

Examining Health Conditions as Predictors of Unmet Need in Older Adults
Anna Broshkevitch, Madeleine Cáceres, Carolyn Foley, and Drew Vipperman
UH 4504: Decision-Making with Geriatric Health
4 December 2018

Abstract

According to current research, unmet need for activities of daily living (ADLs) are associated with greater negative health outcomes in older adults. ADLs include eating, bathing, dressing, transferring from a bed or a chair, and toileting. As the U.S. population ages, it is vital to identify predictors of unmet need in order to interrupt this progression and improve quality of life throughout the aging process. In our analysis, we evaluated chronic and acute health conditions, such as high blood pressure, osteoporosis, and cancer, as predictors of unmet need. We distinguished self-care and mobility-specific types of unmet need, and computed the frequencies of each condition and unmet need of each type. We then used the Chi Square (χ^2) and Fisher's Exact tests to evaluate relationships for statistical significance. Through these analyses, we have identified dementia ($p=0.04$), heart attack ($p=0.04$), and stroke ($p=0.02$) as having significant associations with unresolved unmet need. Working from a disablement model theoretical framework that distinguishes between actual and intrinsic disability, we recommend a large-scale shift from the diagnostic healthcare model to more preventative model of healthcare. Specifically, we suggest providing free or affordable mobility assistance upon diagnosis of heart attack or stroke and free or affordable self-care assistance upon diagnosis of dementia, thus reducing future hospitalization costs and bridging the gap between human physical/mental capacity and environmental demand. We recommend further research be done to evaluate the causal relationship between chronic and acute health conditions and unmet need.

Introduction

As medical technology in the United States becomes more advanced, the population of adults living to an advanced age continues to grow. Currently, individuals over 65 years of age comprise 15.6% of the US population (U.S. Census Bureau, 2018), a number which is expected to double by 2060 (Mather, 2016). In light of this rapid demographic change, research must be done to find new political, social, and medical solutions to meet the needs of our aging population. Older adults have a higher prevalence of disability compared to the overall population, with about one quarter of adults over the age of 65 and approximately half of adults over the age of 85 reporting at least one disability (Hung, Ross, Boockvar, & Siu, 2011, p. 9). Disability is measured based on limitations when performing activities of daily living (ADLs) and instrumental activities of daily living (IADLs). ADLs typically include eating, bathing, dressing, transferring from a bed or a chair, and toileting, while IADLs can include shopping, cooking, managing medications, doing housework, doing laundry, driving or using public transportation, and managing finances.

Older adults living with a condition that limits their ADL or IADL capabilities often require assistance from others to meet their daily needs. This assistance can come from unpaid helpers, such as family members, and paid helpers, either in the community or in long-term care institutions. Nearly 90% of older adults who require help with ADLs and/or IADLs use unpaid help, while only 13% of this population uses paid helpers, suggesting that family members continue to be the primary source of care for older adults (Kaye, Harrington, & Laplante, 2010, p. 15). Nevertheless, older adults with ADL or IADL limitations do not always receive adequate assistance in completing these tasks, resulting in unmet need. Using Herr, Arvieu, Aegerter,

Robine, and Ankri's (2014) definition, we define unmet need as the "...difference between the health care services deemed necessary to deal with a particular health problem and the actual services received" (p. 808). Of community-residing older adults who require ADL assistance, 31% report inadequate help for their ADL need (Freedman & Spillman, 2014b, p. 42).

Overall, older adults with unmet need tend to have more negative health outcomes and a reduced quality of life. One study using data from the National Long-Term Care Survey (or NLTCS) and vital statistics from the Centers for Medicare and Medicaid Services found that older adults who reported insufficient help were 14% more likely to experience at least one hospitalization than those with sufficient help (Xu, Covinsky, Stallard, Thomas, & Sands, 2012, p. 928). Another study using NLTCS data found that older adults who returned home from a hospitalization with unmet ADL needs had an increased risk for hospital readmissions than those with met need. More specifically, unmet need for new disabilities acquired following hospitalization was associated with the highest risk for hospital readmission, compared to those with met need (DePalma, Lentzner, & Weeks, 2001, p. 454). A third study using data from NLTCS and the vital statistics record from the Centers for Medicare and Medicaid Services found that unmet ADL need in older adults, who needed help for 1 or 2 ADL limitations, was associated with a greater risk for 1-year mortality compared to those with met need (He, Craig, Xu, Covinsky, Stallard, Thomas, Hass, & Sands, 2015, p. 1128). In a 2015 study, Hass, et al. found that the overall incidence rate for emergency department admissions was 19% greater for older adults with unmet ADL need compared to those with met need. This increased incidence rate was particularly pronounced for falls and injuries (p. 206).

Due to the increased likelihood of costly negative health outcomes, it is pertinent that we develop interventions for this population of older adults with unmet ADL need, which constitutes nearly a third of older adults with ADL need. As such we have set out to identify those health conditions that predict resolution or lack of resolution of unmet need, which has been formulated into our research question: which health conditions predict for resolved versus unresolved unmet need? We hypothesized that acute conditions resulting in a sudden decrease in physical ability would result in greater unresolved unmet mobility need. Conversely, conditions, either acute or chronic, that decrease a patient's self awareness and ability to self advocate will result in greater unresolved unmet self-care need.

Theoretical framework

As we identify conditions as potential predictors of unmet need it is crucial to think critically about the physiological processes involved in these relationships. We have identified conceptual theories that will be utilized to understand these relationships. As stated in Jette and Verbrugge's Disablement Process, disease resulting in abnormal functioning of body systems will cause functional limitations, eventually leading to handicap. In the scope of this research study, we will determine the disease(s) that may lead to unmet need, and from there, extrapolate the disease process leading to progression through this model. This adds impetus to our study as identification of pertinent diseases can clarify points of intervention within the Disablement Process, preventing further advancement into disability.

Methodology

Measures

We used data from the National Health and Aging Trends Study (NHATS) to determine whether specific health conditions could predict for increased unmet need. The NHATS data was collected from a relatively inclusive sample of Medicare beneficiaries over the age of 65. Based on the classifications provided in the NHATS guidelines, we defined *ADL disability* as either experiencing difficulty completing ADLs or as requiring help from people or assistive devices in order to complete ADLs. NHATS's examples of activities of daily living included: eating, bathing, dressing, toileting, and mobility. This category encompasses data on transferring in and out of bed, as well as data on going outside and getting around in the home. Unmet ADL need refers to experiencing a consequence because an ADL task was left incomplete due to lack of assistance within the previous month. Using these measures, we examined the data in several steps to identify any potential relationships between specific health conditions and resolution (or lack thereof) of unmet ADL need.

