The Dissertation Committee for Amy Givan certifies that this is the approved version of the following dissertation:

PHYSICAL FUNCTION TRANSITIONS AND THE ROLE OF SOCIAL DETERMINANTS OF HEALTH ON FUNCTIONAL RECOVERY AFTER AN ACUTE HOSPITALIZATION AMONG OLDER MEXICAN AMERICANS

Committee:

Soham Al Snih, MD PhD, Supervisor

Yong-Fang Kuo, PhD

Chih-Ying Li, PhD OTR

Kyriakos Markides, PhD

Amol Karmarkar, PhD

PHYSICAL FUNCTION TRANSITIONS AND THE ROLE OF SOCIAL DETERMINANTS OF HEALTH ON FUNCTIONAL RECOVERY AFTER AN ACUTE HOSPITALIZATION AMONG OLDER MEXICAN AMERICANS

by

Amy Hurtado Givan, BS, MS

Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas Medical Branch

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas Medical Branch

December, 2022

Dedication

To my grandparents José Hurtado, Romelia Hurtado, Ramón Rivas, and María Rivas who overcame hardships and continue to model resiliency for our family.

Acknowledgements

There are several people who have supported me through research and deserve a great deal of acknowledgement. First, I would like to thank my dissertation committee members Drs. Soham Al Snih, Yong-Fang Kuo, Chih-Ying Li, Kyriakos Markides, and Amol Karmarkar. I extend deep gratitude to my supervisor, Dr. Al Snih, for her guidance and support in allowing me to grow as a creative thinker and independent researcher. Your constructive feedback has helped me improve in all aspects of research that I will remember for many years to come.

I must thank all of my non-traditional mentors and advisors who encouraged my personal development and helped me understand my value as a person and researcher: Dr. Barbara D. Calvert from the Student Health Services; Dr. Philip S. Clifford from the National Research Mentoring Network; Drs. Daniel Jupiter, Motamedi Massoud, Larry Denner, and Lanette D. Harris from the Innovation and Entrepreneurship Studio. In addition, I would like to acknowledge my previous research mentors who spent endless hours teaching me how to actively learn and become a curious researcher from 2015-2019, Drs. Maria Fernandez del Valle and Grant Tinsley from Southern Illinois University of Edwardsville and Texas Tech University. Thank you to the wonderful administrators, previous and current Rehabilitation Sciences and Population Health students of UTMB, and for my accountability partners (Tracy Tang and Caroline Piaulet) who enlightened my doctoral experience and believed in me in moments of self-doubt.

I would like to acknowledge my husband, Thomas Givan, for his love and patience throughout my education, for listening to my practice research presentations, for reading my written research drafts since 2015, and for allowing me to move our family from state to state in pursuit of research. I thank my immediate and extended family members and my close friends for their understanding in missing certain celebrations and holidays to focus on my studies and research, especially my brother, Brandon Hurtado,

who stayed in constant contact with me each week. Finally, this would not be a complete acknowledgement if I did not thank my sweet dogs, who were by my side during the SARS-CoV-2 pandemic and encouraged me to engage in physical activity at least twice a day, even during the 2020 Texas Winter Storm.

PHYSICAL FUNCTION TRANSITIONS AND THE ROLE OF SOCIAL DETERMINANTS OF HEALTH ON FUNCTIONAL RECOVERY AFTER AN ACUTE HOSPITALIZATION AMONG OLDER MEXICAN AMERICANS

Publication No._____

Amy Givan, MS, PhD

The University of Texas Medical Branch, 2022

Supervisor: Soham Al Snih

The purpose of this project is to 1) examine patterns of physical function transitions and predictors of physical function recovery among older Mexican Americans over a 12-year period; 2) identify social determinants of health that predict physical function recovery after acute hospitalization over a 12-year period; and 3) evaluate the effect of social determinants of health on disability recovery and 30-day readmission after acute hospitalization over a 12-year period. This is a prospective cohort study of community-dwelling Mexican Americans aged ≥75 years from the Hispanic Established Population for the Epidemiologic Study of the Elderly (2004-2016) linked with the United States Census Bureau and Medicare Claims files from the Center for Medicaid and Medicare Services (2004-2013). We examined participant demographic characteristics, socioeconomic factors, health and health care factors, physical/built factors, and socio-cultural environmental factors. Generalized estimating equations (GEE) were used to estimate the odds of physical function recovery, physical function recovery after hospitalization, disability recovery after hospitalization, and 30-day hospital readmission over a 12-year period. Our study found that experiencing a hospitalization decreased the odds of physical

function recovery over time compared to those who did not experience a hospitalization. Hypothesized social determinants of health did not predict physical function over time or physical function and disability recovery after hospitalization or 30-day hospital readmission among Mexican American Medicare Beneficiaries. Additional findings show that older age, being female, having a higher body mass index, having cognitive impairment, and having an Charlson Comorbidity index >3 was associated with physical function recovery over time. Our study found that social determinants of health like nativity status, self-reported loneliness, neighborhood concentration level, sex, and interview language did not predict functional recovery or 30-day hospital readmission among Mexican American Medicare Beneficiaries over a 12-year period. Additional participant and healthcare characteristics may need to be explored to understand mechanisms that affect functional transitions later in life to promote functional maintenance or recovery. This study provides an opportunity for clinicians, researchers, and families aiming to promote functional recovery among older adults.

TABLE OF CONTENTS

List of Tables

List of Figures

List of Abbreviations

ADL	Activity of Daily Living
AIC	Akaike's Information Criterion
BIC	Bayesian Information Criterion
BMI	Body Mass Index
CES-D	Center for Epidemiologic Studies Depression Scale
CI	Confidence Interval
CMS	Center for Medicare and Medicaid Services
DUA	Dual Use Agreements
GEE	Generalized Estimating Equations
HCPCS	Healthcare Common Procedure Coding System
H-EPESE	Hispanic Established Population for the Epidemiologic Study of the Elderly
ICD	International Classification of Diseases
ICF	International Classification of Functioning, Disability, and Health
MBSF	Master Beneficiary Summary Files
MedPAR	Medicare Provider and Analysis and Review
MMSE	Mini Mental State Examination
NCMMR	Interdisciplinary Model of the Disablement Process
NDI	National Death Index
NIA	National Institute of Health
NIMHD	National Institute of Minority Health and Health Disparities
OR	Odds Ratio

PCTL	Percentile
OUTSAF	Outpatient Standard Analytic Files
RESDAC	Research Data Assistance Center
SDOH	Social determinants of health
SPPB	Short Physical Performance Battery
TFMAR	Task Force on Minority Aging Research
US	United States

Chapter 1

SPECIFIC AIMS

The purpose of this project is to examine physical function transitions and predictors of physical function recovery over time and identify social determinants of health predictors of physical function recovery and disability recovery after hospitalization and 30-day hospital readmission among older Mexican Americans over a 12-year period. Physical function was measured using the Short Physical Performance Battery (SPPB) [1,2]. The SPPB is a well-known, geriatric assessment of lower-body performance for community-dwelling older adults and is used as a biomarker of underlying functional decline [3,4]. Disability was assessed using Katz' self-reported activities of daily living (ADL), where participants are asked if they require assistance with bathing, grooming, eating, transferring from bed to chair, walking across a small room, and using the toilet [5]. Social determinants of health were defined as non-medical factors related to where people live or work, such as the neighborhood and built environment, social and community context, education access and quality, health care access, and economic stability [6].

The *first aim* is to examine patterns of physical function transitions and predictors of physical function recovery among older Mexican Americans over a 12-year period. First, it is hypothesized that participants who experience a hospitalization will be less likely to recovery in physical function than participants who did not experience a hospitalization. Second, it is hypothesized that foreign-born participants will be more likely to recover in physical function than U.S.-born participants over time.

The *second aim* is to identify the social determinants of health that predict physical function recovery after an acute hospitalization over a 12-year period. First, it is hypothesized that foreign-born older Mexican Americans will be more likely to recover in physical function after acute hospitalization than U.S.-born older Mexican Americans.

Second, it is hypothesized that older Mexican Americans who report not feeling lonely will be more likely to recover in physical function after an acute hospitalization. Third, it is hypothesized that the association between loneliness status and physical function recovery will be greater among those who reside in highly concentrated Hispanic neighborhoods than those who reside in lower concentrated Hispanic neighborhoods.

The *third aim* is to evaluate the effect of social determinants of health on disability recovery and 30-day readmission after an acute hospitalization over a 12-year period. First, it is hypothesized that older Mexican American females will be more likely to recover from disability after acute hospitalization than older Mexican American males, and that disability recovery will be greater among females who reside in highly concentrated Hispanic neighborhoods than in males who reside in highly concentrated Hispanic neighborhoods. Second, it is hypothesized that older Mexican Americans who had Spanish interviews will be more likely to experience a 30-day readmission that those who were interviewed in English.

Data are from the Hispanic Established Populations for the Epidemiologic Study of the Elderly survey (H-EPESE) from 2004-2016 and the H-EPESE survey linked with the Centers for Medicare and Medicaid Services (CMS) files and United States (U.S.) Census Bureau. The H-EPESE is an ongoing, longitudinal study of Mexican Americans 65 years and older from Texas, New Mexico, Colorado, Arizona, and California. The H-EPESE began in 1993/94 with a sample of 3,050 participants and a new cohort of 902 participants enrolled at Wave 5 (2004/05). To date, ten observational waves have been completed every 2-4 years. The participants from the H-EPESE survey were linked with the CMS Medicare files from Wave 4 (1999-2000) to Wave 9 (2016) using individual identifiers (i.e., sex, date of birth, date of death, and county of residence).

SIGNIFICANCE OF RESEARCH

It has been suggested that the "future of the [U.S.]" is closely related to the growth of Latinos, which is evident by the continuous increase in the Hispanic population more than non-Hispanic White populations [7]. In the U.S., Hispanics of Mexican-origin make up the largest portion of Latinos and primarily drive the projected population growth of Hispanics [7]. The 2018 National Health Interview Survey reported 14.4% of Mexican Americans had a type of functional disability [8]. In 2017, 33.3% of older Hispanics reported having mobility disability, such as serious difficulty walking or climbing stairs [9]. Over a span of 20 years, the prevalence of disability been reported as high as 58.1% among older Mexican Americans [10]. In addition to an increased life expectancy, this phenomena may be attributed to disproportionate living conditions, poor socioeconomic status, and lower educational levels known among Mexican Americans [11,12].

The onset of having a disability can further exacerbate the rate of functional decline, causing it to be less likely to recover from said disability [13]. Hypothetically, an older adult who experiences a fall due low physical performance, may then develop a fear of participating in usual social activities, and thus, may adopt a sedentary lifestyle and increase the risk of frailty and mortality. Functional decline and disability can also impact the healthcare system by increasing healthcare cost and services associated with functional disability, which can lead to the development of more limtations with activities of daily living and decreased odds of transitioning to functional recovery.

The Healthy People 2030 initiative aims to increase the focus on social determinants of health to "improve health and reduce health disparities" [14]. This goal is in line with the National Institute of Aging Strategic Directions of 2020-2025 to support longitudinal studies that will increase knowledge about factors and mechanisms that affect the dynamic aging process [15]. Therefore, there is a critical need to examine the dynamic process of physical function transitions and social determinants of health to uncover the modifiable factors of physical function and disability among older Mexican Americans, a vulnerable population with a high prevalence of functional limitations and disability [16].

This research is expected to be significant because it will provide details of the dynamic functional process over time and identify multiple factors that influence physical function and disability recovery after acute hospitalization, as well as identify individuals likely to recover and benefit from newly developed strategies to improve independence later in life [17]. Further, this research will be meaningful for families, communities, and clinicians who seek to reduce the risk of developing disability and the burden of healthcare because the results may provide information on points of interest for intervention and social determinants of health that could be collected in electronic health records to help develop strategies to promote functional recovery and reduce hospital-associated disability [18,19].

Chapter 2

BACKGROUND

Chapter 2 is organized into 5 sections. The first section will be an overview of older Mexican American including demographics and health characteristics. The second section will be an overview of physical function including definitions and measures. The third section will be an overview of disability including definitions, measures, and conceptual models. The fourth section will be an overview of hospitalizations, including economic impact, rehospitalization significance, conceptual models, and relationship between hospitalization and function among older adults. The fifth section will be an overview of social determinants of health including theoretical concepts, overview of social determinants of health among Hispanics, minority conceptual models, and relation to Hispanic health.

Overview of older Mexican Americans

DEMOGRAPHICS

For every fifth person in the United States (U.S.), at least one person is Hispanic, which equates to approximately 62.1 million Hispanics residing in the U.S. [20]. The U.S. Census Bureau defines Hispanics or Latino as a person of "Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race" [21]. Hispanics of Mexican origin make up 61.5% of the Hispanic population within the U.S., which grew by 13% from 2010-2019 [20,22]. Historically, the southern states have seen the largest growth in the Hispanic population, and California currently has the largest portion of Hispanics alongside Texas and Florida [20].

The population growth of Mexican Americans may be slowing; however, it has been reported that the proportion of Mexican Americans over the age of 80 is increasing more so than non-Hispanic white Americans [11,22]. In 2017, older Hispanics accounted

for 8% of the older U.S. population, and the older Hispanic population is expected to increase to 94.7 million by 2060 [23].

HEALTH

Compared to non-Hispanic Whites, Mexican Americans and other Hispanics have poorer overall health. For example, the Centers for Disease Control and Prevention (CDC) reported Hispanics are 50% more likely to die from diabetes compared to non-Hispanic whites [23]. However, these outcomes may be a result of social, economic, and access disparities [10]. Compared to other Hispanic subgroups, Hispanics of Mexican origin have been shown to have a higher prevalence of type 2 diabetes and lower cognitive function, as well as, exhibit different physical behaviors or physical activity levels [24–26]. Mexican Americans may experience disproportionate living conditions that accelerate adverse health outcomes, such as disability and chronic illnesses [11]. Older Mexican Americans, in particular, may face unique circumstances, such as economic hardship, social deprivation, and depression, which can be further amplified due to language barriers, culture shock, and poor healthcare quality [27]. For example, a study found the prevalence of functional limitations and disability to be higher among foreign-born Mexican Americans compared to foreign-born white Americans [10]. Also, the proportion of functional limitations among older foreign-born Mexican Americans may increase as age increases, whereas the proportion of functional limitations remains lower than older U.S.-born Mexican Americans.

Despite having lower socioeconomic status, Hispanics have an increased life expectancy compared to non-Hispanic whites (82.1 years versus 80.6 years). Hispanic women have a higher life expectancy than Hispanic men (84.2 years versus 79.9 years). The increased longevity may be attributed to strong family systems or return migration (i.e., Hispanics returning to country of birth place after falling ill) [28–30]. For example,

Eschbach et al. (2004) reported Mexican Americans living in high-density Mexican American neighborhoods experience lower mortality rates and poor health outcomes [30].

Physical function

DEFINITIONS

Physical function is used as a biomarker for disability that has been described in successive stages towards disability through the disablement process [13]. Physical function represents the body's underlying physiological change of muscle motor skills or range of joint motion either due to age, illness, or environmental conditions [13,31]. Assessments of physical function are used to identify change in functional status or presence of functional limitations. Functional limitations "are restrictions or lack of abilities in performance of the whole organism or individual" and can be used as a quick metric of functional status [31]. For example, 18.0% of U.S. adults had a functional limitation in 2020 [41]. Healthcare professionals, such as occupational and physical therapists, geriatricians, clinical providers; and researchers, and policy makers in healthcare, require knowledge about functional status to help create personalized therapeutic interventions or to understand population health.

Understanding the change in physical function or development of physical function limitations can be used to inhibit functional decline, limitations, disease, and disability for the aging population. Rates of decline in physical function are unique to each person [32], and it has been suggested that physical function should be targeted to prevent irreversible changes, such as permanent disability [32]. Also, research has shown physical function to be a modifiable factor. For example, Deer et. al (2019) conducted a randomized clinical trial among older adults following acute hospitalization and found those randomized to the physically active intervention groups increased in physical function more than the placebo group 4 weeks after hospitalization and had a lower rate of hospital readmission [33].

The Framework of Functional Decline shown in Figure 1 describes the potential of functional resiliency and ability to recover after functional decline. The degree of functional recovery is related to a person's initial functional state and the external or internal resistance that worsens the functional state or reduces rate of recovery, particularly after a major stressor [16]. Within this framework is "point of no return", which refers to permanent disability or mortality [16]. In theory, an optimal time to intervene in functional decline is above a person's "disability threshold", which is dependent on functional capacity, to increase the likelihood of functional recovery [34].

