influence is Medicare as the primary payor, which is now associated with 7.45 additional medical service visits, on average, as compared to the self-pay category. The changes seen in the influence of the key predictor variable and consumer predisposing and enabling factors from Model 3 to Model 4 are the result of the illness-level factors introduced in Model 4, which each demonstrates statistical significance in their association with the number of medical service visits.

Urinary incontinence is the only illness-level factor with a negative influence on the number of service visits, and is associated with an average 0.99 ($p \leq .05$) fewer medical service visits. Incontinence of bowels is associated with an average 0.82 ($p \leq .01$) additional medical service visits; needing help with medications is associated with an additional 3.34 ($p \leq .001$) medical service visits; the use of assistive devices is associated with an average 1.48 ($p \leq .001$) additional medical service visits; the use of medical devises is associated with 2.13 ($p \leq .001$) additional medical service visits; each additional activity of daily living for which assistance is required is associated with 0.78 ($p \leq .001$) additional medical service visits; a recent episode of emergency medical care is associated with 0.83 ($p \leq .05$) additional medical service visits; and each additional medical diagnosis is associated with 0.45 ($p \leq .001$) additional medical service visits.

The fifth Model adds the fixed effects of agency characteristics and examines if there is a significant relationship between agency characteristics and the number of medically oriented home health care service visits. The key predictor variable and all of the consumer-level covariates described above remain nearly unchanged in the magnitude, direction, and significance of influence on the dependent variable as compared to Model 4 (<0.07 difference in coefficients). Eight of the 13 agency-level variables are found to have statistically significant ($p \leq .001$ or $p \leq .01$) relationships with the number of service visits, although the magnitude of influence for the number of admission in 2006 is less than 0.01. On average, small, positive influences are associated with the number of health services offered (0.54 additional medical visits) and number of employed home health aides (0.18 additional medical visits). Negative influences are associated with the number of care services offered (0.41 fewer medical visits); number of counseling services offered (1.20 fewer medical visits); number of employed personal care aides (0.12 fewer medical visits); number of instrumental incentives for employees (0.64 fewer medical visits); and home health aide retention rate (0.02 fewer medical visits).

The final multilevel model examines cross-level effects and assesses the influence of home health care agency characteristics on the relationship between cognitive impairment status and the number of medical service visits. The introduction of these cross-level effects impacts the influence of consumer characteristics discussed above. Although still non-significant, the direction and magnitude of the influence of cognitive impairment score changes in Model 6 to 0.12 additional medical service visits for each higher point above the within-agency mean score on the cognitive impairment scale, as compared to 0.04 fewer medical visits in Models 4 and 5.

The significant consumer-level covariates with a slightly reduced magnitude of positive influence include: A) “Other” ethnicity, with 5.96 additional medical visits as compared to 6.16 additional medical visits in Model 5; B) needing help with medication, with 3.13 additional medical visits as compared to 3.34 additional medical visits in Model 5; C) using assistive devices, with 1.24 additional medical visits as compared to 1.50 additional medical visits in Model 5; D) using medical devices, with 1.86 additional medical visits as compared to 2.14 additional medical visits in Model 5; and E) the total number of medical diagnoses, with 0.36 additional medical visits as compared to 0.45 additional medical visits in Model 5. The indicator of recent episodes of emergency medical care no longer holds statistical significance.

Significant covariates with a slightly reduced magnitude of negative influence include: A) African American ethnicity, with 1.62 fewer medical visits as compared to 1.70 fewer medical visits in Model 5; B) living with non-family, with 1.89 fewer medical visits as compared to 1.92 fewer medical visits in Model 5; and C) having an informal caregiver, with 1.84 fewer medical visits as compared to 2.03 fewer medical visits in Model 5.

The significant consumer-level covariates with a slightly increased magnitude of positive influence include: A) male gender, with 0.31 additional medical visits compared to a non-significant 0.15 additional medical visits in Model 5; B) paying for services primarily with Medicare, with 8.00 additional medical visits as compared to 7.52 additional medical visits in Model 5; C) paying for services primarily with Medicaid, with 3.82 additional medical visits as compared to 3.58 additional medical visits in Model 5; D) paying for services primarily with private insurance, with 8.05 additional medical visits as compared to 7.63 additional medical visits in Model 5; E) incontinence of bowels, with 0.93 additional medical visits as compared to 0.80 additional medical visits in Model 5; and F) the number of activities of daily living for which assistance is required, with 0.81 additional medical visits as compared to 0.77 additional medical visits in Model 5. The significance and magnitude of agency-level covariates are virtually unchanged (< 0.01 difference in coefficients).

Nine of the 13 agency-level variables have a statistically significant influence on the slope representing the relationship between cognitive impairment status and the number of medical service visits. The variables with a significant positive influence on the slope include: the number of admissions in 2006 (0.001, $p \leq .001$); the number of care services offered (0.21, $p \leq .05$); the number of health services offered (0.29, $p \leq .001$); and the number of instrumental incentives provided to direct care personnel (0.18, $p \leq .001$). Variables with a significant negative influence on the slope include: the number of years in business (-0.06, $p \leq .001$); the number of social services offered (-0.99, $p \leq .001$); the number of employed personal care aides (-0.04, $p \leq .001$); the number of employed home health aides (-0.02, $p \leq .001$); and the personal care aide retention rate (-0.02, $p \leq .001$).

As these six models were developed, the ICC value decreased in general. It stayed at 0.46 for Models 1 through 4, decreased to 0.41 when agency characteristics were introduced in Model 5, and increased slightly to 0.43 in Model 6. Thus, in these models between 41% and 46% of the variance in the number of medical service visits exists between agencies and the introduction of potentially relevant agency factors reduces this proportion.

7.56 Multilevel Model Results for Number of Non-Medical Service Visits

The results of multilevel analyses of the Number of Non-Medical Service Visits are presented in **Appendix D- Table 11** for imputed data and **Appendix D- Table 12** for original data. Whereas the previously described dependent variable represents a subset of visits during which medically oriented services were provided to consumers, the dependent variable described here represents a subset of visits during which non-medically oriented services were provided to consumers. Non-medical visits include Home Health Aide visits and visits for the provision of social services.

Accounting for no other consumer characteristics, the cognitive impairment status of consumers has a highly significant ($p \leq .001$) relationship with the number of non-medical service visits. On average, a one-point increase in cognitive impairment score is associated with a 0.84 visit increase in the number of non-medical service visits above the average 5.95 non-medical visits. When consumer predisposing factors are introduced in Model 2, cognitive impairment still demonstrates statistical significance ($p \leq .001$) and the size of the "cognitive impairment effect" is slightly increased to 0.85 additional non-medical service visits. Three consumer predisposing factors have significant relationships with the number of non-medical service visits. Age has a non-meaningful but highly statistically significant relationship ($p \leq .001$), with 0.04 additional non-medical visits, on average, for each additional year of age. Thus, for every 10 years of additional age above the within-agency average age, there are 0.4 additional non-medical visits. Males receive 0.46 fewer non-medical service visits, on average, as compared to females ($p \leq .001$). Marital status also has a significant relationship with the number of non-medical visits ($p \leq .001$), with an average 0.77 additional non-medical visits for those consumers with a spouse or partner.

When consumer enabling factors are introduced in Model 3, the consumer characteristics discussed above remain similarly influential and significant with a few minor differences. Each higher cognitive impairment score above the within-agency mean score is remains associated with 0.85 additional non-medical service visits ($p \leq .001$). The influences of age and marital status are the same as in Model 2. Gender remains highly significant, but the magnitude of influence has decreased to 0.41 fewer visits for males than for females, on average. African American ethnicity is now associated with a moderately significant influence on the number of non-medical service visits, with 0.36 fewer non-medical visits as compared to Caucasian ethnicity. Medicaid as the primary sources of payment has a significant influence on the number of non-medically oriented home health care service visits, with 1.57 ($p \leq .001$) additional non-medical visits as compared to the self-pay category. In addition, living with non-family is associated with 1.21 ($p \leq .001$) fewer non-medical service visits as compared to consumers who live alone.

In the fourth Model, when consumer illness-level factors are added as level-1 covariates, the magnitude and significance of the influential variables from Model 3 are altered. Cognitive impairment score remains highly significant, but the magnitude is reduced to 0.53 additional non-medical service visits for each point above the within-agency mean score. Age is slightly reduced in the magnitude of influence as compared to Model 4, but remains highly significant. Male gender is now associated with an average 0.41 ($p \leq .001$) fewer non-medical visits as compared to female gender. African American ethnicity is now highly significant ($p \leq .001$), and is associated with 0.63 fewer non-medical service visits as compared to Caucasian ethnicity, Hispanic ethnicity now has a significant association, with 0.82 ($p \leq .01$) additional non-medical service visits as compared to Caucasian ethnicity. The influence of marital status is slightly reduced in magnitude to 0.69 ($p \leq .001$) additional non-medical visits for those with a spouse or partner as compared to those without a spouse. Living with family and non-family are both associated with significant, negative influences on non-medical service visits, with 0.35 ($p \leq .01$) fewer non-medical visits for those living with family and 1.95 ($p \leq .001$) fewer non-medical service visits for those living with non-family as compared to those living alone. Having an informal caregiver is now associated with 0.62 ($p \leq .001$) fewer non-medical service visits as compared to not having an informal caregiver, and using Medicaid as the primary source of payment is now associated with 1.87 ($p \leq .01$) additional medical service visits as compared to paying out of pocket. The changes seen in the influence of the key predictor variable and consumer predisposing and enabling factors from Model 3 to Model 4 are the result of the illness-level factors introduced in Model 4, most of which demonstrate statistical significance in their association with the number of non-medical service visits.

Urinary incontinence is the only illness-level factor without significant influence on the number of non-medical service visits. Incontinence of bowels is associated with an average 0.59 ($p \leq .001$) additional non-medical service visits; needing help with medications is associated with an additional 0.55 ($p \leq .001$) non-medical service visits; the use of assistive devices is associated with an average 1.07 ($p \leq .001$) additional non-medical service visits; the use of medical devises is associated with 1.37 ($p \leq .001$) fewer non-medical service visits; each additional activity of daily living for which assistance is required is associated with 0.99 ($p \leq .001$) additional non-medical service visits; a recent episode of emergency medical care is associated with 0.30 ($p \leq .05$) fewer non-medical service visits; and each additional medical diagnosis is associated with 0.16 ($p \leq .001$) additional non-medical service visits.

The fifth Model adds the fixed effects of agency characteristics and examines if there is a significant relationship between agency characteristics and the number of non-medically oriented home health care service visits. The key predictor variable and all of the consumer-level covariates described above remain nearly unchanged in the magnitude, direction, and significance of influence on the dependent variable as compared to Model 4 (<0.04 difference in coefficients). Twelve of the 13 agency-level variables are found to have statistically significant (<0.01, $p \leq .001$) relationships with the number of non-medical service visits, although the magnitude of influence for several of these variables is very small, including: the number of admissions in 2006 (0.001, $p \leq .01$); the number of years agencies have been in business (0.03, $p \leq .001$); the number of employed home health aides (-0.06, $p \leq .001$); the number of instrumental incentives for employees (-0.06, $p \leq .001$); the personal care aide retention rate (0.02, $p \leq .05$); and the home health aide retention rate (0.02, $p \leq .001$). On average, small, positive influences are associated with the number of referral sources (0.16, $p \leq .001$); number of care services offered (0.52, $p \leq .001$); number of counseling services offered (0.21, $p \leq .01$); and number of employed personal care aides (0.14, $p \leq .001$). Negative influences are associated with the number of health services offered (-0.39, $p \leq .001$), and number of social services offered (-1.95, $p \leq .001$).

The final multilevel model examines cross-level effects and assesses the influence of home health care agency characteristics on the relationship between cognitive impairment status and the number of non-medical service visits. The introduction of these cross-level effects impacts the influence of consumer characteristics discussed above. The influence of cognitive impairment score is further reduced in Model 6 to 0.49 ($p \leq .001$) additional non-medical service visits for each higher point above the within-agency mean score on the cognitive impairment scale, as compared to 0.52 additional non-medical visits in Model 5.

The significant consumer-level covariates with a slightly reduced magnitude of positive influence include: A) age, with 0.02 additional non-medical visits as compared to 0.03 additional non-medical visits in Model 5; B) paying for services primarily with Medicaid, with 1.50 additional non-medical visits as compared to 1.83 additional non-medical visits in Model 5; C) incontinence of bowels, with 0.59 additional non-medical visits as compared to 0.60 additional non-medical visits in Model 5; D) using assistive devices, with 0.91 additional non-medical visits as compared to 1.07 additional non-medical visits in Model 5; and E) the total number of medical diagnoses, with 0.14 additional non-medical visits as compared to 0.16 additional non-medical visits in Model 5. Hispanic ethnicity no longer holds statistical significance.

Significant covariates with a slightly reduced magnitude of negative influence include: A) African American ethnicity, with 0.33 fewer non-medical visits as compared to 0.63 fewer non-medical visits in Model 5; B) living with non-family, with 1.51 fewer non-medical visits as compared to 1.96 fewer non-medical visits in Model 5; and C) having an informal caregiver, with 0.23 fewer non-medical visits as compared to 0.62 fewer non-medical visits in Model 5. The indicator of recent episodes of emergency medical care no longer hold statistical significance, and the influence of living with family remains identical to that found in Model 5.

The significant consumer-level covariates with a slightly increased magnitude of positive influence include: A) having a spouse of partner, with 0.73 additional non-medical visits compared to 0.69 additional non-medical visits in Model 5; B) needing help with medications, with 0.77 additional non-medical visits as compared to 0.55 additional non-medical visits in Model 5; and C) the number of activities of daily living for which assistance is required, with 1.02 additional non-medical visits as compared to 0.99 additional non-medical visits in Model 5. The significant consumer-level covariates with a slightly increased magnitude of negative influence include: A) male gender, with 0.30 fewer non-medical visits as compared to 0.29 fewer non-medical visits in Model 5; and B) using medical devices, with 1.44 fewer non-medical visits as compared to 1.38 fewer non-medical visits in Model 5. The significance and magnitude of agency-level covariates are virtually unchanged (< 0.01 difference in coefficients).

Ten of the 13 agency-level variables have a statistically significant influence on the slope representing the relationship between cognitive impairment status and the number of non-medical service visits. The variables with a significant positive influence on the slope include: the number of years an agency has been in business (0.02, $p \leq .001$); the number of counseling services offered (0.38, $p \leq .001$); the number of health services offered (0.32, $p \leq .001$); and the personal care aide retention rate (0.02, $p \leq .01$). Variables with a significant negative influence on the slope include: the number of care services offered (-0.28, $p \leq .001$); the number of social services offered (-0.77, $p \leq .001$); the number of employed personal care aides (-0.01, $p \leq .05$); the number of employed home health aides (-0.01, $p \leq .001$); the number of instrumental incentives offered to direct care personnel (-0.17, $p \leq .001$); the mean entry-level wage for home health aides (-0.10, $p \leq .05$); and the home health aide retention rate (-0.01, $p \leq .001$).

As these six models were developed, the ICC value decreased in general. It stayed at 0.48 for Models 1 through 3, increased slightly to 0.49 in Model 4, but then decreased to 0.40 when agency characteristics were introduced in Model 5, and increased only slightly to 0.42 in Model 6. Thus, in these models between 40% and 48% of the variance in the number of non-medical service visits exists between agencies and the inclusion of potentially relevant agency factors reduces this proportion.

7.57 Multilevel Model Results for Readmission Status

Unlike the prior four sections describing results of multivariate analyses of continuous service cost and utilization outcomes, this section focuses on the only binary dependent variable, readmission status. Ordinary least squares (OLS) regression analysis of binary variables can be considered a linear probability model, where coefficients represent the probability of the dependent variable having a value of 1, in this case meaning that the home health care consumer has been readmitted for service at the same agency through which services were provided at least once before. As described previously in the section of this report providing information about the distribution of each dependent variable, linear regression models with binary dependent variables violate many of the assumptions upon which statistical predictions are based. Thus, the significance and direction of the results below are most important.

The results of multilevel analyses of Readmission Status are presented in **Appendix D- Table 13** for imputed data and **Appendix D- Table 14** for original data. Accounting for no other consumer characteristics, the cognitive impairment status of consumers has a highly significant ($p \leq .001$) relationship with readmission status. On average, a one-point increase in cognitive impairment score is associated with a 2% greater probability of a service enrollment being a readmission above average probability of 28%. When consumer predisposing factors are introduced in Model 2, the influence of cognitive impairment is unchanged and four consumer predisposing factors have significant relationships with readmission status. Age has a highly statistically significant positive relationship (0.001, $p \leq .001$) with readmission status. Significant negative influences on readmission status include male gender (-0.01, $p \leq .05$), Hispanic ethnicity (-0.06, $p \leq .001$), and “Other” ethnicity (-0.04, $p \leq .05$). Thus, readmission is more likely among those with advanced age and less likely for those of Hispanic or other ethnicity as compared to Caucasian ethnicity.

When consumer enabling factors are introduced in Model 3, the consumer characteristics discussed above remain similarly influential and significant with a few minor differences. The influence of cognitive impairment remains unchanged, the significance of the influence of age is decreased to the 0.01 level and to a non-significant level for gender. Hispanic and “Other” ethnicities retain their significance and the magnitude of influence increases to 8% and 4% lower probability of a service enrollment being a readmission, respectively. Living with family and living with non-family are both associated with moderately significant ($p \leq .05$) positive influences on readmission status (0.01 and 0.02, respectively) as compared to consumers who live alone. Having an informal caregiver has a highly significant negative influence on readmission status (-0.03, $p \leq .001$). Primary payor category is not significant in this or any subsequent model described in this section.

In the fourth Model, when consumer illness-level factors are added as level-1 covariates, cognitive impairment score is no longer significant. “Other” ethnicity, living with family, and living with non-family also become non-significant. The influences of age, Hispanic ethnicity, and having an informal caregiver are very similar in significance and relatively similar in magnitude as compared to Model 3. Male gender now has a significant, negative association with readmission status (-0.01, $p \leq .01$). Urinary incontinence is the only illness-level factor without significant influence on readmission status. Highly significant ($p \leq .001$), positive associations with readmission status are found for incontinence of bowels (0.11); needing help with medications (0.03); the use of assistive devices (0.07); the use of medical devises (0.02); and a recent episode of emergency medical care (0.07). The number of medical diagnoses has a moderately significant influence on readmission status (0.001, $p \leq .05$), and the number of activities of daily living for which assistance is required has a highly significant negative association with readmission status (-0.02, $p \leq .001$).

The fifth Model adds the fixed effects of agency characteristics and examines if there is a significant relationship between agency characteristics and readmission status. The key predictor variable and all of the consumer-level covariates described above remain unchanged in the magnitude, direction, and significance of influence on the dependent variable as compared to Model 4, with the exception of a loss of statistical significance for living with non-family. Eight of the 13 agency-level variables are found to have highly statistically significant ($p \leq .001$) relationships with readmission status, although the magnitude of influence for four of these variables is less than or equal to 0.02, including: the number of admission in 2006 (0.001); the number of referral sources (-0.02); the number of care services offered (-0.01); the number of health services offered (0.01); the number of employed personal care aides (0.001); the number of employed home health aides 0.001); and the home health aide retention rate (0.001). The largest magnitude of influence on readmission status is associated with the number of social services offered (0.07).

The final multilevel model examines cross-level effects and assesses the influence of home health care agency characteristics on the relationship between cognitive impairment status and readmission status. The introduction of these cross-level effects impacts the influence of consumer characteristics discussed above. The influence of cognitive impairment score is now moderately significant ($p \leq .05$) and negative (-0.01). Most of the significant consumer-level and agency-level covariates are unchanged in significance and direction of influence in this model as compared to Model 5. Exceptions include Hispanic ethnicity, which is no longer significant, and living with family, which now has a positive significant association with readmission status (0.02, $p \leq .01$).

Nine of the 13 agency-level variables have a statistically significant influence on the slope representing the relationship between cognitive impairment status and readmission status. A negligible magnitude of influence is demonstrated by the number of admissions in 2006 (0.00001); the number of years agencies have been in business (-0.003); the number of referral sources (0.002); the number of personal care (-0.001) and home health aides (0.001) employed by agencies; and the retention rate for personal care (-0.001) and home health aides (0.001). The only agency characteristic with a larger positive influence on the slope is the number of care services offered (0.01), and the only characteristic with a larger negative influence on the slope is the number of health services offered (-0.01).

As these six models were developed, the ICC value generally decreased. In Model 1 the ICC value is 0.37, it then decreased slightly to 0.34 in Models 2-4, decreased again to 0.31 when agency characteristics were introduced in Model 5, and finally increased slightly to 0.32 in Model 6. Thus, in these models between 31% and 37% of the variance in readmission status exists between agencies and the sequential expansion of the models by including potentially relevant consumer or agency factors in these models generally reduces this proportion.

7.58 Simulated Agency Profiles

In Tables 2 through 7 of Appendix D, all of the variables beginning with “C.I._” represent interactions of agency characteristics with the regression slope, or statistical relationship, between consumer cognitive impairment status and the dependent variable. Thus, the level-1 slope is modeled as the outcome of these cross-level analyses. These coefficients must be interpreted in accordance with the multiplicative nature of the relationships they represent. In order to understand the influences of agency characteristics on the slopes in these models, it is useful to depict hypothetical scenarios in which the effects on dependent variables are demonstrated over a range of values of both the agency characteristic and consumer cognitive status.

Such scenarios are provided in **Appendix D- Tables 15-20**, with one table for each of the six dependent variables. Each table includes only those agency characteristics that were found to be significant influences on the slope. As incrementally higher consumer cognitive impairment scores above the within-agency mean are assessed in these scenarios, and since the mean score is likely to be less than 3, these tables depict increases of 1, 2 and 3 points so as not to surpass the realistic range of scores. To create a range of agency characteristics, a high value and a low value were calculated as one-half of the Standard Deviation above and below the mean for each characteristic. This calculation had to be done with statistics generated by analyses of original date, as opposed to imputed data, in order to obtain Standard Deviations. The fact that these high and low values are calculated for the purpose of illustrating hypothetical scenarios should alleviate any concerns for combining coefficients generated from imputed data with distributional statistics generated from original data.

Appendix D- Table 15 shows simulated agency profiles examining the influences of agency characteristics on the relationship between cognitive impairment and average daily charges. The number of years in business is the only agency-level factor with a significant influence on this slope. For the hypothetical agency represented in Profile 1, which has been in business for nearly 12 years, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with $4.93 less in average daily charges, whereas a 3-

point increase in score is associated with $14.80 less in average daily charges. For the agency represented in Profile 2, which has been in business for more than 27 years, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with $11.24 less in average daily charges, whereas a 3-point increase in score is associated with $33.73 less in average daily charges. Therefore, as agencies remain in business for increasing numbers of years, exponentially lower daily costs of care are associated with increasingly severe cognitive impairment.

Appendix D- Table 16 shows simulated agency profiles examining the influences of agency characteristics on the relationship between cognitive impairment and days of service. Seven agency-level factors have a significant influence on this slope. Since it would be redundant to explore simulated agency profiles for every significant agency characteristic, the two characteristics used here are those with the greatest magnitude of positive influence (average entry-level wage for home health aides) and the greatest magnitude of negative influence (number of health services offered). For the hypothetical agency represented in Profile 1, which pays home health aides at an average starting wage of $9.36, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 37 additional days of service, whereas a 3-point increase in score is associated with 112 additional days of service. For the agency represented in Profile 2, which pays home health aides at an average starting wage of $11.64, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 46 additional days of service, whereas a 3-point increase in score is associated with 139 additional days of service. Therefore, as higher entry-level wages of home health aides are paid by agencies, exponentially more days of service are associated with increasingly severe cognitive impairment. The same is true for the number of admissions in 2006, the number of care services offered, the number of personal care aides employed by agencies, and the retention rates for personal care aides and home health aides.

For the hypothetical agency represented in Profile 1, which offers 6.3 types of health services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 67 fewer days of service, whereas a 3-point increase in score is associated with 202 fewer days of service. For the agency represented in Profile 2, which offers 9 types of health services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 96 fewer days of service, whereas a 3-point increase in score is associated with 287 fewer days of service. Therefore, as greater numbers of health services are offered by agencies, exponentially fewer days of service are associated with increasingly severe cognitive impairment. The same is true for the number of years agencies have been in business and the number of incentives agencies offer to their direct care workers.

Appendix D- Table 17 shows simulated agency profiles examining the influences of agency characteristics on the relationship between cognitive impairment and the total number of service visits. Eight agency-level factors have a significant influence on this slope. The two characteristics used here are those with the greatest magnitude of positive influence (the number of counseling services offered) and the greatest magnitude of negative influence (the number of social services offered). For the hypothetical agency represented in Profile 1, which provides approximately 0.6 counseling services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 0.6 additional total service visits, whereas a 3-point increase in score is associated with 1.8 additional total service visits. For the agency represented in Profile 2, which provides approximately 1.9 counseling services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 2 additional total service visits, whereas a 3-point increase in score is associated with 6 additional total service visits. Therefore, as greater numbers of counseling services are offered by agencies, exponentially more service visits for consumers are associated with increasingly severe cognitive impairment. The same is true for the number of health services offered and the number of incentives agencies offer to their direct care workers.

For the hypothetical agency represented in Profile 1, which provides approximately 1 type of social service, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 2.5 fewer total service visits, whereas a 3-point increase in score is associated with 7.4 fewer total service visits. For the agency represented in Profile 2, which provides approximately 1.7 types of social service, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 4.1 fewer total service visits, whereas a 3-point increase in score is associated with 12.3 fewer total service visits. Therefore, as greater numbers of social services are offered by agencies, exponentially fewer total service visits for consumers are associated with increasingly severe cognitive impairment. The same is true for the number of admissions in 2006, the number of years agencies have been in business, the number of care services offered, the number of personal care aides employed by agencies, and the number of home health aides employed.

Appendix D- Table 18 shows simulated agency profiles examining the influences of agency characteristics on the relationship between cognitive impairment and the number of medical service visits. Eight agency-level factors have a significant influence on this slope. The two characteristics used here are those with the greatest magnitude of positive influence (the number of health services offered) and the greatest magnitude of negative influence (the number of social services offered). For the hypothetical agency represented in Profile 1, which provides approximately 6.3 health services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 1.8 additional medical service visits, whereas a 3-point increase in score is associated with 5.4 additional medical service visits. For the agency represented in Profile 2, which provides approximately 9 health services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 2.6 additional medical service visits, whereas a 3-point increase in score is associated with 7.7 additional medical service visits. Therefore, as greater numbers of health services are offered by agencies, exponentially more medical service visits for consumers are associated with increasingly severe cognitive impairment. The same is true for the number of care services offered and the number of incentives agencies offer to their direct care workers.

For the hypothetical agency represented in Profile 1, which provides approximately 1 type of social service, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 1 fewer medical service visits, whereas a 3-point increase in score is associated with 3.1 fewer medical service visit. For the agency represented in Profile 2, which provides approximately 1.7 types of social service, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 1.7 fewer medical service visits, whereas a 3-point increase in score is associated with 5.1 fewer medical service visits. Therefore, as greater numbers of social services are offered by agencies, exponentially fewer medical service visits for consumers are associated with increasingly severe cognitive impairment. The same is true for the number of admissions in 2006, the number of years agencies have been in business, the number of personal care aides employed by agencies, the number of home health aides employed, and the retention rate for personal care aides.

Appendix D- Table 19 shows simulated agency profiles examining the influences of agency characteristics on the relationship between cognitive impairment and the number of non-medical service visits. Nine agency-level factors have a significant influence on this slope. The two characteristics used here are those with the greatest magnitude of positive influence (the number of counseling services offered) and the greatest magnitude of negative influence (the number of social services offered). For the hypothetical agency represented in Profile 1, which provides approximately 0.6 counseling services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 0.2 additional non-medical service visits, whereas a 3-point increase in score is associated with 0.6 additional non-medical service visits. For the agency represented in Profile 2, which provides approximately 1.9 counseling services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 0.7 additional non-medical service visits, whereas a 3-point increase in score is associated with 2.1 additional non-medical service visits. Therefore, as greater numbers of counseling services are offered by agencies, exponentially more non-medical service visits for consumers are associated with increasingly severe cognitive impairment. The same is true for the number of years agencies have been in business, the number of health services offered, and the retention rate for personal care aides.