The participants in the NHATS survey reported whether they had, at the time of the interview, experienced any of the following ten conditions within the past year: heart attack, heart disease, high blood pressure, arthritis, osteoporosis, diabetes, lung disease, stroke, dementia/Alzheimer's disease, and cancer. Because the subset of data used for this analysis included two years of responses, each NHATS participant provided two time points for this variable. Year 1 is the initial time point, and Year 2 is one year after Year 1. We used these ten conditions in our analysis, paying particular attention to each of their disease patterns in our discussion of the results. For example, we expected that acute conditions (heart attack and

stroke) might result in different health consequences than chronic conditions (all others listed previously), thereby impacting the feasibility of resolving unmet need.

Each Medicare beneficiary in the NHATS study also reported whether they had experienced unmet need (as defined above) for an ADL disability within the past year. All participants in the sample examined were identified as having ADL disability for at least one ADL task, and the subset of data used included only beneficiaries who had reported unmet need in Year 1. In Year 2, each participant either continued to report unmet need, or reported that all ADL needs were met, indicating that their unmet need from Year 1 was resolved. We divided unmet need into unmet *self-care* need and unmet *mobility* need and analyzed each category separately. Unmet self-care need refers to participants reporting unmet need for one or more self-care tasks (eating, bathing, dressing, and toileting), while unmet mobility need refers to participants reporting unmet need when transferring from a bed, going outside, or getting around inside the home. These categories are not mutually exclusive, so participants with both unmet self-care and mobility needs were included in both analyses.

Organization of Data

Our preliminary analysis investigated associations between each of the ten previously specified medical conditions and status of unmet need over a two year period (resolution or lack of resolution of initial unmet need). We compared the prevalence of unmet need for each group of individuals with a specific health condition to the prevalence of unmet need for all individuals in the sample.

As mentioned previously, we divided the data into *self-care* and *mobility* based on the reporting in Year 1. Since self-care and mobility needs require slightly different motor and

cognitive skills, which are controlled by different body systems, we suspected that the nature of certain health conditions might inhibit certain individuals from completing either mobility tasks or self-care tasks but not necessarily both. We rationalized this separation of tasks because the distinction would likely be important in our policy recommendation.

Health Conditions in Year 1 as Predictors of the Resolution of Unmet Need

Second, we organized the data into a workable format and created frequency tables to compare the status of unmet need after one year for each health condition and for each task type (self-care tasks or mobility tasks). Frequency tables were created in two slightly different ways. In the first analysis, we divided the incidence of resolved unmet need within each health condition group by the total number of individuals within that specific health condition group. We compared the frequencies found for each health condition graphically, allowing us to determine whether individuals with a specific health condition were more likely to have unmet needs resolved or not resolved as compared to individuals with other medical conditions. In the second analysis, the incidence of resolved and unresolved unmet within a health condition group was divided by the total number of individuals (across all groups) reporting the same status of unmet need. The frequencies found for each status of unmet need within each health condition were graphed as well, providing a more comprehensive representation of the connection between specific medical conditions and resolution of unmet need. Next, we conducted Chi Square (χ^2) tests using the frequencies from this second analysis to determine the statistical significance of associations between the variables.

Health Conditions in Years 1 and 2 as Predictors of the Resolution of Unmet Need

To evaluate the relationship between having a specific health condition and the resolution of unmet need further, we looked at the health condition information from Year 1 and Year 2 of the study. The participants' answers in Year 1 represented whether they had each condition ever, and their answers in Year 2 represented whether they had each condition between Years 1 and 2. Conceptually, it was improbable that participants with chronic conditions in Year 1 would not have chronic conditions in Year 2, and the data supported that conceptual assumption.

Health Condition Status between Years 1 and 2	
Abbreviation	Meaning
Yes:Yes	Had condition prior to Year 1 and between Years 1 and 2
Yes:No	Had condition prior to year 1 but not between Years 1 and 2 (improbable for chronic conditions)
No:Yes	Had condition between Years 1 and 2 but not prior to Year 1
No:No	Never had condition

Table 1: *Health Condition Status between Years 1 and 2 Abbreviations and Meanings*

We found a prevalence of resolved and unresolved unmet need for each response pattern within each condition. Then, we calculated frequencies by dividing the number of individuals reporting each unmet need status (resolved or unresolved) and disease pattern over the two year period by the total number of individuals across all health status groups reporting that same unmet need status. We graphed frequencies for conditions found to have significant associations

with unmet need status in the original analysis to facilitate visual comparison of results. Finally, we completed a χ^2 test to analyze whether resulting associations were statistically significant. For health condition groups in which the expected value of one cell of the frequency table was less than five, we completed a Fisher's exact test instead to account for the smaller sample size. For both the χ^2 and Fisher's exact tests, we used a significance level of 0.05, meaning p-values less than 0.05 were considered statistically significant.