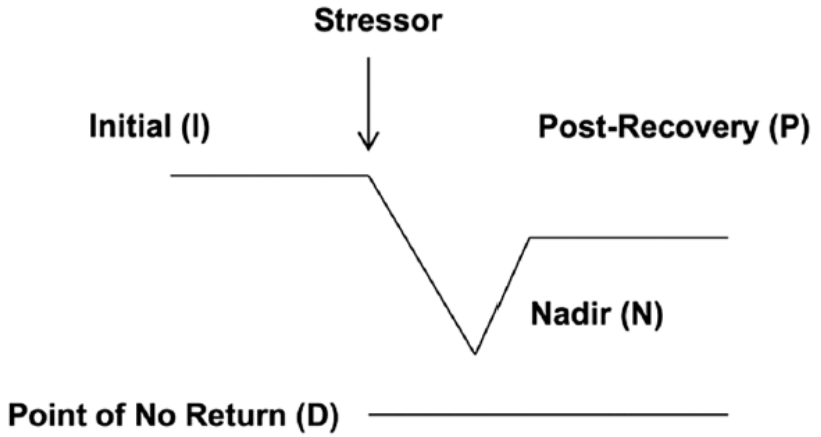

Figure 1 - The Framework of Functional Decline, Recovery, and Resilience. *Reprinted with permission for Kritchevsky (2018).*

MEASURES OF PHYSICAL FUNCTION

Physical function can be assessed through multiple avenues, such self-reported judgments, objective performance, or a combination assessment of both self-reported and objective measures. Objective assessments of physical function can be used to screen change in physical function over time and detect early functional decline. Objective measures of physical function also helps identify those who may respond the most to certain interventions [29]. For example, those who are in a preclinical state of disability, but have no disability, may perform differently to compensate for lost function [29].

The Short Physical Performance Battery (SPPB) is a commonly used objective assessment of physical function for older, community-dwelling adults [2,3]. The SPPB was created to provide a more valid and reproducible measure of physical performance and to detect more accurate levels of function compared to self-reported measures [35]. The SPPB includes 3 objectively measured assessments, such as the chair-to-stand, balance, and gait speed test. Each item is rated on a scale from 0 (unable to do) to 4 (quickest time to completion) with the summary SPPB score ranging from 0 to 12. A higher score indicates better physical performance. A strength of the SPPB is that it can offer a comprehensive view of physical function and has been deemed valid and reliable for older adults [36]. For example, it examines balance, gait, strength, and endurance of older, community-dwelling adults in under 15 minutes [35]. However, it has been criticized that the SPPB may not be appropriate for all populations because the ceiling or floor effects of the SPPB tasks are wide and may underestimate the performance of older adults with higher function [37].

Although commonly used, there is no gold standard of meaningful change in the SPPB [38,39]. Having a criterion for expected change in physical function gives guidance to researchers and clinicians whether a substantial change has occurred in physical capacity or whether a new intervention is needed to prevent functional decline. This may have resulted in the limited research around physical function transitions as opposed to physical function trajectories.

PREDICTORS OF PHYSICAL FUNCTION

Low physical function and functional decline are attributed to several factors, such as poor handgrip strength, slow walking speed, body mass index, and nativity status [40–43]. Age is a strong risk factor of physical function decline over time, but certain domains of physical performance differ by age group [44]. For example, Hall et al. (2017) found chair stands and leg stands significantly differed across adults aged 50-59 years, and found noticeable differences between endurance and gait speed were observed in adults aged 70-

79 years [44]. It has also been suggested that critical points of functional decline include age 70, where overall population level of functional decline has been shown to be accelerated [34]. Among high physical performing older, Finnish adults, it was reported that older age and female sex were more likely to experience a negative change in physical performance, and that younger cohorts may be more likely to improve in physical performance over a 6-year period [45].

Among older Mexican Americans, having depression, type 2 diabetes, higher number of comorbidities, and obesity have been reported to increase the risk of having poor physical function [46]. Further, poor physical function has been associated with an increased healthcare resources, healthcare expenditure, and mortality [47–49]. Research on physical function recovery among older Mexican Americans remains scarce. However, Mutambudzi et al. (2018) examined physical function trajectories among older Mexican Americans over a 9.5-year followed [50]. It was found that those who were in the high-stable physical function trajectory had good physical function at baseline, which did not substantially change over time. Also, older age, male sex, having <7 years of education, being foreign-born, lower cognitive function, having depressive symptoms, comorbid conditions, and obesity were associated with low declining physical function, whereas, only older age, male sex, having <7 years of education, lower cognitive function, and having arthritis were associated with high declining physical function.

Disability

In the U.S., approximately 26% of the population has a disability, which is largely attributed to having a mobility disability (13.7%) [51,52]. Disability can burden healthcare systems, community care, and families, and this burden can be exacerbated depending on access to quality care or disability severity [29]. It appears the prevalence of disability decreases among older adults; however, disparities continue to persist between different race and ethnicity groups [53,54].

In 2017, 33.3% of older Hispanics reported having mobility disability, such as serious difficulty walking or climbing stairs [9]. The U.S. Census Bureau reported approximately, 450,000 Hispanics over the age of 65 have a difficulty going outside of their home due to physical or mental disability, but the prevalence of physical disability was the highest type of disability among community-dwelling Hispanics [55]. Given that older Mexican Americans have a long life expectancy and high risk of disability—older Mexican Americans can live more than two thirds of their later life spent in a disability state [12,56].

DEFINITIONS

Disability is defined as "difficulty or the inability to perform social roles and self-care tasks across any domain of life due to physical, sensory, emotional, or cognitive limitations" [57]. The definition of disability has evolved over several years and depends on the organizational definition, but overall, disability is used to measure the consequence of disease and chronic disease severity.

Katz' self-reported activities of daily living (ADLs) have faced criticism about the varying definitions of disability or different methods for assessing ADLs. For example, the ADL scale may be assessed with differing grades of difficulty or combining ADLs with mobility disability or in short form questionnaires. This may reduce clarity in patients' needs versus available resources and may not be as informing in assessing disease severity or progression compared to biological measures [58]. The definition of disability has improved over recent decades to be more intrinsic of how a person interacts in their environment and preferred social tasks and roles.

MEASURES OF DISABILITY

Disability can be assessed by screening limitations in functional ability. However, screening for limitations has barriers since disability infers severe inability in performing

social roles and self-care tasks. Thus, a person with severe bodily impairment may not have the ability to report limitations and a proxy may under-report the severity of someone's functional abilities. Therefore, screening for function is more appropriate to assess disability status or severity, especially for vulnerable populations and older adults.

The most commonly used tool to assess functional limitations in self-care tasks are the Katz' ADLs [59]. Katz' ADLs have been used extensively in disability-related research and have been used to describe disability prevalence and trends of older adults. The original Katz' ADLs were developed in 1957 to assess the ability to complete basic functional tasks or self-care activities [5,59]. The six core measures of the Katz' ADLs include bathing, dressing, transferring to bed, using the toilet, continence, and eating. Participants are asked if they require assistance on one or more of the core ADLs and respond according to the difficulty and assistance scales. Katz' ADLs reflect a degree of independence, and the original scale includes continence, but continence is not generally used for population estimates. Independent ADLs (IADLs) are used for more complicated tasks that reflect independence in the community, such as shopping, cooking, and managing money. Mobility disability is often evaluated in conjunction with ADLs and in a "hierarchical approach", where the recalled mobility tasks or questions are progressively more difficult and assess multiples levels of function and overall health status [29].

In general, the higher number of disabilities, the increased risk for further functional decline, injuries, illnesses, and mortality for older adults [29]. Disability or needing help with ADLs is associated with healthcare utilization, functional decline, and mortality among older adults [60–62]. Despite multiple variations in assessing disability, the ADLs have been shown to be a reliable and valid measures of overall health status and behaviors of older adults [59].

CONCEPTUAL MODELS

Physical function and disability can be further described through conceptual models that have evolved over time. Altman (2014) stated, "the disablement process is associated with the nature of the interaction a person has with all aspects of his or her environment" [63]. The Disablement Process helps inform researchers, epidemiologists, and public health officials of disability status and need of disability preventative interventions [13].

In Figure 2, the main pathway of the Disablement Process includes Pathology, Impairments, Functional Limitations, and Disability. Pathology refers to a disease or condition. Impairment refers to a body or structure dysfunction. Functional limitation indicates restriction in basic physical activities. Disability refers to severe difficulty doing activities of daily living. Risk factors are predisposing characteristics that may exacerbate the response of an impairment. Extra- and intra-individual factors are factors that work in conjunction with the pathway towards disability.

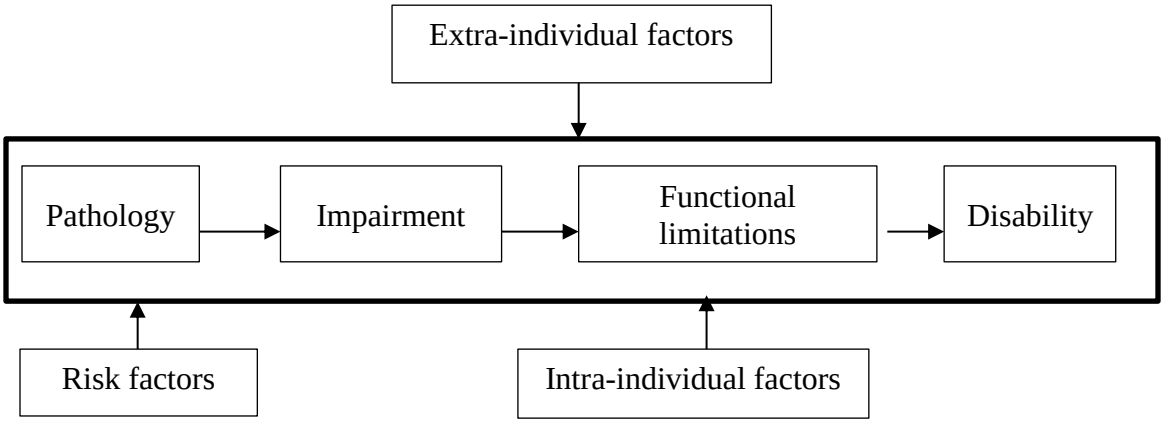

Figure 2 - The Disablement Process by Verbrugge and Jette (1994).

Source: Verbrugge, L.M.; Jette, A.M. The Disablement Process. Soc. Sci. Med 1994, 38, 1–14.

Another model that displays the disablement process is the Enabling-Disabling Model provided by the Institute of Medicine in 1991 (Figure 3) [31]. The model shows that the disabling and enabling process is dynamic and that interventions may reverse the

process. In comparison to the previous model, the Enabling-Disabling Model displays bidirectional arrows and an interactive process of the environment. This places an emphasis on the social and physical environment that contributes to functional decline in a state of "no disabling condition" rather than on individual characteristics. This model is appropriate when the research objective is to study how transitional factors impact functional limitations in persons without disabling conditions [31].

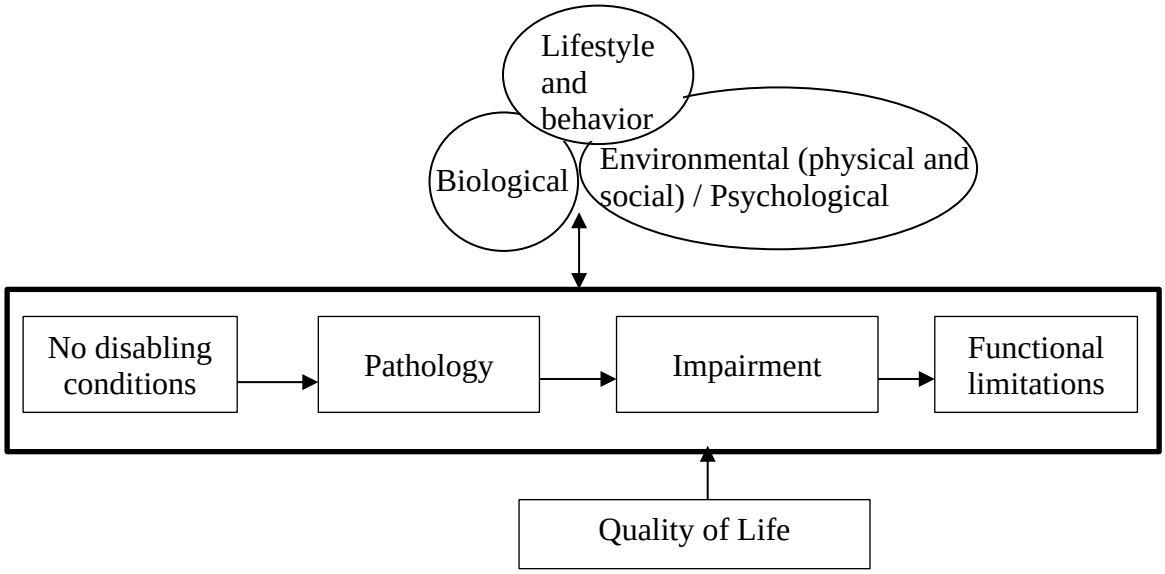

Figure 3 - The Enabling Disabling Model by Institute of Medicine.
Source: Institute of Medicine (US) Committee Models of Disability and Rehabilitation. In Enabling America: Assessing the Role of Rehabilitation Science and Engineering; Brandt, E., Pope, A., Eds.; National Academies Press (US): Washington, DC, 1997.

Hospitalization

From 2016-2017, there was an increase in the U.S. healthcare spending of $10,739 per person [64–66]. Total hospital spending increased by 4.7%, and the highest healthcare expense was due to hospital stays at $35.8 million. In 2017, people with Medicare had higher documented hospital stays, which was largely attributed to older adults [64–66]. Figure 4 shows Hispanics accounted for 18.5% of the overall U.S. healthcare spending; however, non-Hispanic whites had the highest population percentage for healthcare

spending in 2018 [66]. By 2028, the projected national health spending is estimated to be $6.2 trillion, with Medicare patients experiencing the fasted projected spending growth [64]. Risk factors of hospitalization include, age, sex, race, previous hospitalization or emergency department visit, chronic conditions, high medication use, low function, injury, and disability [67–71].

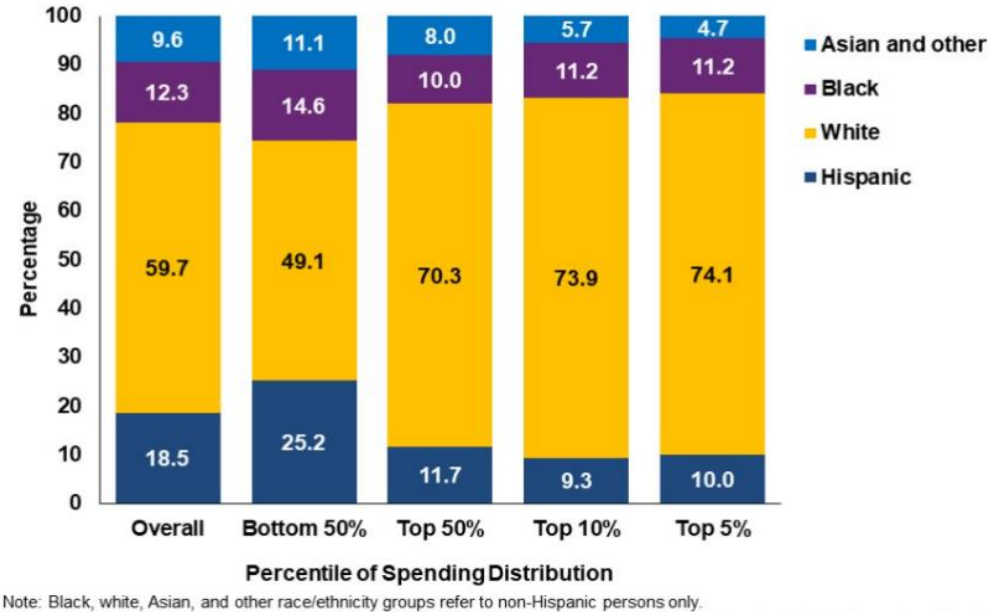

Figure 4 - Percentage of race/ethnicity and distribution of United States' healthcare spending in 2018.

Source: Agency for Healthcare Research and Quality, Center for Financing, Access, and Cost Trends, Medical Expenditure Panel Survey, Household Component, 2018.

CONCEPTUAL MODELS

The Andersen Behavioral Model was developed in the 1960s with the goal of helping families and policy makers understand the use of health services and access to care [72]. The model shown in Figure 5 highlights measures of health service utilization by explaining how a persons' environment affects access to care and how individuals' predisposing characteristics are facilitated by enabling resources, but healthcare use is largely driven by need factors for certain health services [72]. The initial model has

undergone at least 5 revisions and continuous to be evolved and expanded for specific health services, such as long-term services and supports, or for certain populations, such as African Americans [72–74].

Environment refers to the external environment, such as physical, political, and economic, that plays a role in accessing healthcare. Predisposing factors include sociocultural characteristics that occur prior to illness, such as demographics, knowledge, social structure, health beliefs, and perceived control. Enabling factors includes informal support, such as family or community resources or financial availability that enable access to care. Need factors are objective or perceived factors that drive an individual to seek health services, such as biological and functional health and severity or duration of disability [73,74]. To further describe racial/ethnic relevant factors, population characteristics should consider factors, such as domains of attitude, self and family knowledge, social norms, perceived control, financial availability, and social support [73,74].