For the hypothetical agency represented in Profile 1, which provides approximately 1 type of social service, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 0.8 fewer non-medical service visits, whereas a 3-point increase in score is associated with 2.4 fewer non-medical service visits. For the agency represented in Profile 2, which provides approximately 1.7 types of social service, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 1.3 fewer non-medical service visits, whereas a 3-point increase in score is associated with 4 fewer non-medical service visits. Therefore, as greater numbers of social services are offered by agencies, exponentially fewer non-medical service visits for consumers are associated with increasingly severe cognitive impairment. The same is true for the number of care services offered, the number of personal care aides and home health aides employed by agencies, the number of incentives agencies provide to their direct care workers, the average entry-level wage for home health aides, and the retention rate for home health aides.

Appendix D- Table 20 shows simulated agency profiles examining the influences of agency characteristics on the relationship between cognitive impairment and readmission status. Seven agency-level factors have a significant influence on this slope. The two characteristics used here are those with the greatest magnitude of positive influence (the number of care services offered) and the greatest magnitude of negative influence (the number of health services offered). For the hypothetical agency represented in Profile 1, which provides approximately 1.4 care services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 1% greater probability of a service enrollment being a readmission, whereas a 3-point increase in score is associated with 2% greater probability of a service enrollment being a readmission. For the agency represented in Profile 2, which provides approximately 3.2 care services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 2% greater probability of a service enrollment being a readmission, whereas a 3-point increase in score is associated with 5% greater probability of a service enrollment being a readmission. Therefore, as greater numbers of care services are offered by agencies, exponentially higher probabilities of readmission are associated with increasingly severe cognitive impairment. The same is true for the number of admission in 2006, the number of types of referral source, the number of home health aides employed by agencies, and the retention rates for personal care aides and home health aides.

For the hypothetical agency represented in Profile 1, which provides approximately 6.3 health services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 5% greater probability of a service enrollment being a readmission, whereas a 3-point increase in score is associated with 15% greater probability of a service enrollment being a readmission. For the agency represented in Profile 2, which provides approximately 9 health services, a 1-point increase in consumer cognitive impairment above the within-agency mean score is associated with 7% lower probability of a service enrollment being a readmission, whereas a 3-point increase in score is associated with 22% lower probability of a service enrollment being a readmission. Therefore, as greater numbers of health services are offered by agencies, exponentially lower probabilities of readmission are associated with increasingly severe cognitive impairment. The same is true for the number of years agencies have been in business and the number of personal care aides employed by agencies.

8 Discussion

In this section of the report, the findings described above are discussed in order to provide a portrayal of home health care consumers and agencies in the United States as of the year 2007 and to answer the research questions of this study. In addition, the theoretical framework that guided this research is referenced with regard to each major finding in order to suggest further theoretical considerations and framework refinements. Lastly, the limitations of this research are discussed in order to frame and contextualize the appropriate interpretations of study findings and the related suggestions for further research.

8.10 *Predisposing and Enabling Factors*

Home health care consumers sampled in the National Home and Hospice Care Survey are representative of the entire population of consumers in the United States. This consumer population is distinguishable from the general population of residents in the United States in several meaningful areas of relevance to this study. The mean age of home health care consumers is 68 and the median age is approximately 75, as compared to a mean age of 37 and a median age of 36 for the general population as of the year 2000 (U.S. Census Bureau, 2001). Approximately 70% of the home health care consumer population is over age 65, as compared to just 12% of the general population, in 2007—the same year as the NHHCS survey (U.S. Census Bureau, 2009a). Thus the home health care consumer population is considerably older than the general population, on average, and this fits with expectations related to the greater likelihood of disease and disability in the older adult population. The difference in age between consumers with moderate-to-severe cognitive impairment and their less impaired peers is not statistically significant except within the sub-group of consumers who primarily pay for services with Medicaid, where those with moderate-to-severe cognitive impairment are approximately 12 years younger than their less impaired peers, on average. Since the Medicaid home health benefit is available to people of any age living with disabilities related to the inability to independently perform Activities of Daily Living, it may be the case that many of the cognitively impaired consumers in this group are people with developmental disabilities rather than acquired neurocognitive diseases.

The proportion of females among the home health care consumer population (65%) is larger than the proportion of females among the general population (51%) and among people age 65 and older (57%) (U.S. Census Bureau, 2009a). An equivalent proportion of females in the U.S. population as compared to that of the NHHCS sample is found among those age 85 and older (66%) in 2007 (U.S. Census Bureau, 2009). The difference in gender between consumers with varying severities of cognitive impairment is not statistically significant.

The marital status of home health care consumers offers insights of relevance to this study. Not only are the proportions of consumers in each marital status category somewhat different from that of the general population, but the availability of spousal caregivers may relate to the need for assistance from adult children as well as from formal providers. In the general U.S. population of adults aged 65 and older, 57% are married, 30% are widowed, 10% are divorced or separated, and only 4% never married (U.S. Census Bureau, 2009b). In the NHHCS sample, a much smaller proportion is married (32%), a somewhat larger proportion is widowed (35%), the same proportion is divorced or separated, and a much greater proportion never married (21%). Thus, a larger proportion of the home health care consumer population is comprised of people who do not have a spouse (68%) than in the general population (43%). These findings are more dramatic among home health care consumers with moderate-to-severe cognitive impairment, among whom 77% do not have a spouse. This difference in marital status is statistically significant, and directly related to the lack of available spousal caregivers among consumers with moderate-to-severe cognitive impairment, discussed below.

In the modified Andersen-Newman Health Services Utilization Model used to guide this study (see **Figure 5**) the individual determinants of service utilization listed under Predisposing Factors include consumer age, gender, and marital status. The inclusion of these predisposing factors in this study's examination of the relationship between cognitive impairment and service use provides context for a related set of findings in this study pertaining to enabling factors, such as the relationship of the caregiver to the consumer. Enabling factors are another subset of Individual Determinants in the modified Health Services Utilization Model depicted in **Figure 5**. In the NHHCS sample, 82% of consumers have an informal caregiver. A spouse is the informal caregiver in just 27% of these cases, and the adult child or some other family member is the caregiver in the remaining 73% of cases. These findings are not surprising when examining a population of home health care consumers since spouses of people in an elderly population are likely to be elderly themselves, and since these elderly spouses are less likely to have conflicting family and employment demands and are therefore less likely to rely upon supplemental care services from formal providers. For consumers with moderate-to-severe cognitive impairment who have informal caregivers, only 17% have a spousal caregiver and 83% rely upon an adult child or some other family member.

The analyses in this study demonstrate varying proportions of consumers with moderate-to-severe cognitive impairment across primary payor subpopulations. With 89% of home health care consumers receiving services covered primarily by Medicare or Medicaid, and only 12% of consumers paying with private insurance or paying out of pocket, it is clear that the vast majority of people who are enrolled in home health care programs are either over the age of 65, living with a disability, or living in poverty. Affluent people in need of home-based formal care may be more likely to purchase services from private aides who do not work for licensed agencies, and the findings of this study support such a proposition. Among those consumers who pay for services with a public insurance plan, more than twice as many have their services paid for by Medicare than by Medicaid (63%, as compared to 26%). Yet for those consumers who have moderate-to-severe cognitive impairment, as compared to their less impaired peers, statistically significant differences are found in primary payor category, with a smaller proportion of cognitively impaired consumers paying with private insurance (6%, as compared to 12% for those with little-to-no cognitive impairment) and a moderately larger proportion paying with Medicaid (34%, as compared to 22%). If the ability to purchase private insurance and the need to enroll in Medicaid are indicators of high and low socio-economic status, respectively, it appears that home health care consumers with moderate-to-severe cognitive impairment are generally less affluent than consumers with little-to-no cognitive impairment.

For the 10% of consumers who have a secondary source of payment to reimburse agencies for additional services not covered by the primary payor, Medicaid is used as the secondary source of payment in 43% of cases, followed by private insurance (27%) and Medicare (17%). So while Medicare is the leading source of primary payment for services, among those with a secondary payor Medicaid is the leading source of supplementary payment. These findings are consistent with a payment profile that is typical of health care consumers considered *dual eligibles*—those who are dually eligible for both entitlement programs because they are elderly and impoverished. When a consumer is enrolled in both programs, Medicare pays for most home health care coverage and Medicaid is then used for additional services once Medicare coverage for the individual has been exhausted (Cassidy, 2012). Thus, only about 5% of all home health care consumers are *dual eligibles* who require sufficiently extensive services so as to tap both public insurance programs, and the interpretation of other findings in this study can therefore focus primarily on single-payor consumer profiles without much concern for the unique considerations typically afforded to *dual eligibles*.

In the modified Andersen-Newman Health Services Utilization Model used to guide this study, some of the individual determinants of service utilization listed under Enabling Factors have been found to vary significantly between consumers with moderate-to-severe cognitive impairment and those with little-to-no cognitive impairment. This includes the primary source of payment for service and the relationships of the informal caregivers to consumers. The inclusion of these enabling factors in this study's examination of the relationship between cognitive impairment and service use is well justified. The enabling factors that do not significantly vary by cognitive impairment status include the habilitation status of consumers (who they live with), and secondary sources of payment for service. The finding of non-significant differences in habilitation status between consumers with moderate-to-severe cognitive impairment and their peers is surprising, since it is reasonable to expect that significantly fewer consumers with severe cognitive impairment would live alone. People receiving home health care services because of purely medical need should be able to live alone with some success, whereas those with severe cognitive impairment may require a degree of care and supervision that cannot be met by formal providers alone and would therefore be more likely to live with informal caregivers. The findings from this study do, in fact, demonstrate that a smaller proportion of consumers with moderate-to-severe cognitive impairment live alone and a larger proportion lives with non-family members, but these differences are not statistically significant as would be expected.

8.20 *Illness-level Factors*

Home health care consumers need help with an average 2.78 activities of daily living, yet the aides who provide formal care are addressing only an average 1.5 ADLs. The remaining needs are likely addressed by informal care providers, and, indeed, 82% of consumers are found to have informal caregivers. Home health care consumers with cognitive impairment are found to have greater needs, as well as statistically significant differences in the severity of need as compared to their less impaired peers. Consumers with moderate-to-severe cognitive impairment need assistance, on average, with 3.14 activities of daily living (as compared to 2.61 ADLs for those with little-to-no cognitive impairment) and receive assistance from formal providers for an average 1.84 ADLs (as compared to 1.33 ADLs for their less impaired peers).

The medical needs of home health care consumers are extensive, with approximately half of the sample needing assistive or medical devices, experiencing urinary incontinence, and receiving in-patient care prior to enrolment in home health care. More than 75% of consumers who received in-patient care before home health care came out of the hospital, and another 22%

came out of nursing or rehabilitation facilities. These factors help to explain why medical service visits are more than twice as numerous as non-medical service visits for the consumers in this study. When examining differences between consumers with and without cognitive impairment, it is clear that home health care consumers with moderate-to-severe cognitive impairment have significantly greater medical needs than their peers, with larger proportions needing help with medications, needing assistive and medical devices, and experiencing situations requiring emergency medical care. More than three times as many consumers with moderate-to-severe cognitive impairment are incontinent of bowels, far more are incontinent of bladder, and nearly three times as many exhibit difficult behaviors. The only two illness-level factors effecting significantly smaller proportions of consumers with cognitive impairment are the receipt of in-patient care prior to home health care and the experience of some sort of medical procedure that was related to admission to home health care. Similar findings are demonstrated in the analysis of illness-level factors within each category of primary payor, especially in the Medicare group and to a lesser extent in the other groups. Thus, it seems consumers with little-to-no cognitive impairment may be more likely to be receiving home health care services because of some rehabilitative or acute medical needs, whereas those with moderate-to-severe cognitive impairment may be experiencing more chronic and severe disability. The exception to these findings is found in the subpopulation of consumers who pay out of pocket for home health care. In this subgroup, consumers with cognitive impairment have fewer ADL needs, ADL assistance services, and medical emergencies, but many more of these consumers have difficult behaviors, urinary incontinence, and a need for help with medications.

The sample size is relatively small in this primary payor category (n=58), but within this small group of self-pay consumers it seems that a rather unique profile of service needs is evident.

In the modified Andersen-Newman Health Services Utilization Model used to guide this study, the individual determinants of service utilization listed under Illness-level Factors have been found to vary significantly between consumers with moderate-to-severe cognitive impairment and those with little-to-no cognitive impairment. This includes: ADL needs; number of diagnoses; the presence of difficult behaviors; the use of assistive and medical devices; incontinence of bladder and bowels; the need for help with medications; the recent need for emergency medical attention; and the receipt of inpatient care and medical procedures prior to home care admission. The inclusion of these illness-level factors in this study's examination of the relationship between cognitive impairment and service use is well justified. The only illness-level factor that does not significantly vary by cognitive impairment status is the type of inpatient care location used prior to home care.

The analysis of cognitive impairment status and primary diagnosis sheds light on the age differential within each primary payor category (described above). For consumers paying for service with Medicare, 30% have moderate-to-severe cognitive impairment and this is on par with expectations of cognitive impairment status for people of an age typical of Medicare enrollment and the level of medical need described above. A similar proportion (33%) of cognitively impaired consumers is found in the group of consumers paying for services out of pocket, which is a subpopulation with very similar age profiles to the Medicare group. However, in the comparatively younger Medicaid and private insurance groups, the proportions of cognitive impairment are unique. In the Medicaid group, 42% of the consumers have moderate-to-severe cognitive impairment, and in the private insurance group only 19% of consumers are impaired at this level of severity. Advanced age is the greatest risk factor for diseases of dementia (AA, 2011), and the link between older age and more severe cognitive impairment is not clearly demonstrated by the findings in this study, as shown above with the greatest proportion of cognitively impaired individuals found among the relatively younger subpopulation of consumers paying for service with Medicaid. One possible explanation for this finding is the particular measure of cognitive impairment status used in the home health care industry. The 5-point OASIS scale frames cognitive capacity in terms of required reminders and direction in certain situations. While this measure has reasonable sensitivity in detecting the cognitive impairment created by disorders of dementia (Tullai-McGuinness, Madigan & Fortinsky, 2009), it does not have the specificity to separate cases of impairment caused by developmental disability or non-dementing mental illnesses. This measure may be the best indicator of cognitive impairment status available in the NHHCS dataset, but the finding described above supports the need to also examine the relationship between cognitive impairment status and available diagnostic information.

Neuro-cognitive disease does not have its own broad ICD-9 category, and the 60-plus acquired conditions known to cause symptoms of dementia are represented by at least as many unique ICD-9 numbers. Within the array of broad ICD-9 categories of illness, a diagnosis categorized as either mental or neurological disease may be the most likely to correspond with cognitive dysfunction. As compared to their less impaired peers, more than twice the proportion of consumers with moderate-to-severe cognitive impairment are listed in agency files to have a primary diagnosis of a disease of the nervous system, and five times the proportion of cognitively impaired consumers have primary diagnoses of mental disorders. Assessing the proportions of consumers in each primary payor category with primary diagnoses in these two illness categories can enhance our understanding of the relationship between cognitive impairment status and category of primary payor for home health care service. The private insurance group has the smallest proportion (19%) of consumers with moderate-to-severe cognitive impairment and the smallest proportion (6%) of consumers with primary diagnoses categorized as either mental or neurological diseases. The Medicaid group has the largest proportion (42%) of consumers with moderate-to-severe cognitive impairment and a relatively large proportion (24%) of consumers with primary diagnoses categorized as either mental or neurological disease. However, the relationship between these constructs is less clear when considering that Medicare and self-pay subgroups have similar proportions of cognitively impaired consumers (30% and 33% respectively) yet only 8% of Medicare consumers have a primary diagnosis of mental or neurological disease as compared to a much larger 27% of the self-pay group. With such a larger proportion of mental and neurological primary diagnoses, the proportion of self-pay consumers with cognitive impairment might be expected to be significantly larger than in the Medicare group.

The inconsistency of these findings may relate to the complex relationship between billing requirements and the disorders that home health care nurses list as primary diagnoses. While it is difficult to postulate the reasons nurses select a particular primary diagnosis for consumers in the self-pay group, it is clear that this group is not subject to complex regulatory and billing considerations because these consumers and their families simply pay for services out of pocket. For the other three subgroups, however, the reimbursement guidelines of each health insurance program will influence such decisions among home health nurses. This study does not examine sufficiently detailed billing data or provide an adequate depth of analysis to explore this issue further.

8.30 *Services Cost and Utilization*

The dramatic and significant differences in service volume between home health care consumers with moderate-to-severe cognitive impairment and their less impaired peers comprise a key finding of this study. Despite non-significant, moderately higher average charges per day of service, the consumers with cognitive impairment receive services for an average 144 additional days as compared to those with little or no impairment. As stated previously, the association of many more days of service with moderate-to-severe cognitive impairment may represent a profile of service use for this group of consumers that is consistent with chronic disabilities as opposed to short-term, post-acute medical care.

Comparing total costs of care across consumer groups can illustrate the relationships between daily costs, duration of service, and cognitive impairment status. Calculating total costs, based on sample averages, generates profiles of the total costs of home health care for consumers with and without moderate-to-severe cognitive impairment. On average, consumers who have little-to-no cognitive impairment receive services with an average total cost of $15,369 (230.69 days x $66.62/day) and those with moderate-to-severe cognitive impairment receive services with an average total cost or $26,269 (344.92 days x $76.16/day). The difference between these two profiles is $10,900 in additional total costs, on average, for consumers with cognitive impairment. In addition, significantly higher numbers of visits are received by consumers with moderate-to-severe cognitive impairment, on average, as compared to their less impaired peers, and this significant difference is found for both medical and non-medical visits. Coupled with the fact that these cognitively impaired consumers are significantly more likely than their peers to be readmitted to home health care suggests that such excess costs are more likely to be expended multiple times.

Within the four primary payor groups there are several additional noteworthy profiles of service use and cost among consumers with cognitive impairment. The Medicare group demonstrates significant differences in the number of visits and the proportion of readmissions for consumers with moderate-to-severe cognitive impairment. As compared to Medicare consumers with little-to-no cognitive impairment, these more impaired peers accrue nearly $10 of additional charges per day, on average, over a period of 140 additional days of service. The average total costs for these two groups of Medicare consumers, based on average charges and days of service, is $12,261 for those with little-to-no cognitive impairment and $17,430 for those with moderate-to-severe cognitive impairment—a difference of $5,169 that represents a 42% increase in average total cost of service. The Medicare home health benefit is designed to cover services that respond to acute medical needs over short periods of time. The other primary payor categories should therefore demonstrate longer service periods, lower proportions of readmission, and lower daily charges. The self-pay consumers with cognitive impairment actually have a lower average daily cost but a much longer service period ($33.64 and 707 days) than those with little-to-no cognitive impairment ($43.41 and 277 days), and this results in a $11,728 difference that represents a 97% increase in average total cost of service. Consumers paying for service with Medicaid benefits are enrolled in home care for much longer periods of time (510 days), on average, than their Medicare counterparts (179 days). The Medicaid consumers with cognitive impairment have a higher average daily cost and longer service period ($64.89 and 563 days) than their less impaired peers ($48.79 and 472 days), which results in a $13,504 difference that represents a 59% increase in average total cost of service. In the Private Insurance group, consumers receive care for relatively short periods, as seen with the Medicare group (170 days for Private Insurance, as compared to 179 days for Medicare). However, the differences between cognitively impaired consumers and their less impaired peers are more dramatic. The Private Insurance consumers with cognitive impairment have a higher average daily cost and longer service period ($77.83 and 341 days) than those with little-to-no cognitive impairment ($66.21 and 130 days), and this results in a $17,918 difference that represents a 208% increase in average total cost of service. This represents the largest total cost differential between cognitively impaired consumers and their peers within any of the four primary payor categories. Thus, the consumers with moderate-to-severe cognitive impairment receive services that cost between $5,000 and nearly $18,000 more than the services received by their less impaired peers. This represents between 42% and 208% higher service costs for consumers with moderate-to-severe cognitive impairment, on average, as compared to those with little-to-no cognitive impairment.

8.40 *Influence of Consumer Characteristics on Service Cost and Utilization*

Cognitive impairment status is significantly associated with all of the dependent variables in this study when no covariates are included. Once consumer predisposing, enabling and illness-level factors are introduced, more severe cognitive impairment continues to remain significantly associated with higher numbers of days of service, total service visits, and the number of non-medical service visits. For average daily charges, the number of medical service visits, and readmission status, the statistical significance of associations with cognitive impairment status diminishes to the point of non-significance in the presence of combined predisposing, enabling and illness-level covariates. When agency-level characteristics are introduced, cognitive impairment status remains statistically significant in association with the same dependent variables that were significantly associated in the presence of consumer-level covariates. This is also true in the context of the slopes-as-outcomes models, and in this context cognitive impairment status becomes significantly associated with a slightly reduced probability of readmission. So while the average daily cost of service does not seem to vary significantly based on consumer cognitive impairment status, some of the measures of service volume do vary on this basis even while controlling for a large number of consumer and agency characteristics. The particular direction of influence on these service volume measures suggests that people who have impaired cognition receive larger volumes of home health care, on average, which reinforces the finding of larger overall service costs for this group of consumers per service period as previously discussed in reference to the bivariate analyses of this study.

Among the predisposing factors assessed in this study, age was the most consistent positive influence on service cost and volume, meaning that advanced age is generally associated with higher service costs and volume. The significance and magnitude of influence of gender and ethnicity are too inconsistent across models and dependent variables to draw any broad conclusions. Marital status is most significant in association with the number of days of service, where having a spouse is consistently associated with far fewer days of service on average, and with the number of non-medical service visits, where having a spouse consistently predicts additional non-medical visits. The presence of an informal caregiver is found to be one of the more consistently influential enabling factors, with lower service volume among those who have an informal caregiver as compared to those who do not. This finding fits with expectations that formal services may serve to supplement the care being provided by family and friends when such informal care is available, and are provided with greater intensity when informal caregivers are not available.

The insurance program used to pay for services is a highly influential determinant of service costs and volume. In this study, the three insurance categories are compared with a self-paying group of consumers who purchase services without reimbursement. As compared to self-paying consumers, those using Medicare, Medicaid and Private Insurance all generally experience varying degrees of higher average daily charges and additional service visits. Yet the Medicaid group tends to receive services for many more days than the self-pay group, while both the Medicare and private insurance groups receive services for many less days than the self-pay group. It seems therefore that Medicare and private insurance programs are typically paying for costly, short-term home health care interventions, while Medicaid is paying for slightly less costly interventions provided over longer periods of time. This finding also fits with expectations based on the structured scope of each of these insurance programs.

The significant influences of illness-level factors generally fit with expectations. Consumers with greater illness-related needs experience greater volumes of service. An understandable exception to this broad statement is the finding that consumers with recent episodes of emergency medical care, such as hospitalizations, generally have far fewer days of home health care. This is likely due to the fact that home health care agencies discharge clients from their service in the event of a hospital admission. People who are sick enough to have had recent medical emergencies may be more likely to return to the hospital and to discontinue home care until they can be readmitted once they return home.

Research Aim 1 in this study specifies the examination of the association of cognitive impairment with home health care service volume and cost, and has informed study analyses used to investigate the influence of individual determinants of health services utilization as structured by the modified Andersen-Newman Model. All of the consumer characteristics included in the multivariate regressions of this study are found to have statistically significant associations with one or more of the dependent variables, particularly the illness-level factors which demonstrate significant influence on nearly all of the dependent variables. This finding is not surprising when considering the nature of the health service being examined. These significant relationships reinforce the appropriateness of such individual determinants in the theoretical frameworks that guide research in this area.

The notable exception to these findings is the lack of significant associations between consumer characteristics and average daily charges. Very few covariates are significantly associated with this outcome, including cognitive impairment status. The factor that most significantly influences the daily cost of care is the insurance program used to pay for service. These findings suggest that the regulatory and industry guidelines related to reimbursements for health services are far more influential in determining service costs than any particular attributes of home health care consumers or provider agencies. These forces represent healthcare system determinants that could not be specified in the modified Andersen-Newman Health Services

Utilization Model used in this study because of the particular aims of this research and the limitations of the NHHCS data.

8.50 *Influence of Agency Characteristics on Service Cost and Utilization*

Just as with the influences of consumer characteristics described above, the varied attributes of agencies have significant associations with indicators of service volume, and to a lesser extent, with indicators of service cost. The most consistently significant factor in this context is the number of admissions throughout the year prior to the NHHCS data collection (2006), and yet the magnitude of this influence is typically very small for any particular dependent variable. This finding may be related to a very large range of values in this particular variable, as well as a very large standard deviation from the mean, which increases the likelihood of finding statistically significant relationships with a dependent variable simply because of the diffuse variability of values in the predictor.

The number of direct care workers employed by the firm is another consistently significant agency characteristic, which may safely be assumed to relate to the number of clients needing care and is therefore another indicator of agency size. The number of services offered in diverse categories of care, such as counseling, health services and social services, is often significantly associated with consumer-level service volume. The magnitude and direction of these associations are inconsistent across dependent variables and statistical models, but their consistent significance likely relates to the capacity of agencies for accepting different types of consumers. Some agencies may not be capable of handling complex medical situations because they lack the qualified personnel required to provide services for those highly specialized medical needs. Thus, agencies that are sufficiently staffed with diverse licensed professionals to offer a multitude of care, health, social and counseling service can accept a broader array of referrals. This capacity would suggest a “case mix” that is rather distinct from the typical care needs represented on the client roster of a less capable agency, and these unique case mixes likely impact the overall profile of the volume of services provided to consumers.

The number of years agencies have been in business is consistently significant for every dependent variable. This agency-level factor can be considered a reasonable indicator of both acquired organizational experience and sustainable position in the local market. Indicators of employee work-life satisfaction, as supported by the literature reviewed previously in this report, include the average entry-level wage for home health aides, the number of instrumental incentives provided to direct care workers, and the retention rate among personal care aides and home health aides. While non-significant influences on the consumer average daily costs of service, each of these agency characteristics are generally found to have significant associations with one or more of the other dependent variables related to service volume, duration, and readmission.

Research Aim 2 in this study specifies the examination of the association of relevant agency characteristics with consumer-level home health care service volume and cost, and has informed study analyses used to investigate the influence of healthcare system determinants of health services utilization as structured by the modified Andersen-Newman Model. Significant associations are found between these consumer outcomes and many of the agency-level variables considered to be relevant indicators of business characteristics, staffing levels, and services profiles. These significant relationships reinforce the appropriateness of such healthcare system determinants in the theoretical frameworks that guide research in this area and support the inclusion of such determinants in the examination of provider agency size, capacity, and experience, as well as the work-life satisfaction of employees providing care in the home health care arena.

8.60 *Influence of Agency Characteristics on the Relationship between Consumer Cognitive Impairment and Service Cost and Utilization*

While several agency characteristics are described above as having significant associations with consumer service volume, this study also aims to determine if any of these agency characteristics have an effect on the *relationship* between consumer cognitive impairment status and service cost and utilization outcomes. Of the 13 agency characteristics examined in this study, all 13 are found to significantly influence the relationship between consumer cognitive impairment and one or more of the six home health care cost and utilization outcomes, and 11 of these agency characteristics significantly influence 3 or more outcomes. The importance of these results stems from the identification of particular agency characteristics that are significant in influencing the relationships between cognitive impairment and service outcomes related to cost and utilization.

The number of years agencies have been in business is the only agency characteristic with a significant influence on the relationship between cognitive impairment and average daily charges for service. As agencies remain in business for increasing numbers of years, exponentially lower daily costs of care are associated with increasingly severe cognitive impairment. Any number of reasons may be hypothesized to explain these relationships. In general, agencies may strive to suppress daily costs of care in order to boost revenues extracted from capitated reimbursements provided through prospective payment systems. In other words, if an agency is given a predetermined amount of money by an insurance program to cover the anticipated total service needs of a consumer, revenues can be increased by keeping daily costs low and hastening the date of discharge. Such hypotheses cannot be tested with the analyses performed for this study.