Results

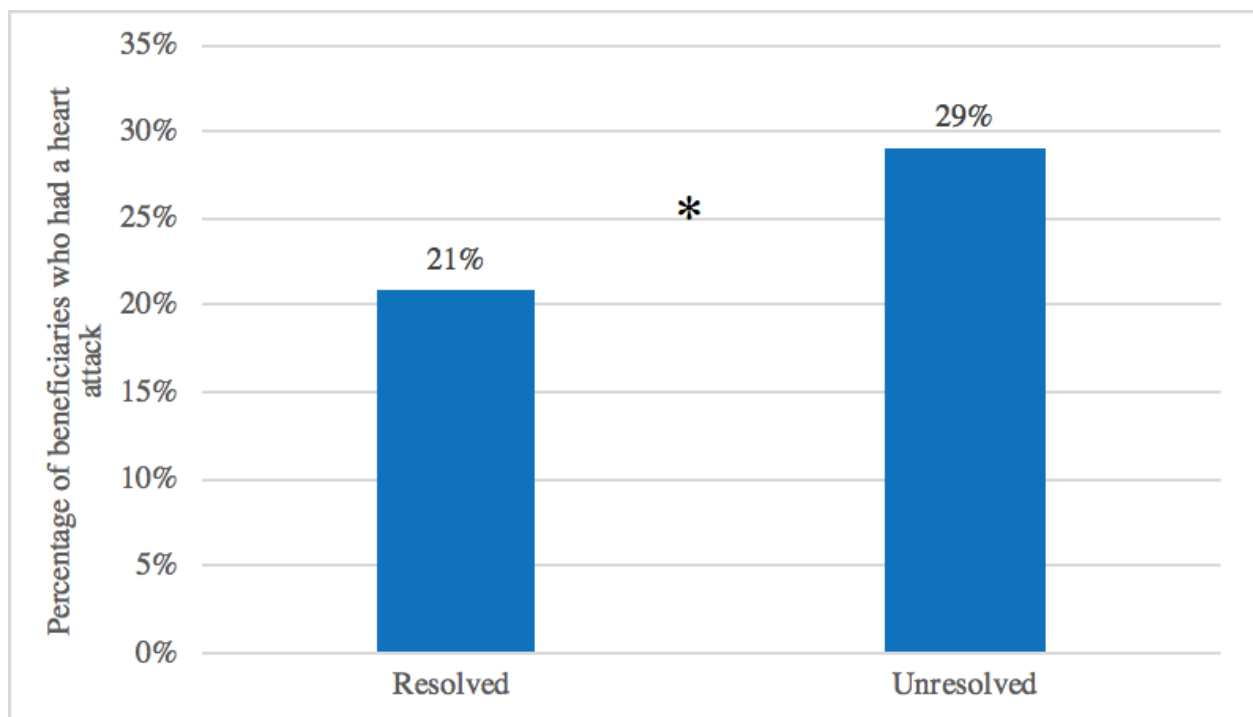


Figure 1: Association of having a heart attack with the resolution of unmet need: 21% of participants with resolved unmet mobility need ($n=220$) had a heart attack, whereas 29% of participants with unresolved unmet mobility need ($n=261$) had a heart attack. A significant association between having a heart attack and the resolution of unmet mobility need was found using a χ^2 test ($\chi^2=4.25$, $p=0.04$). Asterisk (*) indicates $p<0.05$.

First, we evaluated the relative frequency of participants with each medical condition in Year 1 within the resolved and unresolved unmet need conditions for both mobility and self-care needs in Year 2. Supplemental Figure 1 and Supplemental Figure 2 display the relative

frequencies for the resolution of unmet mobility need and of unmet self-care need, respectively, for all ten conditions.

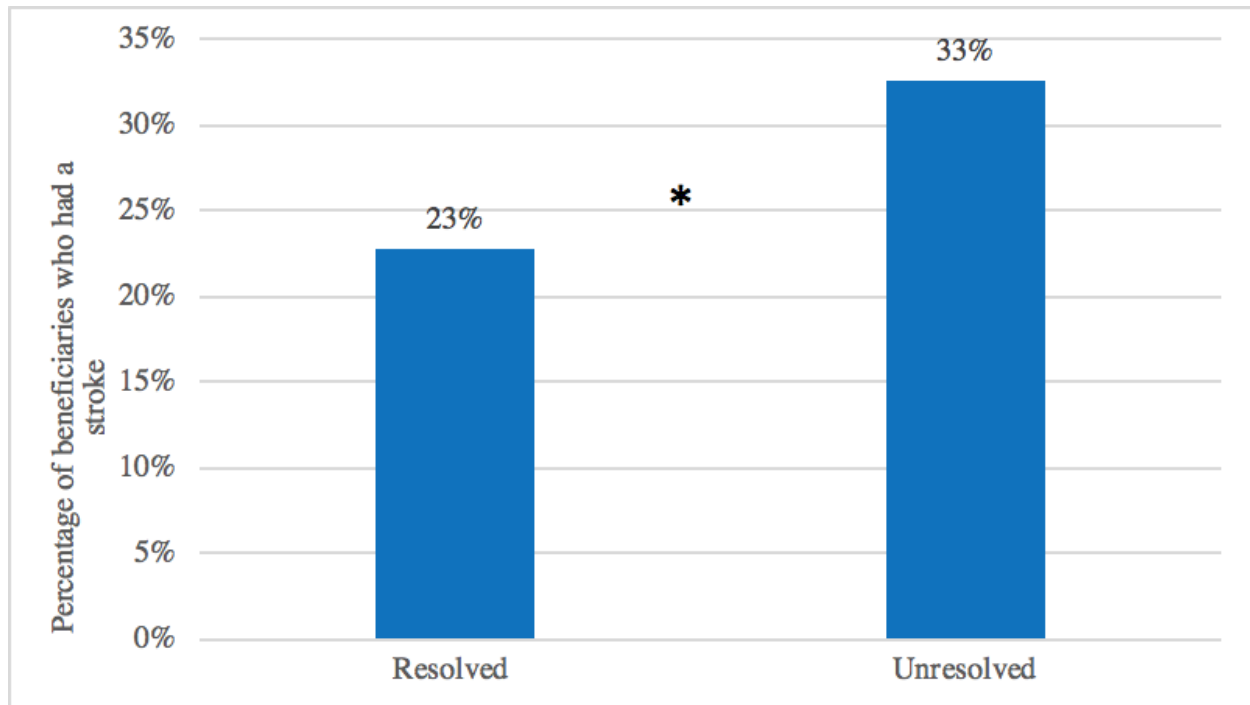


Figure 2: Association of having a stroke with the resolution of unmet need: 23% of participants with resolved unmet mobility need ($n=220$) had a stroke, whereas 33% of participants with unresolved unmet mobility need ($n=260$) had a stroke. A significant association between having a stroke and the resolution of unmet mobility need was found using a χ^2 test ($\chi^2=5.72$, $p=0.02$). Asterisk (*) indicates $p<0.05$.

For the resolution of unmet mobility need, most health conditions had only a negligible difference between the percentage of participants who had the health condition with resolved and unresolved unmet mobility need. Nevertheless, participants who had a heart attack or a stroke were significantly more likely to have unresolved unmet mobility need ($\chi^2=4.25$, $p=0.04$; $\chi^2=5.72$, $p=0.02$, respectively). The percentage of participants who had a heart attack and unresolved unmet mobility need was 29%, eight percentage points greater than those who had a heart attack and resolved unmet mobility need (Figure 1). The percentage of participants who

had a stroke and unresolved unmet mobility need was 33%, ten percentage points greater than those who had a stroke and unresolved unmet mobility need (Figure 2).