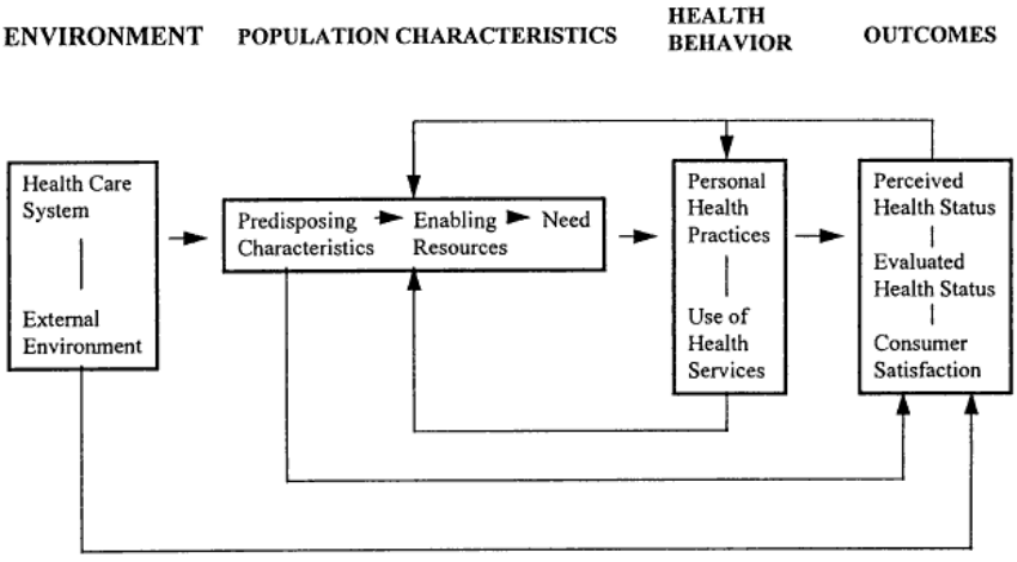

Figure 5 - The Andersen Behavioral Model of Health Service Use.

Source: Andersen, R.M. Revisiting the Behavioral Model and Access to Medical Care: Does it Matter? J. Health Soc. Behav. 1995, 36, 1–10.

REHOSPITALIZATION

In 2018, approximately 3.8 million patients were hospitalized within 30 days of hospital discharge in the U.S., which costs the healthcare system more than $26 billion [75,76]. All-cause hospital readmission is defined as "a subsequent hospital admission for any cause within 30 days following an initial stay" [77]. In 2018, Medicare patients accounted for the most hospital readmissions at 60.3% and had the highest readmission rate. Disparities existed in readmission rates, with non-Hispanic blacks having a higher risk of admission compared to non-Hispanic whites [75,78].

With patient partnerships and 18 community-based care programs throughout the U.S., there has been a national goal to reduce hospital readmission by 20% [80]. For example, the Hospital Readmissions Reduction Program is a CMS initiative under the Affordable Care Act aimed to reduce unnecessary hospital readmissions for designated hospitals and to increase patient safety [79]. Also, approximately 11% of 30-day rehospitalization are considered preventable and most readmissions were due to multiple reasons, such as poor transition in care, medication error, or lack of personalized plan of care [80]. The CMS stated, "identifying the key drivers of readmissions for a hospital and its downstream providers is the first step towards implementing the appropriate interventions necessary for reducing readmissions" [76].

THE RELATIONSHIP BETWEEN HOSPITALIZATION AND FUNCTIONAL STATUS

In 2015, approximately 36% of national healthcare spending was associated with disability, which was largely paid by Medicare ($324.7 billion) [81]. It was reported that the disability-associated healthcare costs per person increased by approximately 30% since 2003, while people without a disability had constant healthcare spending [81]. Hoffman et al. (2010) stated, "Medicare could pay for approximately 10 adults for a year who do not have mobility limitations with the money it costs to pay for 1 adult who transitions to severe limitation" [82]. It was also found that older adults who became or remained functionally

dependent spent an excess of $10,000 in healthcare expenditure in over 2 years [82]. Cheng and colleagues (2020) found that older adults with low self-reported physical function had an increased healthcare use and expenditure compared to those with higher physical function [47]. Those in the highest physical function quartile saved 65.2% in healthcare expenditure compared to those in the lowest physical function quartile [47].

Acute hospitalizations have been shown to intervene physical function transition states for older adults and increase the risk of developing disability, hospital readmission, and becoming deceased following hospital discharge [83–85]. Functional decline after hospitalization or hospital-associated disability is costly for the health care system. A nationally representative study of older adults found that Medicare costs increased as severity of functional impairment worsened one-year after hospitalization, with severe ADL impairment costing 77% more than those without any functional impairments after hospitalization ($46 versus $26 thousand) [86].

Further, another study showed participants who declined in physical function 1-month after hospital discharge had an increased risk of developing disability 12 months later [84]. Barnes et al. (2012) found that one-year after hospitalization, more participants died than recovered from disability or remaining disabled [87]. Volpato et al. (2011) examined patients without disability and found patients who transitioned to a worse physical function status 12 months post-hospital discharge were reported to have a threefold increased risk of rehospitalization or death compared to patients who had a stable physical function 12 months post-discharge [84].

Having high cognition, lower frailty, higher physical activity, and good self-efficacy promote functional recovery during and after acute hospitalization [88–90], which can then promote functional independence after hospitalization. Non-traditional clinical factors, such as social determinants of health, are being research more often given their association with general health and increased risk of mortality after hospitalization [91].

For example, emotional vitality has been shown to play an important role in planning rehabilitation and in the process of patient adaption and recovery [92].

Social determinants of health

Social determinants of health (SDOH) are non-medical factors related to where "people are born, grow, live, work or age"—driven by circumstances, like available resources or political power—that influence health and are known to contribute to health disparities and inequities [6,93]. There are 5 main domains of SDOH, such as economic stability, education access and quality, social and community context, neighborhood and built environment, and health and healthcare quality.

Over the past two decades, there have been national and international efforts to research and address SDOH to close the gaps in health inequities [6,94]. In 2010, the U.S. published the Healthy People 2020 initiative to "create social and physical environments that promote good health for all". The new initiative, Health People 2030, objectives are similar—to improve the health and well-being of all people by reducing health disparities and inequities [14]. For longitudinal studies, this means SDOH can be studied to understand the differences in disproportionate health outcome beyond traditional clinical factors. Also, SDOH may help better describe the lived experience of minorities and the selection of certain factors can be guided through minority and disparity conceptual frameworks.

CONCEPTUAL FRAMEWORKS

The Socio-Ecological Model from the National Institute of Aging (NIA) describes interactions between micro-, meso-, macro-, and chrono-systems at the intra- and inter-individual level. This model describes that health is not only impacted by biology and behavior but is also greatly influenced by SDOH, such as limited English, health literacy, self-beliefs, or financial stress [95].

The NIA Health Disparities Research Framework stems from the Socio-Ecological Model and is shown in Figure 6. This model reportedly helps determine the following: 1) priority populations at varying levels, 2) influential factors in a structured fashion, 3) multi-level factors along causal pathways, and 4) several areas to target for interventions [95]. The framework highlights 4 levels of analysis, such as "environmental, sociocultural, behavioral, and biological determinants of health disparities related to aging", which includes SDOH throughout multiple levels [95]. The environmental level of analysis are factors influenced by disproportionate conditions, and this level includes geographical and political factors, socioeconomic factors, and healthcare factors. The sociocultural level of analysis are population-level beliefs shaped by traditions and migration, such as cultural, social, and psychological factors. Behavioral factors, such as individual and psychological behaviors, are representative of environmental and sociocultural factors that influence health and lifespan. Environmental and sociocultural factors process through behavioral factors to influence the biological level of analysis. Biological factors in this framework may explain the underlying mechanism of outcomes.

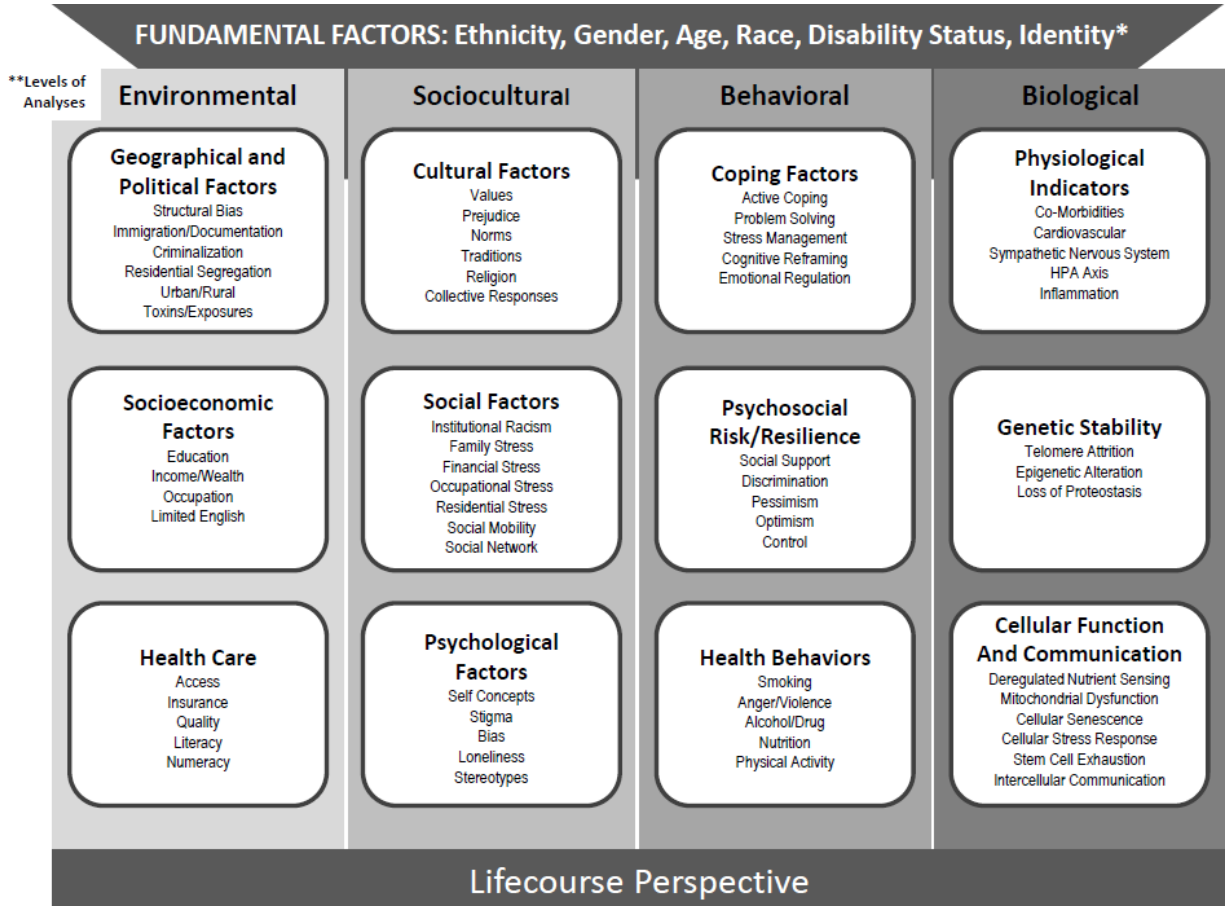

Figure 6 - National Institute Aging Health Disparities Research Framework.
Reprinted with permission for Hill et al. (2015).

Another framework specific to minority health outcomes and SDOH is the National Institute of Minority Health and Health Disparities (NIMHD) Research Framework. The NIMHD is a holistic approach that conceptualizes "factors relevant to the understanding and promotion of minority health and to the understanding and reduction of health disparities" (Figure 7) [96]. Similar to the NIA Health Disparities Research Framework, there are multiple levels of domains (e.g., biological, behavioral, physical/built environment, sociocultural environment, healthcare system) that intersect between individual, interpersonal, community, and societal levels and influence health outcomes of the general population. This framework offers an additional perceptive to understanding influential factors on minority health outcomes and opportunity to capture potentially modifiable factors.

	Individual	Interpersonal	Community	Societal
Biological	Biological Vulnerability and Mechanisms	Caregiver–Child Interaction Family Microbiome	Community Illness Exposure Herd Immunity	Sanitation Immunization Pathogen Exposure
Behavioral	Health Behaviors Coping Strategies	Family Functioning School/Work Functioning	Community Functioning	Policies and Laws
Physical/Built Environment	Personal Environment	Household Environment School/Work Environment	Community Environment Community Resources	Societal Structure
Sociocultural Environment	Sociodemographics Limited English Cultural Identity Response to Discrimination	Social Networks Family/Peer Norms Interpersonal Discrimination	Community Norms Local Structural Discrimination	Social Norms Societal Structural Discrimination
Health Care System	Insurance Coverage Health Literacy Treatment Preferences	Patient–Clinician Relationship Medical Decision-Making	Availability of Services Safety Net Services	Quality of Care Health Care Policies

Figure 7 - The National Institute of Minority Health and Health Disparities Research Framework.

Source: National Institute on Minority Health and Health Disparities (2017). NIMHD Research Framework. Retrieved from https://nimhd.nih.gov/researchFramework. Accessed on Mar 19, 2022.

SOCIAL DETERMINANTS OF HEALTH AMONG HISPANICS

Hispanics are disproportionately affected by SDOH, such as lack of access to healthcare or experiencing language barriers, which affects their overall population health [20]. In the U.S., approximately 70.1% of Hispanics speak another language other than English in their homes and 28.4% reported they do not speak English fluently [97]. Compared to non-Hispanic white populations, Hispanics have fewer years of total educational attainment [97]. Compared to other Hispanic subgroups, Mexicans, Hondurans, Salvadorians, and Guatemalans have fewer years of education when they arrive to the U.S. [97]. Further, substantially more Mexican immigrants have not earned a high school diploma compared to U.S.-born Mexicans (59% vs. 21%) [98].

The U.S. Census Bureau reported that Hispanics have a higher unemployment rate, lower median household income, and higher percentage of population at the poverty level compared to non-Hispanic white populations [23]. Approximately 18.7% of Hispanics do not have health insurance, and a higher proportion of Hispanics of Mexican origin are

without health insurance compared to other Hispanic subgroups. Compared to foreign-born Hispanics, U.S.-born Hispanics tend to have worse health and health behaviors, such as higher prevalence of hypertension or smokers [23].

Long-term exposure to adverse SDOH, such as poor environment, may interact with disease pathways and effect the rate of metabolic conditions or mortality, which may be exacerbated during social adaptation [99]. It has been argued that inequality or causal models may not be appropriate for Hispanic health disparities due to heterogeneity of the Hispanic population, such as generational differences, cultural beliefs, acculturation, and contrasts between foreign- and U.S.-born Hispanics [100].

Examining SDOH allows for researchers and policy makers to understanding the driving factors of health disparities, which can potentially lead to improved interventions or public health recommendations. For example, a cross-sectional study found telomere length—a biological characteristic affected by environmental, sociocultural, and behavioral factors—is positively correlated with education, self-insurance, body mass index, and amount of sleep among Mexican Americans [101]. Also, it has been reported that SDOH, such as nativity status, sex, acculturation, health conditions, mental health, and function are associated with disability among older Mexican Americans [102]. Further, a recent systematic review reported that loneliness and social isolation were associated with health outcomes, such as comorbidity and worse physical health, among older Hispanics in the U.S. [103]. However, positive social and community attributes, such as the presence of family and strength of one's cultural identity, living in high-density neighborhoods, and involvement with religion or the minority community, have shown to offset unfavorable health conditions for older Mexican Americans [30,104,105]. This is promising for populations with a strong familial background since family-centered interventions have shown to promote functional recovery among older adults and decrease family caregiver anxiety and depression [106].

In this chapter we reviewed different conceptual frameworks to explain the disablement process and how physical function and influential factors may lead to disability, as well as how personal and external factors may drive a person's healthcare utilization or health outcomes after hospitalization. However, research related to disability and healthcare utilization in the context of older Mexican Americans is limited. Thus, we reviewed different minority frameworks needed to understand the complexity of how minority health-related factors vary across multiple levels of influence. This project utilized some aspects of these conceptual models and frameworks for a multi-disciplinary perspective on the disabling process around hospitalization in the context of minorities. This is to ensure SDOH, like minority psycho-social-cultural factors, are captured as a predisposing factor along the pathway towards functional health outcomes.

Chapter 3

METHODS

The purpose of this project is to examine patterns of physical function transitions and identify social determinants of health that predict of physical function recovery, disability recovery, and 30-day readmission after hospitalization among older Mexican Americans over a 12-year period. This will be achieved by three specific aims below, followed by conceptual models, hypotheses, data and population description, variables of interest, and statistical procedure.

Specific Aim 1. To examine patterns of physical function transitions and predictors of physical function recovery among older Mexican Americans over a 12-year period.

Specific Aim 2. To identify the social determinants of health that predict physical function recovery after an acute hospitalization over a 12-year period.

Specific Aim 3. To evaluate the effect of social determinants of health on disability recovery and 30-day readmission after acute hospitalization over a 12-year period.

Conceptual models

We are using multiple theoretical models and frameworks to implement our project described in Chapter 2.

We utilize the Andersen's Expanded Behavioral Model of Health Service Use and the NIMHD Research Framework to understand how social determinants of health impact physical function and disability recovery after an acute hospitalization (Figure 8).

The conceptual framework with example variables illustrates potential associated factors of health services and functional status in the context of Mexican Americans. Factors were placed along the sequence according to Andersen's Expanded Behavioral Model of Health Service Use and the NIMHD Research Framework. Environmental factors include social environment and healthcare access. Participant characteristics include

predisposing (demographic, psycho-social-cultural), enabling (behavior), and need factors (biological). Health outcomes include health services and functional outcomes, such as experiencing an acute hospitalization or disability recovery.