The number of social services offered by agencies is significantly influential for four of the six dependent variables. With a mean of 1.4 social services, most agencies provided either one or two social services. As greater numbers of social services are offered by agencies, exponentially fewer visits for all types of service are associated with increasingly severe cognitive impairment. Yet, the number of social services offered by agencies is not significantly influential on the relationship between cognitive impairment and the number of days of service received by consumers. Thus, the provision of additional social services by an agency is relevant to the intensity of home health care service delivery, but not to the duration of the service overall. Despite this lack of significant influence, the number of days of service is significantly influenced by several agency characteristics other than the number of social services, four of which demonstrate influences of the greatest magnitude in these cross-level analyses. Exponentially greater numbers of days of service are associated with increasingly severe cognitive impairment when agencies offer more care services and higher entry-level wages for direct care workers, and exponentially fewer days of service are associated with increasingly severe cognitive impairment when agencies offer more health services and greater numbers of incentives for direct care workers. As stated above, any number of reasons may be hypothesized to explain these complex relationships, but such hypotheses cannot be tested in this study. Again, the major contribution here is the identification of particular agency characteristics that are significant in influencing the relationships between cognitive impairment and service outcomes related to cost and utilization. Research Aim 3 of this study asks if the characteristics of home health care agencies moderate the relationship between consumer cognitive impairment status and indicators of service costs and utilization. This study is successful in identifying and describing the significant influences of selected agency characteristics in moderating those relationships.

9 Study Limitations

This study is not a randomized prospective study. Rather, it is a cross sectional study of existing survey data. It is well known that making causal inference in such studies is difficult. Although there are certain methods for attempting to make causal inference in such cases, this study does not aim to establish causality. In addition, the numerous variables and analyses of this study suggest a likelihood of finding significant relationships based on chance alone. However, the variables included in this study are theoretically relevant, and, while some type-1 errors may be expected, this study offers findings that can be used to guide theory testing in future studies. The underdeveloped state of knowledge in the areas addressed by this study supports the preliminary investigation of meaningful relationships between selected variables, and this study specifically tests the significance of associations among factors initially considered to be most relevant.

The use of data from a single survey year does not allow for the investigation of changes in outcomes as characteristics of home health care agencies change over time. However, such a study is not possible with the National Home and Hospice Care Survey data. Despite multiple survey periods spanning two decades, each data collection effort utilized a distinctly random sample of eligible agencies. Alternative sources of data would be required to examine changes in outcomes over time within discrete agencies. In addition, this study would ideally allow for the examination of whether or not the appropriate amount of care is delivered by using some measures of changes in consumer health or quality of life outcomes over time. The NHHCS questionnaires do not elicit data related to the impact of care services, and so this study must simply pave the road for future research efforts that can examine such outcomes in comparison to services delivered.

Agencies in the personal care sector are excluded from the sampling frame in the National Home and Hospice Care Survey. However, home health care agencies can provide both levels of care (skilled health care as well as personal care) and can accept payment from clients, private insurance, and public insurance programs. Thus, consumers in the NHHCS sample likely differ from an equally large sample of clients of agencies providing personal care only. Differences may include illness levels, functional abilities, insurance coverage, and more. Thus, a limitation of this study is the lack of generalizability of findings to community-based health care settings other than home health care.

The National Home and Hospice Care Survey uses a 5-point cognitive impairment scale score equivalent to the standardized OASIS measure found in nearly all case records. Since the construct of dementia cannot be operationally defined in a research context without high quality diagnostic information, and such information is not available in the NHHCS dataset, this OASIS scale is used as a proxy measure for cognitive impairment and is significantly correlated with a “gold standard” measure of cognitive impairment, the Short Portable Mental Status Questionnaire (r = .62, significant at p = .01) (Tullai-McGuinness, Madigan & Fortinsky, 2009). However, this proxy measure should not be considered an indicator of dementia status, and it does not allow for distinctions to be made between acute conditions like delirium and long-term conditions like coma. In addition, a proportion of consumers considered moderately-to-severely cognitively impaired are not elderly and are therefore likely suffering from some form of pervasive developmental disorder as opposed to an acquired neurodegenerative disease.

Several findings in this study are likely impacted by macro-level health care system forces, such as industry regulations, fiscal structures, and market competition and profit motivation. It is important to examine these forces in order to better understand and contextualize the findings presented in this report. However, this study does not include an explanatory model that addresses these forces, and the NHHCS dataset does not contain appropriate data to explore certain healthcare system determinants that might structure insurance reimbursement rates and service eligibility guidelines.

10 Conclusion-

10.10 *Significance of the Study*

The research presented in this report is structured around three specific aims: 1) To examine the association of cognitive impairment with home health care service volume and cost;

2) To examine the association of home health care agency characteristics with consumer service volume and cost; and 3) To examine the influence of home health care agency characteristics on the association of consumers' cognitive impairment status with service volume and cost. These aims have been met, and the findings reported above are useful in answering the research questions related to each aim as well as in providing information that should be used to shape future studies. In addition, the research described here has been shaped by a theoretical framework that was adapted to fit the particular topics of study, and the findings of the study serve to reinforce the components selected for this modified health services utilization framework and suggest additional components to be included in subsequent adaptations of the model.

Home health care consumers with moderate-to-severe cognitive impairment are less likely to have a spouse than their less impaired peers and more likely to be enrolled in health insurance programs for people living in poverty. They are less likely to have a spousal caregiver, and their informal caregivers are more likely to be other family members. As compared to consumers with little-to-no cognitive impairment, those with moderate-to-severe cognitive impairment typically have more needs for care, more co-occurring illnesses, greater medical needs, and disabilities that are more severe and long-lasting. The findings that home health care consumers with cognitive impairment generally have more needs for assistance and receive more assistance than other consumers suggest that unique packages of care may be warranted, with potential impacts on the number of service visits, the costs of care, and the profiles of particular services provided.

With regard to the service cost and utilization measures examined in this study, the research presented here demonstrates that home health care consumers with moderate-to-severe cognitive impairment receive services for many more days, including more medical and non-medical service visits, and are more likely to be readmitted to home health care as compared to their less impaired peers. Excess costs of service associated with significantly higher durations and intensities of service are more likely to be expended on multiple occasions because of readmission. Powerful findings from these analyses suggest that consumers with moderate-to-severe cognitive impairment may require services which cost between 42% and 208% more than the services provided to those consumers who have little-to-no cognitive impairment, on average. In 2007 there were an estimated 1,460,000 people receiving home health care service *each day* (Caffrey et al.., 2011). With 32% of these consumers living with moderate-to-severe cognitive impairment, the excess costs described above warrant serious attention from health care practitioners and policymakers. As the number of older adults with neurocognitive disease double by the year 2030 and then double again by 2050 (Prince et al.., 2013), it is critical to identify models of home health care service delivery that both effectively respond to the unique needs of these impaired consumers and control, or even reduce, the excess costs associated with their care.

Toward these ends, the research described in this report identifies a large number of compelling factors that significantly influence the relationship between cognitive impairment and service volume and cost. The most influential factor in determining service costs, by far, is the insurance program used to pay for services. The regulatory and industry guidelines that structure reimbursements for health services must be further examined. However, several characteristics of provider agencies are found to significantly influence the relationship between consumer cognitive status and service volume. These include: the number of annual admissions; the size of the array of referral sources; the number of years in business; the provision of care, counseling, health, and social services; the number of full-time employees providing care services and health services; entry-level wages for home health aides; instrumental incentives offered to direct care workers; and retention rates for home health aides and personal care aides. These 13 agency characteristics are indicators of agency size, experience, and capacity, and of employee work-life satisfaction, and are all shown to be significant. Since service volume is an important component of determining total service cost, these agency attributes are of great importance to future research and policy efforts. The major contribution of this study is the identification of these highly relevant factors of influence, as well as several other factors that were not included in these analyses, which can be examined in future studies to build understanding of the most important areas of potential intervention to assure effective and efficient care for people living with cognitive impairment.

10.20 *Recommendations*

Based on the research described in this report, recommendations for future research, practice, and policy efforts can be proposed. It is important that future research examine additional characteristics of agencies which may be influential forces in determining service utilization and costs, including macro-level healthcare system determinants that could not be specified in the modified Andersen-Newman Health Services Utilization Model used in this study because of the particular aims of this research and limitations of available data. Such analyses will likely yield important information that enhances understanding of the industry and organizational forces that impact services for consumers with cognitive impairment and allows for the further development of a theoretical framework of home health care services utilization.

Relationships among similar constructs should be assessed using software that allows for the use of sample weights with more appropriate models of regression that are capable of accounting for the non-linear distributions of the service cost and volume outcomes examined in this study. In addition, it is important to subsequently examine causality among the constructs and relationships described in this study so that policymakers can better gauge the potential impact of regulations that govern these industries and insurance programs.

Further research with similar data and cognitive impairment measures could also attempt to explore age and diagnosis differences within the cognitively impaired population in order to better identify cases that are more likely representative of older adults living with disorders of dementia. In addition, more detailed home health care billing and service data can be used to unpack the complex relationships among insurance programs, consumer cognitive impairment status, and service cost and volume. Most importantly, researchers studying home health care for consumers with cognitive impairment should endeavor to incorporate measures of service quality and health and mental health outcomes in order to assess the effectiveness of services in general and in response to the implementation of innovative models of practice.

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Appendix A- Table 1

Individual Determinants of Home Health Care Service Utilization

Categories	Constructs	Operational Definitions	Variable Type
Predisposing Factors	Age	Age of patient at time of survey	Ratio
	Gender	Gender of patient	Nominal
	Marital Status	Current marital status of patient	Nominal
	Race/Ethnicity	Race/ethnicity of patient	Nominal
Enabling Factors	Habitation Status	Who patient currently lives with	Nominal
	Informal Caregiver Relation	Relationship of informal caregiver to patient	Nominal
	Service Primary Payment Source	Primary source of payment for services	Nominal
Illness-Level Factors	Cognitive Status	Degree of assistance needed due to cognitive impairment	Nominal
	Incontinence Status	Bladder and/or bowel incontinence	Nominal
	Medication Problems	Patient needs help taking medications	Nominal
	Need for ADL Assistance	Number of ADLs patient needs help with	Ratio
	Need for Emergency Care	Patient used emergency care	Nominal
	Number of diagnoses	Total number of diagnoses	Ratio
	Use of Assistive Devices	Use of one or more assistive devices	Nominal
	Use of Medical Devices	Use of one or more medical devices	Nominal

Appendix A- Table 2

Home Health Care Agency Characteristics

Categories	**Constructs**	**Operational Definitions**	**Variable Type**
Business Characteristics	Annual Admissions	Number of home health admissions in 2006	Ratio
	Referral Source Array	Number of referral source categories (e.g., hospitals, agencies)	Ratio
	Years in Business	Number of years in business	Ratio
Services Profile	Care Services Offered	Number of care services offered	Ratio
	Counseling Services Offered	Number of counseling services offered	Ratio
	Health Services Offered	Number of health/medical services offered	Ratio
	Social Services Offered	Number of social services offered	Ratio
Staffing	Care and Health Employees	Number of FTEs for care and health services	Ratio
	Entry-Level Wages	Entry wage for certified and non-certified aides	Ratio
	Instrumental Incentives	Total number of incentives other than wages	Ratio
	Retention Rate	Percentage of aides employed more than one year	Ratio

Appendix A- Table 3

Home Health Care Services Utilization Measures

Categories	**Constructs**	**Operational Definitions**	**Variable Type**
Service Cost	Average Daily Charges	Total amount billed in last complete billing cycle divided by number of days that charges cover	Ratio
Service Utilization	Total Service Volume	Total number of visits for all services	Ratio
	Medical Service Volume	Number of visits for medical services	Ratio
	Non-Medical Service Volume	Number of visits for non-medical services	Ratio
	Days of Service	Number of days receiving care in the current service period	Ratio
	Readmission Status	Current enrollment as a consumer of service from agency is or is not a readmission	Nominal

Appendix B- Table 1

Assessment of Missing Data

Including consumer- and agency-level variables used in regression analyses

Number of variables with any cases missing data	Number of cases	Percentage of cases missing data	Cumulative percentage of cases missing data
0	1747	51.37	51.37
1	975	28.67	80.04
2	431	12.67	92.71
3	146	4.29	97.00
4	52	1.53	98.53
5	27	0.79	99.32
6	0	0.00	n/a
7	8	0.24	99.74
8	0	0.00	n/a
9	5	0.15	100.00
Total	3391	100.00	

Appendix B- Table 2

Significance Tests of Missingness on Select Variables

	Select Consumer Characteristics														
	Age t			Female p			Lives Alone p			Demented p			Total ADL Needs p		
Consumer-level Missingness Variable	Missing Data	Valid Data	P-value	Missing	Valid	P	Missing	Valid	P	Missing	Valid	P	Missing	Valid	P
Partner	70.9	68.2	0.061*	0.7	0.6	0.014**	0.5	0.3	0.001***	0.3	0.3	0.602	2.6	2.7	0.226
Race-White	62.5	68.7	0.006***	0.6	0.6	0.483	0.3	0.3	0.117	0.2	0.3	0.045**	2.6	2.7	0.516
Has a Primary Caregiver	71.7	68.4	0.482	0.8	0.6	0.078*	0.3	0.3	0.877	0.3	0.3	0.858	2.0	2.7	0.029**
Primary Payor is Medicare	66.9	68.5	0.309	0.6	0.6	0.078*	0.3	0.3	0.333	0.3	0.3	0.798	2.7	2.7	0.520
Demented	51.8	68.8	0.001***	0.6	0.6	0.919	0.1	0.3	0.012**		-		2.5	2.7	0.596
Bladder	64.8	68.9	0.002***	0.5	0.7	0.001***	0.1	0.3	0.001***	0.3	0.3	0.917	3.2	2.6	0.001***
Primary Diagnosis Category	58.9	68.7	0.002***	0.6	0.6	0.680	0.3	0.3	0.484	0.2	0.3	0.274	2.8	2.7	0.528
Average Daily Charges	68.2	68.5	0.744	0.6	0.6	0.017**	0.3	0.3	0.015**	0.3	0.3	0.241	2.7	2.7	0.362
Length of Service	36.8	68.5	0.028**	0.5	0.6	0.931	0.0	0.3	0.240	0.3	0.3	0.493	3.0	2.7	0.868
Readmission	69.1	68.4	0.814	0.6	0.6	0.143	0.3	0.3	0.816	0.3	0.3	0.742	2.5	2.7	0.362

	Age t			Female p			Lives Alone p			Demented p			Total ADL Needs p		
Agency-level Missingness Variable	Missing Data	Valid Data	P-value	Missing	Valid	P	Missing	Valid	P	Missing	Valid	P	Missing	Valid	P
Annual Admissions	66.3	68.6	0.227	0.6	0.6	0.324	0.3	0.3	0.608	0.3	0.3	0.222	3.0	2.7	0.010**
Years in Business	68.7	68.4	0.888	0.6	0.6	0.143	0.3	0.3	0.778	0.2	0.3	0.127	2.4	2.7	0.024**
Entry-Level Wages	67.2	68.6	0.656	0.6	0.6	0.484	0.3	0.3	0.070*	0.3	0.3	0.436	2.7	2.7	0.982
Retention Rate (1+ years)	63.6	68.9	0.002***	0.6	0.6	0.219	0.3	0.3	0.375	0.3	0.3	0.074*	2.8	2.7	0.181

Note: Missingness variables are Dummy Variables where valid data=1 and missing data=0. Dashes indicate the coefficient was not estimated.

n=3603

* significance at 10% level (0.1), ** significance at 5% level (0.05), *** significance at 1% level (0.01)

p = Test of Proportions outputs: p-value for Ha: diff != 0, with P > lzl)

t = T-test outputs: p-value for Ha: diff != 0, with Pr (ITI > ltl)

Appendix B- Table 3

Logistic Regression of Relevant Independent Variables on Select Binary "Missingness" Variables

Data Level	Dummy Missingness Variable	Constant: P > lzl
Consumer	Has spouse/partner	0.000
Consumer	White ethnicity	0.028
Consumer	Lives alone	0.002
Consumer	Has a primary caregiver	0.015
Consumer	Medicare is primary payor	0.274
Consumer	Has dementia	0.052
Consumer	Incontinent of bladder	0.000
Consumer	Readmission	0.000
Consumer	Primary Diagnosis	0.000
Consumer	avedlych	0.000
Agency	hhadm	0.000
Agency	hhagyyrs	0.001
Agency	avgwage	0.000

n=3603

Appendix B- Table 4

Select Variables Mean Values across Imputed Datasets

	Select Consumer Variables				Select Agency Variables		
	Mean: Days of Service	Mean: Avg. Daily Charge	Mean: # of Activities of Daily Living for which help is needed	Mean: Number of Medical Service Visits	Mean: Years that Agency has Been in Business	Mean: Annual Admissions	Mean: Entry-Level Wages
Original Data (*M* =0)	267.12	64.41	2.77	13.91	19.60	1060.34	10.64
Imputation # 1	267.30	68.71	2.78	13.91	19.59	1046.70	10.61
Imputation # 2	267.30	70.99	2.78	13.91	19.60	1046.77	10.59
Imputation # 3	267.31	69.30	2.78	13.91	19.60	1046.95	10.58
Imputation # 4	267.27	70.59	2.77	13.91	19.64	1046.71	10.60
Imputation # 5	267.31	69.22	2.78	13.91	19.62	1047.32	10.60
Imputation # 6	267.28	69.27	2.78	13.91	19.60	1047.16	10.60
Imputation # 7	267.25	68.97	2.78	13.91	19.65	1046.68	10.64
Imputation # 8	267.32	68.89	2.80	13.91	19.62	1047.22	10.60
Imputation # 9	267.30	70.54	2.78	13.91	19.60	1046.88	10.59
Imputation # 10	267.27	70.26	2.78	13.91	19.62	1047.23	10.59
Pooled: *M* = 1-10	267.29	69.67	2.78	13.91	19.61	1046.96	10.60

n for select consumer and agency variables in original dataset ranges from 2975 to 3309

n for select consumer and agency variables in each imputed dataset is 3309

Appendix B- Table 5

Imputation Variance Analysis

Data Level	Variable	Mean	Within-Imputation Variances	Between-Imputation Variances	Total Variances	Relative Increases in Variance Due to Nonresponse	Relative Efficiencies for using finite *M* rather than a hypothetically infinite # of imputations
Consumer	Days of Service	267.29	337.671	0.001	337.671	0.000	1.000
Consumer	Average Daily Charges	69.67	15.614	0.690	16.373	0.049	0.995
Consumer	Number of Activities of Daily Living for which help is needed	2.78	0.005	0.000	0.006	0.012	0.999
Consumer	Number of Medical Service Visits	13.91	1.213	0.000	1.213	0.000	1.000
Agency	Years in Business	19.61	1.339	0.000	1.340	0.000	1.000
Agency	Annual Admissions	1046.96	6226.700	0.062	6226.770	0.000	1.000
Agency	Entry-Level Wages	10.60	0.032	0.000	0.033	0.007	0.999

n=3309

Appendix C- Table 1

Imputed Data: Consumer Characteristics- Predisposing Factors

	All Consumers (n=3309)	Consumers without Cognitive Impairment (n=2248)	Consumers with Cognitive Impairment (n=1061)
	Mean	*Mean*	*Mean*
Age	68.28	69.78	65.12
	Percentage	*Percentage*	*Percentage*
Gender			
Female	65	64	67
Male	35	36	33
Marital Status			
Married	32	36	23*
Widowed	35	34	39
Divorced	9	10	7
Separated	1	2	1
Never married	21	17	30*
Living with a partner	1	2	0
Race/Ethnicity			
Caucasian	73	74	72
African American	16	16	18
Latino/Hispanic	8	8	9
Other	2	2	1

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 2

Original Data: Consumer Characteristics- Predisposing Factors

	All Consumers (n=3255)		Consumers without Cognitive Impairment (n=2333)		Consumers with Cognitive Impairment (n=922)	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Age	68.28	22	69.84	19	65.41	25
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Gender						
Female	2130	65	1504	64	591	67
Male	1179	35	829	36	331	33
Marital Status						
Married	1067	35	814	40	242	**25***
Widowed	1056	34	725	32	323	38
Divorced	264	8	209	9	51	6
Separated	29	1	23	2	4	**0***
Never married	557	21	317	16	219	**30***
Living with a partner	36	1	33	1	3	0
Race/Ethnicity						
Caucasian	2519	73	1800	74	681	71
African American	397	17	260	16	131	18
Latino/Hispanic	216	9	139	9	76	9
Other	64	2	49	2	14	1

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 3

Imputed Data: Consumer Characteristics- Predisposing Factors by Primary Payor

	Primary Payor is Medicare			Primary Payor is Medicaid			Primary Payor is Private Insurance			Primary Payor is Self Pay		
	All Medicare Consumers (n=2068)	Medicare Consumers without Cognitive Impairment (n=1450)	Medicare Consumers with Cognitive Impairment (n=617)	All Medicaid Consumers (n=847)	Medicaid Consumers without Cognitive Impairment (n=488)	Medicaid Consumers with Cognitive Impairment (n=360)	All Private Insurance Consumers (n=337)	Private Insurance Consumers without Cognitive Impairment (n=272)	Private Insurance Consumers with Cognitive Impairment (n=64)	All Self Pay Consumers (n=58)	Self Pay Consumers without Cognitive Impairment (n=39)	Self Pay Consumers with Cognitive Impairment (n=19)
	Mean	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*
Age	76.38	75.79	77.78	52.71	57.85	**45.72***	56.07	58.36	46.32	77.91	75.39	83.15
	Percentage	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*
Gender												
Female	66	64	71	64	65	63	59	62	44	67	66	69
Male	34	36	29	36	35	37	41	38	56	33	34	31
Marital Status												
Married	37	40	30	12	16	7	49	52	37	24	30	11
Widowed	40	37	50	29	33	24	18	18	18	57	47	78
Divorced	9	10	7	10	11	8	7	8	1	4	6	1
Separated	1	2	0	2	3	1	1	1	0	1	2	0
Never married	11	10	12	45	33	60	25	20	43	11	11	10
Living with a partner	1	1	1	3	4	0	1	1	0	2	3	0
Race/Ethnicity												
Caucasian	73	74	71	72	72	71	79	80	73	97	97	98
African American	17	16	20	17	18	16	15	13	22	1	0	2
Latino/Hispanic	9	9	9	9	9	10	4	4	5	1	2	0
Other	1	2	0	2	2	3	2	3	1	1	1	0

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 4

Consumer Characteristics- Predisposing Factors by Primary Payor

	Primary Payor is Medicare						Original Data: Primary Payor is Medicaid					
	All Medicare Consumers (n=1907)		Medicare Consumers without Cognitive Impairment (n=1372)		Medicare Consumers with Cognitive Impairment (n=535)		All Medicaid Consumers (n=850)		Medicaid Consumers without Cognitive Impairment (n=573)		Medicaid Consumers with Cognitive Impairment (n=277)	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Age	76.61	13.07	75.89	12.99	78.27	13.21	52.63	27.55	58.17	24.63	**46.07***	27.53
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Gender												
Female	1276	66	896	64	364	71	561	64	385	65	164	64
Male	648	34	476	36	171	29	313	36	188	35	113	36
Marital Status												
Married	723	39	536	42	182	**33***	130	14	102	18	26	**8***
Widowed	726	41	486	37	233	**49***	213	27	159	31	54	24
Divorced	150	9	120	9	29	6	89	8	68	10	19	7
Separated	13	1	10	1	3	0*	12	2	9	3	1	1
Never married	143	10	101	10	40	11	322	46	155	33	151	**61***
Living with a partner	12	0	10	0	2	1	20	3	19	5	1	0
Race/Ethnicity												
Caucasian	1473	71	1058	72	402	69	642	72	434	71	190	71
African American	222	18	150	16	70	21	126	17	79	18	45	15
Latino/Hispanic	139	10	87	10	52	10	62	9	39	9	23	10
Other	32	1	28	2	3	0*	22	2	11	2	11	3

	Primary Payor is Private Insurance						Primary Payor is Self Pay					
	All Private Insurance Consumers (n=291)		Private Insurance Consumers without Cognitive Impairment (n=241)		Private Insurance Consumers with Cognitive Impairment (n=50)		All Self Pay Consumers (n=102)		Self Pay Consumers without Cognitive Impairment (n=70)		Self Pay Consumers with Cognitive Impairment (n=32)	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Age	56.07	21.10	58.63	17.78	45.92	27.05	78.03	22.98	74.77	24.87	**84.45***	15.74
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Gender												
Female	163	60	131	64	27	44	68	69	48	69	19	71
Male	135	40	110	36	23	56	37	31	22	31	13	29
Marital Status												
Married	142	53	122	57	18	40	26	24	16	34	9	9
Widowed	31	13	24	13	7	16	59	61	39	48	19	**83***
Divorced	15	6	13	7	2	1	5	3	4	2	0	0
Separated	3	0	3	0	0	0	0	0	0	0	0	0
Never married	70	27	47	22	21	43	9	11	6	13	3	8
Living with a partner	3	0	3	0	0	0	1	2	1	3	0	0
Race/Ethnicity												
Caucasian	228	79	186	80	31	73	101	98	67	98	31	100
African American	29	15	22	14	1	23	1	1	0	0	1	1
Latino/Hispanic	10	4	8	4	0	4	1	0	1	2	0	0
Other	9	2	9	3	0	0*	0	0	0	0	0	0

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

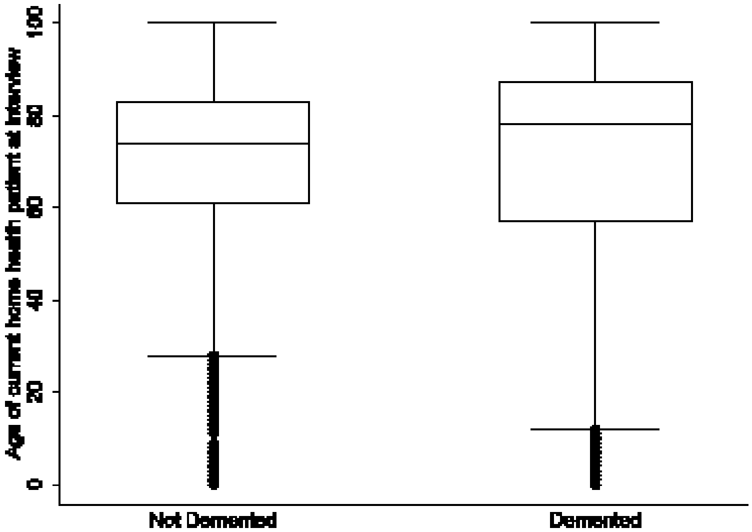
Appendix C- Table 5

Age Distribution for Home Health Care Consumers

Age	Frequency	Percent	Cumulative Percent
0	22	0.66	0.66
1	16	0.48	1.15
2	11	0.33	1.48
3	7	0.21	1.69
4	6	0.18	1.87
5	10	0.30	2.18
6	7	0.21	2.39
7	12	0.36	2.75
9	8	0.24	3.11
10	6	0.18	3.29
11	10	0.30	3.60
12	7	0.21	3.81
13	11	0.33	4.14
14	5	0.15	4.29
15	11	0.33	4.62
16	9	0.27	4.90
17	7	0.21	5.11
18	11	0.33	5.44
19	8	0.24	5.68
20	10	0.30	5.98
21	7	0.21	6.20
22	6	0.18	6.38
23	6	0.18	6.56
24	8	0.24	6.80
25	9	0.27	7.07
26	6	0.18	7.25
28	8	0.24	7.62
29	12	0.36	7.98
30	9	0.27	8.25
31	8	0.24	8.49
32	8	0.24	8.73
33	8	0.24	8.98
35	11	0.33	9.43
36	6	0.18	9.61
37	19	0.57	10.18
39	7	0.21	10.49
40	7	0.21	10.70
41	18	0.54	11.24
42	10	0.30	11.54
43	22	0.66	12.21
44	15	0.45	12.66
45	10	0.30	12.96
46	20	0.60	13.57
47	16	0.48	14.05
48	20	0.60	14.66
49	16	0.48	15.14
50	27	0.82	15.96
51	27	0.82	16.77
52	23	0.70	17.47
53	29	0.88	18.34
54	26	0.79	19.13
55	32	0.97	20.10
56	44	1.33	21.43
57	25	0.76	22.18
58	33	1.00	23.18
59	40	1.21	24.39
60	38	1.15	25.54
61	32	0.97	26.50
62	36	1.09	27.59
63	38	1.15	28.74
64	42	1.27	30.01
65	59	1.78	31.79
66	45	1.36	33.15
67	62	1.87	35.03
68	65	1.96	36.99
69	47	1.42	38.41
70	69	2.09	40.50
71	62	1.87	42.37
72	75	2.27	44.64
73	65	1.96	46.60
74	60	1.81	48.41
75	72	2.18	50.59
76	72	2.18	52.77
77	91	2.75	55.52
78	102	3.08	58.60
79	113	3.41	62.01
80	100	3.02	65.03
81	84	2.54	67.57
82	89	2.69	70.26
83	95	2.87	73.13
84	96	2.90	76.04
85	104	3.14	79.18
86	85	2.57	81.75
87	92	2.78	84.53
88	83	2.51	87.04
89	75	2.27	89.30
90	73	2.21	91.51
91	57	1.72	93.23
92	51	1.54	94.77
93	42	1.27	96.04
94	39	1.18	97.22
95	27	0.82	98.04
96	17	0.51	98.55
97	15	0.45	99.00
98	8	0.24	99.24
99	10	0.30	99.55
100	15	0.45	100
Total	3,309	100	