Interestingly, self-care tasks were found to have different trends in terms of unmet need amongst different health conditions. Of the ten conditions analyzed, only dementia/Alzheimer's disease was found to have a statistically significant association with unresolved unmet self-care need ($\chi^2=4.08$, $p=0.04$). The percent of study participants who reported both dementia and unresolved unmet self-care need was 28.47%, about ten percentage points above the group reporting dementia and resolved unmet self-care need (Figure 3). None of the other medical conditions analyzed, including those found to be associated with unresolved unmet mobility need, produced significant results in relation to unmet self-care need.

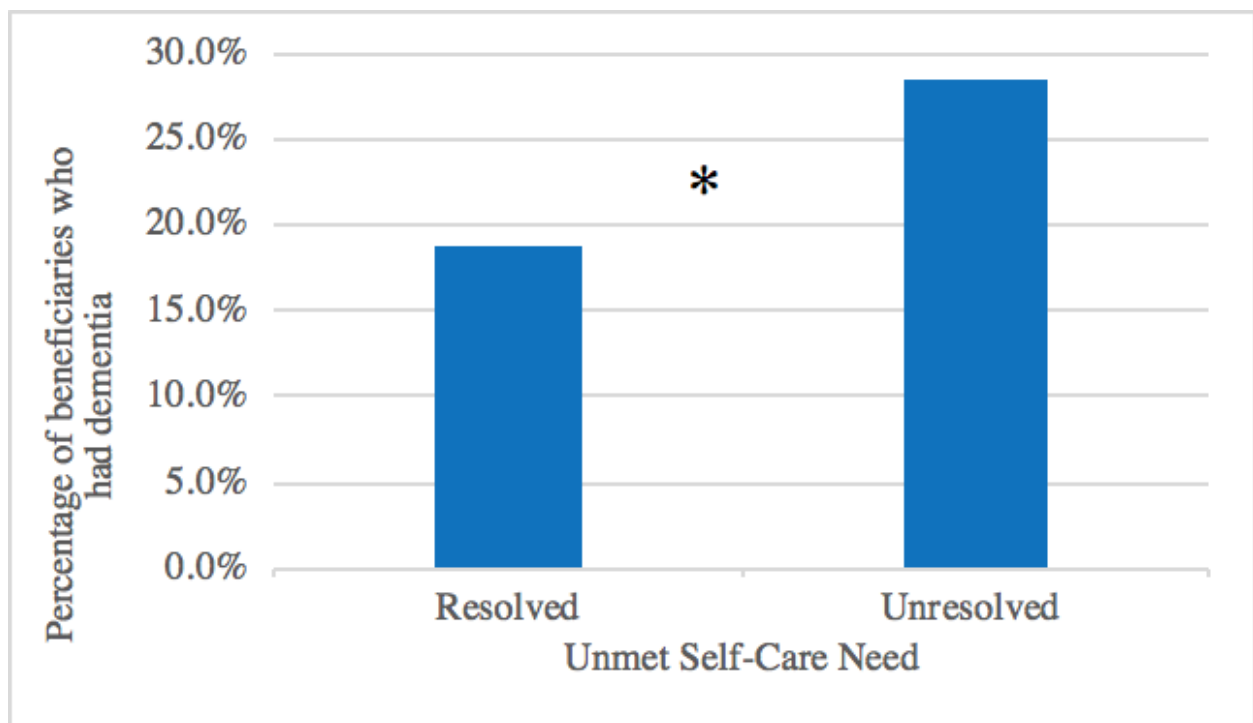


Figure 3: Association of having a dementia with the resolution of unmet need: 19% of participants with resolved unmet self-care need ($n=171$) had dementia, whereas 28% of participants with unresolved unmet self-care need ($n=137$) had dementia. A significant association between having dementia and the resolution of unmet self-care need was found using a Chi Square test ($p=0.04$). Asterisk (*) indicates $p<0.05$.

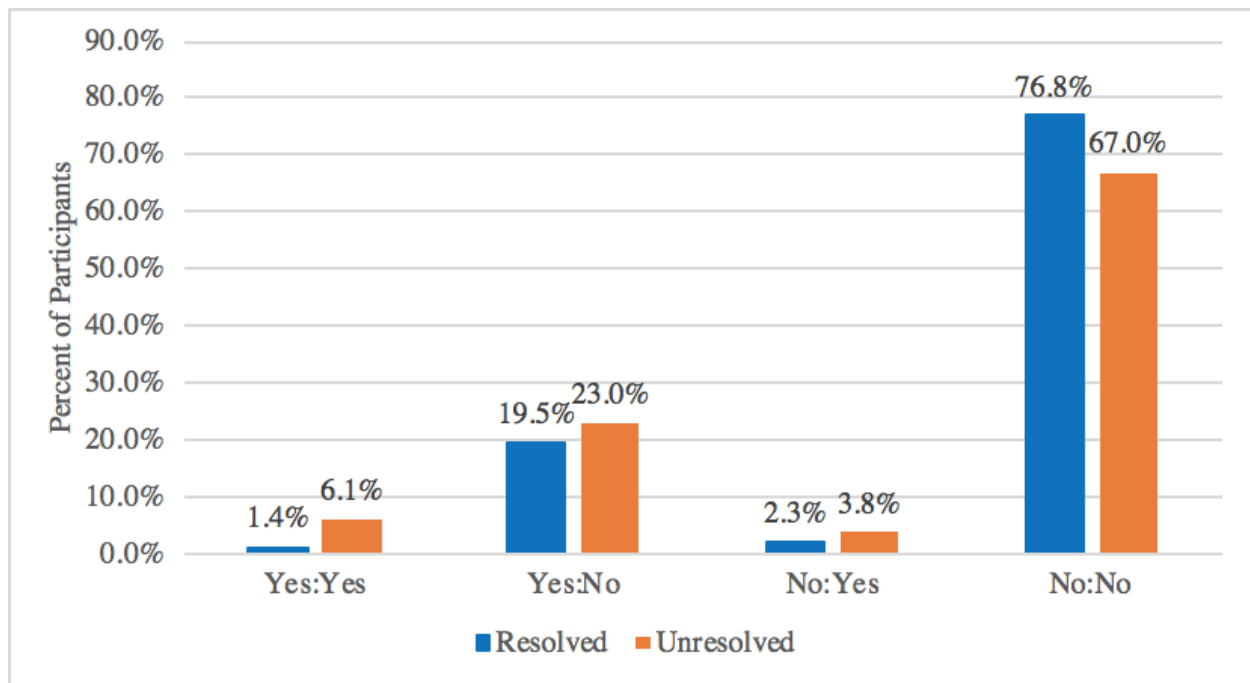


Figure 4: Association of the heart attack status prior to year 1 and between years 1 and 2 with the resolution of unmet need: 6.1% of participants with unresolved unmet mobility need ($n=261$) had heart attacks prior to Year 1 and between Years 1 and 2, over 4 times the percentage of participants with resolved unmet mobility need ($n=220$) with the same heart attack status (1.4%). A significant association between the heart attack status prior to Year 1 and between Years 1 and 2 with the resolution of unmet mobility need was found using a χ^2 test ($\chi^2=10.05$, $p=0.02$).