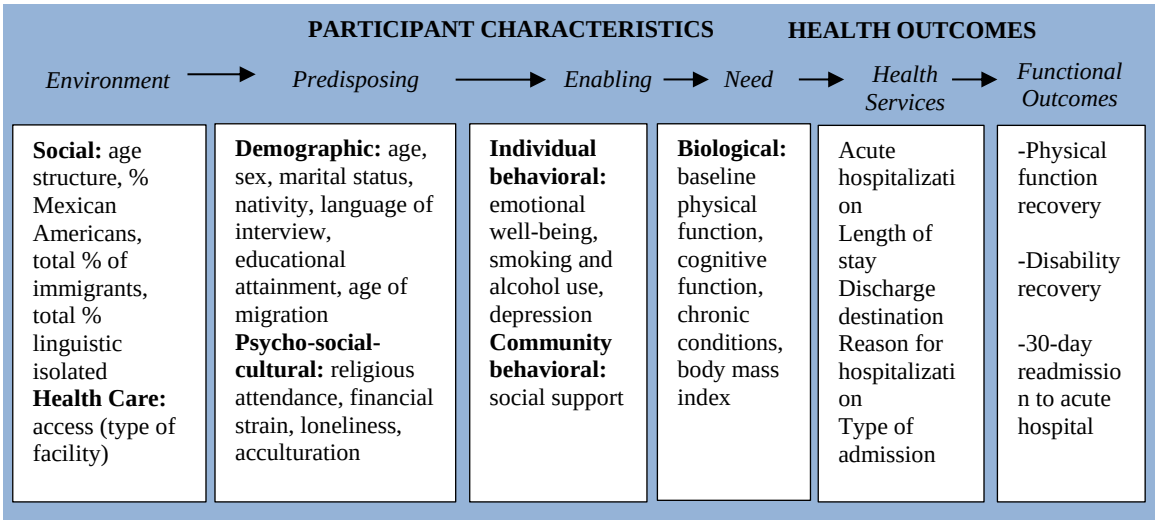

Figure 8 - The proposed integrated conceptual framework with example variables.

Hypotheses

From the illustrated conceptual model, several hypotheses can be tested with longitudinal data. There are three specific hypotheses for each specific aim that can be examined in the present study.

Hypothesis 1.a. Participants who experienced a hospitalization will be less likely to recover in physical function than participants who did not experience a hospitalization.

Hypothesis 1.b. Foreign-born participants will be more likely to recover in physical function than U.S.-born participants over time.

Hypothesis 2.a. Foreign-born older Mexican Americans will be more likely to recover in physical function after acute hospitalization than foreign-born older Mexican Americans.

Hypothesis 2.b. Older Mexican Americans who report not feeling lonely will be more likely to recover in physical function after an acute hospitalization.

Hypothesis 2.c. The association between loneliness status and physical function recovery will be greater among those who reside in highly concentrated Hispanic neighborhoods than those who reside in lower concentrated Hispanic neighborhoods.

Hypothesis 3.a. Older Mexican American females will be more likely to recover from disability after acute hospitalization than older Mexican American males, and that disability recovery will be greater among those females who reside in highly concentrated Hispanic neighborhoods than in males who reside in lower concentrated Hispanic neighborhoods.

Hypothesis 3.b. Older Mexican Americans who had Spanish interviews will be more likely to experience a 30-day readmission that those who were interviewed in English.

Data source and selection

DATA SOURCE

This study uses data from The Hispanic Established Populations for the Epidemiologic Study of the Elderly survey, United States Census Bureau, and Medicare Files from the Centers for Medicare and Medicaid Services.

The Hispanic Established Populations for the Epidemiologic Study of the Elderly (H-EPESE) is an ongoing, longitudinal study of Mexican Americans 65 years and older from Texas, New Mexico, Colorado, Arizona, and California. The H-EPESE has been continuously funded by the NIA and provides information on demographic characteristics, physical function, mental health and function, physical health, social support, and caregiver needs of community-dwelling older Hispanics. The H-EPESE began in 1993 to 1994 with a sample of 3,050 participants at least 65 years and older at baseline and a new cohort of 902 participants aged $\geq$ 75 years was enrolled at Wave 5 (2004/05). Ten observation waves

have been completed every 2-4 years (1993-1994, 1995-1996, 1998-1999, 2000-2001, 2004-2005, 2007-2008, 2010-2011, 2012-2013, 2016, 2020-2021).

To be generalizable to older Mexican Americans, multistage area probability sampling was used to design the study sample, modelled after the Epidemiologic Study of the Elderly [107]. From the 5 Southwestern states listed above, counties were ordered by number of Hispanics and counties with >30% Hispanics were targeted for inclusion. The list of counties was obtained from the census tract and 300 primary sampling units were selected for door-to-door screening. By random selection, 175 households within sampling units were screened. At-home interviews were conducted by bilingual (English/Spanish) project staff and Harris Interactive Inc. employers depending on the respondent or proxy language preference. The interview lasted approximately 90 minutes for the first interview and approximately 60 minutes for interviews thereafter. Survey instrument, definition of variables, and the de-identified raw data are archived at the National Archive of Computerized Data on Aging [108].

The United States Census Bureau (U.S. Census Bureau) Summary Files 1 and 2 (1990-2000) were used as proxies for neighborhood environments. The U.S. Census files have previously been linked with the H-EPESE, and Summary Tape File 1 and File 2 are readily available. Summary Tape File 1 contains data on age, race, sex, marital status, Hispanic origin, household type and relationship, occupancy/vacancy status, tenure, units in structure, contract rent, value, and number of rooms. Summary Tape File 2 contains population and housing characteristics for many detailed races and Hispanic or Latino categories. For this project, we used the 2000 U.S. Census data, which has been deemed a valid method for capturing social determinants of health and has been previously used among other Hispanic-related research [30,109–111]. Lastly, the U.S. Census Bureau uses the term “Hispanic” rather than “Latino”, thus, “Hispanic” term, which encompasses all Latinos and Spanish-speaking populations, will be used for census-based operationalization (e.g., percent of Hispanics living in a neighborhood).

The Medicare Files from the Centers for Medicare and Medicaid Services (CMS) were previously requested through the Research Data Assistance Center (ResDAC) [112]. There are currently three Dual Use Agreements (DUAs) from CMS available for use with approval at the University's Office of Biostatistics. Table 1 shows the CMS files and their corresponding variables used for this project.

Table 1: Definitions of files used from the CMS used.

Data Source	Definitions
Master Beneficiary Summary Files (MBSF)	Contains beneficiary's unique identifier, state and county codes, zip code, date of birth, date of death, sex, race, age, monthly entitlement indicators [A/B/both], reasons for entitlement, state buy-in indicators, and monthly managed care indicators [113].
Medicare Provider and Analysis and Review (MedPAR)	Contains information on inpatient hospital and skilled nursing facility final action stay records (one or multiple claims) [114].
Outpatient Standard Analytic Files (OUTSAF)	Contains institutional outpatient providers, such as hospital outpatient departments, rural health clinics, renal dialysis facilities, outpatient rehabilitation facilities, and community mental health centers. The claims include diagnosis (ICD-9, ICD-10), Healthcare Common Procedure Coding System (HCPCS) codes, dates of service, reimbursement amount, outpatient provider number, revenue center codes, and beneficiary demographic information [115].
Carrier File (Physician/Supplier Part B File)	Contains final fee-for-service claims. Most of the claims are from physicians, physician assistants, clinical social workers, or nurse practitioners. The claims include diagnosis and procedure (ICD-9, CMS HCPCS codes), dates of service, reimbursement amounts, provider numbers (e.g., UPIN, PIN, NPI), and beneficiary demographic information [116].
Notes: Definitions are from Research Data Assistance Center [117]. CMS=Centers for Medicare and Medicaid Services; ICD-9=International Classification of Diseases 9th; HCPCS=Healthcare Common Procedure Coding System; UPIN=Unique Physician Identification Number; PIN= Provider Identification Number; NPI=Replaces the Unique Physician Identification Number	

Our requests for CMS data are limited to beneficiaries participating in the H-EPESE study. Information of the participants (sex, date of birth, date of death, and county of residence) was linked with the CMS Medicare files [Medicare MBSF, MedPAR,

OUTSAF, Carrier files] from Wave 4 (1999-2000) to Wave 9 (2016), using individual identifiers consistent across datasets and determined by CMS. All linkage was done by their designated contractor, which followed the CMS and the Health Insurance Portability and Accountability Act of 1996 guidelines, and requirements as outlined in the Data Use Agreement (DUA number 50783).

We included data from the H-EPESE survey from Wave 5 to 9 (N=2,069) linked with the U.S. Census Bureau and CMS files. For the initial linkage, inclusion criteria were as follows: a) age ≥ 75 years at Wave 5; and b) Medicare Parts A and B coverage without Health Maintenance Organization (Medicare Advantage) insurance for 12 months prior to the interview date. A total of 1,514 participants were successfully linked between the H-EPESE, U.S. Census Bureau, and CMS files. Participants were further excluded if they did not have at least one interview between Wave 5 (2004/05) and 9 (2016) with one year Medicare Part A & B coverage without HMO prior to interview date (N=264). The final sample of participants linked with CMS files was 1,250.

SAMPLE SELECTION

For each aim, the H-EPESE observational Wave 5 (2004/05) to Wave 9 (2016) survey data were extracted from the National Archive of Computerized Data on Aging. The survey study population includes 2,069 Mexican Americans aged 75 years and older, which allows for the new cohort enrolled at Wave 5 (2004/05) (n=902) to be analyzed. The overall population characteristics of older Mexican Americans enrolled in the H-EPESE at Wave 5 (N=2,069) and count of missingness in the overall sample are presented in Table 2. All participant demographic and health characteristics include age, sex, body mass index, having depressive symptoms, cognitive function, presence of chronic conditions (previous heart attack, stroke, cancer, and hip fracture, and having diabetes, arthritis, and hypertension), physical function status, and number of activities of living requiring assistance. Social determinants of health available for descriptive analysis across all

participants include sex, educational attainment, median household income, insurance status, nativity status, interview language, marital status, loneliness, neighborhood concentration. Complete definitions of the participant characteristics in Table 2 can be found in the **MEASUREMENT** section.

Table 2: Description of overall population characteristics of older Mexican Americans enrolled in the H-EPESE at Wave 5 (2004/05) and count of missingness of overall sample (N=2,069).

Variables	Overall sample N (%)	Missingness N (%)
Demographic + Socioeconomic Factors		
Age (years), mean ± SD	81.9 ± 5.1	1 (0.1%)
Sex (female)	1,268 (61.3%)	0 (0. 0%)
Education (years), mean ± SD	4.93 ± 4.04	1 (0.1%)
Median household income ($), mean (IQR)	$24,726.00 ($12,005)	0 (0.0%)
Health and Health Care Factors		
Body mass index (kg/m^2), mean ± SD	27.5 ± 4.9	427 (20.6%)
Depressive symptoms (CES-D ≥16)	358 (18.8%)	168 (8.1%)
Cognitive impairment (MMSE <21)	761 (39.0%)	119 (5.8%)
Chronic conditions		
Heart attack	177 (8.6%)	21 (1.0%)
Stroke	173 (8.4%)	15 (0.7%)
Cancer	149 (7.2%)	9 (0.4%)
Hip fracture	99 (4.8%)	11 (0.5%)
Diabetes	689 (33.4%)	8 (0.4%)
Arthritis	1,224 (60.2%)	37 (1.8%)
Hypertension	1,261 (61.7%)	24 (1.1%)
Physical function status		72 (3.5%)
Low (SPPB 0-6)	1,115 (55.8%)	-
Moderate (SPPB 7-9)	542 (27.1%)	-
High (SPPB 10-12)	340 (17.0%)	-
Activities of daily living, mean ± SD	1.4 ± 2.2	2 (0.1%)
Insurance coverage	1,983 (95.8%)	0 (0.0%)
Physical/Built + Socio-Cultural Environmental Factors*		
Interview language (Spanish)	1,660 (80.3%)	1 (0.1%)
Marital Status		6 (0.3%)
Married	879 (42.6%)	-
Widowed	975 (47.2%)	-
Not Married	209 (10.1%)	-

Lonely (yes)	598 (31.8%)	186 (9.0%)
Nativity status (U.S.-born)	1,157 (56.0%)	1 (0.1%)
Neighborhood concentration (>60th percentile)	1,473 (71.2%)	0 (0.0%)
Notes: H-EPESE=Hispanic Established Populations for the Epidemiologic Study of the Elderly; SD=Standard Deviation; IQR=Interquartile Range; kg=kilograms; m=meters; CES-D=Center for Epidemiological Studies Depression Scale; MMSE=Mini-Mental State Examination; SPPB=Short Physical Performance Battery		

The sample and status of follow-up at each observational wave is presented in Table 3. At Wave 5 (2004/05), 1,741 participants were interviewed in-person, 185 participants were interviewed with an assisted proxy, and 142 interviews were conducted with proxy only. At Wave 6 (2007/08), 1,172 participants were re-interviewed while 140 interviews were proxy only and 135 interviews were assisted proxy. At Wave 7 (2010/11), 851 participants were interviewed in-person and up to 794 participants had been confirmed deceased by the National Death Index (NDI) and reports from relatives. At Wave 8 (2012/13), 543 participants were interviewed in-person, 25 participants refused to be interviewed, and 18 participants were lost to follow-up. At Wave 9 (2016), 314 participants were interviewed, 140 interviews required a proxy, 344 participants were confirmed deceased, 42 participants refused to be interviewed, and 163 participants were lost to follow-up.

Table 3: Follow-up status at each observational wave of the H-EPESE.

Status	**Wave 5**	**Wave 6**	**Wave 7**	**Wave 8**	**Wave 9**
	2004/05	**2007/08**	**2010/11**	**2012/13**	**2016**
Sample size	2069	1542	1078	743	480
Assisted proxy	185	135	138	103	140
Proxy only	142	140	24	55	0
Deceased	0	363	431	272	344
Refused	0	98	88	25	42
Lost to follow-up	1	161	174	18	163
Interviewed in person	1741	1172	851	543	314

We included data from the H-EPESE survey from Wave 5 to 9 and U.S. Census Bureau linked with CMS files (n=1,250). Participants were selected based on the first two consecutive waves (predecessor to successor) to capture change in physical function (Aims 1 and 2) or disability (Aim 3) across consecutive observational waves (Wave 6 vs 5, Wave 7 vs 6, etc.). This allowed for multiple observations for each participant.

For example, Figure 9 shows the schematic longitudinal analytic approach, where participants may experience an acute hospitalization between two consecutive waves where SPPB transitions, change in ADL disability, or 30-day hospital readmission may occur in the immediate successor interview or over the follow-up period. Any hospital admission claims in the CMS Medicare MedPAR files within the year prior to the interview date of the successor record were used to determine acute hospitalization. In the case of participants with multiple hospitalizations, the last claim closer to the interview date of the successor observational wave was used. Of the 1,250 participants, there were approximately 1,401 observations over the 12-year period.

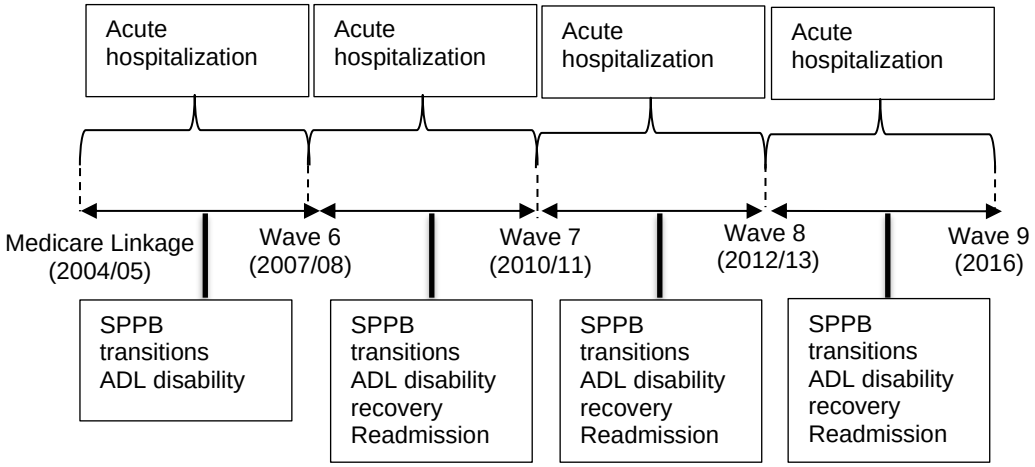

Figure 9 - Schematic of longitudinal analytic approach.
Where, physical function was measured by the Short Physical Performance Battery (SPPB). Disability was assessed using activities of daily living (ADLs), were requiring assistance with >1 ADL indicated having disability.

Figure 10 shows the consort flow diagram of the final analytic sample for Aims 1-2 (N=597) and Aim 3 (N=619). Given the analytic approach, participants without at least

one consecutive interview (predecessor – successor) (N=518) were excluded. For Aims 1 and 2, participants were further excluded if the participant did not have a physical function measure for the immediate predecessor and successor (N=54) and had missing covariates at baseline (N=87). For Aim 3, participants were further excluded if the participant did not have an ADL assessment for the immediate predecessor and successor (N=21) and had missing covariates at baseline (N=98).