Appendix C- Table 6

Box Plot of Age Distribution by Cognitive Impairment Status



Appendix C, Table 7

Imputed Data: Consumer Characteristics- Enabling Factors

	All Consumers (n=3309)	Consumers without Cognitive Impairment (n=2248)	Consumers with Cognitive Impairment (n=1061)
	Percentage	*Percentage*	*Percentage*
Habitation Status			
Alone	31	32	27
With family members	62	61	63
With non-family members	8	6	10
Has a caregiver	82	82	83
Informal Caregiver Status			
Spouse/Significant Other	27	32	**17***
Child	23	19	**30***
Other family member	50	49	53
Service Primary Payment Source			
Medicare	63	64	58
Medicaid	26	22	**34***
Private insurance	10	12	**6***
Self-pay	2	2	2
Any Secondary Payment Source	10	10	9
Secondary Payment Source			
Medicare	17	17	19
Medicaid	43	39	52
Private insurance	27	29	22
Self-pay	14	16	8

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 8

Original Data: Consumer Characteristics- Enabling Factors

	All Consumers (n=3255)		**Consumers without Cognitive Impairment (n=2333)**		**Consumers with Cognitive Impairment (n=922)**	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Habitation Status						
Alone	1037	31	800	33	229	27
With family members	2041	62	1399	61	604	63
With non-family members	207	7	124	6	79	10
Has a caregiver	2682	82	1847	82	794	83
Informal Caregiver Status						
Spouse/Significant Other	848	30	664	36	178	**19***
Child	592	22	332	18	241	**30***
Other family member	1230	48	843	46	371	52
Service Primary Payment Source						
Medicare	1924	62	1372	64	535	58
Medicaid	874	26	573	22	277	**34***
Private insurance	298	10	241	12	50	**6***
Self-pay	105	2	70	2	32	2
Any Secondary Payment Source	378	10	280	10	93	9
Secondary Payment Source						
Medicare	93	17	72	17	42	52
Medicaid	141	43	97	39	21	19
Private insurance	94	27	74	29	20	22
Self-pay	50	14	37	16	10	7

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 9

Imputed Data: Consumer Characteristics- Enabling Factors by Primary Payor	Primary Payor is Medicare			Primary Payor is Medicaid			Primary Payor is Private Insurance			Primary Payor is Self Pay		
	All Medicare Consumers (n=2068)	Medicare Consumers without Cognitive Impairment (n=1450)	Medicare Consumers with Cognitive Impairment (n=617)	All Medicaid Consumers (n=847)	Medicaid Consumers without Cognitive Impairment (n=488)	Medicaid Consumers with Cognitive Impairment (n=360)	All Private Insurance Consumers (n=337)	Private Insurance Consumers without Cognitive Impairment (n=272)	Private Insurance Consumers with Cognitive Impairment (n=64)	All Self Pay Consumers (n=58)	Self Pay Consumers without Cognitive Impairment (n=39)	Self Pay Consumers with Cognitive Impairment (n=19)
	Percentage	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*
Habitation Status												
Alone	31	32	27	35	41	28	18	19	14	41	34	57
With family members	61	61	62	57	53	62	78	77	86	52	61	32
With non family members	8	7	11	8	6	11	4	4	0	7	4	12
Has a caregiver	85	84	86	77	76	79	81	80	82	66	69	59
Informal Caregiver Status												
Spouse/Significant Other	30	34	**21***	12	16	**7***	48	51	35	24	29	13
Child	14	13	16	45	38	**54***	22	18	41	17	17	19
Other family member	56	53	**64***	43	46	39	29	31	23	59	55	68
Any Secondary Payment Source	9	-	-	9	-	-	21	-	-	4	-	-
Secondary Payment Source												
Medicare	58	-	-	6	-	-	45	-	-	0	-	-
Medicaid	1	-	-	58	-	-	13	-	-	72	-	-
Private insurance	38	-	-	21	-	-	4	-	-	5	-	-
Self-pay	3	-	-	15	-	-	38	-	-	23	-	-

Note: All values represent weighted estimates within consumer categories (table columns). Dashes indicate the coefficient was not estimated.

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 10

Original Data: Consumer Characteristics- Enabling Factors by Primary Payor

	Primary Payor is Medicare						Original Data: Primary Payor is Medicaid					
	All Medicare Consumers (n=1907)		Medicare Consumers without Cognitive Impairment (n=1372)		Medicare Consumers with Cognitive Impairment (n=535)		All Medicaid Consumers (n=850)		Medicaid Consumers without Cognitive Impairment (n=573)		Medicaid Consumers with Cognitive Impairment (n=277)	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Habitation Status												
Alone	593	31	450	32	139	28	307	35	242	41	62	**27***
With family members	1189	61	837	61	341	64	504	57	297	53	188	62
With non family members	129	7	81	7	47	8	59	8	31	6	26	10
Has a caregiver	1641	85	1155	84	472	86	646	78	392	76	233	81
Informal Caregiver Status												
Spouse/Significant Other	547	32	416	36	128	**22***	114	14	90	19	23	**9***
Child	217	14	142	13	73	17	288	44	132	35	141	53
Other family member	871	54	592	51	270	**61***	240	42	168	46	67	38
Any Secondary Payment Source	212	9	-		-		95	9	-		-	
Secondary Payment Source												
Medicare	120	58	-		-		1	6	-		-	
Medicaid	1	1	-		-		71	58	-		-	
Private insurance	75	38	-		-		13	21	-		-	
Self-pay	16	3	-		-		10	15	-		-	

	Primary Payor is Private Insurance						Primary Payor is Self Pay					
	All Private Insurance Consumers (n=291)		Private Insurance Consumers without Cognitive Impairment (n=241)		Private Insurance Consumers with Cognitive Impairment (n=50)		All Self Pay Consumers (n=102)		Self Pay Consumers without Cognitive Impairment (n=70)		Self Pay Consumers with Cognitive Impairment (n=32)	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Habitation Status												
Alone	54	18	49	19	5	14	53	42	39	35	14	61
With family members	229	78	182	76	44	86	46	51	27	60	16	**29***
With non family members	8	4	7	5	0	0	6	7	4	5	2	10
Has a caregiver	235	80	188	79	44	82	73	67	46	71	25	59
Informal Caregiver Status												
Spouse/Significant Other	126	51	110	55	16	36	24	29	15	35	8	15
Child	60	23	39	18	19	38	11	15	7	13	4	24
Other family member	48	26	38	26	9	25	38	56	24	52	13	61
Any Secondary Payment Source	61	22	-		-		10	5	-		-	
Secondary Payment Source												
Medicare	20	45	-		-		0	0	-		-	
Medicaid	13	13	-		-		8	72	-		-	
Private insurance	5	4	-		-		1	5	-		-	
Self-pay	23	38	-		-		1	23	-		-	

Note: All values represent weighted estimates within consumer categories (table columns). Dashes indicate the coefficient was not estimated.

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 11

Imputed Data: Consumer Characteristics- Illness Level Factors

	All Consumers (n=3309)	**Consumers without Cognitive Impairment (n=2248)**	**Consumers with Cognitive Impairment (n=1061)**
	Mean	*Mean*	*Mean*
Number of ADLs requiring assistance	2.78	2.61	**3.14***
Number of ADLs for which staff provides assistance	1.50	1.33	**1.84***
Number of diagnoses	4.24	4.09	**4.54***
	Percentage	*Percentage*	*Percentage*
Difficult Behaviors	8	5	**14***
Use of Assistive Devices	58	55	**64***
Use of Medical Devices	45	43	**51***
Incontinence Status			
Bladder incontinence	48	39	**67***
Bowels incontinence	20	12	**37***
Needs Help Taking Medications	38	30	**53***
Used Any Emergency Care	14	12	**18***
Inpatient Care Prior to Home Health Care	51	55	**42***
Place Staying Prior to Home Health Care			
Hospital	76	75	79
Nursing Facility	11	11	10
Rehabilitation Center	11	12	8
Assisted Living Facility	2	2	3
Other	0	0	0
Any Surgical, Diagnostic or Therapeutic Procedures Related to Admission to Home Health Care	23	27	**16***

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 12

Original Data: Consumer Characteristics- Illness Level Factors

	All Consumers (n=3255)		Consumers without Cognitive Impairment (n=2333)		Consumers with Cognitive Impairment (n=922)	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Number of ADLs requiring assistance	2.77	1.61	2.61	1.66	**3.13***	1.46
Number of ADLs for which staff provides assistance	1.50	1.72	1.33	1.64	**1.83***	1.80
Number of diagnoses	4.24	2.11	4.09	2.06	**4.54***	2.11
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Difficult Behaviors	192	8	71	5	120	**15***
Use of Assistive Devices	1993	58	1320	54	640	**64***
Use of Medical Devices	1499	45	1017	42	453	50
Incontinence Status						
Bladder incontinence	1426	47	833	37	567	**66***
Bowels incontinence	661	20	283	11	345	**36***
Needs Help Taking Medications	1126	38	684	31	439	**53***
Used Any Emergency Care	423	14	276	12	144	**18***
Inpatient Care Prior to Home Health Care	1629	51	1233	55	377	**42***
Place Staying Prior to Home Health Care						
Hospital	1220	76	932	75	273	79
Nursing Facility	237	11	173	11	60	10
Rehabilitation Center	130	11	103	12	27	8
Assisted Living Facility	29	2	16	2	13	3
Other	10	0	6	0	4	0
Any Surgical, Diagnostic or Therapeutic Procedures Related to Admission to Home Health Care	835	23	652	27	165	**16***

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 13

Imputed Data: Consumer Characteristics- Illness Level Factors by Primary Payor

	Primary Payor is Medicare			Primary Payor is Medicaid			Primary Payor is Private Insurance			Primary Payor is Self Pay		
	All Medicare Consumers (n=2068)	Medicare Consumers without Cognitive Impairment (n=1450)	Medicare Consumers with Cognitive Impairment (n=617)	All Medicaid Consumers (n=847)	Medicaid Consumers without Cognitive Impairment (n=488)	Medicaid Consumers with Cognitive Impairment (n=360)	All Private Insurance Consumers (n=337)	Private Insurance Consumers without Cognitive Impairment (n=272)	Private Insurance Consumers with Cognitive Impairment (n=64)	All Self Pay Consumers (n=58)	Self Pay Consumers without Cognitive Impairment (n=39)	Self Pay Consumers with Cognitive Impairment (n=19)
	Mean	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*
Number of ADLs requiring assistance	2.96	2.79	**3.35***	2.53	2.31	2.82	2.41	2.24	**3.14***	2.35	2.40	2.24
Number of ADLs for which staff provides assistance	1.36	1.21	**1.68***	2.00	1.83	2.23	1.22	1.05	1.76	1.87	2.38	1.01
Number of diagnoses	4.58	4.36	**5.10***	3.68	3.71	3.64	3.75	3.53	4.65	2.91	2.76	3.20
	Percentage	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*
Difficult Behaviors	9	6	**17***	6	4	9	6	3	**19***	6	4	8
Use of Assistive Devices	61	57	**72***	54	57	50	44	39	**65***	66	59	81
Use of Medical Devices	47	44	53	43	43	43	44	36	**77***	35	40	26
Incontinence Status												
Bladder incontinence	53	45	**73***	46	36	**59***	23	13	**63***	39	24	**70***
Bowels incontinence	18	12	**33***	25	14	**40***	17	7	**58***	8	9	7
Needs Help Taking Medications	37	31	**52***	44	35	**56***	27	22	**47***	39	27	63
Used Any Emergency Care	15	13	20	12	11	13	12	10	23	6	9	0
Inpatient Care Prior to Home Health Care	54	57	**46***	34	37	29	74	75	71	27	29	22
Place Staying Prior to Home Health Care												
Hospital	74	73	78	75	75	76	85	83	94	72	74	64
Nursing Facility	12	12	12	13	15	9	5	5	3	18	13	32
Rehabilitation Center	12	13	7	10	9	12	8	9	4	9	12	0
Assisted Living Facility	2	2	4	2	1	3	2	2	0	2	1	4
Other	0	0	0	1	0	1	0	0	0	0	0	0
Any Surgical, Diagnostic or Therapeutic Procedures Related to Admission to Home Health Care	23	26	**17***	14	16	12	49	52	36	13	18	2

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 14

Original Data: Consumer Characteristics- Illness Level Factors by Primary Payor

	Primary Payor is Medicare						**Primary Payor is Medicaid**					
	All Medicare Consumers (n=1907)		**Medicare Consumers without Cognitive Impairment (n=1372)**		**Medicare Consumers with Cognitive Impairment (n=535)**		**All Medicaid Consumers (n=850)**		**Medicaid Consumers without Cognitive Impairment (n=573)**		**Medicaid Consumers with Cognitive Impairment (n=277)**	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Number of ADLs requiring assistance	2.93	1.48	2.76	1.52	**3.32***	1.31	2.50	1.80	2.29	1.91	2.76	1.59
Number of ADLs for which staff provides assistance	1.37	1.64	1.20	1.56	**1.73***	1.73	2.01	1.91	1.83	1.85	2.21	1.88
Number of diagnoses	4.60	2.14	4.38	2.07	**5.06***	2.18	3.68	1.87	3.74	2.05	3.63	1.59
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Difficult Behaviors	127	10	45	6	82	**18***	43	6	16	4	26	9
Use of Assistive Devices	1231	61	825	56	395	**72***	497	55	314	58	165	50
Use of Medical Devices	894	47	607	44	275	52	401	43	263	44	125	42
Incontinence Status												
Bladder incontinence	911	52	559	43	343	**71***	372	44	195	34	162	**58***
Bowels incontinence	361	18	168	11	182	**33***	219	25	78	13	122	**40***
Needs Help Taking Medications	625	36	375	29	249	**50***	345	43	209	34	136	**56***
Used Any Emergency Care	282	15	181	13	100	**21***	90	12	57	10	32	14
Inpatient Care Prior to Home Health Care	1056	54	791	58	259	**47***	279	33	200	36	70	30
Place Staying Prior to Home Health Care												
Hospital	773	74	587	73	182	77	204	75	145	75	52	75
Nursing Facility	170	12	122	13	46	12	44	13	33	16	9	9
Rehabilitation Center	87	11	68	12	19	7	21	9	16	8	5	12
Assisted Living Facility	19	2	9	2	10	4	6	2	4	1	2	3
Other	6	0	4	0	2	0	4	1	2	0	2	1
Any Surgical, Diagnostic or Therapeutic Procedures Related to Admission to Home Health Care	474	23	375	26	94	**17***	167	14	108	16	49	12

	Primary Payor is Private Insurance						**Primary Payor is Self Pay**					
	All Private Insurance Consumers (n=291)		**Private Insurance Consumers without Cognitive Impairment (n=241)**		**Private Insurance Consumers with Cognitive Impairment (n=50)**		**All Self Pay Consumers (n=102)**		**Self Pay Consumers without Cognitive Impairment (n=70)**		**Self Pay Consumers with Cognitive Impairment (n=32)**	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Number of ADLs requiring assistance	2.46	1.55	2.29	1.62	**3.15***	1.04	2.26	2.26	2.31	2.38	2.04	2.05
Number of ADLs for which staff provides assistance	1.23	1.45	1.05	1.36	1.77	1.52	1.97	2.26	2.55	2.08	**0.86***	1.67
Number of diagnoses	3.81	2.05	3.60	1.85	4.68	2.40	2.82	2.43	2.64	2.32	3.08	2.67
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Difficult Behaviors	14	6	6	3	8	**19***	5	6	2	5	3	8
Use of Assistive Devices	131	45	96	40	34	**65***	76	65	48	55	26	**82***
Use of Medical Devices	138	45	100	37	36	**77***	35	38	26	45	8	27
Incontinence Status												
Bladder incontinence	60	22	32	12	27	**64***	41	35	20	17	11	**70***
Bowels incontinence	48	18	22	8	25	**61***	14	7	5	6	7	5
Needs Help Taking Medications	82	28	58	24	23	46	38	39	21	28	17	**65***
Used Any Emergency Care	31	13	21	10	9	23	7	7	7	10	0	0
Inpatient Care Prior to Home Health Care	207	74	175	74	30	72	30	27	20	31	9	21
Place Staying Prior to Home Health Care												
Hospital	182	84	153	82	27	94	14	69	9	71	4	59
Nursing Facility	7	5	6	5	1	3	12	19	8	14	4	36
Rehabilitation Center	15	9	13	10	2	4	1	9	1	14	0	0
Assisted Living Facility	2	2	2	2	0	0	2	2	1	1	1	4
Other	0	0	0	0	0	0	0	0	0	0	0	0
Any Surgical, Diagnostic or Therapeutic Procedures Related to Admission to Home Health Care	151	50	133	53	16	36	14	14	13	21	1	**1***

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 15

Imputed Data: Consumer Characteristics- Illness Level Factors- Cognitive Status

	All Consumers (n=3309)
	Percentage
Cognitive Status	
No cognitive impairment	45
Requires occasional reminders	23
Requires some direction in certain situations	17
Requires a great deal of direction in routine situations	12
Severe cognitive impairment	3
Cognitive Impairment	32

Note: All values represent weighted estimates within consumer categories (table columns)

Appendix C, Table 16

Original Data: Consumer Characteristics- Illness Level Factors- Cognitive Status

	All Consumers (n=3255)	
	Frequency	*Percentage*
Cognitive Status		
No cognitive impairment	1573	45
Requires occasional reminders	760	23
Requires some direction in certain situations	514	17
Requires a great deal of direction in routine situations	328	12
Severe cognitive impairment	80	3
Cognitive Impairment	922	32

Note: All values represent weighted estimates within consumer categories (table columns)

Appendix C, Table 17

Imputed Data: Consumer Characteristics- Illness Level Factors- Cognitive Status by Primary Payor

	All Medicare Consumers (n=2068)	All Medicaid Consumers (n=847)	All Private Insurance Consumers (n=337)	All Self Pay Consumers (n=58)
	Percentage	*Percentage*	*Percentage*	*Percentage*
Cognitive Status				
No cognitive impairment	44	37	73	48
Requires occasional reminders	26	21	8	19
Requires some direction in certain situations	18	19	5	23
Requires a great deal of direction in routine situations	11	17	11	9
Severe cognitive impairment	1	6	3	1
Cognitive Impairment	30	42	19	33

Note: All values represent weighted estimates within consumer categories (table columns)

Appendix C, Table 18

Original Data: Consumer Characteristics- Illness Level Factors- Cognitive Status by Primary Payor

	All Medicare Consumers (n=1907)		All Medicaid Consumers (n=850)		All Private Insurance Consumers (n=291)		All Self Pay Consumers (n=102)	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Cognitive Status								
No cognitive impairment	878	44	385	37	213	72	39	51
Requires occasional reminders	494	26	188	21	28	8	31	15
Requires some direction in certain situations	327	18	131	19	18	5	18	24
Requires a great deal of direction in routine situations	178	11	106	18	25	12	13	9
Severe cognitive impairment	30	2	40	6	7	3	1	1
Cognitive Impairment	535	30	277	42	50	20	32	34

Note : All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 19

Imputed Data: Consumer Characteristics- Illness Level Factors- Primary Diagnosis Category

	All Consumers (n=3309)	Consumers without Cognitive Impairment (n=2248)	Consumers with Cognitive Impairment (n=1061)
	Percentage	*Percentage*	*Percentage*
Primary Diagnosis Category (ICD9 Codes)			
Infectious And Parasitic Diseases (001-139)	1	1	0
Neoplasms (140-239)	4	5	2*
Endocrine, Nutritional And Metabolic Diseases, And Immunity Disorders (240-279)	14	13	15
Diseases Of The Blood And Blood-Forming Organs (280-289)	2	2	1*
Mental Disorders (290-319)	5	2	10*
Diseases Of The Nervous System (320-359)	7	5	12*
Diseases Of The Sense Organs (350-389)	0	0	0
Diseases Of The Circulatory System (390-459)	19	20	17
Diseases Of The Respiratory System (460-519)	5	7	3*
Diseases Of The Digestive System (520-579)	2	2	1
Diseases Of The Genitourinary System (580-629)	3	3	2
Complications Of Pregnancy, Childbirth, And The Puerperium (630-679)	0	0	0
Diseases Of The Skin And Subcutaneous Tissue (680-709)	5	5	4
Diseases Of The Musculoskeletal System And Connective Tissue (710-739)	9	10	6*
Congenital Anomalies (740-759)	1	0	2*
Certain Conditions Originating In The Perinatal Period (760-779)	1	0	3
Symptoms, Signs, And Ill-Defined Conditions (780-799)	9	7	13*
Injury And Poisoning (800-999)	4	5	3*
Supplementary Classification Of Factors Influencing Health Status And Contact With Health Services (V01-V82)	9	11	5*

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 20

Original Data: Consumer Characteristics- Illness Level Factors- Primary Diagnosis Categories

	All Consumers (n=3255)		Consumers without Cognitive Impairment (n=2333)		Consumers with Cognitive Impairment (n=922)	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Primary Diagnosis Category (ICD9 Codes)						
Infectious And Parasitic Diseases (001-139)	17	1	13	1	4	0
Neoplasms (140-239)	127	4	109	5	16	2*
Endocrine, Nutritional And Metabolic Diseases, And Immunity Disorders (240-279)	396	14	276	13	117	15
Diseases Of The Blood And Blood-Forming Organs (280-289)	87	2	64	3	23	1*
Mental Disorders (290-319)	136	5	53	2	80	10*
Diseases Of The Nervous System (320-359)	264	7	127	5	125	12*
Diseases Of The Sense Organs (350-389)	11	0	10	0	1	0
Diseases Of The Circulatory System (390-459)	600	19	422	20	171	17
Diseases Of The Respiratory System (460-519)	213	5	169	7	42	3*
Diseases Of The Digestive System (520-579)	67	2	51	2	16	2
Diseases Of The Genitourinary System (580-629)	79	3	61	3	16	2
Complications Of Pregnancy, Childbirth, And The Puerperium (630-679)	10	0	9	0	1	0
Diseases Of The Skin And Subcutaneous Tissue (680-709)	162	5	128	5	30	4
Diseases Of The Musculoskeletal System And Connective Tissue (710-739)	312	9	253	10	58	7*
Congenital Anomalies (740-759)	29	1	9	0	18	2*
Certain Conditions Originating In The Perinatal Period (760-779)	21	1	13	0	8	3
Symptoms, Signs, And Ill-Defined Conditions (780-799)	321	9	200	7	112	13*
Injury And Poisoning (800-999)	141	4	117	6	21	2*
Supplementary Classification Of Factors Influencing Health Status And Contact With Health Services (V01-V82)	316	9	249	11	63	5*

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 21

Imputed Data: Consumer Characteristics- Illness Level Factors- Primary Diagnosis Category by Primary Payor

	Primary Payor is Medicare			Primary Payor is Medicaid			Primary Payor is Private Insurance			Primary Payor is Self Pay		
	All Medicare Consumers (n=2068)	Medicare Consumers without Cognitive Impairment (n=1450)	Medicare Consumers with Cognitive Impairment (n=617)	All Medicaid Consumers (n=847)	Medicaid Consumers without Cognitive Impairment (n=488)	Medicaid Consumers with Cognitive Impairment (n=360)	All Private Insurance Consumers (n=337)	Private Insurance Consumers without Cognitive Impairment (n=272)	Private Insurance Consumers with Cognitive Impairment (n=64)	All Self Pay Consumers (n=58)	Self Pay Consumers without Cognitive Impairment (n=39)	Self Pay Consumers with Cognitive Impairment (n=19)
	Percentage	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*
Primary Diagnosis Category (ICD9 Codes)												
Infectious And Parasitic Diseases (001-139)	0	1	0	2	2	1	0	0	0	1	2	0
Neoplasms (140-239)	4	4	2	2	3	1	8	8	7	6	8	0
Endocrine, Nutritional And Metabolic Diseases, And Immunity Disorders (240-279)	16	14	21	11	14	6	9	8	11	5	5	6
Diseases Of The Blood And Blood-Forming Organs (280-289)	3	3	2	0	1	0	1	1	0	0	0	0
Mental Disorders (290-319)	2	1	4	13	8	19	0	0	2	18	5	45
Diseases Of The Nervous System (320-359)	6	4	10	11	8	14	6	4	17	9	8	12
Diseases Of The Sense Organs (350-389)	0	0	0	0	1	0	0	0	0	0	0	0
Diseases Of The Circulatory System (390-459)	20	20	21	19	22	15	14	17	2	19	22	14
Diseases Of The Respiratory System (460-519)	5	7	3	6	9	3	3	3	5	12	17	3
Diseases Of The Digestive System (520-579)	2	2	2	1	2	0	2	2	2	2	1	5
Diseases Of The Genitourinary System (580-629)	3	3	2	1	1	2	4	3	5	3	4	0
Complications Of Pregnancy, Childbirth, And The Puerperium (630-679)	0	0	0	0	1	0	0	0	0	0	0	0
Diseases Of The Skin And Subcutaneous Tissue (680-709)	5	5	6	2	2	2	10	10	7	0	0	0
Diseases Of The Musculoskeletal System And Connective Tissue (710-739)	10	11	7	7	8	6	9	11	3	10	11	7
Congenital Anomalies (740-759)	0	0	0	2	1	4	0	0	2	0	0	0
Certain Conditions Originating In The Perinatal Period (760-779)	0	0	0	4	2	6	2	0	9	0	0	0
Symptoms, Signs, And Ill-Defined Conditions (780-799)	10	9	13	10	6	16	5	5	5	7	7	6
Injury And Poisoning (800-999)	5	6	2	3	2	3	8	9	3	3	5	0
Supplementary Classification Of Factors Influencing Health Status And Contact With Health Services (V01-V82)	9	10	5	6	9	3	19	19	21	3	5	1

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 22

Original Data: Consumer Characteristics- Illness Level Factors- Primary Diagnosis Category by Primary Payor