While the first analysis focused on the resolution of unmet need based on each participant's health condition status in Year 1 of the study, the next analysis utilizes health condition data from Years 1 and 2. For the unmet mobility need data, analyses focused on heart attack and stroke. As these are acute events, rather than truly chronic conditions, the data about these conditions in Year 2 reflect if the participant had a heart attack or a stroke between Years 1 and 2 of the study. Participants who had a heart attack both before Year 1 and between Years 1 and 2 were significantly more likely to have unresolved unmet mobility need in Year 2 ($\chi^2=10.05$, $p=0.02$). Six percent of participants with unresolved unmet mobility need had heart

attacks prior to Year 1 and between Years 1 and 2, over four times the percentage of participants with resolved unmet mobility need with the same heart attack status (Figure 4).

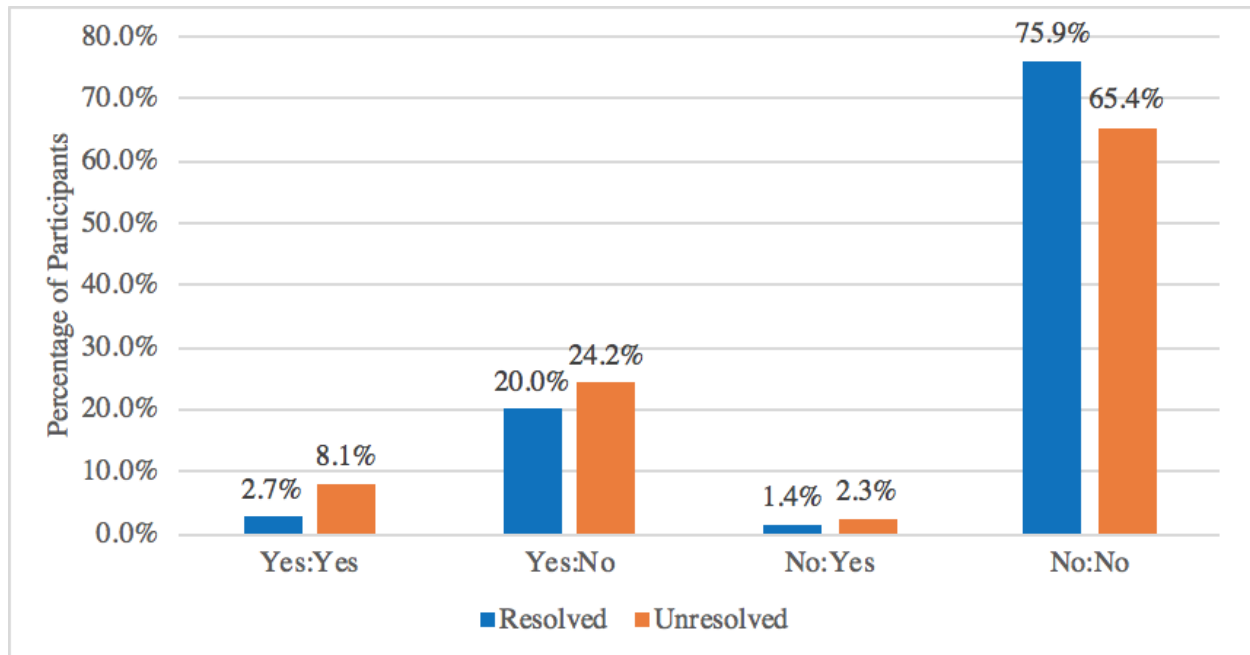


Figure 5: Association of the stroke status prior to Year 1 and between Years 1 and 2 with the resolution of unmet need: 8.1% of participants with unresolved unmet mobility need ($n=260$) had strokes prior to Year 1 and between Years 1 and 2, nearly 3 times the percentage of participants with resolved unmet mobility need ($n=220$) with the same stroke status (2.7%). A significant association between the stroke status prior to Year 1 and between Years 1 and 2 with the resolution of unmet mobility need was found using a Fisher's Exact test ($p=0.02$).

Participants who had a stroke both before Year 1 and between Years 1 and 2 were significantly more likely to have unresolved unmet mobility need in Year 2 (Fisher's Exact test; $p=0.02$). Eight percent of participants with unresolved unmet mobility need had strokes prior to Year 1 and between Years 1 and 2, nearly three times the percentage of participants with resolved unmet mobility need and the same stroke status (Figure 5). For both heart attack and stroke events, the percentage of participants with unresolved unmet mobility need who only had the event before Year 1 was 1.2 times the percentage with resolved unmet mobility need. For both heart attack and stroke events, the percentage of participants with unresolved unmet

mobility need who only had the event between Years 1 and 2 was 1.7 times the percentage with resolved unmet mobility need, suggesting that the recency of the adverse health event may influence of the resolution of unmet mobility need. For both heart attack and stroke events, the percentage of participants with unresolved unmet mobility need who had never had the event was 0.86 times the percentage with resolved unmet mobility need (Figures 4 and 5).

In contrast to the analysis for unmet mobility need, comparison of change in health condition status and resolution of unmet self-care need did not yield any significant results. The major condition of interest for this analysis was dementia, as participants reporting a diagnosis of dementia in Year 1 were found to be less likely to have their unmet self-care need resolved. Because dementia is a chronic, progressive condition that can be only managed, not cured, patients with a dementia diagnosis in Year 1 also had a dementia diagnosis in Year 2. This disease pattern eliminated the “Yes:No” category seen for stroke and heart attack, limiting the scope of the analysis to include only participants who were diagnosed with dementia between Years 1 and 2 (as well as participants whose health status for dementia remained constant between Years 1 and 2). A Fisher’s exact test was performed to determine whether acquisition of a dementia diagnosis between Year 1 and Year 2 was associated with a greater likelihood of unresolved unmet self-care need, with the results indicating weak confidence in the association ($p=0.07$). However, these results indicate that we can be 93% confident that an association between the variables exists, just under the limit of 95% confidence required to label the results significant. This suggests that there is a trend towards greater unresolved unmet self-care need in the participants with a new diagnosis of dementia in Year 2. A trend is also seen for participants

with a new diagnosis of high blood pressure in Year 2 ($p=0.06$), while results for all other conditions were far from significant.