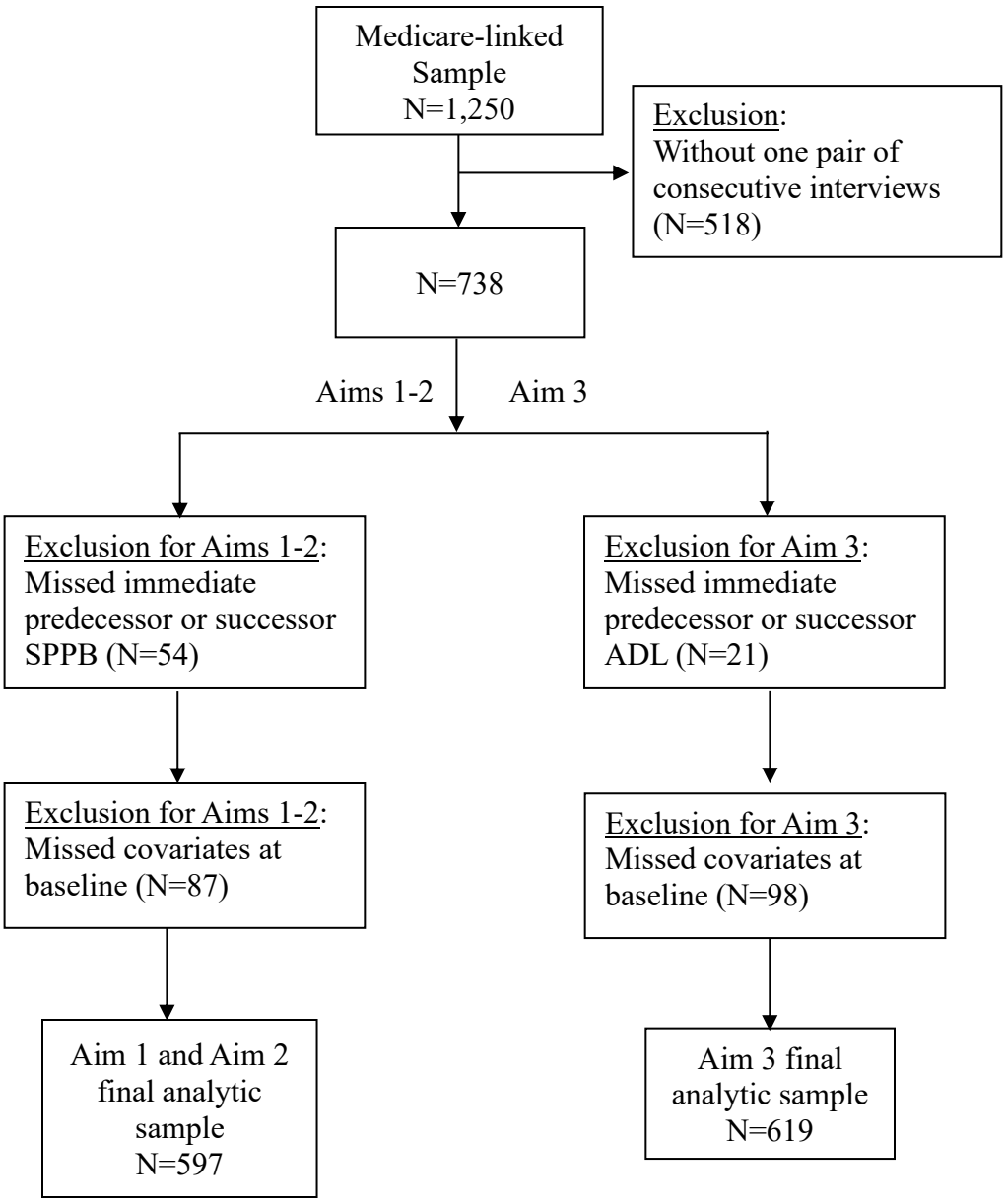

Figure 10 - Consort flow diagram of final analytic sample for each Aim.

Table 4 shows the descriptive characteristics of the dataset total observations between excluded and included older Mexican American Medicare Beneficiaries for Aims 1 and 2. Participants who were excluded were significantly older, were females, had fewer years of education, had a higher body mass index (BMI), higher prevalence of depressive symptoms, higher prevalence of cognitive impairment, higher Charlson

Comorbidity Score, poorer baseline physical function, lower prevalence of Spanish interview, and a lower prevalence of not feeling lonely than those included in the study.

Table 4: Descriptive characteristics between excluded and included older Mexican American Medicare Beneficiaries for Aim 1 and 2 (N=1,401).

Variables	Excluded 292 (20.8%)	Included 1109 (79.2%)	*p*
Demographic + Socioeconomic Factors			
Age (years), mean ± SD	84.7 ± 5.2	82.9 + 4.7	<.0001
Sex (female), %	71.2%	62.9%	0.001
Education (years), mean ± SD	4.1 ± 3.5	5.0 ± 4.0	0.0004
Household income ($), median (IQR)	$23,762.5 (19,375-29,030)	$23,138.0 (19,522-27,768)	0.585
Health and Health Care Factors			
BMI (kg/m^2), mean ± SD	29.0 ± 5.4	27.5 ± 5.0	0.009
Depressive symptoms (CES-D ≥16)	32.9%	17.2%	<.0001
Cognitive impairment (MMSE <21)	62.6%	31.3%	<.0001
Charlson Comorbidity Score, median (IQR)	3 (0-10)	3 (0-8)	0.015
Physical function status			<.0001
Low	87.3%	49.9%	-
Moderate	9.6%	31.1%	-
High	3.2%	19.0%	-
Physical/Built + Socio-Cultural Environmental Factors			
Interview language (Spanish),	79.9%	85.7%	0.017
Marital Status, %			0.205
Married	33.5%	37.5%	-
Not Married	66.6%	62.5%	-
Lonely (no), %	61.5%	72.3%	0.002
Nativity status (U.S.-born)	56.9%	58.8%	0.549
Neighborhood concentration, median (IQR)	70.0 (59.5-78.8)	71.6 (60.4-79.6)	0.172

Notes: Values are presented as mean + standard deviation (SD) or N (%). Chi-square tests were used for categorical variables. Unpaired t-tests were used for normally distributed continuous variables. Wilcoxon test was used for non-parametric continuous variables (household income, Charlson comorbidity score, neighborhood concentration)
SD=Standard Deviation; IQR=Interquartile Range; H-EPESE=Hispanic Established Populations for the Epidemiologic Study of the Elderly; BMI=Body Mass Index;

kg=kilograms; m=meters; CES-D= Center for Epidemiological Studies Depression Scale; MMSE=Mini-Mental State Examination; SPPB=Short Physical Performance Battery

Table 5 shows the descriptive characteristics of the primary dataset total observations between excluded and included older Mexican American Medicare Beneficiaries for Aim 3. Participants who were excluded were significantly older, were female, had fewer years of education, a higher BMI, higher prevalence of depressive symptoms, cognitive impairment, higher Charlson Comorbidity Score, poorer baseline physical function, lower prevalence of Spanish interview, lower prevalence of being married, and a lower prevalence of not feeling lonely than those included in the study.

Table 5: Descriptive characteristics between excluded and included older Mexican American Medicare Beneficiaries for Aim 3.

Variables	Excluded 258 (18.4%)	Included 1143 (81.6%)	*p*
Demographic + Socioeconomic Factors			
Age (years), mean ± SD	85.1 ± 5.1	82.8 ± 4.7	<.0001
Sex (female), %	72.9%	62.8%	0.002
Education (years), mean ± SD	4.1 ± 3.5	5.0 ± 4.0	0.001
Household income ($), median (IQR)	$23,706.5 (19,375-29,030)	$23,138.0 (19,522-27,819)	0.624
Health and Health Care Factors			
BMI (kg/m^2), mean ± SD	28.9 ± 5.9	27.5 ± 5.0	0.072
Depressive symptoms (CES-D ≥16), %	38.2%	16.9%	<.0001
Cognitive impairment (MMSE <21), %	67.4%	31.4%	<.0001
Charlson Comorbidity Score, median (IQR)	4 (0-11)	3 (0-8)	0.001
Physical function status, %			<.0001
Low	94.0%	49.7%	-
Moderate	4.6%	31.4%	-
High	1.4%	18.9%	-
Physical/Built + Socio-Cultural Environmental Factors			
Interview language (Spanish), %	77.7%	86.0%	0.001
Marital Status, %			0.047

Married	31.2%	37.9%	-
Not Married	68.8%	62.1%	-
Lonely (no), %	58.4%	72.4%	0.0002
Nativity status (U.S.-born), %	56.6%	58.8%	0.517
Neighborhood concentration, median (IQR), %	69.7 (59.5-78.5)	72.3 (60.4-79.6)	0.076

Notes: Values are presented as mean + standard deviation (SD) or N (%). Chi-square tests were used for categorical variables. Unpaired t-tests were used for normally distributed continuous variables. Wilcoxon test was used for non-parametric continuous variables (household income, Charlson comorbidity score, neighborhood concentration)
SD=Standard Deviation; IQR=Interquartile Range; H-EPESE=Hispanic Established Populations for the Epidemiologic Study of the Elderly; BMI=Body Mass Index; kg=kilograms; m=meters; CES-D=Center for Epidemiological Studies Depression Scale; MMSE=Mini-Mental State Examination; SPPB=Short Physical Performance Battery

MEASUREMENTS

Independent variables

Table 6: Description of independent variables from H-EPESE survey and U.S. Census Bureau.

Variables	Description
Demographic + Socioeconomic Factors	
Age	Defined as total age (years) as continuous. Data source: H-EPESE
Sex	Categorized female versus male. Data source: H-EPESE
Education	Total educational years attained. Data source: H-EPESE
Median household income	Total household income of persons >15 years and older residing in household and used a continuous variable [118]. Data source: U.S. Census Bureau
Health and Health Care Factors	
Body mass index	Computed by dividing weight (kilograms) by height (meters^2) and used as a continuous variable [90]. Data source: H-EPESE
Depressive symptoms	Derived from the Center for Epidemiological Studies Depression Scale (CES-D). The CES-D is a 20-item scale with a 4-point scale with a total of 60 points. Participants were asked about frequency of specific symptoms (rarely, none, most, or all of

	the time). A score > 16 on the CES-D survey is considered having high depressive symptoms [119]. Depressive symptoms were dichotomized as having depression (> 16 CES-D) versus no depression (<16 CES-D). Data source: H-EPESE
Cognitive function	Described using Mini-Mental State Examination (MMSE) with a total score ranging from 0-30. English and Spanish versions of the MMSE were adopted from the DIS and have been used in prior community surveys [120]. Cognitive function was assessed a continuous variable. Cognitive impairment was defined as an MMSE score <21. Data source: H-EPESE
Number of chronic conditions	Defined as the total number of chronic conditions, such as previous heart attack, stroke, cancer, hip fracture, arthritis, hypertension, diabetes. A prior physician diagnosis of chronic condition was assessed with the question, "Have you ever been told that you have [condition]?" Data source: H-EPESE
Physical function	The Short Physical Performance Battery (SPPB) will be used [35]. The SPPB includes 3 objectively measured assessments (balance, chair-to-stand, and gait speed). Each item is rated on a scale from 0 (unable to do) to 4 (quickest time to completion) with total scores from 0 to 12. Higher scores indicate better physical performance. SPPB reliability, validity, and responsiveness have been demonstrated. Participants were categorized as low (SPPB=0-7), moderate (SPPB=7-10), or high (SPPB=10-12) physical function [121]. Data source: H-EPESE
Disability	Assessed with modified Katz activities of daily living (ADL) scale [122]. Self-reported limitation or requiring assistance with at least 1 of the following tasks: bathing, grooming, eating, transferring from bed to chair, walking across a small room, and using the toilet. ADL disability is dichotomized as "yes" (need help) vs "no" (help needed) Data source: H-EPESE
Physical/Built + Socio-Cultural Environmental Factors	
Interview language	Participant interview preference conducted in Spanish versus English. Data source: H-EPESE
Marital Status	Categorized into married and not married (widowed, separated, never married). Data source: H-EPESE
Loneliness	Derived from CES-D scale (yes response for "I felt lonely," with responses "rarely/none", "some/little", "occasionally/moderate", or "most/all of the time". Loneliness was categorized as yes ("rarely/none") versus no

	("some/little", "occasionally/moderate", or "most/all of the time"). Data source: H-EPESE
Nativity status	Foreign-(Mexico)born versus U.S.-born. Data source: H-EPESE
Neighborhood concentration	Dichotomized as low versus high using percentage of Mexican Americans within the participants neighborhood based on 60th percentile [30,123]. Percentage of Mexican Americans was derived from U.S. Census files and was scaled from 0 to 1, where higher scores indicate greater community homogeneity. Data source: U.S. Census Bureau

Table 7: Description of independent health care variables from CMS files.

Variable	Source	Description
Primary diagnosis	MedPAR	Primary diagnosis included initial diagnosis at the time of hospital admission reported in ICD-9, ICD-10 codes, MS-DRG, RUGs, HHRG and files. Used for descriptive purposes only.
Comorbidity index	MedPAR, OUTSAF, Carrier	The Charlson Comorbidity Index was used to create the weighted comorbidity score. Comorbidity index was dichotomized by median the score of $\geq$3 versus <3.
Provider type	OUTSAF	Primary care physician (general practice, family medicine, and internal medicine), nurse practitioner, and specialists (neurologists, psychiatrist, geriatric psychiatrist, and neuropsychiatrist). Used for descriptive purpose only.
All-cause hospitalization	MedPAR	All-cause hospitalization included any short or long-term hospital with >1 one day between admission and discharge date on the hospital claims. The last hospitalization within a year prior to successor-record date was used.
Length of stay	MedPAR	Length of hospital stay included duration in days of index hospitalization.
Reason for hospitalization	MedPAR, Carrier	Reason for hospitalization included medical versus surgery from the ICD-9/-10 diagnosis codes.
Number of hospitalizations	MedPAR	Any acute hospital admission in a given year using admission dates. Used for sample selection only
Discharge destination	MedPAR, OUTSAF	Discharge destination was derived from facility codes and include either a home or institutional discharge destination (e.g., Board and Care, Transitional Living, Intermediate Care, Skilled Nursing Facilities, Acute Unit of Own Facility).

Provider institution facility	MedPAR, Carrier	Included medical school affiliated hospital versus non-medical school affiliated hospital using medical school affiliation codes
Notes: CMS=Center for Medicaid and Medicare; MBSF= Master Beneficiary Summary Files; MedPAR=Medicare Provider and Analysis and Review; OUTSAF= Outpatient Standard Analytic Files; CMS=Centers for Medicare and Medicaid Services; ICD-9/10=International Classification of Diseases 9th or 10th; MS-DRG= Medicare Severity-Diagnosis Related Groups; RUGs=Resource Utilization Group; HHRG= Home Health Resource Group		

Dependent variables

Table 8: Description of dependent variables used from H-EPESE survey and CMS files.

Variable	Data Source	Description
Physical function recovery (Aim 1 and Aim 2)	H-EPESE	The SPPB categories low (SPPB=0-7), moderate (SPPB=7-10), or high (SPPB=10-12) physical function were used to create the physical function recovery variable. Over time, 2 physical function transition groups include "declined" (low-low, moderate-low, high-low, high-moderate) or "recovered" (low-moderate, low-high, moderate-high, high-moderate, moderate-moderate, high-high).
Disability recovery (Aim 3)	H-EPESE	Modified Katz' ADLs were used to describe disability recovery. Disability recovery was defined as regain of the same level as reported before the acute hospitalization, whereas those who required additional assistance in ADL were considered to have worsened in disability.
30-day hospital readmission	CMS files (MedPAR)	Readmission was defined as admission to an acute care hospital in the 30 days after discharge from the acute care index hospitalization, and was identified as a hospital readmission within a year prior to successor-record date
Notes: H-EPESE=Hispanic Established Populations for the Epidemiologic Study of the Elderly; CMS=Center for Medicaid and Medicare; SPPB=Short Physical Performance Battery; ADL=Activities of Daily Living; MedPAR= Medicare Provider and Analysis and Review; NDI=National Death Index		

ANALYTIC PROCEDURES

Multiple analyses and statistical techniques for each aim were conducted, such as descriptive analyses, tables, graphs, box plots, and other forms of exploratory data analysis. Guided by the literature and our conceptual models, we present hypotheses based on our specific aims. A p-value of <0.05 was set for statistical significance. We conducted all statistical analyses for each aim in SAS® (Version 9.4).

Generalized estimating equations (GEE) were used to estimate the odds of physical function recovery, disability recovery, and 30-day rehospitalization over a 12-year period (Aims 1–3). The GEE is an extension of the traditional linear models and uses generalized linear models to model longitudinal data by estimating population average regression coefficients as a function of covariates. In SAS®, the PROC GENMOD fits marginal models for GEE by estimating maximum likelihood (quasi-likelihood method). This procedure relies on R-side covariance structures and assumes independence across participants that data missing completely at random (restrictive) [124]. Compared to the other procedures (e.g., GLIMMIX or MIXED), the PROC GENMOD estimates population averages for binary outcomes rather than subject-specific outcomes and does not require any assumptions about participant residuals or random effects [125]. Model assumptions were tested by examining model residuals. A first-order autoregressive covariance structure was used, and this covariance structure assumes correlation between residuals decreases exponentially and gets smaller over time [126].

For Aim 2 and Aim 3, we follow a one-level model with interaction terms for hospitalization and selected social determinants of health to carefully examine the difference between those hospitalized and not hospitalized. This approach allows us to maintain those who did not experience a hospitalization and examine the relationship between the main SDOH predictor and functional recovery status and the significant differences after hospitalization and no hospitalization. Then we subset the analysis by

those who were hospitalized to examine how all predictors and covariates influence functional recovery after hospitalization or 30-day hospital readmission.