	Primary Payor is Medicare						**Primary Payor is Medicaid**					
	All Medicare Consumers (n=1907)		**Medicare Consumers without Cognitive Impairment (n=1372)**		**Medicare Consumers with Cognitive Impairment (n=535)**		**All Medicaid Consumers (n=850)**		**Medicaid Consumers without Cognitive Impairment (n=573)**		**Medicaid Consumers with Cognitive Impairment (n=277)**	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Primary Diagnosis Category (ICD9 Codes)												
Infectious And Parasitic Diseases (001-139)	10	0	9	1	1	0	6	2	3	3	3	1
Neoplasms (140-239)	63	4	54	4	9	2	22	2	19	3	2	1
Endocrine, Nutritional And Metabolic Diseases, And Immunity Disorders (240-279)	260	16	163	14	95	**22***	102	11	85	14	17	**6***
Diseases Of The Blood And Blood-Forming Organs (280-289)	73	3	52	4	21	2	6	0	6	1	0	**0***
Mental Disorders (290-319)	34	2	13	1	21	**4***	83	13	34	8	48	20
Diseases Of The Nervous System (320-359)	108	6	59	4	47	**9***	109	11	48	8	55	14
Diseases Of The Sense Organs (350-389)	4	0	3	0	1	0	7	0	7	1	0	**0***
Diseases Of The Circulatory System (390-459)	371	21	259	21	111	20	148	19	102	22	43	15
Diseases Of The Respiratory System (460-519)	123	5	97	6	25	**3***	64	6	51	9	12	**3***
Diseases Of The Digestive System (520-579)	40	2	27	2	13	2	14	1	13	2	1	**0***
Diseases Of The Genitourinary System (580-629)	56	3	42	3	12	3	12	1	9	1	3	2
Complications Of Pregnancy, Childbirth, And The Puerperium (630-679)	0	0	0	0	0	0	8	0	7	1	1	0
Diseases Of The Skin And Subcutaneous Tissue (680-709)	116	5	88	5	25	5	17	2	14	2	2	2
Diseases Of The Musculoskeletal System And Connective Tissue (710-739)	174	9	140	10	33	7	85	7	68	8	17	6
Congenital Anomalies (740-759)	3	0	2	0	1	0	22	2	7	1	13	4
Certain Conditions Originating In The Perinatal Period (760-779)	0	0	0	0	0	0	15	4	10	2	5	6
Symptoms, Signs, And Ill-Defined Conditions (780-799)	212	10	143	8	66	13	73	110	32	6	37	**16***
Injury And Poisoning (800-999)	77	5	67	6	10	**2***	29	3	18	2	8	3
Supplementary Classification Of Factors Influencing Health Status And Contact With Health Services (V01-V82)	200	8	154	10	44	6	52	6	40	8	10	**2***

	Primary Payor is Private Insurance						**Primary Payor is Self Pay (Patient/Family)**					
	All Private Insurance Consumers (n=291)		**Private Insurance Consumers without Cognitive Impairment (n=241)**		**Private Insurance Consumers with Cognitive Impairment (n=50)**		**All Self Pay Consumers (n=102)**		**Self Pay Consumers without Cognitive Impairment (n=70)**		**Self Pay Consumers with Cognitive Impairment (n=32)**	
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Primary Diagnosis Category (ICD9 Codes)												
Infectious And Parasitic Diseases (001-139)	0	0	0	0	0	0	1	1	1	2	0	0
Neoplasms (140-239)	30	8	26	8	3	7	6	6	5	9	1	0
Endocrine, Nutritional And Metabolic Diseases, And Immunity Disorders (240-279)	19	9	16	9	2	11	6	4	4	4	2	7
Diseases Of The Blood And Blood-Forming Organs (280-289)	3	1	3	1	0	0	1	0	1	0	0	0
Mental Disorders (290-319)	2	0	0	0	1	1	10	20	5	6	5	**50***
Diseases Of The Nervous System (320-359)	27	6	14	4	12	16	14	10	3	6	8	8
Diseases Of The Sense Organs (350-389)	0	0	0	0	0	0	0	0	0	0	0	0
Diseases Of The Circulatory System (390-459)	35	15	29	17	3	**2***	28	19	19	24	9	13
Diseases Of The Respiratory System (460-519)	12	3	9	3	3	5	7	14	6	19	1	4
Diseases Of The Digestive System (520-579)	10	2	9	2	1	2	2	3	1	1	1	6
Diseases Of The Genitourinary System (580-629)	9	4	8	4	1	5	2	3	2	5	0	0
Complications Of Pregnancy, Childbirth, And The Puerperium (630-679)	2	0	2	0	0	0	0	0	0	0	0	0
Diseases Of The Skin And Subcutaneous Tissue (680-709)	22	10	20	10	2	7	0	0	0	0	0	0
Diseases Of The Musculoskeletal System And Connective Tissue (710-739)	27	9	24	11	3	**3***	14	10	12	12	2	6
Congenital Anomalies (740-759)	3	0	0	0	3	2	0	0	0	0	0	0
Certain Conditions Originating In The Perinatal Period (760-779)	4	2	2	0	2	9	0	0	0	0	0	0
Symptoms, Signs, And Ill-Defined Conditions (780-799)	14	5	10	5	4	5	7	4	4	3	3	6
Injury And Poisoning (800-999)	28	7	25	8	3	3	2	3	2	5	0	0
Supplementary Classification Of Factors Influencing Health Status And Contact With Health Services (V01-V82)	51	19	44	19	7	21	5	2	5	4	0	0

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 23

Imputed Data: Home Health Care Services Cost & Utilization

	All Consumers (n=3309)	Consumers without Cognitive Impairment (n=2248)	Consumers with Cognitive Impairment (n=1061)
	Mean	*Mean*	*Mean*
Average Daily Charges (in dollars)	69.67	66.62	76.16
Days of Service	267.29	230.69	**344.92***
Service Profile			
Total Number of Visits	20.33	18.18	**24.89***
Number of Non-Medical Visits	5.36	4.73	**6.71***
Number of Medical Service Visits	11.65	10.81	**13.41***
	Percentage	*Percentage*	*Percentage*
Readmission	29	27	**34***

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference (p < 0.05) by cognitive impairment

Appendix C, Table 24

Original Data: Home Health Care Services Cost & Utilization

	All Consumers (n=3255)		Consumers without Cognitive Impairment (n=2333)		Consumers with Cognitive Impairment (n=922)	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Average Daily Charges (in dollars)	64.41	71.70	60.84	70.26	72.09	73.36
Days of Service	267.12	343.78	229.30	325.47	**340.51***	358.22
Service Profile						
Total Number of Service Visits	20.18	21.78	17.97	19.88	**24.36***	23.60
Number of Non-Medical Service Visits	5.22	8.83	4.57	8.48	**6.44***	9.12
Number of Medical Service Visits	11.65	12.05	10.80	10.73	**13.29***	13.70
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Readmission	1011	29	683	27	312	**35***

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference (p < 0.05) by cognitive impairment

Appendix C, Table 25

Imputed Data: Home Health Care Services Cost & Utilization by Primary Payor

	Primary Payor is Medicare			Primary Payor is Medicaid			Primary Payor is Private Insurance			Primary Payor is Self Pay		
	All Medicare Consumers (n=2068)	Medicare Consumers without Cognitive Impairment (n=1450)	Medicare Consumers with Cognitive Impairment (n=617)	All Medicaid Consumers (n=847)	Medicaid Consumers without Cognitive Impairment (n=488)	Medicaid Consumers with Cognitive Impairment (n=360)	All Private Insurance Consumers (n=337)	Private Insurance Consumers without Cognitive Impairment (n=272)	Private Insurance Consumers with Cognitive Impairment (n=64)	All Self Pay Consumers (n=58)	Self Pay Consumers without Cognitive Impairment (n=39)	Self Pay Consumers with Cognitive Impairment (n=19)
	Mean	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*	*Mean*
Average Daily Charges (in dollars)	76.45	73.29	83.84	55.62	48.79	64.89	68.43	66.21	77.83	40.23	43.41	33.64
Days of Service	179.44	167.30	207.90	510.31	471.69	562.78	170.16	129.98	**340.79***	417.62	277.28	**706.46***
Service Profile												
Total Number of Visits	17.83	16.12	**21.84***	27.44	24.69	31.17	18.22	17.27	22.23	17.81	19.43	14.50
Number of Non-Medical Visits	4.16	3.37	**6.01***	8.79	9.00	8.51	3.46	3.44	3.53	9.36	10.89	6.26
Number of Medical Service Visits	12.39	11.94	13.46	10.22	7.84	**13.46***	11.81	11.09	14.88	4.68	4.12	5.80
	Percentage	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*	*Percentage*
Readmission	33	29	**43***	26	28	23	18	18	20	18	16	23

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

Appendix C, Table 26

Original Data: Home Health Care Services Cost & Utilization by Primary Payor

	Primary Payor is Medicare						**Primary Payor is Medicaid**					
	All Medicare Consumers (n=1907)		**Medicare Consumers without Cognitive Impairment (n=1372)**		**Medicare Consumers with Cognitive Impairment (n=535)**		**All Medicaid Consumers (n=850)**		**Medicaid Consumers without Cognitive Impairment (n=573)**		**Medicaid Consumers with Cognitive Impairment (n=277)**	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Average Daily Charges (in dollars)	71.31	73.40	67.80	71.90	79.77	76.88	51.98	65.08	44.77	60.16	62.48	65.64
Days of Service	183.30	259.67	170.35	256.78	209.60	264.54	515.75	425.55	479.28	456.76	555.55	371.08
Service Profile												
Total Number of Service Visits	18.09	17.92	16.25	15.82	**22.16***	21.16	27.23	29.14	24.29	29.64	29.97	26.23
Number of Non-Medical Service Visits	4.27	7.37	3.39	6.60	**6.07***	8.32	8.46	11.49	8.83	12.32	7.92	10.13
Number of Medical Service Visits	12.46	10.25	11.98	9.74	13.57	11.23	10.20	15.63	7.52	12.73	**13.25***	16.27
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Readmission	670	33	449	29	211	**43***	239	26	165	29	70	22

	Primary Payor is Private Insurance						**Primary Payor is Self Pay (Patient/Family)**					
	All Private Insurance Consumers (n=291)		**Private Insurance Consumers without Cognitive Impairment (n=241)**		**Private Insurance Consumers with Cognitive Impairment (n=50)**		**All Self Pay Consumers (n=102)**		**Self Pay Consumers without Cognitive Impairment (n=70)**		**Self Pay Consumers with Cognitive Impairment (n=32)**	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Average Daily Charges (in dollars)	59.86	64.88	58.93	63.59	64.81	67.15	33.43	87.82	30.91	85.31	31.04	68.91
Days of Service	178.18	270.10	136.78	209.59	**347.07***	370.52	443.93	559.50	307.22	453.84	**740.34***	532.50
Service Profile												
Total Number of Service Visits	18.44	20.68	17.57	20.16	22.06	21.22	18.65	29.07	20.23	29.51	13.43	20.45
Number of Non-Medical Service Visits	3.65	7.86	3.66	8.11	3.58	6.55	10.08	13.56	12.05	13.33	**5.69***	12.52
Number of Medical Service Visits	11.66	11.86	10.95	10.85	14.59	14.07	4.51	11.13	3.31	9.86	5.60	6.56
	Frequency	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Readmission	49	18	37	18	12	21	27	14	16	9	9	17

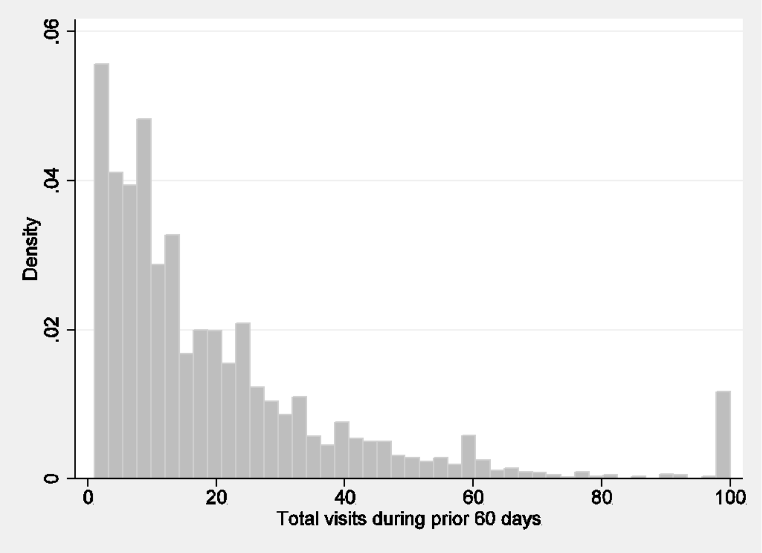
Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant difference ($p < 0.05$) by cognitive impairment

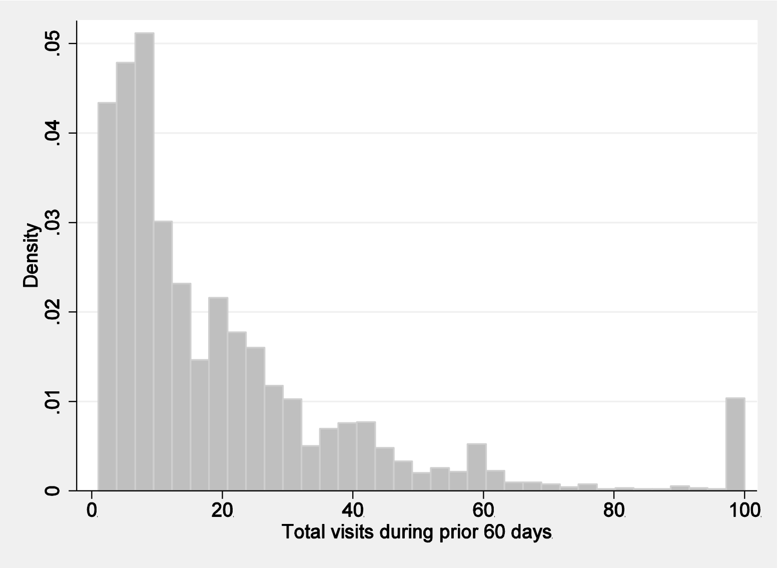
Appendix C, Figure 1

Histograms of Distribution of Values for Total Service Visits (Imputed and Original Data)

Imputed Data- Total Visits



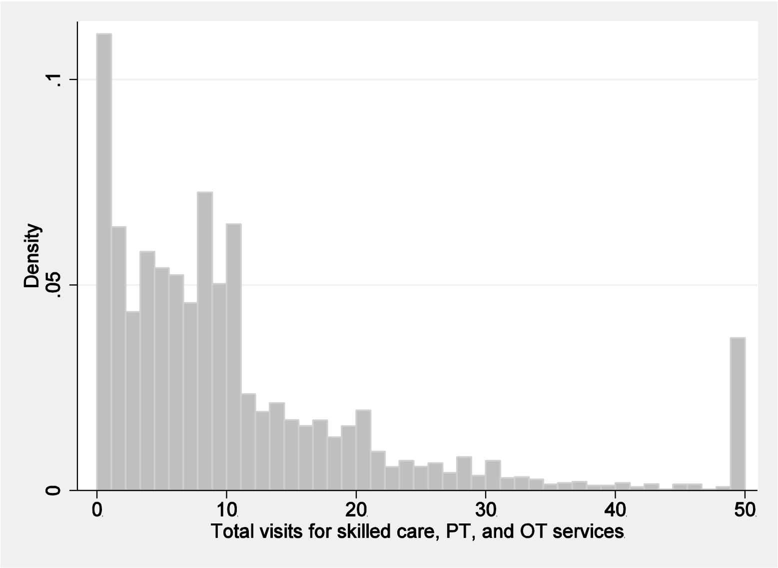
Original Data- Total Visits



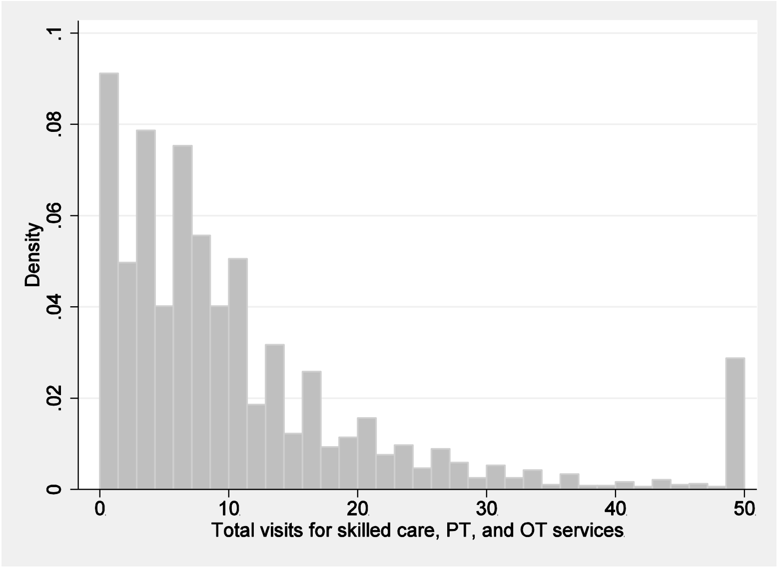
Appendix C, Figure 2

Histograms of Distribution of Values for Medical Service Visits (Imputed and Original Data)

Imputed Data- Medical Visits



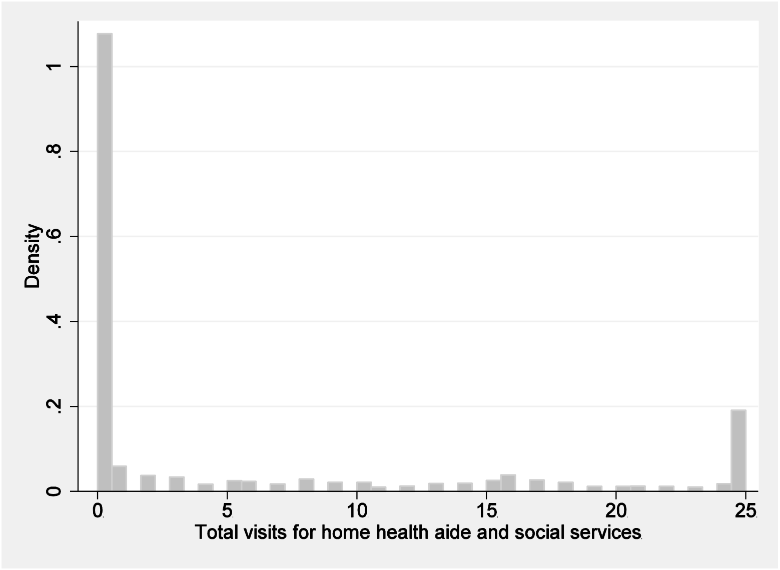
Original Data- Medical Visits



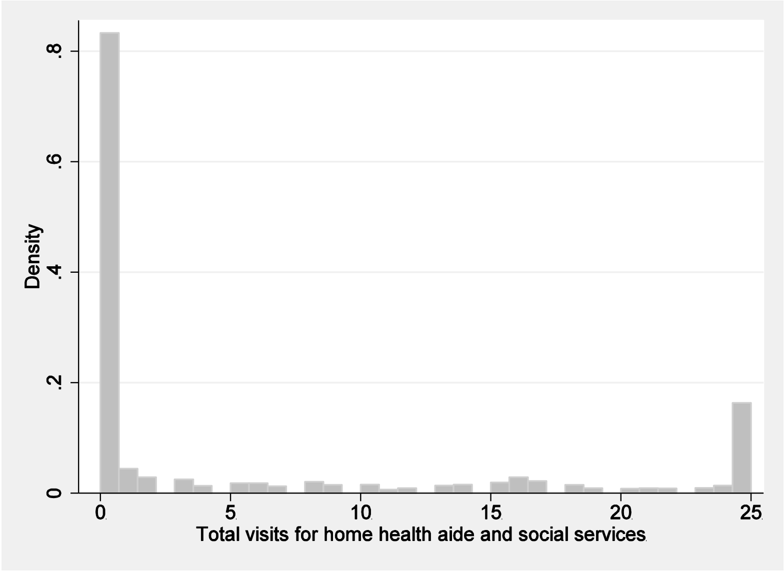
Appendix C, Figure 3

Histograms of Distribution of Values for Non-Medical Service Visits (Imputed and Original Data)

Imputed Data- Non-Medical Visits



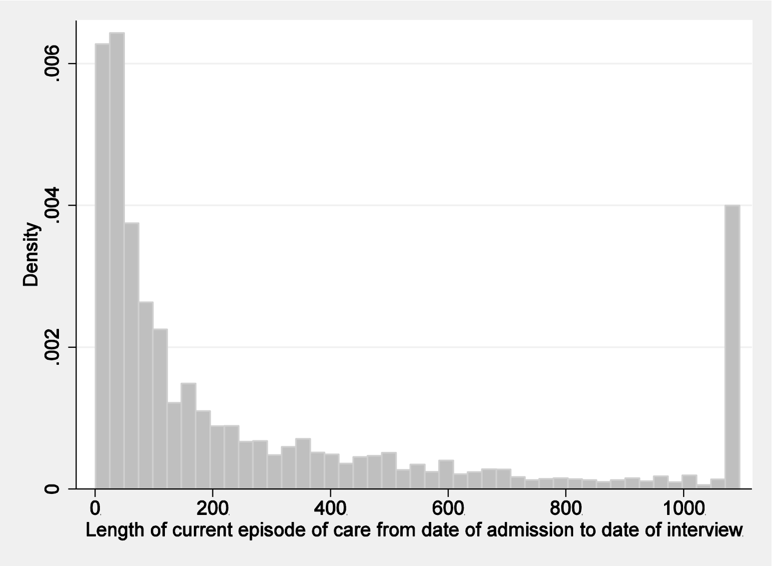
Original Data- Non-Medical Visits



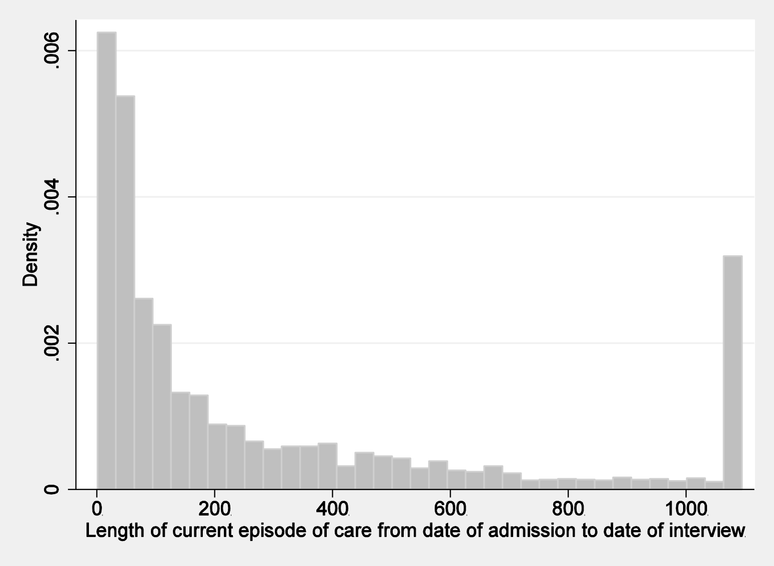
Appendix C, Figure 4

Histograms of Distribution of Values for Days of Service (Imputed and Original Data)

Imputed Data- Days of Service



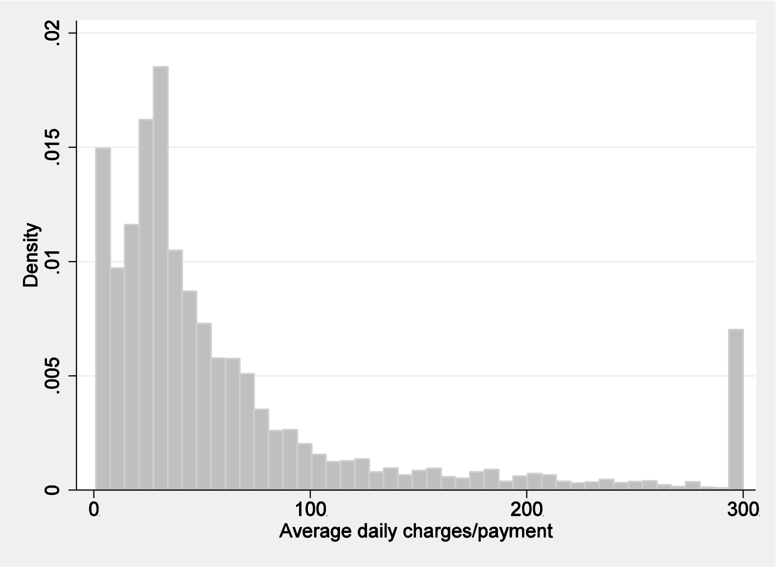
Original Data- Days of Service



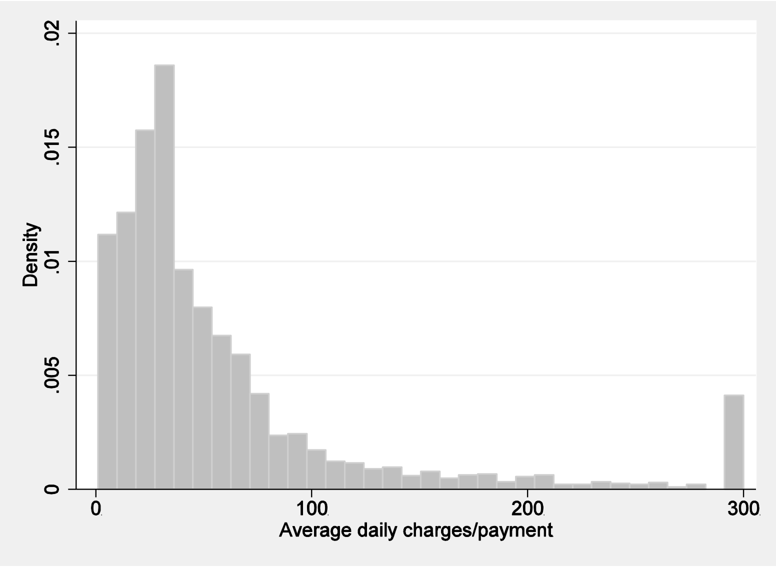
Appendix C, Figure 5

Histograms of Distribution of Values for Average Daily Charges (Imputed and Original Data)

Imputed Data- Average Daily Charges



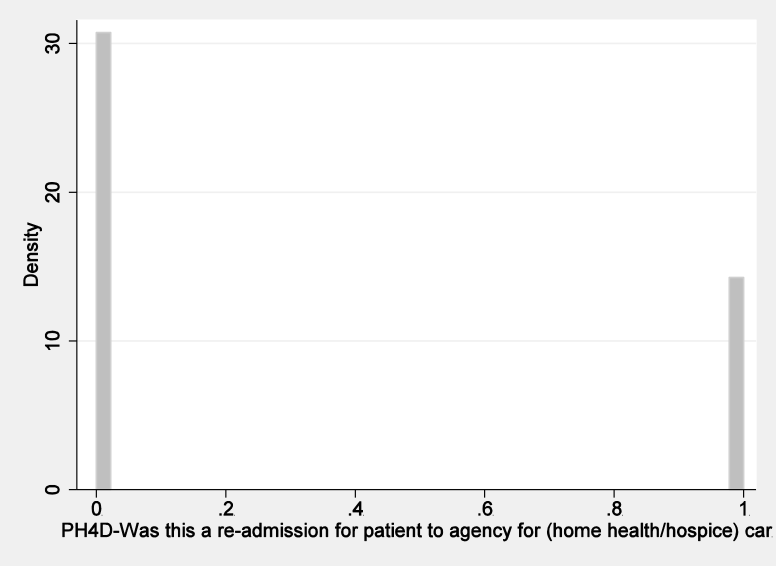
Original Data- Average Daily Charges



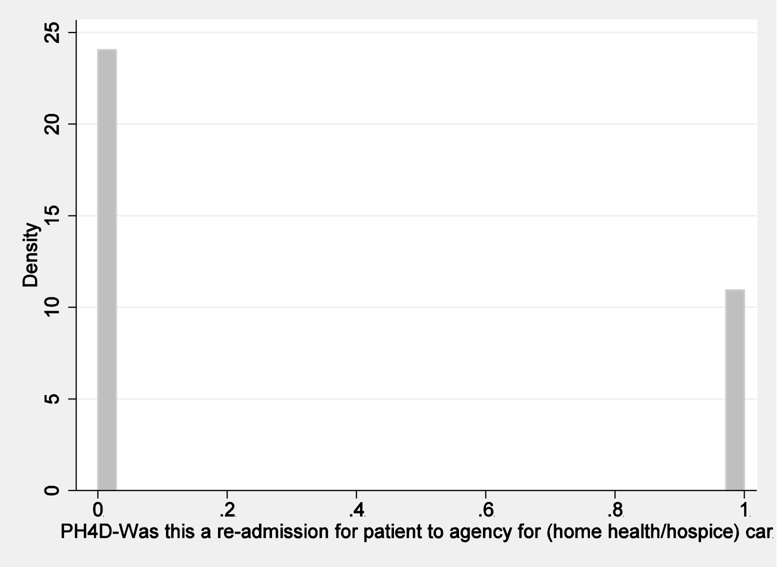
Appendix C, Figure 6

Histograms of Distribution of Values for Readmission Status (Imputed and Original Data)