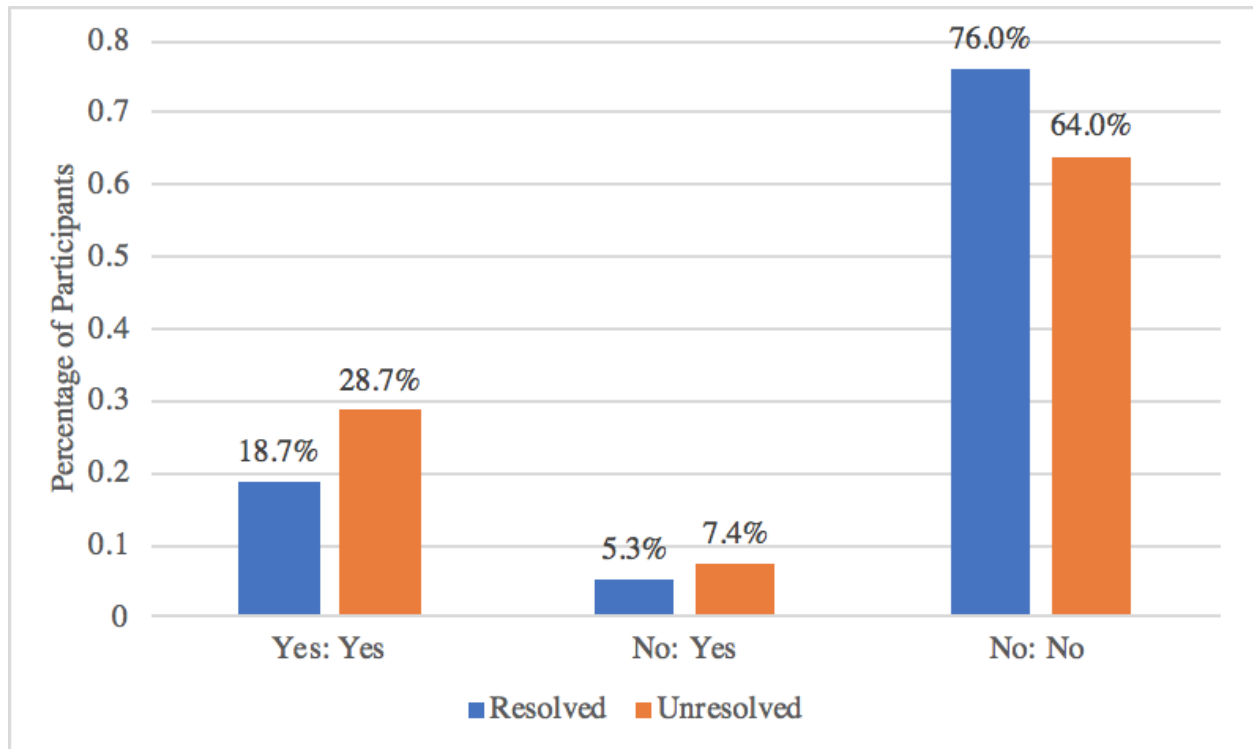


Figure 6: Association of the acquisition of a new dementia diagnosis between Years 1 and 2 with the resolution of unmet self-care need: 7.35% of participants with unresolved unmet self-care need ($n=136$) were diagnosed with dementia between Years 1 and 2, only marginally greater than the percentage of participants with resolved unmet self-care need ($n=171$) and the same pattern of dementia diagnosis (5.3%). A strong trend, but no statistically significant association, was found with the resolution of unmet self-care need using a Fisher's Exact test ($p=0.07$).

Conclusion and policy recommendations

This analysis provides evidence that older adults who have multiple heart attacks or strokes, including one in the preceding year, are much more likely to have unresolved unmet mobility need. However, having a single heart attack or stroke still increases the likelihood of having unresolved unmet mobility need with those who had a more recent heart attack or stroke

being more likely to have unresolved unmet mobility need than those who had a heart attack or stroke at least one year prior. In addition, persons with dementia are more likely to have unresolved unmet self-care need. As such, resources should be allocated to these three patient populations to target those most likely to have unresolved unmet needs.

A state or federal government that provides medical, social, or economic intervention to its inhabitants only once a person's condition has reached disability stage—when individuals have difficulty doing life activities—misses a valuable opportunity to investigate how the series of events which led up to the difficulty might be prevented. Our current model of care focuses on treating symptoms while ignoring the political context within which said symptoms emerged in the first place. As a result, older adults who are at high risk for having unmet need only receive assistance once their condition has reached such severity that they must be hospitalized. A 72-year-old man may suffer from a stroke and, as a result, have trouble with mobility. He may struggle to get out of bed in the morning and, eventually, fall and break his hip. Only then, when he goes to the hospital for surgery, does he receive the benefits of Medicare. We implore policymakers to imagine the series of events that lead to hospitalization, invasive emergency surgery, and death as highly political as well as strictly physiological.

According to Verbrugge and Jette (1994), some disability activists recommend assessing both actual disability¹ as well as the more typically-assessed intrinsic disability² (p. 8-9). The difference between the two allow us to see how someone's severely impairing *intrinsic disability* can potentially be rendered into a relatively well-managed *actual disability*. In the same vein, an

¹ Verbrugge and Jette (1994) define *actual disability* as someone's disability while using special assistance, such as a wheelchair or a human aid (p. 8).

² Similarly, Verbrugge and Jette (1994) define *intrinsic disability* as someone's disability without special assistance (p. 8).

older adult's quality of care may be subject to similar polarizations depending on whether their needs are being met; older adults who have access to human and technological support from the diagnosis of their chronic or acute conditions will be less likely to become further injured or impaired down the road. In the event of a heart attack, for example, physicians advise that cardiac rehabilitation programs begin as soon as patient is stabilized and should last for approximately three months (Schopfer & Forman, 2016). While some Medicare assistance exists, these programs are underutilized by geriatric patients. We recommend future research to fully understand why cardiac rehabilitation are underutilized and how to tailor the programs to meet the needs of an older population.