This procedure does not include an automatic process for selecting the best model fitting model; thus, it is suggested to manually select and evaluate models. The model selection is dependent on relevant factors and confounders (based on bivariate correlations (Appendix B, Tables 1-4)) and pseudo-likelihood estimations (-2 log likelihood (-2LL)), pseudo-Akaike's Information Criterion (AIC), and pseudo-Bayesian Information Criterion (BIC) values. Compared to an unconditional model (no predictors), a lower -2LL of the models built with more parameters indicate a better fit, which is comparable to the chi-square differences test used for other longitudinal analyses.

Specific Aim 1

Aim 1 was to examine physical function transitions and predictors of physical function recovery among older Mexican Americans over a 12-year period (N=1,109).

First, t-test and Chi-square test were used for continuous and categorical variables, such as demographic and socioeconomic characteristics, health and health care factor, physical/built and socio-cultural environmental characteristics by physical function recovery status (declined versus recovered). Second, we calculated counts and frequencies to estimate proportions and describe change in population functional status by baseline physical function status. Count data was used to capture the number of events without any boundaries or predetermined notion at each wave (Wave 5-Wave 6, Wave 6-Wave 7, Wave 7-Wave 8, Wave 8-Wave 9). Third, we examined the factors that predict the odds of recovering in physical function over time by model building. An alpha level of 0.05 was set significance for individual predictors.

Hypothesis 1.a. Participants who experienced a hospitalization will be less likely to recovery in physical function than participants who did not experience a hospitalization.

Hypothesis 1.b. Foreign-born participants will be more likely to recover in physical function than U.S.-born participants over time.

To test hypothesis 1a-1b. We included sociodemographic and health factors of Mexican Americans in the generalized estimating equations models using the PROC GENMOD procedure with a binomial distribution to estimate the odds of physical function recovery as a function of hospitalization. First, an unconditional model (no predictors) was created to estimate the odds of recovering in physical function for participants and whether there was a significant variability in physical function recovery across all participants. Then we conducted several standard models in a stepwise fashion to examine these relationships to carefully examine the model change with different parameters. Last, models were built in the following order:

Model 1: Time

Model 2: Time + Demographic characteristics (age, female sex, education)

Model 3: Model 2 + Health factors (BMI, depressive symptoms, cognitive impairment, Charlson comorbidity index, hospitalization)

Model 4: Model 3 + Socio-cultural environmental characteristics (Spanish interview, foreign-born, self-reported loneliness)

Specific Aim 2

Aim 2 was to identify the social determinants of health that predict physical function recovery after an acute hospitalization over a 12-year period (N=1,109).

First, we used t-test and Chi-square analyses to examine differences in continuous and categorical demographic and socioeconomic characteristics, health and health care factor, physical/built and socio-cultural environmental characteristics, and healthcare variables by physical function recovery after acute hospitalization. Second, used

generalized estimating equation models to identify predictors of physical function recovery after acute hospitalization. Third, we tested the moderator effect of hospitalization and foreign-born status, hospitalization status and loneliness status, and loneliness status and neighborhood concentration level by model building. The influential diagnostics and model checking procedures are similar to Aim 1.

Hypothesis 2.a. Foreign-born older Mexican Americans will be more likely to recover in physical function after acute hospitalization than U.S.-born older Mexican Americans.

Hypothesis 2.b. Older Mexican Americans who report not feeling lonely will be more likely to recover in physical function after an acute hospitalization.

To test hypothesis 2a-2b. We applied generalized estimating equations using the PROC GENMOD with a binomial distribution to estimate the OR of physical function recovery over time after acute hospitalization. For example,

Model 1: Time

Mode1 2: Time + Demographic + Socioeconomic (Age, female sex, education)

Model 3: Model 2 + Health factors (BMI, depressive symptoms, cognitive impairment, Charlson comorbidity index)

Model 4: Model 3 + Physical/Built + Socio-cultural environment (Spanish interview, foreign-born status, loneliness status, neighborhood concentration level)

Model 5: Model 3 + Health care factor (provider institution)

Hypothesis 2.c. The association between loneliness status and physical function recovery will be greater among those who reside in highly concentrated Hispanic neighborhoods than those who reside in lower concentrated Hispanic neighborhoods.

To test hypothesis 2c. Interaction terms were constructed between loneliness and neighborhood concentration to determine whether physical function recovery across these social determinants of health. For example,

Model 6: Model 5 + interaction terms between loneliness and neighborhood concentration level

Figure 11 shows the conceptual model of the moderator effect where self-reported loneliness status is the independent variable, neighborhood concentration level is the moderator variable, and physical function recovery is the dependent variable.

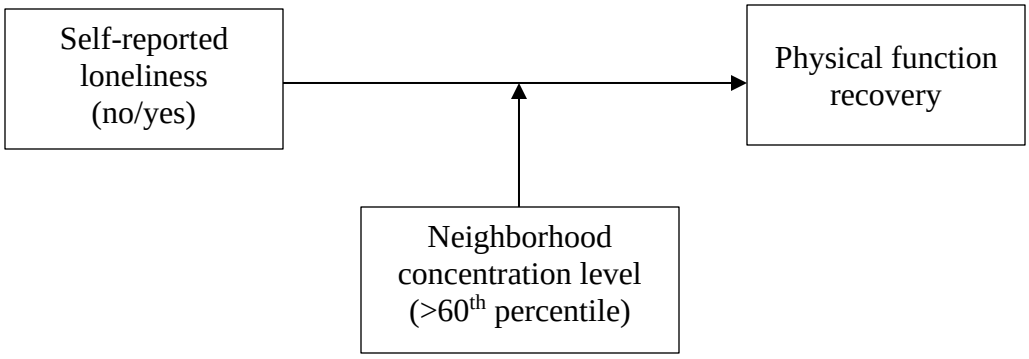

Figure 11 - The moderation effect for neighborhood concentration level in the relationship between loneliness status and physical function recovery.

Subset Analysis for Aim 2

In addition to the analytic procedure for Aim 2, subset analysis was conducted for those with hospitalization (N=299). The purpose of this additional analysis was to better interpret potential predictors of physical function recovery after hospitalization. This reduces the complexity of calculating and interpreting odds ratios for interaction terms, regardless of statistical significance. The magnitude of estimates are summarized in Tables

in Appendix C. The model building process mirrored the model building explained for this analysis.

Specific Aim 3

Aim 3 was to evaluate the effect of social determinants of health (e.g., sociodemographic, environmental, and health care access factors) on disability recovery and 30-day readmission after an acute hospitalization over a 12-year period (N=1,143).

First, t-test and Chi-square analyses were conducted to test the differences in continuous and categorical demographic and socioeconomic characteristics, health and health care factor, physical/built and socio-cultural environmental characteristics, and healthcare factors by disability recovery and 30-day readmission. Second, we identified predictors of disability recovery. Third, the moderator effect (neighborhood concentration) was tested. Fourth, we identified predictors of 30-day readmission. The influential diagnostics and model checking procedures are similar to Aims 1 and 2.

Hypothesis 3.a. Older Mexican American females will be more likely to recover from disability after acute hospitalization than older Mexican American males, and that disability recovery will be greater among those females who reside in highly concentrated Hispanic neighborhoods than in females who reside in lower concentrated Hispanic neighborhoods.

To test hypothesis 3a. We applied generalized estimating equation using the PROC GENMOD to estimate the odds of disability recovery after acute hospitalization. Similar to Aims 1 and 2, we constructed several models and test for main effects and contextual effects of social determinants of health, but Hypothesis 3 required an interaction term analysis between sex and neighborhood concentration to assess its effect on disability recovery. For example,

Model 6: Demographic and Socioeconomic characteristics (age, female sex, education, income) + Health factors (depressive symptoms, cognitive impairment, Charlson comorbidity index, baseline physical function) + Physical/Built and Socio-cultural environmental factors (Spanish interview, neighborhood concentration level) + Health care factors (provider institution, discharge destination) + interaction terms between sex and neighborhood concentration level

Figure 12 shows the conceptual model of the moderator effect where sex is the independent variable, neighborhood concentration level is the moderator variable, and disability recovery is the dependent variable.

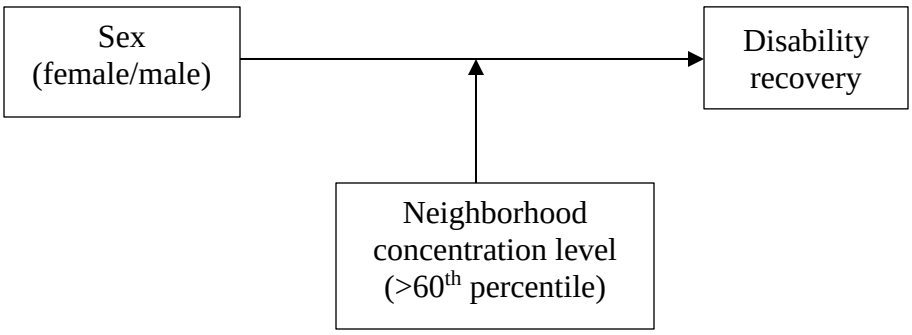

Figure 12 - The moderation effect for neighborhood concentration level in the relationship between sex and disability recovery.

Hypothesis 3.b. Older Mexican Americans who had Spanish interviews will be more likely to experience a 30-day readmission that those who were interviewed in English.

To test hypothesis 3b. We conducted a subset analysis among older Mexican Americans who experienced a hospitalization (N=305). Then we applied generalized estimating equations models to estimate the odds of 30-day hospital readmission over time.

The model simultaneously controlled for demographic and socioeconomic characteristics health factors, physical/built and socio-cultural environmental factors.

Subset Analysis for Aim 3

In addition to the analytic procedure for Aim 3, a subset analysis was conducted for those with hospitalization only (N=305). The purpose of this additional analysis was to better interpret potential predictors of disability recovery after hospitalization. The magnitude of estimates are summarized in Tables in Appendix C. The model building process mirrored the model building explained for this analysis.

Chapter 4

AIM 1 RESULTS

In this chapter, we examined physical function transitions and predictors of physical function recovery among older Mexican Americans over a 12-year period. We hypothesized that participants who experienced a hospitalization will be less likely to recovery in physical function than participants who did not experience a hospitalization and foreign-born participants will be more likely to recover in physical function than U.S.-born participants among older Mexican Americans over a 12-year period.

RESULTS OF DESCRIPTIVE ANALYSES

Demographics

A total of 1,109 observations were analyzed over the 12-year period. Table 9 presents the overall baseline descriptive characteristics by physical function status (declined versus recovered) (N=1,109).

Overall, the average age was 82.9 $\pm$ 4.7 years, 62.9% were female, had a median household income of $23,138.0 (IQR=19,522 – 27,768), had 5.0 $\pm$ 4.0 years of education, had an average BMI of 27.5 $\pm$ 5.0 kg/m^2, 17.2% had depressive symptoms, 31.3% had cognitive impairment, had a median Charlson comorbidity score of 3 (IRQ=0-8), 85.7% had a Spanish interview, 37.5% were married, 27.7% self-reported feeling lonely, 41.2% were foreign-born, and 40.5% lived in highly Hispanic concentrated neighborhoods.

Of the 1,109 observations, 804 declined in physical function and 305 recovered in physical function over the 12-year period. Those who recovered in physical function were younger, had more years of education, a lower prevalence of depressive symptoms, a lower prevalence of cognitive impairment, a lower Charlson comorbidity score, a lower prevalence of interviews conducted in Spanish, and a higher prevalence of self-reporting feeling lonely compared to those who decline in physical function.

Table 9: Descriptive characteristics of the overall sample among older Mexican Americans by physical function recovery status (N=1,109).

	Physical function status		
Variables	**Declined**	**Recovered**	**p**
Sample size	804 (72.5%)	305 (27.5%)	-
Demographic + Socioeconomic Factors			
Age (years), mean ± SD	83.5 ± 4.9	81.2 ± 3.8	<.0001
Sex, %			0.018
Male	35.0	42.6	-
Female	65.0	57.4	-
Education (years), mean ± SD	4.6 ± 3.8	5.9 ± 4.4	0.018
Household income (USD), median (IQR)	$23,305 (19,522-27,819)	$22,162 (19,962-27,135)	0.202
Health Factors			
BMI (kg/m^2), mean ± SD	27.7 ± 5.3	26.9 ± 4.2	0.584
Depressive symptoms (CES-D ≥16), %	20.3	9.2	<.0001
Cognitive impairment (MMSE <21), %	36.2	18.4	<.0001
Charlson Comorbidity Index, %			0.0002
<3	46.0	58.7	-
≥3	54.0	41.3	-
Hospitalization, %	73.0	27.0	<.0001
Physical/Built + Socio-Cultural Environmental Factors			
Spanish interview, %	87.2	81.6	0.019
Marital status, %			0.080
Not married	64.1	58.4	-
Married	36.0	41.6	-
Lonely (no), %	70.5	77.1	0.030
Foreign-born, %	42.4	38.0	0.186
Neighborhood concentration, %			0.116
<60th PCTL	58.1	63.3	-
≥60th PCTL	42.9	36.7	-

Notes: Values are presented as means ± standard deviation (SD) or N (%)
Categorical variables were tested using Chi-square test, and continuous variables tested using t-test. Kruskal-Wallis was used for non-parametric test (household income).
BMI = body mass index measured in kilograms/meters-squared; CES-D = Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; SPPB = Short Physical Performance Battery

At Wave 5, there were 540 observations (48.7%), at Wave 6 there were 313 observations (28.2%), at Wave 7 there were 193 observations (17.4%), and at Wave 8 there were 63 observations (5.7%). Overall, 49.9% had low physical function at baseline, 31.1% had moderate physical function at baseline, 19.0% had high physical function at baseline. Figure 13 shows the prevalence of physical function transitions at each wave by preceding physical function status (low, moderate, high). Panel A shows the physical function transitions from Wave 5 to Wave 6 (N=540). Of those who recovered (N=150), most participants started with moderate physical function at baseline (51%) than low or high physical function at baseline (19% versus 29%), respectively. Panel B shows the physical function transitions from Wave 6 to Wave 7 (N=313). Of those who recovered (N=99), most participants started with low physical function at baseline (40%) than moderate or high physical function (38% versus 21%), respectively. Panel C shows the physical function transitions from Wave 7 to Wave 8 (N=193). Of those who recovered (N=48), most participants started with moderate physical function at baseline (52%) than low or high physical function (19% versus 29%), respectively. Panel D shows the physical function transitions from Wave 8 to Wave 9 (N=63). Of those who recovered (N=9), there were zero participants who had high physical function at baseline, and most had low physical function than moderate physical function at baseline (75% versus 25%), respectively. Overall, there was a higher proportion of participants who transitioned to a worse functional status in the subsequent wave, which differed across baseline physical function status.

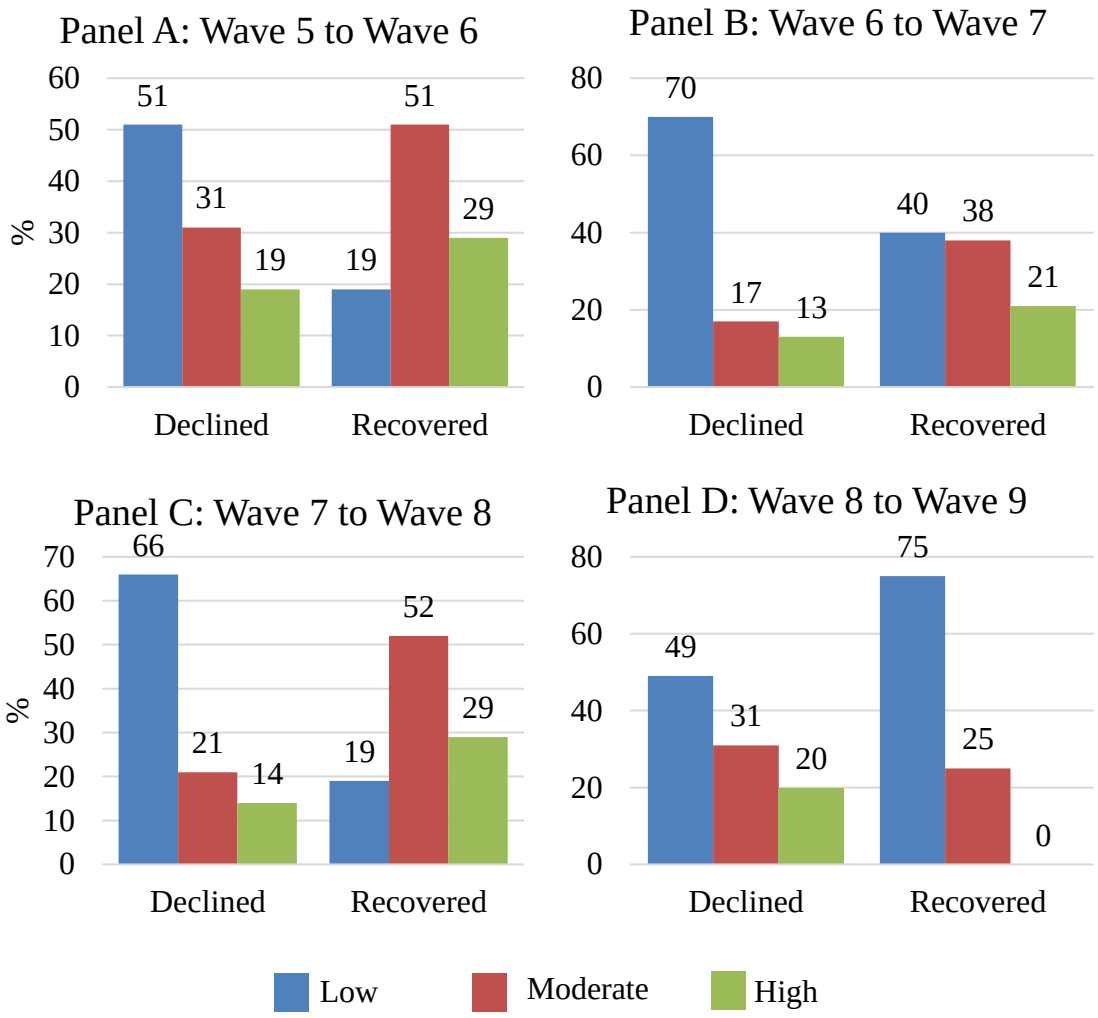

Figure 13 - Proportion of physical function transitions at each wave by preceding physical function status (low (blue), moderate (red), high (green).