Imputed Data- Readmission



Original Data- Readmission

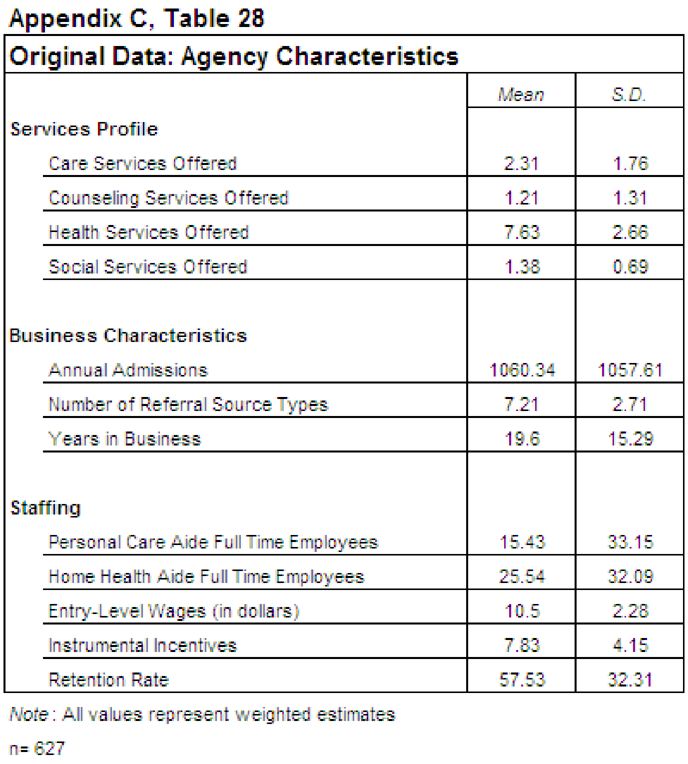


Appendix C, Table 27

Imputed Data: Agency Characteristics	*Mean*
Services Profile	
Care Services Offered	2.31
Counseling Services Offered	1.21
Health Services Offered	7.63
Social Services Offered	1.38
Business Characteristics	
Annual Admissions	1046.96
Number of Referral Source Types	7.21
Years in Business	19.61
Staffing	
Care Full Time Employees	15.43
Health Full Time Employees	25.54
Entry-Level Wages (in dollars)	9.87
Instrumental Incentives	7.83
Retention Rate	46.77

Note: All values represent weighted estimates

n= 627



Appendix C, Table 28

Original Data: Agency Characteristics

	Mean	*S.D.*
Services Profile		
Care Services Offered	2.31	1.76
Counseling Services Offered	1.21	1.31
Health Services Offered	7.63	2.66
Social Services Offered	1.38	0.69
Business Characteristics		
Annual Admissions	1060.34	1057.61
Number of Referral Source Types	7.21	2.71
Years in Business	19.6	15.29
Staffing		
Personal Care Aide Full Time Employees	15.43	33.15
Home Health Aide Full Time Employees	25.54	32.09
Entry-Level Wages (in dollars)	10.5	2.28
Instrumental Incentives	7.83	4.15
Retention Rate	57.53	32.31

Note: All values represent weighted estimates

n= 627

Appendix C, Table 29

Imputed Data: Correlation Matrix for Consumer-Level Variables

	Cognitive Status	Age	Gender	Partner Status (Y/N)	Habilitation Status	Primary Caregiver Status (Y/N)	Difficult Behaviors (Y/N)	Bladder Incontinence (Y/N)	Bowel Incontinence (Y/N)	Medication Problems	Number of ADLs Requiring Assistance	Number of ADLs Supported by Agency Staff	Need for Emergency Care (Y/N)	Number of Diagnoses	Primary Diagnosis Category	Use of Assistive Devices (Y/N)	Use of Medical Devices (Y/N)	Service Primary Payment Source	Average Daily Charges	Length of Current Service Period	Readmission Status (Y/N)	Total Service Visits	Number of Medical Visits	Number of Non-Medical Visits
Cognitive Status	1																							
Age	-0.08	1																						
Gender	0.00	-0.17*	1																					
Partner Status (Y/N)	-0.12*	0.09*	0.23*	1																				
Habilitation Status	0.12*	-0.15*	0.15*	0.27*	1																			
Primary Caregiver Status (Y/N)	0.07	-0.02	0.02	0.16*	0.28*	1																		
Difficult Behaviors (Y/N)	0.21*	-0.03	0.02	0.01	0.04	0.05*	1																	
Bladder Incontinence (Y/N)	0.31*	0.06	-0.12*	-0.08*	0.03	0.03	0.06*	1																
Bowel Incontinence (Y/N)	0.35*	-0.21*	0.06	-0.05*	0.12*	0.09	0.06	0.41*	1															
Medication Problems	0.19*	-0.06	0.01	-0.05	-0.03	-0.03	0.05	0.09*	0.07	1														
Number of ADLs Requiring Assistance	0.24*	-0.05	0.02	0.09*	0.22*	0.25*	0.09	0.19*	0.24*	0.09*	1													
Number of ADLs Supported by Agency Staff	0.20*	-0.03	-0.01	-0.03	-0.04	0.00	0.03	0.13*	0.17*	0.18	0.39*	1												
Need for Emergency Care (Y/N)	0.04*	0.02	0.03	0.03	0.04*	0.02	0.02	0.03	0.02	0.03	0.04	0.01	1											
Number of Diagnoses	0.01*	0.16*	-0.02	0.07	-0.07	-0.08	0.02	0.08*	-0.01	0.01	-0.05	-0.02	0.14*	1										
Primary Diagnosis Category	-0.10	-0.01	0.02	0.05	0.06	0.03	-0.03	-0.06	-0.02	-0.15*	0.04*	-0.08*	-0.03	0.00	1									
Use of Assistive Devices (Y/N)	0.10*	0.09*	-0.04	0.00	0.01	-0.01*	0.04	0.16*	0.14*	0.05	0.14*	0.12*	0.06	0.07*	-0.03	1								
Use of Medical Devices (Y/N)	0.08*	-0.12*	0.06	0.04	0.04	0.02	0.00	0.06*	0.09*	0.16*	0.01	0.03	0.09	0.19*	-0.21*	0.11*	1							
Service Primary Payment Source	0.01	-0.31*	0.06	-0.07	-0.04	-0.10*	-0.02	-0.12*	0.03	0.00	-0.08*	0.08	-0.06	-0.16*	0.00	-0.02*	-0.04	1						
Average Daily Charges	0.11	-0.09	0.04	0.02	0.03	0.03	0.01	0.02	0.08	0.13	0.15*	0.11	-0.02	0.00	0.03	0.05	0.05	-0.01*	1					
Length of Current Service Period	0.17*	-0.12*	-0.02	-0.17*	-0.08	-0.12*	0.02	0.12*	0.15*	0.12*	0.00	0.22*	-0.06*	-0.05	-0.16*	0.08*	0.04	0.22*	-0.06	1				
Readmission Status (Y/N)	0.0251	0.09*	-0.01	0.00	-0.02	0.00	-0.02	0.09*	0.05*	-0.01	-0.05	-0.02	0.05*	0.14*	-0.04*	0.04	0.09*	-0.08*	-0.08	-0.07*	1			
Total Service Visits	0.15*	-0.13	0.05	-0.08*	-0.07	-0.08*	0.04	0.09*	0.15*	0.22*	0.14*	0.40*	-0.01	0.01	-0.12*	0.11*	0.11*	0.08	0.24*	0.29*	-0.03	1		
Number of Medical Visits	0.10*	-0.14	0.07*	0.00	0.04	0.01*	0.02	0.07	0.13*	0.21*	0.11	0.06	0.05	0.09	0.03	0.08	0.19*	-0.13	0.32*	-0.02	-0.02	0.59*	1	
Number of Non-Medical Visits	0.08*	0.07	-0.03	-0.08*	-0.17*	-0.13	0.02	0.07*	0.06	0.07	0.05*	0.55*	-0.03	-0.01	-0.15*	0.09*	-0.05	0.16*	-0.04	0.36*	0.00	0.60*	-0.12	1

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant relationships ($p < 0.05$) demonstrated through OLS regression

Appendix C, Table 30

Original Data: Correlation Matrix for Consumer-Level Variables

	Cognitive Status	Age	Gender	Partner Status (Y/N)	Habilitation Status	Primary Caregiver Status (Y/N)	Difficult Behaviors (Y/N)	Bladder Incontinence (Y/N)	Bowel Incontinence (Y/N)	Medication Problems	Number of ADLs Requiring Assistance	Number of ADLs Supported by Agency Staff	Need for Emergency Care (Y/N)	Number of Diagnoses	Primary Diagnosis Category	Use of Assistive Devices (Y/N)	Use of Medical Devices (Y/N)	Service Primary Payment Source	Average Daily Charges	Length of Current Service Period	Readmission Status (Y/N)	Total Service Visits	Number of Medical Visits	Number of Non-Medical Visits
Cognitive Status	1																							
Age	-0.13	1																						
Gender	0.01	-0.19*	1																					
Partner Status (Y/N)	-0.13*	0.09	0.24*	1																				
Habilitation Status	0.13*	-0.19*	0.14*	0.30*	1																			
Primary Caregiver Status (Y/N)	0.09	-0.05*	0.03	0.15*	0.24*	1																		
Difficult Behaviors (Y/N)	0.25*	-0.06	0.01	-0.02	0.03	0.04*	1																	
Bladder Incontinence (Y/N)	0.31*	0.04	-0.13*	-0.10*	0.00	0.03	0.08*	1																
Bowel Incontinence (Y/N)	0.38*	-0.26*	0.05	-0.08*	0.10*	0.07	0.09	0.40*	1															
Medication Problems	0.19*	-0.05	0.01	-0.07	-0.03	-0.01	0.10	0.09*	0.08	1														
Number of ADLs Requiring Assistance	0.26*	-0.09	0.02	0.07*	0.23*	0.24*	0.11	0.18*	0.27*	0.08	1													
Number of ADLs Supported by Agency Staff	0.24*	-0.05	0.00	-0.05	-0.03	0.02	0.08	0.14*	0.19*	0.14*	0.39*	1												
Need for Emergency Care (Y/N)	0.07*	0.01	0.03	0.03	0.05*	0.02	0.03	0.03	0.04	0.04	0.06	0.05	1											
Number of Diagnoses	0.00*	0.19*	-0.01	0.08	-0.06	-0.06	-0.02	0.10*	-0.03	0.01	-0.06	-0.01	0.15*	1										
Primary Diagnosis Category	-0.11	-0.03	-0.01	0.05	0.05	0.02	-0.04	-0.07	-0.03	-0.13*	0.05*	-0.07*	0.01	0.01	1									
Use of Assistive Devices (Y/N)	0.13*	0.12*	-0.08*	-0.02	-0.04	-0.01*	0.04	0.16*	0.12*	0.08	0.13*	0.14*	0.06	0.08*	-0.05	1								
Use of Medical Devices (Y/N)	0.08*	-0.12*	0.09	0.05	0.03	0.04	0.02	0.08*	0.09*	0.18*	0.02	0.03	0.08	0.18*	-0.20*	0.13*	1							
Service Primary Payment Source	0.04	-0.29*	0.07	-0.07	-0.02	-0.09*	-0.04	-0.11*	0.04	-0.01	-0.07*	0.09	-0.05	-0.18*	-0.01	-0.03*	-0.03	1						
Average Daily Charges	0.14	-0.15	0.04	0.00	0.06	0.04	0.02	0.03*	0.13	0.16	0.19*	0.14	0.01*	-0.01	0.02	0.08	0.07	-0.08*	1					
Length of Current Service Period	0.21*	-0.12*	-0.01	-0.19*	-0.09	-0.11*	0.03	0.13	0.14*	0.12*	0.00	0.25*	-0.06*	-0.06	-0.20*	0.06*	0.05	0.25*	-0.04	1				
Readmission Status (Y/N)	0.01	0.10*	0.01	0.00	-0.04	0.00	-0.03	0.07*	0.01*	0.00	-0.06	-0.01	0.06*	0.15*	-0.06*	0.02	0.09*	-0.09*	-0.10	-0.07*	1			
Total Service Visits	0.16*	-0.15	0.06*	-0.09*	-0.05	-0.04*	0.06	0.11*	0.18*	0.17*	0.15*	0.39*	0.01	-0.01	-0.10*	0.14*	0.10*	0.07	0.33*	0.29*	-0.03	1		
Number of Medical Visits	0.12*	-0.13	0.06*	0.00	0.07	0.05*	0.04	0.09	0.15*	0.21*	0.14	0.05	0.06	0.09	0.06	0.10	0.18*	-0.17	0.41*	-0.04	0.00	0.54*	1	
Number of Non-Medical Visits	0.09*	0.06	-0.04	-0.10	-0.16*	-0.11	0.03	0.07	0.06	0.03	0.03*	0.55*	-0.02	-0.02	-0.14*	0.09*	-0.05	0.17*	-0.02	0.36*	0.00	0.61*	-0.14	1

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant relationships ($p < 0.05$) demonstrated through OLS regression

Appendix C, Table 31

Imputed Data: Correlation Matrix for Agency-Level Variables

	Annual Admissions	Years in Business	Referral Source Array Size	Care Services Offered	Counseling Services Offered	Health Services Offered	Social Services Offered	Number of Personal Care Aide Full Time Employees	Number of Home Health Aide Full Time Employess	Number of Instrumental Incentives for Home Health Aides	Personal Care Aide Entry Level Wages	Home Healthe Aide Entry Level Wages	Number of Personal Care Aides Employed 1 Year or More	Number of Home Health Aides Employed 1 Year or More
Annual Admissions	1													
Years in Business	0.36*	1												
Referral Source Array Size	0.17*	0.11*	1											
Care Services Offered	-0.02	0.08	0.01	1										
Counseling Services Offered	0.31*	0.19*	0.13*	0.37*	1									
Health Services Offered	0.27*	0.10*	0.15*	0.11	0.55*	1								
Social Services Offered	0.18*	0.04	0.16*	0.16	0.47*	0.50*	1							
Number of Personal Care Aide Full Time Employees	0.16*	0.08	-0.06	0.23*	0.04	-0.06	-0.06	1						
Number of Home Health Aide Full Time Employess	0.46*	0.18*	0.03	0.04*	0.19*	0.20*	0.10*	0.39*	1					
Number of Instrumental Incentives for Home Health Aides	0.37*	0.26*	0.18*	0.04	0.37*	0.36*	0.28*	-0.02	0.22*	1				
Personal Care Aide Entry Level Wages	0.20	-0.06	0.00	-0.14*	0.00	0.14*	0.07	-0.08*	0.09	-0.02	1			
Home Healthe Aide Entry Level Wages	0.15	-0.07*	-0.02	-0.13*	0.02	0.18*	0.09	-0.08*	0.06	-0.05	0.79*	1		
Number of Personal Care Aides Employed 1 Year or More	0.03	0.02	-0.03	0.20*	0.01	-0.08	-0.04	0.19*	0.02	-0.07	-0.13*	-0.24*	1	
Number of Home Health Aides Employed 1 Year or More	0.18*	0.26*	0.10*	-0.02	0.09	0.13*	0.02	-0.03	0.03*	0.21*	-0.10	-0.11*	0.17*	1

Note: All values represent weighted estimates within consumer categories (table columns)

* = Statistically significant relationships ($p < 0.05$) demonstrated through OLS regression

Appendix C, Table 32

Original Data: Correlation Matrix for Agency-Level Variables

	Annual Admissions	Years in Business	Referral Source Array Size	Care Services Offered	Counseling Services Offered	Health Services Offered	Social Services Offered	Number of Personal Care Aide Full Time Employees	Number of Home Health Aide Full Time Employess	Number of Instrumental Incentives for Home Health Aides	Personal Care Aide Entry Level Wages	Home Healthe Aide Entry Level Wages	Number of Personal Care Aides Employed 1 Year or More	Number of Home Health Aides Employed 1 Year or More
Annual Admissions	1													
Years in Business	0.23*	1												
Referral Source Array Size	0.17*	0.19*	1											
Care Services Offered	-0.04	-0.12	0.11	1										
Counseling Services Offered	0.31*	0.21*	0.07*	0.28*	1									
Health Services Offered	0.44*	0.21*	0.22*	0.03	0.51*	1								
Social Services Offered	0.18*	0.06	0.15*	0.04	0.37*	0.53*	1							
Number of Personal Care Aide Full Time Employees	0.01*	0.04	-0.13	0.16*	-0.04	-0.15	-0.26	1						
Number of Home Health Aide Full Time Employess	0.53*	0.09*	0.07	0.03*	0.14*	0.29*	0.01*	0.19*	1					
Number of Instrumental Incentives for Home Health Aides	0.42*	0.31*	0.18*	0.08	0.44*	0.60*	0.40*	-0.18	0.18*	1				
Personal Care Aide Entry Level Wages	0.03	-0.11	-0.04	-0.23*	-0.09	0.03*	-0.04	-0.20*	0.17	-0.06	1			
Home Healthe Aide Entry Level Wages	-0.02	-0.18*	-0.05	-0.15*	-0.13	0.04*	0.02	-0.24*	0.01	-0.11	0.71*	1		
Number of Personal Care Aides Employed 1 Year or More	0.12	0.14	-0.10	0.01*	0.13	0.06	-0.14	0.22*	0.17	-0.03	0.07	-0.08*	1	
Number of Home Health Aides Employed 1 Year or More	0.27*	0.26*	0.15*	0.11	0.14	0.25	0.04	-0.10*	0.15*	0.30*	-0.01	-0.09*	0.34*	1

Note: All values represent weighted estimates within consumer categories (table colu

* = Statistically significant relationships ($p < 0.05$) demonstrated through OLS regressi

Appendix D- Table 1

Imputed Data: Fully Unconditional Models	Total Visits	Medical Visits	Non-Medical Visits	Days of Service	Average Daily Charges	Readmission Status
	(N = 3309 Consumers in 627 Agencies)	(N = 3309 Consumers in 627 Agencies)	(N = 3309 Consumers in 627 Agencies)	(N = 3309 Consumers in 627 Agencies)	(N = 3309 Consumers in 627 Agencies)	(N = 3309 Consumers in 627 Agencies)
Intercept	22.63 ***	12.86 ***	5.95 ***	291.56 ***	68.02 ***	0.28 ***
Random-Effects Parameters						
Between-Agency Variance	14.16	8.43	6.11	232.02	39.08	0.20
Within-Agency Between-Consumer Variance	17.35	10.10	6.80	269.36	62.45	0.40
Total Variance	31.52	18.53	12.91	501.38	101.54	0.60
Variance Partition Coefficient	0.45	0.45	0.47	0.46	0.38	0.34

Note: All values represent weighted estimates.
* *p* < .05
** *p* < .01
*** *p* < .001

Appendix D- Table 2

Original Data: Fully Unconditional Models	Total Visits	Medical Visits	Non-Medical Visits	Days of Service	Average Daily Charges	Readmission Status
	(N = 3309 Consumers in 627 Agencies)	(N = 3309 Consumers in 627 Agencies)	(N = 3309 Consumers in 627 Agencies)	(N = 3307 Consumers in 627 Agencies)	(N = 3033 Consumers in 588 Agencies)	(N = 3232 Consumers in 622 Agencies)
Intraclass Correlation Coefficient	0.41	0.41	0.45	0.43	0.36	0.21
Intercept	22.44 ***	12.86 ***	5.75 ***	291.49 ***	63.09 ***	0.28 ***
Random-Effects Parameters						
Between-Agency Variance	205.65	71.09	37.39	53853.44	1549.63	0.04
Within-Agency Between-Consumer Variance	300.80	102.06	45.92	72534.46	2713.57	0.16
Total Variance	506.45	173.15	83.31	126387.90	4263.20	0.20
Variance Partition Coefficient	0.41	0.41	0.45	0.43	0.36	0.21

Note: All values represent weighted estimates.
* *p* < .05
** *p* < .01
*** *p* < .001

Appendix D- Table 3

Imputed Data: Regression Analysis- Average Daily Charges

	Model 1 (M1)	Model 2 (M2)	Model 3 (M3)	Model 4 (M4)	Model 5 (M5)	Model 6 (M6)
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)
Intraclass Correlation Coefficient (ICC)	0.39	0.39	0.39	0.40	0.38	0.38
Consumer Level Variables						
Intercept	68.02 ***	68.04 ***	68.09 ***	68.10 ***	69.55 ***	69.63 ***
[a] Cognitive Impairment Score	3.95 *	3.72	3.86	2.15	2.13	1.92
[a] Age		0.22 *	0.12	0.09	0.09	0.06
[a] Male		2.68	1.92	2.05	2.07	2.46
[c,a] Hispanic		12.33	15.52	14.58	14.68	14.99
[c,a] African American		-12.28 ***	-11.37 **	-14.19 ***	-14.20 ***	-14.18 ***
[c,a] Other Race/Ethnicity		-2.51	-1.34	-0.78	-1.01	-1.98
[a] Has a Spouse or Partner		5.21	3.45	0.91	0.93	0.57
[d,a] Lives with Family			1.10	0.72	0.65	0.77
[d,a] Lives with Others			4.82	1.63	1.62	2.80
[a] Has an Informal Caregiver			3.44	0.34	0.42	0.95
[e,a] Primary Payor is Medicare			49.73 ***	43.51 ***	43.82 ***	42.23 **
[e,a] Primary Payor is Medicaid			15.10	13.62	13.93	12.01
[e,a] Primary Payor is Private Insurance			41.90 ***	38.70 ***	38.81 ***	39.44 ***
[a] Incontinence of Bladder				-7.35	-7.42	-6.90
[a] Incontinence of Bowels				1.10	1.26	2.88
[a] Needs Help with Medications				11.64 *	11.68 *	12.88 **
[a] Uses Assistive Devices				2.74	2.74	2.50
[a] Uses Medical Devices				-4.54	-4.54	-5.10
[a] Number of ADLs for which help is needed				6.12 **	6.09	6.03 **
[a] Any Recent Episodes of Emergency Care				-2.20	-2.16	-4.11
[a] Total Number of Diagnoses				2.69	2.69	2.63 *
Agency Level Variables						
[b] Annual Admissions					0.01 ***	0.01 ***
[b] Years in Business					-0.20	-0.20 *
[b] Number of Referral Sources					0.49	0.48
[b] Number of Care Services Offered					1.38	1.37
[b] Number of Counseling Services Offered					-1.32	-1.29
[b] Number of Health Services Offered					0.86	0.89
[b] Number of Social Services Offered					-1.37	-1.39
[b] Number of Personal Care Aides Employed					-0.22 *	-0.22 *
[b] Number of Home Health Aides Employed					0.59 ***	0.59 ***
[b] Number of Instrumental Incentives					-1.14	-1.12
[b] Mean Wage for Home Health Aides					-1.88	-1.89
[b] Personal Care Aide 1-Year Retention Rate					-0.17 **	-0.17 **
[b] Home Health Aide 1-Year Retention Rate					-0.24 **	-0.24 **
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						0.003
C.I._Years in Business						-0.41 **
C.I._Number of Referral Sources						-0.37
C.I._Number of Care Services Offered						0.02
C.I._Number of Counseling Services Offered						1.30
C.I._Number of Health Services Offered						0.17
C.I._Number of Social Services Offered						-1.51
C.I._Number of Personal Care Aides Employed						-0.08
C.I._Number of Home Health Aides Employed						-0.10
C.I._Number of Instrumental Incentives						-0.10
C.I._Mean Wage for Home Health Aides						-2.13
C.I._Personal Care Aide 1-Year Retention Rate						0.001
C.I._Home Health Aide 1-Year Retention Rate						-0.02

Note: All values represent weighted estimates. Models 4 through 6 have slightly reduced sample sizes (64 fewer cases). STATA's mi estimate command issues a warning if the estimation sample varies across imputations. The varied estimation sample in these models is merely a characteristic of the estimator when combined with more than one imputed dataset. The esampvaryok command was used to allow estimation to continue, and results from all imputations were used to compute MI estimates. However, the estimation sample was thus reduced by the number of cases with non-comparable observations.