We recommend a large-scale shift from the diagnostic care model to more preventative models of care. While even those with resolved unmet need may necessitate emergency or invasive medical intervention, our goal is to reduce undesirable, preventable hospitalizations. In the event of hospitalization related to unmet need, rehabilitative services would be needed regardless, in addition to the cost of ambulance transportation. Some examples of assistance might include: government subsidized assistive technologies, paid caregivers, respite care, and/or physical therapy.

Beyond the level of the older individuals and caregivers whose lives are directly impacted by tardy, misdirected government health intervention, a model that does not respond to unmet need in older adults has limited economic feasibility. As discussed in our introduction, hospitalization rates are 19% higher among older adults with unmet ADL need as opposed to those with met ADL need (Hass, 2015, p. 206). DePalma, Lentzner, and Weeks (2001) found that those with unmet need face some of the highest risks for hospital readmission (p. 454).

Hospital admission can end up costing tens of thousands or even hundreds of thousands of dollars. For older adults without health insurance, such costs are astronomical.

The information gathered throughout this study will help identify populations where certain unmet mobility and self-care needs are not being resolved, and we can tailor our preventative care efforts to serve such populations accordingly. For example, since we know that individuals who had experienced a heart attack or stroke were most likely to have unresolved unmet need related to mobility, we recommend that older adults who have had a heart attack or stroke receive access to free or highly affordable mobility assistance soon after their acute condition is diagnosed, whether they choose to make use of said assistance immediately or not. We also know that study participants with dementia were most likely to have unresolved unmet need related to self-care. Since dementia affects the brain, many older adults with dementia retain motor function and may have little trouble getting in and out of beds and chairs; they may not need mobility assistance. The problem arises, then, during mealtimes, toileting, getting dressed, etc when more decision-making skills are required. For policymakers, we recommend that older adults with dementia have access to free or highly affordable self-care assistance soon after their chronic condition is diagnosed, whether they choose to make use of said assistance immediately or not.

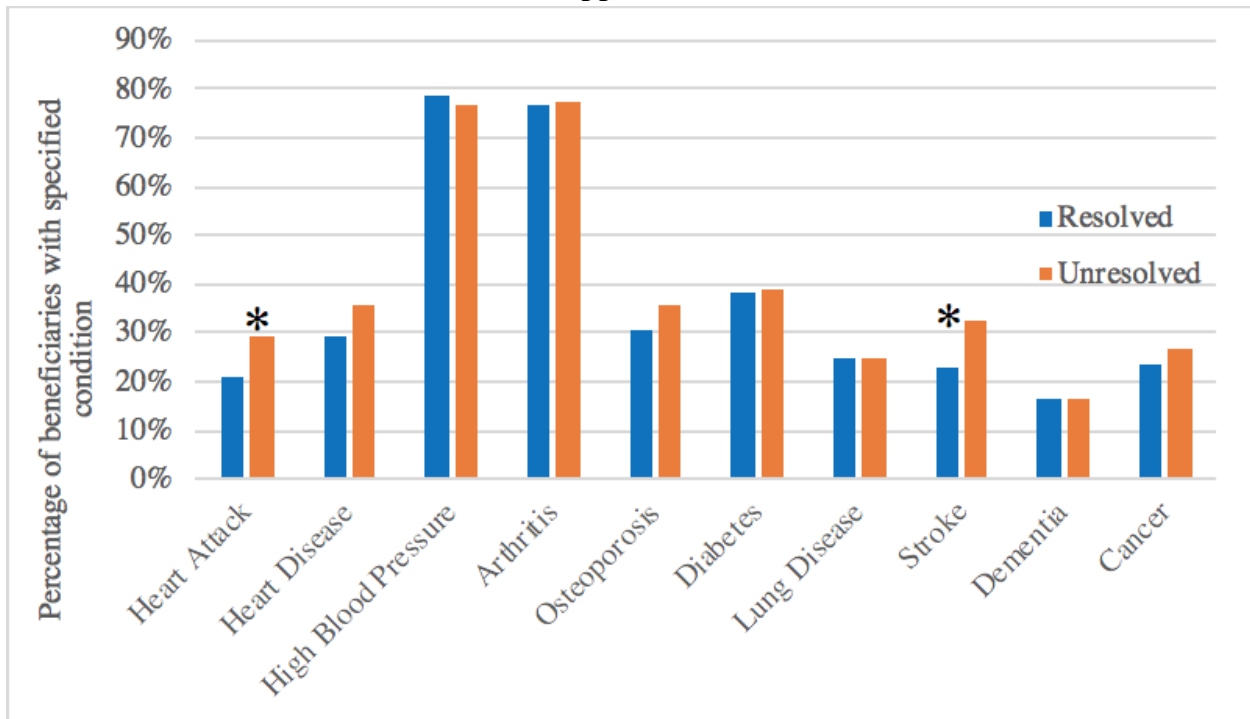
In conclusion, when the intrinsic disability and actual disability of older adults in our country are radically different, we must ask ourselves: Which of their unmet needs *could* be resolved through human or technological support? Of those unmet needs, which have *not* been resolved and *why*? Here, identifying potential relationships between unmet need and certain chronic and acute conditions becomes invaluable to healthcare providers and policymakers alike.

Older adults who are less likely to have unresolved unmet need must be granted affordable access to resources designed to bridge the gap between their physical or mental capacity and the demands of their environment.