RESULTS OF LONGITUDINAL ANALYSES

Table 10 shows the results from the final generalized estimating equations models used to estimate the odds of physical function recovery over time among older Mexican Americans, controlling for confounders (age, sex, education, depressive symptoms, cognitive impairment, interview language) and clinical [BMI (kg/m^2) and Charlson comorbidity index] predictors of physical function status. The full model building process can be viewed in Appendix C Table C.1.

Table 10: Final generalized estimating equations model for physical function recovery over 12-year period among older Mexican Americans (N=1,109).

Predictor variables	Full Model OR (95% CI)
Time	**1.22 (1.03-1.45)**
Demographic + Socioeconomic Factors	
Age (years)	**0.87 (0.84-0.91)**
Female sex	**0.73 (0.54-0.98)**
Education (years)	1.03 (0.99-1.07)
Health Factors	
BMI (kg/m^2)	**0.96 (0.93-0.99)**
Depressive symptoms (CES-D ≥16)	0.62 (0.38-1.01)
Cognitive impairment (MMSE<21)	**0.56 (0.39-0.81)**
Charlson Comorbidity Index (≥3)	**0.80 (0.58-1.10)**
Experienced a hospitalization (yes)	**0.53 (0.37-0.77)**
Physical/Built + Socio-Cultural Environmental Factors	
Spanish interview	0.71 (0.48-1.06)
Foreign-born	1.10 (0.79-1.52)
Lonely (no)	1.06 (0.74-1.50)

Notes: An OR> 1 indicates increased odds of physical function recovery; An OR <1 indicates decreased odds of physical function recovery. Significant predictors of physical function recovery are bolded and highlighted in light grey.

OR=odds ratio; CI=Confidence Interval; BMI=body mass index measured in kilograms/meters-squared; CES-D=Center for Epidemiologic Studies Depression Scale; MMSE=Mini Mental State Examination

Main findings

Overall, participants tended to transition to worse functional states in subsequent interview, but patterns of transitions differed depending on time of interview and participants who recovered tended to have moderate physical function at baseline. Over a 12-year period, experiencing a hospitalization decreased the odds of recovering in physical function by 47% (95% CI = 0.37-0.77) compared to those who did not experience a hospitalization. Nativity status (foreign-born versus U.S.-born) did not predict physical function recovery status over a 12-year period. Additional findings show that older age, female sex, increasing BMI (kg/m^2), having cognitive impairment, and having an Charlson

comorbidity index ≥3 decreased the odds of recovering in physical function over a 12-year period.

Chapter 5

AIM 2 RESULTS

In this chapter, we examined social determinants of health that predict physical function recovery after an acute hospitalization over a 12-year period. We hypothesized that foreign-born older Mexican Americans will be more likely to recover in physical function after acute hospitalization than U.S.-born older Mexican Americans. We also hypothesized participants who reported not feeling lonely will be more likely to recover in physical function after an acute hospitalization. Lastly, we hypothesized that the association between loneliness status and physical function recovery will be greater among those who reside in highly concentrated Hispanic neighborhoods than those who reside in lower concentrated Hispanic neighborhoods.

RESULTS OF DESCRIPTIVE ANALYSES

The sample analyzed is the same as those analyzed in Aim 1 (N=1,109). The number of interviews per participant ranged from 1 – 4, resulting in 1,109 records and 299 records of hospitalization. Approximately 48.1% (N=287) had 1 observation, 26.3% (N=157) had 2 observations, 17.4% (N=104) had 3 observations, and 8.2% (N=49) had 4 observations. Overall, there were 810 observations (410 individuals) without hospitalization and 299 observations (187 individuals) with a hospitalization.

Table 11 shows the participant characteristics for the overall sample by hospitalization status. Of the 1,109 observations, 810 did not experience a hospitalization and 299 experienced a hospitalization over the 12-year period. Those who experienced a hospitalization had, on average, fewer years of education, a higher prevalence of depressive symptoms, a higher Charlson comorbidity score, and a lower prevalence of not being married compared to those who did not experience a hospitalization over the 12-year period.

Table 11: Descriptive characteristics of the overall sample among older Mexican Americans by hospitalization status (N=1,109).

	Hospitalization status		
Variables	**No hospitalization**	**Hospitalization**	**p**
Sample size	810 (73.0%)	299 (27.0%)	-
Demographic + Socioeconomic Factors			
Age (years), mean ± SD	82.9 ± 4.7	82.8 ± 4.8	0.774
Sex, %			0.416
Male	37.8	35.1	-
Female	62.2	64.9	-
Education (years), mean ± SD	5.1 ± 4.0	4.6 ± 3.9	0.028
Household income (USD), median (IQR)	$23,012 (19,500-28,067)	$23,214 (20,353-27,563)	0.849
Health Factors			
BMI (kg/m^2), mean ± SD	27.5 ± 5.1	27.6 ± 4.7	0.605
Depressive symptoms (CES-D ≥16), %	15.7	21.4	0.025
Cognitive impairment (MMSE <21), %	30.7	32.8	0.517
Charlson Comorbidity Index, %			<.0001
<3	62.6	14.1	-
≥3	37.4	86.0	-
Physical/Built + Socio-Cultural Environmental Factors			
Spanish interview, %	84.7	88.3	0.129
Marital status, %			0.048
Not married	60.7	67.2	-
Married	39.3	32.8	-
Lonely (no), %	73.6	68.9	0.122
Foreign-born, %	41.4	40.8	0.868
Neighborhood concentration, %			0.674
<60th PCTL	59.1	60.5	-
≥60th PCTL	40.9	39.5	-

Notes: Values are presented as means ± standard deviation (SD) or N (%)
Categorical variables were tested using Chi-square test, and continuous variables tested using t-test. Kruskal-Wallis was used for non-parametric test (household income).
BMI = body mass index measured in kilograms/meters-squared; CES-D Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; SPPB = Short Physical Performance Battery

Table 12 shows the participant characteristics for the overall sample across physical function status, stratified by hospitalization status. Among those who did not experience a hospitalization (N=810), those who recovered in physical function were younger, had more years of education, a lower BMI kg/m^2, a lower prevalence of depressive symptoms, a lower prevalence of cognitive impairment, and a lower prevalence of interviews conducted in Spanish compared to those who declined in physical function. Among those who experienced an acute hospitalization (N=229), those who recovered in physical function were younger, had a lower prevalence of depressive symptoms, and had a lower Charlson comorbidity score compared to those who declined in physical function after hospitalization.

Table 12: Overall descriptive characteristics by change in physical function status, stratified by hospitalization status (N=1,109).

	No acute hospitalization (N=810)			**Experienced acute hospitalization (N=299)**		
Variables	**Declined** (N=558)	**Recovered** (N=252)	***p***	**Declined** (N=246)	**Recovered** (N=53)	***p***
Demographic + Socioeconomic Factors						
Age (years), mean ± SD	83.6 ± 4.8	81.2 ± 3.8	<.0001	83.1 ± 4.9	81.2 ± 4.1	0.005
Sex, %			0.065	-	-	0.164
Male	35.7	42.5	-	33.3	43.4	-
Female	64.3	57.5	-	66.7	56.6	-
Education (years), mean ± SD	4.7 ± 3.7	6.2 ± 4.4	<.0001	4.6 ± 3.9	4.5 ± 3.8	0.956
Household income (USD), median (IQR)	$23,494 (19,522-28,330)	$22,125 (19,500-26,927)	0.070	$23,176 (19,962-26,961)	$23,775 (20,515-30,656)	0.295
Health Factors						
BMI (kg/m^2), mean ± SD	27.7 ± 5.5	26.8 ± 4.1	0.0219	27.7 ± 4.8	27.4 ± 4.6	0.761
Depressive symptoms (CES-D ≥16)	18.8	8.7	0.0003	23.6	11.3	0.049

Cognitive impairment (MMSE <21)	36.7	17.5	<.0001	35.0	22.6	0.083
Charlson Comorbidity Index, %			0.195	-	-	0.016
<3	61.1	65.9	-	11.8	24.5	-
≥3	38.9	34.1	-	88.2	75.5	-
Physical/Built + Socio-Cultural Environmental Factors						
Spanish interview, %	86.7	80.2	0.016	88.2	88.7	0.923
Marital status, %			0.431	-	-	0.069
Not married	61.7	58.7	-	69.5	56.6	-
Married	38.4	41.3	-	30.5	43.4	-
Lonely (no), %	72.0	77.0	0.140	67.1	77.4	0.142
Foreign-born, %	43.2	37.3	0.115	40.7	41.5	0.908
Neighborhood concentration ≥60th PCTL, %	42.3	37.7	0.218	41.1	32.1	0.225

Notes: Values are presented as means ± standard deviation (SD) or N (%)
Categorical variables were tested using Chi-square test and continuous variables tested using t-test. Fisher's exact test was used for Charlson Comorbidity Index and Kruskal-Wallis was used for non-parametric test (household income).

BMI = body mass index measured in kilograms/meters-squared; CES-D Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; SPPB = Short Physical Performance Battery; PCTL = percentile

Figure 14 shows the percentage of participants living in highly concentrated Hispanic neighborhoods who declined or recovered in physical function after hospitalization by loneliness status. Among the 181 observations who lived in highly concentrated Hispanic neighborhoods and experienced a hospitalization, approximately 69% self-reported not feeling lonely (N=125). Among those who did not report feeling lonely, 77% had declined in physical function after hospitalization, whereas 23% had recovered in physical function after hospitalization. However, recovery status did not differ significantly (p=0.096) that those who reported feeling lonely (N=56).

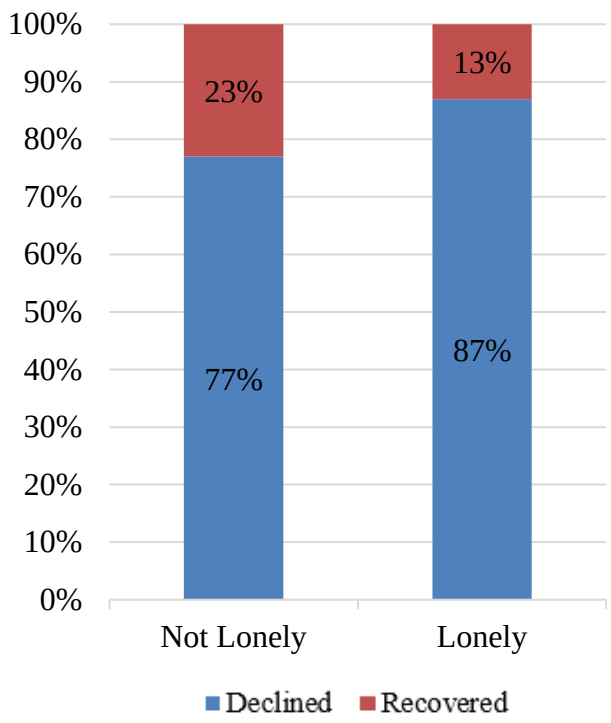

Figure 14 - Percentage of participants living in highly concentrated Hispanic neighborhoods who declined (N=142) versus recovered (N=36) in physical function after hospitalization by loneliness status.

Table 13 shows the healthcare characteristics among those hospitalized by physical function status (declined versus recovered). Overall, 35.8% visited a medical school affiliated hospital, 41.5% had a primary care physician visit prior to hospitalization, 2.0% visited a specialized physician, 72.2% experienced a hospitalization due to a medical reason, 51.8% had a length of hospital stay >4 days, and most participants were discharged home compared to being institutionalized (80.6% versus 19.4%). Participants who recovered in physical function had a higher prevalence of being discharged home compared to those who declined in physical function (98.1% versus 76.8%, p=0.0004). Participant groups did not differ significantly by additional healthcare factors. However, participants who recovered in physical function, had a higher prevalence of visiting a community hospital, had a lower prevalence of seeing a specialist, had a higher prevalence of visiting

the hospital due to a medical reason rather than surgical, and had a lower length of hospital stay, respectively.

Table 13: Descriptive analysis of healthcare factors by physical function status after acute hospitalization (N=299).

	Overall sample	Declined	Recovered	*p*
Total observations	N=299	N=246	N=53	-
Variables				
Provider institute, %				0.760
Medical school affiliated	35.8	36.2	34.0	-
Non-medical school affiliated	64.2	63.8	66.0	-
Provider type, %				0.394
Primary care physician	41.5	41.9	39.6	-
Specialists	2.0	2.4	0.0	-
No visit	56.5	55.7	60.4	
Reason for hospitalization, %				0.209
Medical	72.2	70.7	79.3	-
Surgical	27.8	29.3	20.8	-
Length of stay (> 4 days), %	51.8	53.3	45.3	0.292
Discharge destination, %				0.0004
Institutionalized	19.4	23.2	1.9	-
Home	80.6	76.8	98.1	-
Notes: Values are presented as N (%); Categorical variables were tested using Chi-square test.				

Figure 15 shows the top ten most frequent major diagnostic categories among those hospitalized by physical function status (declined versus recovered). Overall, most participants were hospitalized due to a circulatory problem (24.1%) followed by a musculoskeletal system and connective tissue problem (15.4%) then respiratory problem (14.7%). Compared to those who declined in physical function, those who recovered in physical function had a higher prevalence of being hospitalized due to problem with a circulatory system (28.3% versus 23.2%), respiratory system (17.0% versus 7.6%), and digestive system (17.0% versus 6.1%), respectively. Whereas participants who declined in

physical function had a higher prevalence of being hospitalized due to problem with their musculoskeletal system and connective tissue (17.1% versus 7.6%) and nervous system (11.8% versus 1.9%), respectively.

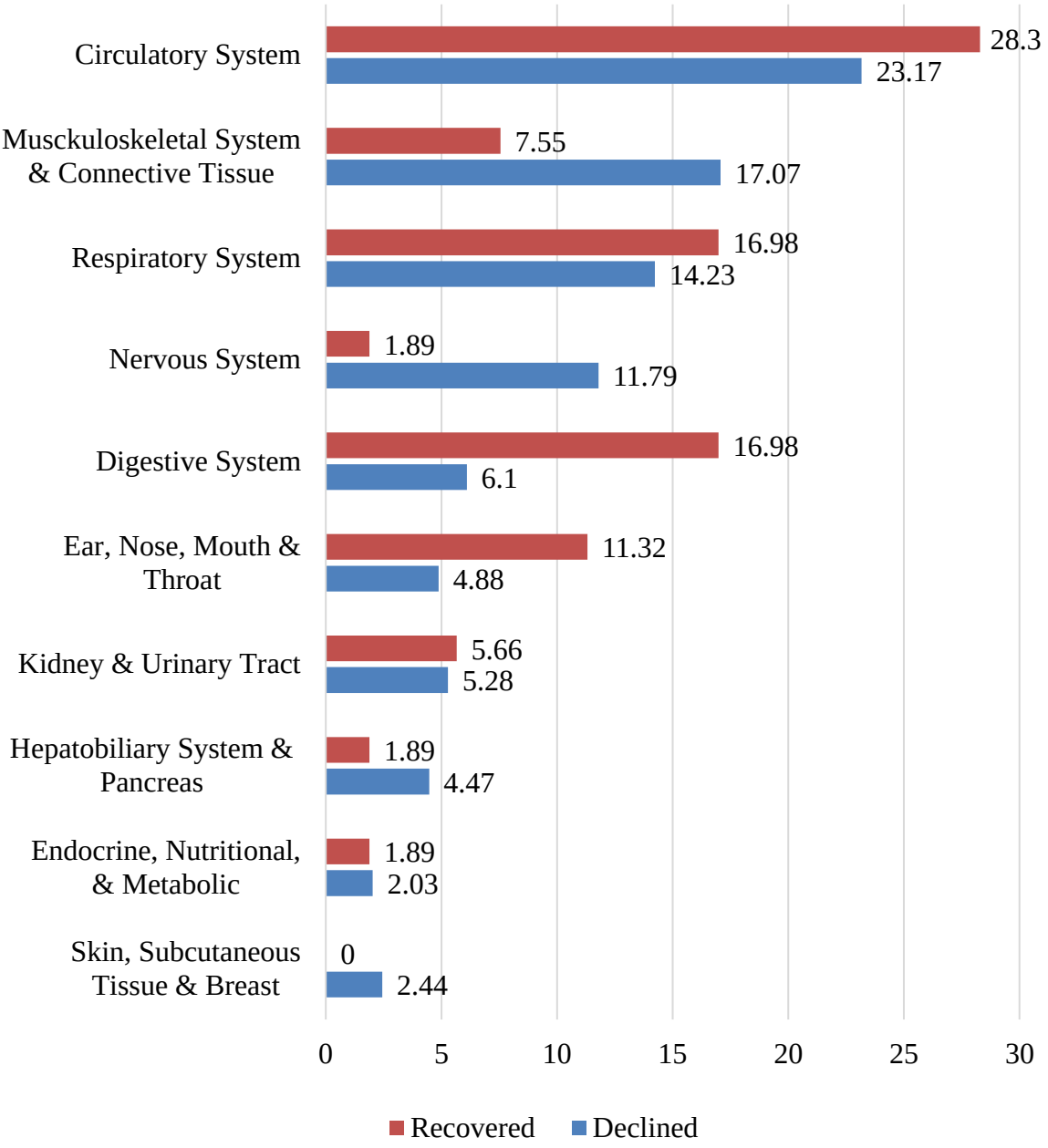

Figure 15 - Prevalence of most frequent major diagnostic categories by physical function status after hospitalization (recovered (red) versus declined (blue)).