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 4

Original Data: Coefficients from Mixed-Effects Regression Analysis of Average Daily Charges

	Model 1 (M1)	Model 2 (M2)	Model 3 (M3)	Model 4 (M4)	Model 5 (M5)	Model 6 (M6)
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 2,984 Consumers in 586 Agencies)	(N = 2,649 Consumers in 574 Agencies)	(N = 2,631 Consumers in 574 Agencies)	(N = 2,255 Consumers in 541 Agencies)	(N = 1,191 Consumers in 272 Agencies)	(N = 1,191 Consumers in 272 Agencies)
Intraclass Correlation Coefficient (ICC)	0.38	0.38	0.38	0.56	0.40	0.42
Consumer Level Variables						
Intercept	63.57 ***	64.11 ***	63.90 ***	67.96 ***	62.52 ***	61.94 ***
[a] Cognitive Impairment Score	3.84 ***	2.59 ***	2.87 ***	3.33 ***	3.76 ***	-0.32
[a] Age		0.32 ***	0.19 ***	0.01	-0.05 **	-0.11 ***
[a] Male		1.54 **	0.02	-0.11	-2.49 ***	-0.67
[c,a] Hispanic		2.06	4.29 ***	0.42	-11.40 ***	-11.01 ***
[c,a] African American		-14.27 ***	-13.48 ***	-14.87 ***	-16.37 ***	-12.70 ***
[c,a] Other Race/Ethnicity		-1.59	-1.32	1.97	-7.84 **	-5.71
[a] Has a Spouse or Partner		8.07 ***	8.18 ***	4.05 ***	9.56 ***	10.25 ***
[d,a] Lives with Family			-2.42 ***	2.45 ***	-7.21 ***	-10.35 ***
[d,a] Lives with Others			5.11 ***	3.36 **	-11.47 ***	-8.21 ***
[a] Has an Informal Caregiver			7.11 ***	0.32	0.93	-0.95
[e,a] Primary Payor is Medicare			48.81 ***	23.00 ***	19.31 ***	25.00 ***
[e,a] Primary Payor is Medicaid			14.14 ***	7.82 ***	-0.41	4.53 *
[e,a] Primary Payor is Private Insurance			39.98 ***	14.20 ***	3.57	7.69 **
[a] Incontinence of Bladder				-3.63 ***	-0.88	2.17 **
[a] Incontinence of Bowels				-5.57 ***	1.60	-3.49 ***
[a] Needs Help with Medications				16.62 ***	19.16 ***	16.77 ***
[a] Uses Assistive Devices				7.20 ***	5.42 ***	3.16 ***
[a] Uses Medical Devices				-1.90 ***	0.72	1.76 **
[a] Number of ADLs for which help is needed				7.39 ***	6.51 ***	6.01 ***
[a] Any Recent Episodes of Emergency Care				3.76 ***	7.08 ***	3.76 ***
[a] Total Number of Diagnoses				2.75 ***	2.02 ***	1.65 ***
Agency Level Variables						
[b] Annual Admissions					0.03 ***	0.03 ***
[b] Years in Business					-0.73 ***	-0.67 ***
[b] Number of Referral Sources					2.29 ***	2.24 ***
[b] Number of Care Services Offered					-0.91 *	-0.47
[b] Number of Counseling Services Offered					0.66	0.54
[b] Number of Health Services Offered					0.01	-0.22
[b] Number of Social Services Offered					-2.14 *	-1.76
[b] Number of Personal Care Aides Employed					-0.07 *	-0.05
[b] Number of Home Health Aides Employed					-0.08 *	-0.06
[b] Number of Instrumental Incentives					1.77 ***	1.74 ***
[b] Mean Wage for Home Health Aides					0.53	0.53 *
[b] Personal Care Aide 1-Year Retention Rate					0.11 ***	0.05 *
[b] Home Health Aide 1-Year Retention Rate					-0.10 ***	-0.09 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						-0.01 ***
C.I._Years in Business						-0.09 **
C.I._Number of Referral Sources						-0.13
C.I._Number of Care Services Offered						0.04
C.I._Number of Counseling Services Offered						1.23 *
C.I._Number of Health Services Offered						-2.19 ***
C.I._Number of Social Services Offered						4.26 ***
C.I._Number of Personal Care Aides Employed						-0.12 ***
C.I._Number of Home Health Aides Employed						0.09 ***
C.I._Number of Instrumental Incentives						0.48 ***
C.I._Mean Wage for Home Health Aides						-4.37 ***
C.I._Personal Care Aide 1-Year Retention Rate						-0.16 ***
C.I._Home Health Aide 1-Year Retention Rate						-0.02

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 5

Imputed Data: Coefficients from Mixed-Effects Regression Analysis of Days of Service

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)
Intraclass Correlation Coefficient (ICC)	0.46	0.47	0.47	0.47	0.41	0.41
Consumer Level Variables						
Intercept	291.55 ***	291.54 ***	291.49 ***	289.06 ***	295.54 ***	295.43 ***
[a] Cognitive Impairment Score	19.92 ***	18.27 ***	17.55 ***	12.58 ***	12.19 ***	-1.92 ***
[a] Age		0.72 ***	1.36 ***	1.39 ***	1.38 ***	1.33 ***
[a] Male		-16.10 ***	-12.39 ***	-10.94 ***	-11.14 ***	-7.86 *
[c,a] Hispanic		25.59 **	7.10	17.61	17.45	8.97
[c,a] African American		41.45 ***	36.03 ***	32.20 ***	32.16 ***	27.70 ***
[c,a] Other Race/Ethnicity		-20.61	-27.24 *	-14.85	-15.29	-20.22
[a] Has a Spouse or Partner		-38.31 ***	-32.34 ***	-29.74 ***	-29.20 ***	-34.84 ***
[d,a] Lives with Family			4.72	5.39	5.68	7.09
[d,a] Lives with Others			-34.85 ***	-28.53 ***	-28.74 ***	-24.92 ***
[a] Has an Informal Caregiver			-27.27 ***	-30.44 ***	-30.37 ***	-32.97 ***
[e,a] Primary Payor is Medicare			-92.07 **	-37.94	-38.69	-39.72
[e,a] Primary Payor is Medicaid			63.40 *	99.33 **	97.66 **	90.29 **
[e,a] Primary Payor is Private Insurance			-93.25 **	-37.94	-40.50	-38.47
[a] Incontinence of Bladder				40.54 *	40.09 *	42.31 *
[a] Incontinence of Bowels				-15.75	-14.96	-10.52
[a] Needs Help with Medications				41.96 ***	42.14 ***	49.05 ***
[a] Uses Assistive Devices				27.55 ***	27.46 ***	29.22 ***
[a] Uses Medical Devices				5.48	4.95	7.62 *
[a] Number of ADLs for which help is needed				-3.23 *	-3.29 *	-4.17 **
[a] Any Recent Episodes of Emergency Care				-44.95 ***	-44.22 ***	-40.45 ***
[a] Total Number of Diagnoses				2.16 **	1.93 *	2.04 *
Agency Level Variables						
[b] Annual Admissions					-0.05 ***	-0.05 ***
[b] Years in Business					4.06 ***	4.08 ***
[b] Number of Referral Sources					7.91 ***	7.93 ***
[b] Number of Care Services Offered					34.15 ***	34.11 ***
[b] Number of Counseling Services Offered					-18.46 ***	-18.43 ***
[b] Number of Health Services Offered					-11.42 ***	-11.38 ***
[b] Number of Social Services Offered					-65.16 ***	-65.25 ***
[b] Number of Personal Care Aides Employed					-1.69 ***	-1.69 ***
[b] Number of Home Health Aides Employed					2.47 ***	2.47 ***
[b] Number of Instrumental Incentives					-11.23 ***	-11.21 ***
[b] Mean Wage for Home Health Aides					-13.72 *	-13.77 *
[b] Personal Care Aide 1-Year Retention Rate					0.46 *	0.44 *
[b] Home Health Aide 1-Year Retention Rate					-0.41	-0.42 *
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						0.01 ***
C.I._Years in Business						-0.58 ***
C.I._Number of Referral Sources						0.74
C.I._Number of Care Services Offered						3.38 **
C.I._Number of Counseling Services Offered						-4.07
C.I._Number of Health Services Offered						-10.66 ***
C.I._Number of Social Services Offered						-0.11
C.I._Number of Personal Care Aides Employed						0.47 ***
C.I._Number of Home Health Aides Employed						-0.03
C.I._Number of Instrumental Incentives						-2.78 ***
C.I._Mean Wage for Home Health Aides						3.98 *
C.I._Personal Care Aide 1-Year Retention Rate						0.35 ***
C.I._Home Health Aide 1-Year Retention Rate						0.28 ***

Note: All values represent weighted estimates. Models 4 through 6 have slightly reduced sample sizes (64 fewer cases). STATA's mi estimate command issues a warning if the estimation sample varies across imputations. The varied estimation sample in these models is merely a characteristic of the estimator when combined with more than one imputed dataset. The esampvaryok command was used to allow estimation to continue, and results from all imputations were used to compute MI estimates. However, the estimation sample was thus reduced by the number of cases with non-comparable observations.

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 6

Original Data: Coefficients from Mixed-Effects Regression Analysis of Days of Service

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,254 Consumers in 624 Agencies)	(N = 2,882 Consumers in 614 Agencies)	(N = 2,783 Consumers in 602 Agencies)	(N = 2,387 Consumers in 569 Agencies)	(N = 1,261 Consumers in 284 Agencies)	(N = 1,261 Consumers in 284 Agencies)
Intraclass Correlation Coefficient (ICC)	0.43	0.46	0.44	0.48	0.32	0.32
Consumer Level Variables						
Intercept	289.21 ***	296.96 ***	301.99 ***	290.24 ***	251.51 ***	250.49 ***
[a] Cognitive Impairment Score	18.27 ***	14.27 ***	14.42 ***	17.70 ***	3.45	7.90 **
[a] Age		1.24 ***	1.43 ***	1.39 ***	1.44 ***	1.63 ***
[a] Male		-10.48 ***	-6.38 *	-4.19	8.46 *	11.60 **
[c,a] Hispanic		47.01 ***	50.75 ***	72.80 ***	68.75 ***	61.28 ***
[c,a] African American		41.26 ***	41.60 ***	61.09 ***	58.70 ***	58.81 ***
[c,a] Other Race/Ethnicity		-21.88	-45.34 ***	21.50	22.87	22.85
[a] Has a Spouse or Partner		-33.54 ***	-24.94 ***	-34.75 ***	-27.63 ***	-28.45 ***
[d,a] Lives with Family			-15.70 ***	-32.60 ***	-40.41 ***	-39.29 ***
[d,a] Lives with Others			-35.90 ***	-53.44 ***	18.25 *	17.04 *
[a] Has an Informal Caregiver			-57.68 ***	-21.83 ***	-14.22 **	-9.44
[e,a] Primary Payor is Medicare			-44.36 ***	-123.67 ***	-546.64 ***	-540.63 ***
[e,a] Primary Payor is Medicaid			24.26 *	25.29 *	-324.78 ***	-320.94 ***
[e,a] Primary Payor is Private Insurance			-81.90 ***	-75.41 ***	-445.42 ***	-437.64 ***
[a] Incontinence of Bladder				59.10 ***	81.04 ***	77.50 ***
[a] Incontinence of Bowels				-21.33 ***	-8.30	-4.21
[a] Needs Help with Medications				60.51 ***	70.97 ***	78.37 ***
[a] Uses Assistive Devices				33.07 ***	45.08 ***	42.49 ***
[a] Uses Medical Devices				24.80 ***	11.09 **	8.71 **
[a] Number of ADLs for which help is needed				-11.69 ***	-5.37 ***	-6.78 ***
[a] Any Recent Episodes of Emergency Care				-35.30 ***	-15.66 ***	-10.17 *
[a] Total Number of Diagnoses				0.94	8.93 ***	8.43 ***
Agency Level Variables						
[b] Annual Admissions					-0.06 ***	-0.07 ***
[b] Years in Business					-0.61 **	-0.55 *
[b] Number of Referral Sources					6.65 ***	6.48 ***
[b] Number of Care Services Offered					40.23 ***	39.83 ***
[b] Number of Counseling Services Offered					-9.70 **	-9.05 **
[b] Number of Health Services Offered					-9.78 ***	-9.31 ***
[b] Number of Social Services Offered					-28.82 ***	-30.33 ***
[b] Number of Personal Care Aides Employed					1.08 ***	1.12 ***
[b] Number of Home Health Aides Employed					0.26	0.27
[b] Number of Instrumental Incentives					-3.55 ***	-3.44 ***
[b] Mean Wage for Home Health Aides					-7.69 ***	-7.24 ***
[b] Personal Care Aide 1-Year Retention Rate					-0.31 ***	-0.33 ***
[b] Home Health Aide 1-Year Retention Rate					1.25 ***	1.22 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						-0.02 ***
C.I._Years in Business						-0.25
C.I._Number of Referral Sources						-0.07
C.I._Number of Care Services Offered						6.80 ***
C.I._Number of Counseling Services Offered						1.84
C.I._Number of Health Services Offered						2.37 *
C.I._Number of Social Services Offered						17.48 ***
C.I._Number of Personal Care Aides Employed						-0.16
C.I._Number of Home Health Aides Employed						0.40 ***
C.I._Number of Instrumental Incentives						-3.69 ***
C.I._Mean Wage for Home Health Aides						0.94
C.I._Personal Care Aide 1-Year Retention Rate						-0.11
C.I._Home Health Aide 1-Year Retention Rate						0.53 ***

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 7

Imputed Data: Coefficients from Mixed-Effects Regression Analysis of Total Number of Service Visits

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)
Intraclass Correlation Coefficient (ICC)	0.45	0.45	0.45	0.46	0.41	0.43
Consumer Level Variables						
Intercept	22.63 ***	22.63 ***	22.63 ***	22.41 ***	22.00 ***	22.04 ***
[a] Cognitive Impairment Score	1.05 **	0.99 **	1.20 **	0.22 *	0.22 *	0.75 ***
[a] Age		0.07 ***	0.07 ***	0.06 ***	0.06 ***	0.03 **
[a] Male		0.79 ***	0.75 ***	0.12	0.12	0.94 ***
[c,a] Hispanic		3.16 ***	3.16 ***	3.85 ***	3.90 ***	3.25 ***
[c,a] African American		-1.05 *	-1.03	-2.61 ***	-2.64 ***	-2.33 ***
[c,a] Other Race/Ethnicity		14.55 ***	14.97 ***	16.23 ***	16.20 ***	15.99 ***
[a] Has a Spouse or Partner		0.98 **	1.52 ***	0.90	0.91	0.83
[d,a] Lives with Family			-1.37 ***	-2.26 ***	-2.27 ***	-2.30 ***
[d,a] Lives with Others			-2.99 ***	-4.63 ***	-4.69 ***	-4.43 ***
[a] Has an Informal Caregiver			-1.70 ***	-3.24 ***	-3.23 ***	-2.48 ***
[e,a] Primary Payor is Medicare			9.38 ***	8.27 ***	8.28 ***	8.81 ***
[e,a] Primary Payor is Medicaid			7.94 ***	8.24 ***	8.25 ***	7.76 **
[e,a] Primary Payor is Private Insurance			8.81 ***	9.87 ***	9.75 ***	10.34 **
[a] Incontinence of Bladder				-2.17 **	-2.19 **	-1.52
[a] Incontinence of Bowels				2.72 ***	2.74 ***	3.51 ***
[a] Needs Help with Medications				4.61 ***	4.61 ***	4.70 ***
[a] Uses Assistive Devices				3.82 ***	3.83 ***	3.05 ***
[a] Uses Medical Devices				1.69 ***	1.67 ***	1.62 ***
[a] Number of ADLs for which help is needed				2.19 ***	2.18 ***	2.29 ***
[a] Any Recent Episodes of Emergency Care				0.52 *	0.54 *	-0.78 *
[a] Total Number of Diagnoses				0.76 ***	0.76 ***	0.61 ***
Agency Level Variables						
[b] Annual Admissions					-0.002 ***	-0.002 ***
[b] Years in Business					0.03	0.03
[b] Number of Referral Sources					0.43 ***	0.42 ***
[b] Number of Care Services Offered					1.17 ***	1.16 ***
[b] Number of Counseling Services Offered					-2.03 ***	-2.03 ***
[b] Number of Health Services Offered					0.02	0.03
[b] Number of Social Services Offered					-2.65 ***	-2.66 ***
[b] Number of Personal Care Aides Employed					0.11 ***	0.11 ***
[b] Number of Home Health Aides Employed					0.16 ***	0.17 ***
[b] Number of Instrumental Incentives					-1.10 ***	-1.11 ***
[b] Mean Wage for Home Health Aides					-0.55	-0.59
[b] Personal Care Aide 1-Year Retention Rate					-0.01	-0.01
[b] Home Health Aide 1-Year Retention Rate					-0.01	-0.01
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						-0.0002
C.I._Years in Business						-0.07 ***
C.I._Number of Referral Sources						-0.01
C.I._Number of Care Services Offered						-0.37 **
C.I._Number of Counseling Services Offered						1.07 ***
C.I._Number of Health Services Offered						0.65 ***
C.I._Number of Social Services Offered						-2.37 ***
C.I._Number of Personal Care Aides Employed						-0.03 **
C.I._Number of Home Health Aides Employed						-0.09 ***
C.I._Number of Instrumental Incentives						0.18 ***
C.I._Mean Wage for Home Health Aides						-0.65
C.I._Personal Care Aide 1-Year Retention Rate						-0.01
C.I._Home Health Aide 1-Year Retention Rate						-0.01

Note: All values represent weighted estimates. Models 4 through 6 have slightly reduced sample sizes (64 fewer cases). STATA's mi estimate command issues a warning if the estimation sample varies across imputations. The varied estimation sample in these models is merely a characteristic of the estimator when combined with more than one imputed dataset. The esampvaryok command was used to allow estimation to continue, and results from all imputations were used to compute MI estimates. However, the estimation sample was thus reduced by the number of cases with non-comparable observations.

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 8

Original Data: Coefficients from Mixed-Effects Regression Analysis of Total Number of Service Visits

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,255 Consumers in 624 Agencies)	(N = 2,883 Consumers in 614 Agencies)	(N = 2,784 Consumers in 602 Agencies)	(N = 2,388 Consumers in 570 Agencies)	(N = 1,261 Consumers in 284 Agencies)	(N = 1,261 Consumers in 284 Agencies)
Intraclass Correlation Coefficient (ICC)	0.40	0.40	0.41	0.47	0.35	0.39
Consumer Level Variables						
Intercept	22.27 ***	22.33 ***	22.61 ***	23.00 ***	19.71 ***	19.75 ***
[a] Cognitive Impairment Score	1.02 ***	0.72 ***	0.65 ***	0.08	0.55 ***	0.38 *
[a] Age		0.07 ***	0.08 ***	0.05 ***	0.03 ***	0.02 *
[a] Male		0.49 **	0.09	-1.10 ***	-1.29 ***	-0.25
[c,a] Hispanic		1.93 ***	4.51 ***	5.61 ***	-4.34 ***	-4.98 ***
[c,a] African American		-0.68 **	-0.60 *	-0.94 ***	-2.16 ***	-0.57 *
[c,a] Other Race/Ethnicity		-1.85 *	-0.21	0.52	-6.71 ***	-4.84 ***
[a] Has a Spouse or Partner		0.85 ***	0.91 ***	1.68 ***	2.28 ***	2.84 ***
[d,a] Lives with Family			-1.93 ***	-4.45 ***	-4.70 ***	-5.75 ***
[d,a] Lives with Others			-3.46 ***	-7.19 ***	-8.12 ***	-6.53 ***
[a] Has an Informal Caregiver			-3.76 ***	-4.35 ***	-0.95 **	-1.01 ***
[e,a] Primary Payor is Medicare			11.06 ***	8.28 ***	6.56 ***	7.93 ***
[e,a] Primary Payor is Medicaid			10.17 ***	10.73 ***	6.48 ***	7.85 ***
[e,a] Primary Payor is Private Insurance			11.79 ***	12.32 ***	3.31 ***	5.97 ***
[a] Incontinence of Bladder				-1.08 ***	2.08 ***	2.61 ***
[a] Incontinence of Bowels				-0.03	0.93 ***	-0.77 *
[a] Needs Help with Medications				5.21 ***	4.13 ***	3.56 ***
[a] Uses Assistive Devices				6.10 ***	4.19 ***	3.01 ***
[a] Uses Medical Devices				0.58 **	1.34 ***	1.44 ***
[a] Number of ADLs for which help is needed				2.50 ***	2.87 ***	2.80 ***
[a] Any Recent Episodes of Emergency Care				1.80 ***	3.23 ***	2.67 ***
[a] Total Number of Diagnoses				0.36 ***	-0.28 ***	-0.35 ***
Agency Level Variables						
[b] Annual Admissions					0.001	0.0003
[b] Years in Business					-0.14 ***	-0.13 ***
[b] Number of Referral Sources					1.01 ***	1.00 ***
[b] Number of Care Services Offered					-0.39 **	-0.50 ***
[b] Number of Counseling Services Offered					-1.19 ***	-1.20 ***
[b] Number of Health Services Offered					-0.83 ***	-0.73 ***
[b] Number of Social Services Offered					0.22	-0.11
[b] Number of Personal Care Aides Employed					0.21 ***	0.22 ***
[b] Number of Home Health Aides Employed					-0.01	-0.01
[b] Number of Instrumental Incentives					0.01	-0.04
[b] Mean Wage for Home Health Aides					-0.39 ***	-0.40 ***
[b] Personal Care Aide 1-Year Retention Rate					-0.01	-0.01
[b] Home Health Aide 1-Year Retention Rate					0.03 ***	0.03 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						-0.003 ***
C.I._Years in Business						-0.11 ***
C.I._Number of Referral Sources						0.30 ***
C.I._Number of Care Services Offered						-0.82 ***
C.I._Number of Counseling Services Offered						-0.03
C.I._Number of Health Services Offered						0.35 ***
C.I._Number of Social Services Offered						3.32 ***
C.I._Number of Personal Care Aides Employed						-0.01
C.I._Number of Home Health Aides Employed						-0.01
C.I._Number of Instrumental Incentives						-0.40 ***
C.I._Mean Wage for Home Health Aides						-1.77 ***
C.I._Personal Care Aide 1-Year Retention Rate						-0.02 ***
C.I._Home Health Aide 1-Year Retention Rate						-0.02 ***

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 9

Imputed Data: Coefficients from Mixed-Effects Regression Analysis of Number of Medical Service Visits

	Model 1 (M1)	Model 2 (M2)	Model 3 (M3)	Model 4 (M4)	Model 5 (M5)	Model 6 (M6)
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)
Intraclass Correlation Coefficient (ICC)	0.46	0.46	0.46	0.46	0.41	0.43
Consumer Level Variables						
Intercept	12.86 ***	12.86 ***	12.87 ***	12.80 ***	11.67 ***	11.69 ***
[a] Cognitive Impairment Score	0.30 **	0.32 **	0.45 ***	-0.04	-0.04	0.12
[a] Age		0.01 ***	-0.004	-0.003	-0.003	-0.01
[a] Male		0.39 ***	0.35 **	0.14	0.15	0.31 **
[c,a] Hispanic		-0.51	-0.24	-0.32	-0.27	-0.14
[c,a] African American		-0.79	-0.70	-1.68 ***	-1.70 ***	-1.62 ***
[c,a] Other Race/Ethnicity		5.59 ***	5.85 ***	6.16 ***	6.16 ***	5.96 ***
[a] Has a Spouse or Partner		0.63 ***	0.48 **	0.03	0.03	-0.07
[d,a] Lives with Family			-0.05	-0.22	-0.24	-0.22
[d,a] Lives with Others			-1.50 ***	-1.89 ***	-1.92 ***	-1.89 ***
[a] Has an Informal Caregiver			-1.41 ***	-2.05 ***	-2.03 ***	-1.84 ***
[e,a] Primary Payor is Medicare			8.15 ***	7.45 ***	7.52 ***	8.00 ***
[e,a] Primary Payor is Medicaid			3.67 ***	3.51 **	3.58 **	3.82 **
[e,a] Primary Payor is Private Insurance			7.43 ***	7.59 ***	7.63 ***	8.05 ***
[a] Incontinence of Bladder				-0.99 *	-0.98 *	-0.83
[a] Incontinence of Bowels				0.82 **	0.80 **	0.93 **
[a] Needs Help with Medications				3.34 ***	3.34 ***	3.13 ***
[a] Uses Assistive Devices				1.48 ***	1.50 ***	1.24 ***
[a] Uses Medical Devices				2.13 ***	2.14 ***	1.86 ***
[a] Number of ADLs for which help is needed				0.78 ***	0.77 ***	0.81 ***
[a] Any Recent Episodes of Emergency Care				0.83 ***	0.84 ***	0.12
[a] Total Number of Diagnoses				0.45 ***	0.45 ***	0.36 ***
Agency Level Variables						
[b] Annual Admissions					-0.001 **	-0.001 *
[b] Years in Business					0.01	0.01
[b] Number of Referral Sources					0.01	0.01
[b] Number of Care Services Offered					-0.41 ***	-0.42 ***
[b] Number of Counseling Services Offered					-1.20 ***	-1.19 ***
[b] Number of Health Services Offered					0.54 ***	0.54 ***
[b] Number of Social Services Offered					0.09	0.08
[b] Number of Personal Care Aides Employed					-0.12 ***	-0.12 ***
[b] Number of Home Health Aides Employed					0.18 ***	0.18 ***
[b] Number of Instrumental Incentives					-0.64 ***	-0.64 ***
[b] Mean Wage for Home Health Aides					-0.02	-0.02
[b] Personal Care Aide 1-Year Retention Rate					-0.02	-0.02
[b] Home Health Aide 1-Year Retention Rate					-0.02 ***	-0.02 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						-0.0007 ***
C.I._Years in Business						-0.06 ***
C.I._Number of Referral Sources						-0.01
C.I._Number of Care Services Offered						0.21 *
C.I._Number of Counseling Services Offered						0.14
C.I._Number of Health Services Offered						0.29 ***
C.I._Number of Social Services Offered						-0.99 ***
C.I._Number of Personal Care Aides Employed						-0.04 ***
C.I._Number of Home Health Aides Employed						-0.02 ***
C.I._Number of Instrumental Incentives						0.18 ***
C.I._Mean Wage for Home Health Aides						-0.17
C.I._Personal Care Aide 1-Year Retention Rate						-0.02 ***
C.I._Home Health Aide 1-Year Retention Rate						-0.002

Note: All values represent weighted estimates. Models 4 through 6 have slightly reduced sample sizes (64 fewer cases). STATA's mi estimate command issues a warning if the estimation sample varies across imputations. The varied estimation sample in these models is merely a characteristic of the estimator when combined with more than one imputed dataset. The esampvaryok command was used to allow estimation to continue, and results from all imputations were used to compute MI estimates. However, the estimation sample was thus reduced by the number of cases with non-comparable observations.

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 10

Original Data: Coefficients from Mixed-Effects Regression Analysis of Number of Medical Service Visits

	Model 1 (M1)	Model 2 (M2)	Model 3 (M3)	Model 4 (M4)	Model 5 (M5)	Model 6 (M6)
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,255 Consumers in 624 Agencies)	(N = 2,883 Consumers in 614 Agencies)	(N = 2,784 Consumers in 602 Agencies)	(N = 2,388 Consumers in 570 Agencies)	(N = 1,261 Consumers in 284 Agencies)	(N = 1.261 Consumers in 284 Agencies)
Intraclass Correlation Coefficient (ICC)	0.40	0.40	0.42	0.42	0.21	0.22
Consumer Level Variables						
Intercept	12.86 ***	12.97 ***	12.94 ***	13.06 ***	10.80 ***	10.74 ***
[a] Cognitive Impairment Score	0.36 ***	0.35 ***	0.19 ***	-0.16 **	0.25 ***	-0.21 *
[a] Age		0.002	-0.01	-0.0005	-0.01 **	-0.02 ***
[a] Male		0.39 ***	0.14	-0.13	0.26	0.91 ***
[c,a] Hispanic		-1.35 ***	0.89 ***	0.53 **	-3.53 ***	-3.80 ***
[c,a] African American		-0.07	0.06	-0.23	-1.72 ***	-1.18 ***
[c,a] Other Race/Ethnicity		-1.99 ***	-0.98 *	-0.58	-3.37 ***	-2.74 ***
[a] Has a Spouse or Partner		0.63 ***	-0.11	0.40 *	0.99 ***	0.97 ***
[d,a] Lives with Family			0.01	-0.84 ***	-2.38 ***	-2.53 ***
[d,a] Lives with Others			-1.66 ***	-3.01 ***	-4.00 ***	-3.79 ***
[a] Has an Informal Caregiver			-2.55 ***	-3.39 ***	0.64 ***	0.31
[e,a] Primary Payor is Medicare			8.13 ***	8.26 ***	9.27 ***	10.03 ***
[e,a] Primary Payor is Medicaid			4.24 ***	4.15 ***	3.66 ***	4.23 ***
[e,a] Primary Payor is Private Insurance			7.37 ***	9.24 ***	5.03 ***	5.72 ***
[a] Incontinence of Bladder				0.10	1.36 ***	1.50 ***
[a] Incontinence of Bowels				0.14	-0.99 ***	-1.38 ***
[a] Needs Help with Medications				2.78 ***	2.29 ***	2.20 ***
[a] Uses Assistive Devices				3.02 ***	1.42 ***	0.90 ***
[a] Uses Medical Devices				1.35 ***	1.84 ***	1.73 ***
[a] Number of ADLs for which help is needed				0.89 ***	0.96 ***	0.92 ***
[a] Any Recent Episodes of Emergency Care				1.32 ***	1.21 ***	0.85 ***
[a] Total Number of Diagnoses				-0.0001	-0.38 ***	-0.43 ***
Agency Level Variables						
[b] Annual Admissions					0.001 ***	0.0003
[b] Years in Business					-0.11 ***	-0.10 ***
[b] Number of Referral Sources					0.66 ***	0.65 ***
[b] Number of Care Services Offered					-0.97 ***	-0.95 ***
[b] Number of Counseling Services Offered					0.35 ***	0.34 ***
[b] Number of Health Services Offered					-0.15 ***	-0.13 **
[b] Number of Social Services Offered					1.56 ***	1.48 ***
[b] Number of Personal Care Aides Employed					-0.01	0.0004
[b] Number of Home Health Aides Employed					0.03 ***	0.03 ***
[b] Number of Instrumental Incentives					0.09 ***	0.10 ***
[b] Mean Wage for Home Health Aides					0.55 ***	0.59 ***
[b] Personal Care Aide 1-Year Retention Rate					-0.03 ***	-0.03 ***
[b] Home Health Aide 1-Year Retention Rate					0.03 ***	0.02 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						-0.002 ***
C.I._Years in Business						-0.09 ***
C.I._Number of Referral Sources						0.12 ***
C.I._Number of Care Services Offered						-0.10 *
C.I._Number of Counseling Services Offered						0.09
C.I._Number of Health Services Offered						-0.005
C.I._Number of Social Services Offered						0.95 ***
C.I._Number of Personal Care Aides Employed						-0.03 ***
C.I._Number of Home Health Aides Employed						0.003
C.I._Number of Instrumental Incentives						0.05 *
C.I._Mean Wage for Home Health Aides						-0.74 ***
C.I._Personal Care Aide 1-Year Retention Rate						-0.01 *
C.I._Home Health Aide 1-Year Retention Rate						0.01 ***