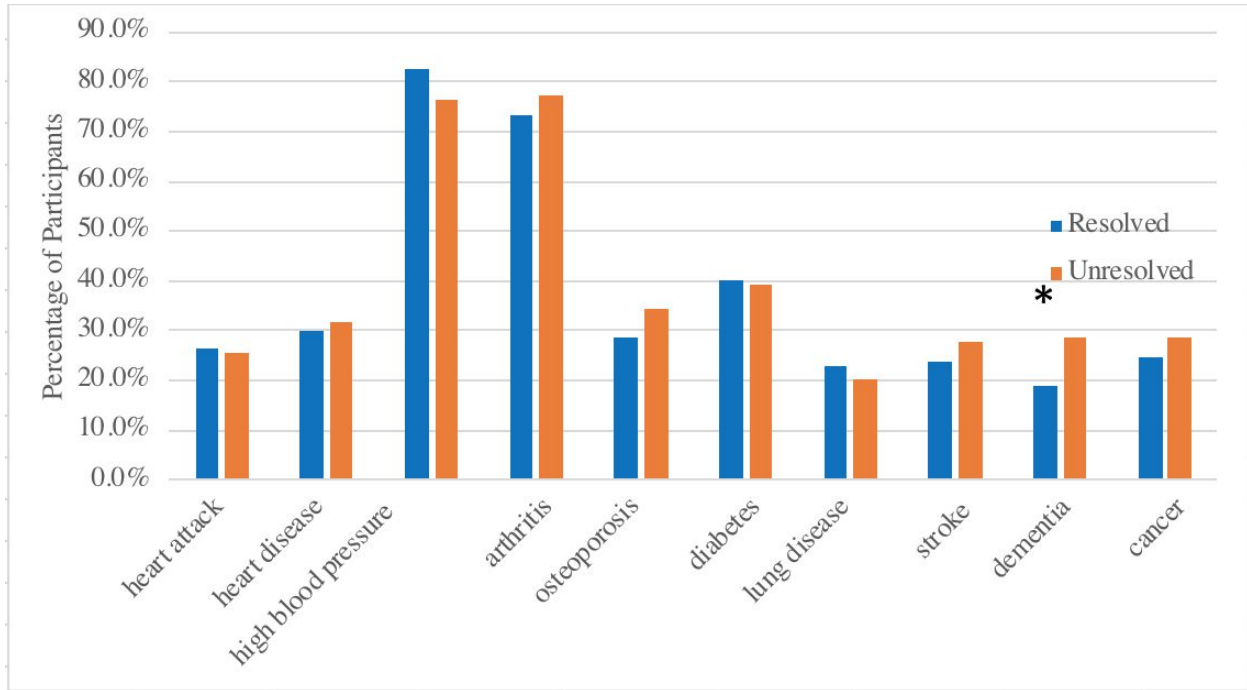
Acknowledgements

The authors would like to thank Dr. Laura Sands for providing the initial research focus and supporting the team through continuous conversation and feedback as the study progressed.

Appendix



Supplemental Figure 1: Association of having a chronic condition and resolution of unmet mobility need: The association between unresolved unmet mobility need and a stroke χ^2 test ($p=0.02$) or heart attack χ^2 test ($p=0.04$) were statistically significant. Of study participants 21% who have resolved unmet need had a heart attack and 29% of participants with unresolved unmet self-care need had heart attack . Of study participants 23% who have resolved unmet need had a stroke, and 33% of participants with unresolved unmet need had a stroke.



Supplemental Figure 2: Association of having a chronic condition and resolution of unmet self-care need: The association between unresolved unmet self-care need and dementia were statistically significant *Chi Square test* ($p=0.4$). Of study participants with resolved unmet need, 19% have dementia, whereas 28% of participants with unresolved unmet self-care need have dementia.

References

- Centers for Medicare and Medicaid Services. (2012). Medicare Enrollment: Hospital Insurance and/or Supplementary Medical Insurance Programs for Total, Fee-for-Service and Managed Care Enrollees as of July 1, 2011: Selected Calendar Years 1966-2011. *Medicare and Medicaid Statistical Supplement*. Retrieved from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareMedicaidStatSupp/2012.html>
- DePalma, G., Xu, H., Covinsky, K.E., Craig, B.A., Stallard, E., Thomas, J., & Sands, L.P. (2013). Hospital Readmission Among Older Adults Who Return Home With Unmet Need for ADL Disability. *The Gerontologist*, *53*(3), 454–461.
- Freedman, V.A., & Spillman, B.C. (2014b). The Residential Continuum From Home to Nursing Home: Size, Characteristics and Unmet Needs of Older Adults. *The Journals of Gerontology: Series B*, *69*(1), 42-50.
- Hancock, G.A., Woods, B., Challis, D., Orrell, M. (2005). The needs of older people with dementia in residential care. *International Journal of Geriatric Psychiatry*, *21*(1), 43-49.
- Hass, Z., DePalma, G., Craig, B.A., Xu, H., & Sands, L.P. (2017). Unmet Need for Help With Activities of Daily Living Disabilities and Emergency Department Admissions Among Older Medicare Recipients. *The Gerontologist*, *57*(2), 206-210.
- He, S., Craig, B.A., Xu, H., Covinsky, K.E., Stallard, E., Thomas, J., Hass, Z., & Sands, L.P. (2015). Unmet Need for ADL Assistance Is Associated With Mortality Among Older Adults With Mild Disability. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *70*(9), 1128–1132.

- Herr, M., Arvieu, J.J., Aegerter, P., Robine, J., & Ankri, J. (2014). Unmet health care needs of older people: prevalence and predictors in a French cross-sectional survey. *European Journal of Public Health, 24*(5), 1-6.
- Hung, W.W., Ross, J.S., Boockvar, K.S., & Siu, A.L. (2011). Recent trends in chronic disease, impairment and disability among older adults in the United States. *BMC Geriatrics, 11*(1), 47.
- Kaye, H.S., Harrington, C., & Laplante, M.P. (2010). Long-Term Care: Who Gets It, Who Provides It, Who Pays, And How Much? *Health Affairs, 29*(1), 11-21.
- Mather, M. (2016). Fact Sheet: Aging in the United States. *Population Reference Bureau*. Retrieved from <https://www.prb.org/aging-unitedstates-fact-sheet/>
- National Health and Aging Trends Study. (2011). *NHATS disability data* [Data file].
- Schopfer, D. W. & Forman, D. E. (2016). Benefits of Cardiac Rehabilitation in Older Adults. *American College of Cardiology*. Retrieved from <https://www.acc.org/latest-in-cardiology/articles/2016/10/19/09/22/benefits-of-cardiac-rehabilitation-in-older-adults>
- U.S. Census Bureau. (2018). Age and Sex Tables. *United States Census Bureau*. Retrieved from <https://www.census.gov/topics/population/age-and-sex/data/tables.html>
- Verbrugge, L. M., & Jette, A. M. (1994). The disablement process. *Soc Sci Med, 38*(1), 1-14.
- Xu, H., Covinsky, K.E., Stallard, E., Thomas, J., & Sands, L.P. (2012). Insufficient Help for ADL Disabilities and Risk for All-cause Hospitalization. *Journal of the American Geriatrics Society, 60*(5), 927–933.