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 11

Imputed Data: Coefficients from Mixed-Effects Regression Analysis of Number of Non-Medical Service Visits

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)
Intraclass Correlation Coefficient (ICC)	0.48	0.48	0.48	0.49	0.40	0.42
Consumer Level Variables						
Intercept	5.95 ***	5.95 ***	5.95 ***	5.92 ***	6.39 ***	6.39 ***
a Cognitive Impairment Score	0.84 ***	0.85 ***	0.85 ***	0.53 ***	0.52 ***	0.49 ***
a Age		0.04 ***	0.04 ***	0.03 ***	0.03 ***	0.02 ***
a Male		-0.46 ***	-0.41 ***	-0.29 ***	-0.29 ***	-0.30 ***
c,a Hispanic		0.42	0.32	0.82 **	0.81 **	0.19
c,a African American		-0.26	-0.36 *	-0.63 ***	-0.63 ***	-0.33 **
c,a Other Race/Ethnicity		-0.64	-0.67	-0.15	-0.14	-0.10
a Has a Spouse or Partner		0.77 ***	0.76 ***	0.69 ***	0.69 ***	0.73 ***
d,a Lives with Family			0.04	-0.35 **	-0.34 **	-0.34 **
d,a Lives with Others			-1.21 ***	-1.95 ***	-1.96 ***	-1.51 ***
a Has an Informal Caregiver			-0.08	-0.62 ***	-0.62 ***	-0.23 *
e,a Primary Payor is Medicare			0.76	0.49	0.44	0.14
e,a Primary Payor is Medicaid			1.57 ***	1.87 **	1.83 **	1.50 **
e,a Primary Payor is Private Insurance			0.02	0.38	0.30	0.15
a Incontinence of Bladder				0.13	0.12	0.03
a Incontinence of Bowels				0.59 ***	0.60 ***	0.59 ***
a Needs Help with Medications				0.55 ***	0.55 ***	0.77 ***
a Uses Assistive Devices				1.07 ***	1.07 ***	0.91 ***
a Uses Medical Devices				-1.37 ***	-1.38 ***	-1.44 ***
a Number of ADLs for which help is needed				0.99 ***	0.99 ***	1.02 ***
a Any Recent Episodes of Emergency Care				-0.30 *	-0.30 **	-0.24
a Total Number of Diagnoses				0.16 ***	0.16 ***	0.14 ***
Agency Level Variables						
b Annual Admissions					-0.001 ***	-0.001 ***
b Years in Business					0.03 ***	0.03 ***
b Number of Referral Sources					0.16 ***	0.16 ***
b Number of Care Services Offered					0.52 ***	0.52 ***
b Number of Counseling Services Offered					0.21 **	0.20 **
b Number of Health Services Offered					-0.39 ***	-0.39 ***
b Number of Social Services Offered					-1.95 ***	-1.94 ***
b Number of Personal Care Aides Employed					0.14 ***	0.14 ***
b Number of Home Health Aides Employed					-0.06 ***	-0.06 ***
b Number of Instrumental Incentives					-0.06 ***	-0.06 ***
b Mean Wage for Home Health Aides					-0.19	-0.19
b Personal Care Aide 1-Year Retention Rate					0.02 *	0.02 *
b Home Health Aide 1-Year Retention Rate					0.02 ***	0.02 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						0.00005
C.I._Years in Business						0.02 ***
C.I._Number of Referral Sources						0.02
C.I._Number of Care Services Offered						-0.28 ***
C.I._Number of Counseling Services Offered						0.38 ***
C.I._Number of Health Services Offered						0.32 ***
C.I._Number of Social Services Offered						-0.77 ***
C.I._Number of Personal Care Aides Employed						-0.01 *
C.I._Number of Home Health Aides Employed						-0.01 ***
C.I._Number of Instrumental Incentives						-0.17 ***
C.I._Mean Wage for Home Health Aides						-0.10 *
C.I._Personal Care Aide 1-Year Retention Rate						0.02 **
C.I._Home Health Aide 1-Year Retention Rate						-0.01 ***

Note: All values represent weighted estimates. Models 4 through 6 have slightly reduced sample sizes (64 fewer cases). STATA's mi estimate command issues a warning if the estimation sample varies across imputations. The varied estimation sample in these models is merely a characteristic of the estimator when combined with more than one imputed dataset. The esampvaryok command was used to allow estimation to continue, and results from all imputations were used to compute MI estimates. However, the estimation sample was thus reduced by the number of cases with non-comparable observations.

a Measure has been Group Mean Centered
b Measure has been Grand Mean Centered
c Compared to: White
d Compared to: Lives Alone
e Compared to: Primary Payor is Self Pay
* *p* < .05
** *p* < .01
*** *p* < .001

Appendix D- Table 12

Original Data: Coefficients from Mixed-Effects Regression Analysis of Number of Non-Medical Service Visits

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,255 Consumers in 624 Agencies)	(N = 2,883 Consumers in 614 Agencies)	(N = 2,784 Consumers in 602 Agencies)	(N = 2,388 Consumers in 570 Agencies)	(N = 1,261 Consumers in 284 Agencies)	(N = 1.261 Consumers in 284 Agencies)
Intraclass Correlation Coefficient (ICC)	0.46	0.48	0.47	0.52	0.31	0.33
Consumer Level Variables						
Intercept	5.71 ***	5.68 ***	5.77 ***	5.74 ***	5.53 ***	5.58 ***
[a] Cognitive Impairment Score	0.76 ***	0.77 ***	0.78 ***	0.73 ***	-0.30 ***	-0.19 **
[a] Age		0.04 ***	0.04 ***	0.01 ***	0.02 ***	0.02 ***
[a] Male		-0.10	-0.21 **	-0.12	-1.30 ***	-1.51 ***
[c,a] Hispanic		0.22	0.07	0.52 ***	-1.37 ***	-1.50 ***
[c,a] African American		-0.88 ***	-1.00 ***	-0.68 ***	-1.21 ***	-1.01 ***
[c,a] Other Race/Ethnicity		-1.04 ***	-1.10 ***	-0.68 *	-3.29 ***	-2.69 ***
[a] Has a Spouse or Partner		0.60 ***	0.69 ***	0.63 ***	0.19	0.51 ***
[d,a] Lives with Family			-0.05	-1.07 ***	-0.85 ***	-1.38 ***
[d,a] Lives with Others			-1.32 ***	-2.78 ***	-2.13 ***	-2.07 ***
[a] Has an Informal Caregiver			-0.18	0.41 ***	-0.20	-0.06
[e,a] Primary Payor is Medicare			1.69 ***	-0.32	-0.91 **	-0.70 *
[e,a] Primary Payor is Medicaid			2.25 ***	2.35 ***	1.79 ***	2.04 ***
[e,a] Primary Payor is Private Insurance			0.44	-0.17	-1.36 ***	-0.38
[a] Incontinence of Bladder				0.36 ***	0.36 ***	0.48 ***
[a] Incontinence of Bowels				-1.41 ***	-0.07	-0.09
[a] Needs Help with Medications				0.99 ***	1.46 ***	1.29 ***
[a] Uses Assistive Devices				1.92 ***	2.29 ***	2.16 ***
[a] Uses Medical Devices				-1.50 ***	-0.66 ***	-0.67 ***
[a] Number of ADLs for which help is needed				1.13 ***	1.36 ***	1.34 ***
[a] Any Recent Episodes of Emergency Care				-0.55 ***	-0.20	-0.05
[a] Total Number of Diagnoses				0.22 ***	0.30 ***	0.27 ***
Agency Level Variables						
[b] Annual Admissions					0.0003 *	0.0004 **
[b] Years in Business					-0.04 ***	-0.04 ***
[b] Number of Referral Sources					0.22 ***	0.24 ***
[b] Number of Care Services Offered					0.02	0.01
[b] Number of Counseling Services Offered					-0.87 ***	-0.88 ***
[b] Number of Health Services Offered					-0.30 ***	-0.28 ***
[b] Number of Social Services Offered					-0.73 ***	-0.84 ***
[b] Number of Personal Care Aides Employed					0.14 ***	0.14 ***
[b] Number of Home Health Aides Employed					-0.04 ***	-0.04 ***
[b] Number of Instrumental Incentives					-0.05 *	-0.06 **
[b] Mean Wage for Home Health Aides					-0.42 ***	-0.45 ***
[b] Personal Care Aide 1-Year Retention Rate					0.01 ***	0.01 ***
[b] Home Health Aide 1-Year Retention Rate					-0.001	-0.003
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						0.0004 **
C.I._Years in Business						0.02 ***
C.I._Number of Referral Sources						0.04 *
C.I._Number of Care Services Offered						0.07 *
C.I._Number of Counseling Services Offered						-0.11
C.I._Number of Health Services Offered						0.16 ***
C.I._Number of Social Services Offered						0.81 ***
C.I._Number of Personal Care Aides Employed						-0.01 **
C.I._Number of Home Health Aides Employed						0.0002
C.I._Number of Instrumental Incentives						-0.27 ***
C.I._Mean Wage for Home Health Aides						-0.16 ***
C.I._Personal Care Aide 1-Year Retention Rate						-0.004 *
C.I._Home Health Aide 1-Year Retention Rate						-0.02 ***

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 13

Imputed Data: Coefficients from Mixed-Effects Regression Analysis of Readmission Status

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,309 Consumers in 627 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)	(N = 3,245 Consumers in 624 Agencies)
Intraclass Correlation Coefficient (ICC)	0.37	0.34	0.34	0.34	0.31	0.32
Consumer Level Variables						
Intercept	0.28 ***	0.28 ***	0.28 ***	0.28 ***	0.30 ***	0.30 ***
a Cognitive Impairment Score	0.02 ***	0.02 ***	0.02 ***	-0.002	-0.001	-0.01 *
a Age		0.001 ***	0.001 **	0.001 **	0.001 **	0.001 **
a Male		-0.01 *	-0.01	-0.01 **	-0.01 **	-0.01
c,a Hispanic		-0.06 ***	-0.08 ***	-0.07 ***	-0.07 ***	-0.08 ***
c,a African American		0.004	0.003	0.000	-0.001	-0.004
c,a Other Race/Ethnicity		-0.04 *	-0.05 *	-0.01	-0.01	-0.02
a Has a Spouse or Partner		-0.01	-0.003	-0.001	-0.002	-0.01
d,a Lives with Family			0.01 *	0.01	0.01	0.02 **
d,a Lives with Others			0.02 *	0.03	0.03 *	0.03 **
a Has an Informal Caregiver			-0.03 ***	-0.04 ***	-0.04 ***	-0.05 ***
e,a Primary Payor is Medicare			-0.09	-0.07	-0.07	-0.07
e,a Primary Payor is Medicaid			-0.01	0.01	0.01	0.01
e,a Primary Payor is Private Insurance			-0.20	-0.18	-0.18	-0.18
a Incontinence of Bladder				0.01	0.01	0.004
a Incontinence of Bowels				0.11 ***	0.11 ***	0.12 ***
a Needs Help with Medications				0.03 ***	0.03 ***	0.04 ***
a Uses Assistive Devices				0.07 ***	0.07 ***	0.07 ***
a Uses Medical Devices				0.02 ***	0.02 ***	0.02 **
a Number of ADLs for which help is needed				-0.02 ***	-0.02 ***	-0.02 ***
a Any Recent Episodes of Emergency Care				0.07 ***	0.07 ***	0.06 ***
a Total Number of Diagnoses				0.004 *	0.004 **	0.004 **
Agency Level Variables						
b Annual Admissions					-0.0001 ***	-0.0001 ***
b Years in Business					-0.0001	-0.00004
b Number of Referral Sources					-0.02 ***	-0.02 ***
b Number of Care Services Offered					-0.01 ***	-0.01 ***
b Number of Counseling Services Offered					0.003	0.003
b Number of Health Services Offered					0.01 ***	0.01 ***
b Number of Social Services Offered					0.07 ***	0.07 ***
b Number of Personal Care Aides Employed					-0.001 ***	-0.001 ***
b Number of Home Health Aides Employed					0.001 ***	0.001 ***
b Number of Instrumental Incentives					0.001	0.001
b Mean Wage for Home Health Aides					-0.001	-0.002
b Personal Care Aide 1-Year Retention Rate					-0.0001	-0.0001
b Home Health Aide 1-Year Retention Rate					0.002 ***	0.002 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						0.00001 **
C.I._Years in Business						-0.003 ***
C.I._Number of Referral Sources						0.002 *
C.I._Number of Care Services Offered						0.01 **
C.I._Number of Counseling Services Offered						0.004
C.I._Number of Health Services Offered						-0.01 ***
C.I._Number of Social Services Offered						0.001
C.I._Number of Personal Care Aides Employed						-0.001 ***
C.I._Number of Home Health Aides Employed						0.001 ***
C.I._Number of Instrumental Incentives						0.001
C.I._Mean Wage for Home Health Aides						0.002
C.I._Personal Care Aide 1-Year Retention Rate						-0.001 ***
C.I._Home Health Aide 1-Year Retention Rate						0.001 ***

Note: All values represent weighted estimates. Models 4 through 6 have slightly reduced sample sizes (64 fewer cases). STATA's mi estimate command issues a warning if the estimation sample varies across imputations. The varied estimation sample in these models is merely a characteristic of the estimator when combined with more than one imputed dataset. The esampvaryok command was used to allow estimation to continue, and results from all imputations were used to compute MI estimates. However, the estimation sample was thus reduced by the number of cases with non-comparable observations.

a Measure has been Group Mean Centered
b Measure has been Grand Mean Centered
c Compared to: White
d Compared to: Lives Alone
e Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 14

Original Data: Coefficients from Mixed-Effects Regression Analysis of Readmission Status

	Model 1 (M1)	**Model 2 (M2)**	**Model 3 (M3)**	**Model 4 (M4)**	**Model 5 (M5)**	**Model 6 (M6)**
	Unadjusted Model	M1 plus Predisposing Factors	M2 plus Enabling Factors	M3 plus Illness- Level Factors	M4 plus Agency Characteristics	M5 plus Cross-Level Interactions
	(N = 3,179 Consumers in 619 Agencies)	(N = 2,824 Consumers in 607 Agencies)	(N = 2,732 Consumers in 595 Agencies)	(N = 2,344 Consumers in 563 Agencies)	(N = 1,246 Consumers in 283 Agencies)	(N = 1,246 Consumers in 283 Agencies)
Intraclass Correlation Coefficient (ICC)	0.20	0.17	0.19	0.18	0.13	0.15
Consumer Level Variables						
Intercept	0.28 ***	0.28 ***	0.28 ***	0.27 ***	0.27 ***	0.27 ***
[a] Cognitive Impairment Score	0.02 ***	0.002	-0.002	-0.01 *	0.002 ***	-0.02 ***
[a] Age		0.001 ***	0.001 ***	0.001 ***	0.002 ***	0.001 ***
[a] Male		0.01 **	0.04 ***	0.03 ***	-0.03 ***	-0.03 ***
[c,a] Hispanic		-0.11 ***	-0.10 ***	-0.09 ***	0.13 ***	0.13 ***
[c,a] African American		-0.02 ***	-0.03 ***	-0.02 **	-0.05 ***	-0.05 ***
[c,a] Other Race/Ethnicity		-0.08 ***	-0.05 **	0.02	0.19 ***	0.16 ***
[a] Has a Spouse or Partner		-0.03 ***	-0.04 ***	-0.01	-0.01 *	-0.03 ***
[d,a] Lives with Family			0.01	-0.03 ***	-0.04 ***	-0.02 *
[d,a] Lives with Others			0.02 **	-0.05 ***	-0.01	-0.01
[a] Has an Informal Caregiver			0.002	0.02 ***	0.06 ***	0.04 ***
[e,a] Primary Payor is Medicare			0.06 ***	0.07 ***	0.10 ***	0.15 ***
[e,a] Primary Payor is Medicaid			0.13 ***	0.12 ***	0.23 ***	0.24 ***
[e,a] Primary Payor is Private Insurance			-0.08 ***	-0.09 ***	0.06 *	0.05 *
[a] Incontinence of Bladder				0.01	0.003	-0.02 ***
[a] Incontinence of Bowels				0.04 ***	0.07 ***	0.08 ***
[a] Needs Help with Medications				0.02 ***	-0.10 ***	-0.08 ***
[a] Uses Assistive Devices				0.04 ***	0.11 ***	0.10 ***
[a] Uses Medical Devices				0.05 ***	-0.02 **	-0.03 ***
[a] Number of ADLs for which help is needed				-0.01 ***	-0.02 ***	-0.02 ***
[a] Any Recent Episodes of Emergency Care				0.09 ***	0.19 ***	0.15 ***
[a] Total Number of Diagnoses				-0.002	0.001	0.002
Agency Level Variables						
[b] Annual Admissions					-0.0001 ***	-0.0001 ***
[b] Years in Business					-0.0004	0.0004
[b] Number of Referral Sources					-0.02 ***	-0.02 ***
[b] Number of Care Services Offered					0.01 **	0.004
[b] Number of Counseling Services Offered					0.003	0.001
[b] Number of Health Services Offered					0.002	0.001
[b] Number of Social Services Offered					0.09 ***	0.10 ***
[b] Number of Personal Care Aides Employed					-0.001 ***	-0.001 ***
[b] Number of Home Health Aides Employed					0.002 ***	0.002 ***
[b] Number of Instrumental Incentives					-0.003 **	-0.001
[b] Mean Wage for Home Health Aides					-0.01 ***	-0.01 ***
[b] Personal Care Aide 1-Year Retention Rate					0.0001	-0.0001
[b] Home Health Aide 1-Year Retention Rate					0.002 ***	0.002 ***
Cross-Level Interactions between Cognitive Impairment (C.I.) and Agency Characteristics						
C.I._Annual Admissions						0.00002 **
C.I._Years in Business						-0.01 ***
C.I._Number of Referral Sources						-0.003 **
C.I._Number of Care Services Offered						0.01 **
C.I._Number of Counseling Services Offered						-0.01 *
C.I._Number of Health Services Offered						-0.01 ***
C.I._Number of Social Services Offered						0.02 ***
C.I._Number of Personal Care Aides Employed						0.0001
C.I._Number of Home Health Aides Employed						0.001 ***
C.I._Number of Instrumental Incentives						0.005 ***
C.I._Mean Wage for Home Health Aides						-0.002
C.I._Personal Care Aide 1-Year Retention Rate						-0.001 ***
C.I._Home Health Aide 1-Year Retention Rate						0.001 ***

[a] Measure has been Group Mean Centered
[b] Measure has been Grand Mean Centered
[c] Compared to: White
[d] Compared to: Lives Alone
[e] Compared to: Primary Payor is Self Pay
* $p < .05$
** $p < .01$
*** $p < .001$

Appendix D- Table 15

Simulated Agency Profiles: Influences on Relationship between Cognitive Impairment and Average Daily Charges

					Profile 1				Profile 2			
Agency Characteristic	Regression Coefficients *	Mean **	S.D. **	1/2 S.D. **	1/2 S.D. Below Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score	1/2 S.D. Above Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score
Years in Business	-0.41	19.60	15.29	7.65	11.96	-4.93	-9.87	-14.80	27.25	-11.24	-22.49	-33.73

* = Cross-Level Interactions between Cognitive Impairment Score and Agency Characteristics

** = Based on original, unimputed data for which Standard Deviations are available

Appendix D- Table 16

Simulated Agency Profiles: Influences on Relationship between Cognitive Impairment and Days of Service

					Profile 1				Profile 2			
Agency Characteristic	Regression Coefficients *	Mean **	S.D. **	1/2 S.D. **	1/2 S.D. Below Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score	1/2 S.D. Above Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score
Annual Admissions	0.01	1060.34	1057.61	528.81	531.54	5.41	10.81	16.22	1589.15	16.16	32.32	48.49
Years in Business	-0.58	19.60	15.29	7.65	11.96	-6.88	-13.76	-20.64	27.25	-15.68	-31.37	-47.05
Number of Care Services Offered	3.38	2.31	1.76	0.88	1.43	4.83	9.67	14.50	3.19	10.78	21.56	32.35
Number of Health Services Offered	-10.66	7.63	2.66	1.33	6.30	-67.19	-134.38	-201.57	8.96	-95.56	-191.11	-286.67
Number of Personal Care Aides Employed	0.47	15.43	33.15	16.58	-1.15	-0.54	-1.07	-1.61	32.01	15.02	30.04	45.06
Number of Instrumental Incentives	-2.78	7.83	4.15	2.08	5.76	-16.00	-32.01	-48.01	9.91	-27.55	-55.09	-82.64
Mean Wage for Home Health Aides	3.98	10.50	2.28	1.14	9.36	37.24	74.49	111.73	11.64	46.32	92.63	138.95

* = Cross-Level Interactions between Cognitive Impairment Score and Agency Characteristics

** = Based on original, unimputed data for which Standard Deviations are available

Appendix D- Table 17

Simulated Agency Profiles: Influences on Relationship between Cognitive Impairment and Total Number of Service Visits

					Profile 1				Profile 2			
Agency Characteristic	Regression Coefficients *	Mean **	S.D. **	1/2 S.D. **	1/2 S.D. Below Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score	1/2 S.D. Above Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score
Years in Business	-0.07	19.60	15.29	7.65	11.96	-0.84	-1.67	-2.51	27.25	-1.91	-3.81	-5.72
Number of Care Services Offered	-0.37	2.31	1.76	0.88	1.43	-0.53	-1.06	-1.59	3.19	-1.18	-2.36	-3.54
Number of Counseling Services Offered	1.07	1.21	1.31	0.66	0.56	0.59	1.19	1.78	1.87	2.00	3.99	5.99
Number of Health Services Offered	0.65	7.63	2.66	1.33	6.30	4.10	8.19	12.29	8.96	5.82	11.65	17.47
Number of Social Services Offered	-2.37	1.38	0.69	0.35	1.04	-2.45	-4.91	-7.36	1.73	-4.09	-8.18	-12.26
Number of Personal Care Aides Employed	-0.03	15.43	33.15	16.58	-1.15	0.03	0.07	0.10	32.01	-0.96	-1.92	-2.88
Number of Home Health Aides Employed	-0.09	25.54	32.09	16.05	9.50	-0.85	-1.71	-2.56	41.59	-3.74	-7.49	-11.23
Number of Instrumental Incentives	0.18	7.83	4.15	2.08	5.76	1.04	2.07	3.11	9.91	1.78	3.57	5.35

* = Cross-Level Interactions between Cognitive Impairment Score and Agency Characteristics

** = Based on original, unimputed data for which Standard Deviations are available

Appendix D- Table 18

Simulated Agency Profiles: Influences on Relationship between Cognitive Impairment and Number of Medical Service Visits

					Profile 1				Profile 2			
Agency Characteristic	Regression Coefficients *	Mean **	S.D. **	1/2 S.D. **	1/2 S.D. Below Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score	1/2 S.D. Above Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score
Annual Admissions	-0.0007	1060.34	1057.61	528.81	531.54	-0.39	-0.78	-1.16	1589.15	-1.16	-2.32	-3.48
Years in Business	-0.06	19.60	15.29	7.65	11.96	-0.66	-1.32	-1.97	27.25	-1.50	-3.00	-4.50
Number of Care Services Offered	0.21	2.31	1.76	0.88	1.43	0.30	0.60	0.90	3.19	0.67	1.34	2.00
Number of Health Services Offered	0.29	7.63	2.66	1.33	6.30	1.81	3.61	5.42	8.96	2.57	5.14	7.71
Number of Social Services Offered	-0.99	1.38	0.69	0.35	1.04	-1.02	-2.05	-3.07	1.73	-1.71	-3.41	-5.12
Number of Personal Care Aides Employed	-0.04	15.43	33.15	16.58	-1.15	0.04	0.08	0.12	32.01	-1.14	-2.28	-3.42
Number of Home Health Aides Employed	-0.02	25.54	32.09	16.05	9.50	-0.18	-0.36	-0.54	41.59	-0.78	-1.57	-2.35
Number of Instrumental Incentives	0.18	7.83	4.15	2.08	5.76	1.01	2.02	3.04	9.91	1.74	3.48	5.23

* = Cross-Level Interactions between Cognitive Impairment Score and Agency Characteristics

** = Based on original, unimputed data for which Standard Deviations are available

Appendix D- Table 19

Simulated Agency Profiles: Influences on Relationship between Cognitive Impairment and Number of Non-Medical Service Visits

					Profile 1				Profile 2			
Agency Characteristic	Regression Coefficients *	Mean **	S.D. **	1/2 S.D. **	1/2 S.D. Below Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score	1/2 S.D. Above Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score
Years in Business	0.02	19.60	15.29	7.65	11.96	0.23	0.47	0.70	27.25	0.53	1.07	1.60
Number of Care Services Offered	-0.28	2.31	1.76	0.88	1.43	-0.40	-0.80	-1.20	3.19	-0.89	-1.78	-2.67
Number of Counseling Services Offered	0.38	1.21	1.31	0.66	0.56	0.21	0.42	0.64	1.87	0.71	1.42	2.13
Number of Health Services Offered	0.32	7.63	2.66	1.33	6.30	2.02	4.05	6.07	8.96	2.88	5.76	8.64
Number of Social Services Offered	-0.77	1.38	0.69	0.35	1.04	-0.80	-1.60	-2.40	1.73	-1.33	-2.67	-4.00
Number of Personal Care Aides Employed	-0.01	15.43	33.15	16.58	-1.15	0.01	0.01	0.02	32.01	-0.18	-0.35	-0.53
Number of Home Health Aides Employed	-0.01	25.54	32.09	16.05	9.50	-0.14	-0.28	-0.42	41.59	-0.61	-1.23	-1.84
Number of Instrumental Incentives	-0.17	7.83	4.15	2.08	5.76	-0.96	-1.92	-2.88	9.91	-1.65	-3.30	-4.96
Mean Wage for Home Health Aides	-0.10	10.50	2.28	1.14	9.36	-0.97	-1.94	-2.91	11.64	-1.21	-2.41	-3.62

* = Cross-Level Interactions between Cognitive Impairment Score and Agency Characteristics

** = Based on original, unimputed data for which Standard Deviations are available

Appendix D- Table 20

Simulated Agency Profiles: Influences on Relationship between Cognitive Impairment and Readmission Status

					Profile 1				Profile 2			
Agency Characteristic	Regression Coefficients *	Mean **	S.D. **	1/2 S.D. **	1/2 S.D. Below Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score	1/2 S.D. Above Mean	1-Point Increase in Cognitive Impairment Score Above Agency Mean Score	2-Point Increase in Cognitive Impairment Score Above Agency Mean Score	3-Point Increase in Cognitive Impairment Score Above Agency Mean Score
Annual Admissions	0.00001	1060.34	1057.61	528.81	531.54	0.01	0.01	0.02	1589.15	0.02	0.03	0.05
Years in Business	-0.003	19.60	15.29	7.65	11.96	-0.04	-0.08	-0.12	27.25	-0.09	-0.19	-0.28
Number of Referral Sources	0.002	7.21	2.71	1.36	5.86	0.01	0.03	0.04	8.57	0.02	0.04	0.06
Number of Care Services Offered	0.01	2.31	1.76	0.88	1.43	0.01	0.02	0.02	3.19	0.02	0.03	0.05
Number of Health Services Offered	-0.01	7.63	2.66	1.33	6.30	-0.05	-0.10	-0.15	8.96	-0.07	-0.14	-0.22
Number of Personal Care Aides Employed	-0.001	15.43	33.15	16.58	-1.15	0.00	0.00	0.00	32.01	-0.02	-0.05	-0.07
Number of Home Health Aides Employed	0.001	25.54	32.09	16.05	9.50	0.01	0.02	0.03	41.59	0.04	0.08	0.12

* = Cross-Level Interactions between Cognitive Impairment Score and Agency Characteristics

** = Based on original, unimputed data for which Standard Deviations are available