RESULTS OF LONGITUDINAL ANALYSES

Table 14 presents the results of the full model of physical function recovery after hospitalization over 12-years of follow-up, controlling for confounders (age, sex, education, depressive symptoms, cognitive impairment, and interview language) and

clinical [(BMI kg/m^2), Charlson comorbidity index, provider institution, discharge destination] predictors of physical function status. Appendix B Tables B1-B2 displays the bivariate correlations used to distinguish potential confounders. The full model building process can be viewed in Appendix C Table C1.

There were 6 models built to examine the relationship between hypothesized SDOH and physical function recovery after hospitalization for the main analysis (presented as probability). The full model building process can be viewed in Appendix C Table C1. Model 1 included time and previous hospitalization status (yes/no). Model 2 includes demographic and socioeconomic factors (age, female, total years of education); Model 3 includes Model 2 plus health factors [BMI (kg/m^2), depressive symptoms (CES-D $\geq$16), cognitive impairment (MMSE >21), Charlson Comorbidity Index ($\geq$3)]; Model 4 includes Model 3 plus physical/built and socio-cultural environmental factors [Spanish interview, nativity status (foreign-born versus U.S.-born), self-reported loneliness, neighborhood concentration (>60^{th} percentile)]; and Model 5 includes Model 5 plus healthcare characteristics [(provider institution (medical school affiliated versus non-medical school affiliated hospital). Model 6 (not shown here) includes Model 5 plus the interaction term between neighborhood concentration level and self-reported loneliness status; however no significant interaction was found (p=0.1238).

The analysis including those with and without a hospitalization (n=1,109) in Table 14 shows that time increased the probability of recovering in physical function (β=0.20, SE=0.09, p=0.022). The hypothesized SDOH (being foreign-born, loneliness status, neighborhood concentration) were presented using beta estimates to reduce the complexity of interpretation and were found not statistically associated with the probability of recovering in physical function after hospitalization.

Table 14: Generalized estimating equations models for physical function recovery after hospitalization among Mexican American Medicare Beneficiaries over a 12-year period (N=1,109).

Predictor variables	Model 5 β (SE, p-value)
Time	**0.20 (0.09, p=0.022)**
Admitted to hospital	-0.73 (0.45, p=0.104)
Foreign-born	0.52 (0.38, p=0.168)
Lonely (no)	0.35 (0.46, p=0.450)
Neighborhood concentration >60th PCTL	-0.14 (0.16, p=0.370)

Notes: The model controls for time, age, female (versus male), total years of education, BMI (kg/m2), depressive symptoms (CES-D ≥16), cognitive impairment (MMSE >21), Charlson Comorbidity Index (≥3 versus <3), hospitalization, Spanish interview (versus English), nativity status (foreign-born versus U.S.-born), self-reported loneliness status (no versus yes), neighborhood concentration level (≥60th percentile), provider institution (medical school affiliated versus non-medical school affiliated hospital), and discharge destination (home versus institutionalized).

Significant predictors of physical function recovery are bolded and highlighted in light grey.
PCTL=Percentile

The subset analyses (presented as odds ratio) using only participants with a hospitalization (N=299) or only participants without a hospitalization (N=810) showed similar results, where being foreign-born, loneliness status, and neighborhood concentration level were not associated with physical function recovery after hospitalization over the 12-year period. The full multivariate models of the subset analysis can be viewed in the Appendix C Tables.

Table 15 shows the full multivariate model among those with a hospitalization only (N=299) controlling for time, age, female (versus male), total years of education, BMI (kg/m^2), depressive symptoms (CES-D >16), cognitive impairment (MMSE >21), Charlson Comorbidity Index (≥3 versus <3), Spanish interview (versus English), nativity status (foreign-born versus U.S.-born), self-reported loneliness status (no versus yes),

neighborhood concentration level (>60th percentile), and provider institution (medical school affiliated versus non-medical school affiliated hospital). Additional findings show that for every increased year in age, there was 9% decreased odds in recovering in physical function after hospitalization (95% CI = 0.83-0.99).

Table 15: Subset analysis of generalized estimating equations models for physical function recovery after hospitalization among Mexican American Medicare Beneficiaries with a hospitalization over a 12-year period (N=299).

Predictor variables	Multivariate model OR (95% CI)
Time	1.26 (0.85-1.87)
Foreign-born	1.45 (0.73-3.87)
Lonely (no)	1.56 (0.71-3.43)
Neighborhood concentration >60th PCTL	0.65 (0.33-1.31)

Notes: The multivariate controls for time, age, female (versus male), total years of education, BMI (kg/m^2), depressive symptoms (CES-D ≥16), cognitive impairment (MMSE >21), Charlson Comorbidity Index (≥3 versus <3), Spanish interview (versus English), nativity status (foreign-born versus U.S.-born), self-reported loneliness status (no versus yes), neighborhood concentration level (≥60th percentile), and provider institution (medical school affiliated versus non-medical school affiliated hospital)

OR=Odds ratio; CI=Confidence interval; PCTL=Percentile

Main findings

Our findings show that our hypothesized social determinants of health [nativity status (foreign-born versus U.S.-born) and self-report loneliness (no versus yes)] did not predict physical function recovery after acute hospitalization among older Mexican American Medicare Beneficiaries over a 12-year period. Also, neighborhood concentration level (≥60th percentile versus <60th percentile) did not moderate the relationship between loneliness status and physical function recovery after acute hospitalization over the 12-year period. These findings were further confirmed by our subset analyses. Additional findings uncovered in the subset analysis found that among

those who were hospitalized, age increased the odds of recovering in physical function over a 12-year period.

Chapter 6

AIM 3 RESULTS

This chapter reports the evaluation of the effect of social determinants of health on disability recovery and 30-day readmission after acute hospitalization over a 12-year period. We hypothesized that 1) older Mexican American females will be more likely to recover from disability after acute hospitalization than older Mexican American males, and disability recovery will be greater among females who reside in highly concentrated Hispanic neighborhoods than in males who reside in highly concentrated Hispanic neighborhoods; and 2) Older Mexican Americans interviewed in Spanish will be more likely to experience 30-day readmission after acute hospitalization than those interviewed in Spanish.

RESULTS OF DESCRIPTIVE ANALYSES FOR ADL RECOVERY

The sample included 619 participants which totaled to 1,143 observations over the 12-year period. Approximately 49.1% (N=304) had 1 observation, 25.2% (N=156) had 2 observations, 17.6% (N=109) had 3 observations, and 8.1% (N=50) had 4 observations. Overall, there were 838 observations (427 individuals) without hospitalization and 305 observations (192 individuals) with a hospitalization.

Table 17 shows the participant characteristics for the overall sample by change in ADL disability, stratified by hospitalization status. Of the 1,143 observations, the average age was 82.8 $\pm$ 4.7 years, 62.8% were female, had a median household income of $23,138.0 (IQR=19,522-27,819), had 5.0 $\pm$ 4.0 years of education, had an average BMI of 27.5 $\pm$ 5.0, 16.9% had depressive symptoms, 31.4% had cognitive impairment, 50.1% had an Charlson comorbidity score $\geq$3, 49.7% had low physical function at baseline, 31.4% had moderate physical function at baseline, 18.9% had high physical function at baseline, 86.0% had a

Spanish interview, 37.9% were married, 27.6% self-reported feeling lonely, 41.2% were foreign-born, and 40.6% lived in highly Hispanic concentrated neighborhoods.

Among those who experienced a hospitalization (N=305), 118 participants recovered in disability and 187 participants declined in disability. Those who recovered in disability after hospitalization were younger, had a higher median household income, a lower prevalence of cognitive impairment, higher lower body physical function, and a lower prevalence of ADLs at baseline compared to those who did not recover in disability after hospitalization. Among those who did not experience a hospitalization (N=838), 452 participants recovered in disability and 386 participants declined in disability. Those recovered in disability were younger, had more years of education, a lower prevalence of depressive symptoms, lower prevalence of cognitive impairment, higher lower body physical function, a lower prevalence of ADLs at baseline, a lower prevalence of Spanish interviews, and a lower prevalence of living in highly concentrated Hispanic neighborhoods compared to those who declined in disability.

Table 16: Overall descriptive characteristics by change in disability status, stratified by hospitalization status (N=1,143).

	No acute hospitalization			**Experienced acute hospitalization**		
Total observations	**Declined** (N=386)	**Recovered** (N=452)	***p***	**Declined** (N=187)	**Recovered** (N=118)	***p***
Variables						
Demographic + Socioeconomic Factors						
Age (years), mean ± SD	83.9 ± 4.9	81.8 ± 4.2	<.0001	83.6 ± 4.9	81.6 ± 4.5	.0003
Sex, %			0.941	-	-	0.104
Male	38.1	37.8	-	31.6	40.7	-
Female	61.9	62.2	-	68.5	59.3	-
Education (years), mean ± SD	4.6 ± 3.7	5.6 ± 4.2	.0004	4.5 ± 3.8	4.6 ± 4.0	0.843
Household income	$22,572 (19,349-26,620)	$23,138 (20,130-28,404)	0.155	$22,162 (19,349-26,023)	$24,529 (20,542-32,361)	0.001

(USD), median (IQR)						
Health Factors						
BMI (kg/m^2), mean ± SD	27.4 ± 5.3	27.6 ± 5.0	0.481	27.3 ± 4.9	28.2 ± 4.6	0.087
Depressive symptoms (CES-D ≥16)	18.1	12.6	0.026	23.0	19.5	0.469
Cognitive impairment (MMSE <21)	40.9	22.1	<.0001	38.5	24.6	0.012
Charlson Comorbidity Index (≥3), %	39.9	34.5	0.108	88.8	82.2	0.105
Physical function (SPPB), %			<.0001	-	-	<.0001
<7	56.7	41.4	-	65.2	40.7	-
7-10	33.4	31.9	-	24.1	34.8	-
>10	11.9	26.8	-	10.7	24.6	-
Any ADL (yes)	45.6	26.8	<.0001	49.7	22.9	<.0001
Physical/Built + Socio-Cultural Environmental Factors						
Spanish interview, %	88.1	82.5	0.024	88.8	88.1	0.866
Marital status, %			0.578	-	-	0.631
Not Married	61.4	59.5	-	67.9	65.3	-
Married	38.6	40.5	-	32.1	34.8	-
Foreign-born, %	40.2	42.5	0.496	39.6	42.4	0.638
Lonely (no), %	71.5	75.7	0.172	65.2	74.6	0.086
Neighborhood concentration (≥60th PCTL), %	45.3	37.6	0.024	42.8	33.1	0.090

Notes: Values are presented as mean + standard deviation (SD) or N (%). Categorical variables were tested using Chi-square test and continuous variables tested using t-test. Kruskal-Wallis was used for non-parametric test (household income).
SD=Standard Deviation; BMI=body mass index; kg=kilograms; m=meters; CES-D=Center for Epidemiological Studies Depression Scale; MMSE=Mini-Mental State Examination; SPPB=Short Physical Performance Battery; PCTL=percentile

Figure 16 shows the percentage of participants residing in highly concentrated Hispanic neighbors who declined or recovered in disability after hospitalization by

females. Approximately 39 observations were recorded for those who recovered in disability versus 80 observations recorded for those who declined in disability after hospitalization, which did not significantly differ across sex (p=0.297). Among females who resided in highly concentrated Hispanic neighborhoods, approximately 29% recovered in disability after hospitalization. Among males who resided in highly concentrated Hispanic neighborhoods, approximately 39% recovered in disability after hospitalization.

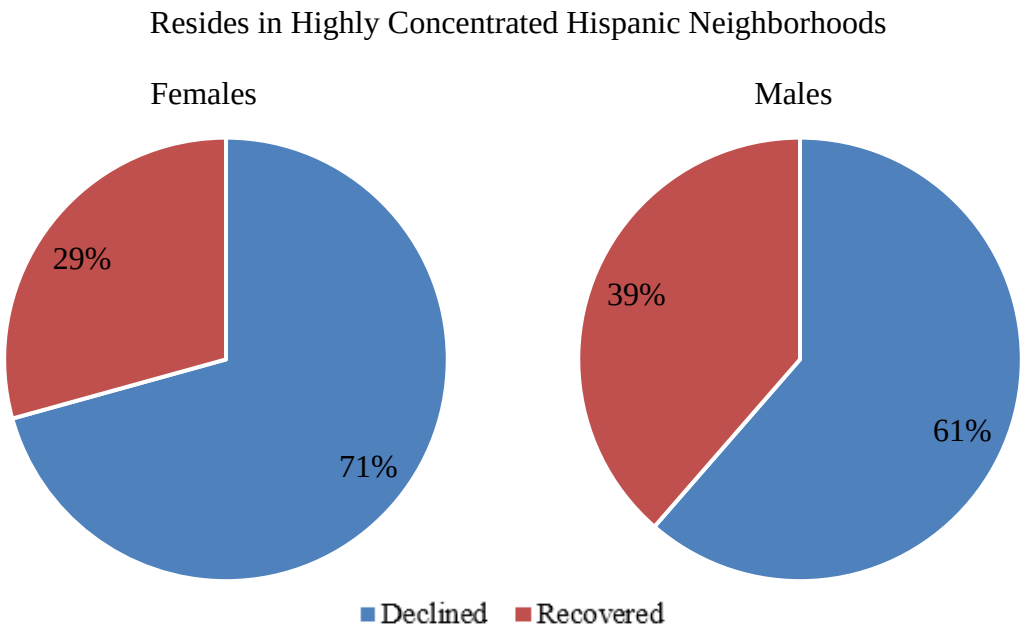

Figure 16 - Percentage of participants who reside in highly concentrated Hispanic neighbors and declined (N=80) or recovered (N=39) in disability after hospitalization by females (N=75) and males (N=44).

Table 18 shows the healthcare characteristics among those hospitalized by declined versus recovered ADL groups. Overall, 36.1% had access to a medical school affiliated hospital, 41.3% had a primary care physician visit prior to hospitalization, 2.3% visited a specialized physician, 72.5% experienced a hospitalization due to a medical/elective reason, 52.1% had a length of hospital stay >4 days, and most participants were discharged home compared to being institutionalized (80.3% versus 19.7%). Those who recovered in

disability had a higher prevalence of being discharged home compared to those who declined in disability after hospitalization (89.8% versus 74.3%, p=0.001). Those who recovered in disability after hospitalization had a lower prevalence of using a community hospital, a higher prevalence of seeing a Specialist, lower prevalence of being hospitalized due to a medical reason, and a longer length of hospital stay, respectively.

Table 17: Healthcare factors by end of follow-up disability status after acute hospitalization (N=305).

	Overall sample	**Declined**	**Recovered**	
Total observations	N=305	N=187	N=118	***p***
Variables				
Provider institute, %				0.914
Medical school affiliated	36.1	35.8	36.4	-
Non-medical school affiliated	63.9	64.2	63.5	-
Provider type, %				0.662
Primary care physician	41.3	43.3	38.1	-
Specialists	2.3	2.1	2.5	-
Other	56.4	54.6	59.3	-
Reason for hospitalization, %				0.895
Medical	72.5	72.7	72.0	-
Surgical	27.5	27.3	28.0	-
Length of stay (> 4 days), %	52.1	51.9	52.5	0.909
Discharge destination, %				0.001
Home	80.3	74.3	89.8	-
Institutionalized	19.7	25.7	10.2	-
Notes: Values are presented as N (%); Categorical variables were tested using Chi-square test.				

The top ten most frequent major diagnostic categories among those hospitalized by ADL group (declined versus recovered) are shown in Figure 17. Overall, the most common diagnosis was due to the nervous system (24.3%), circulatory system (15.1%), and musculoskeletal system and connective tissue (15.1%). However, among those who recovered in disability after hospitalization, the most common diagnosis was due to the

nervous system (29.7%) followed by musculoskeletal system and connective tissue (16.1%). Whereas, among those who did not recover, the most common diagnosis was due to the nervous system (20.9%) followed by circulatory system (17.1%).

Compared to those who declined in disability, those who recovered in disability had a higher prevalence of being hospitalized due to problem with a nervous system (29.7% versus 20.9%) and musculoskeletal system and connective tissue (16.1% versus 14.1%), respectively. Whereas participants who declined in disability had a higher prevalence of being hospitalized due to problem with their circulatory system (17.1% versus 12.9%) and respiratory system (11.2% versus 7.6%) compared to those who recovered, respectively.

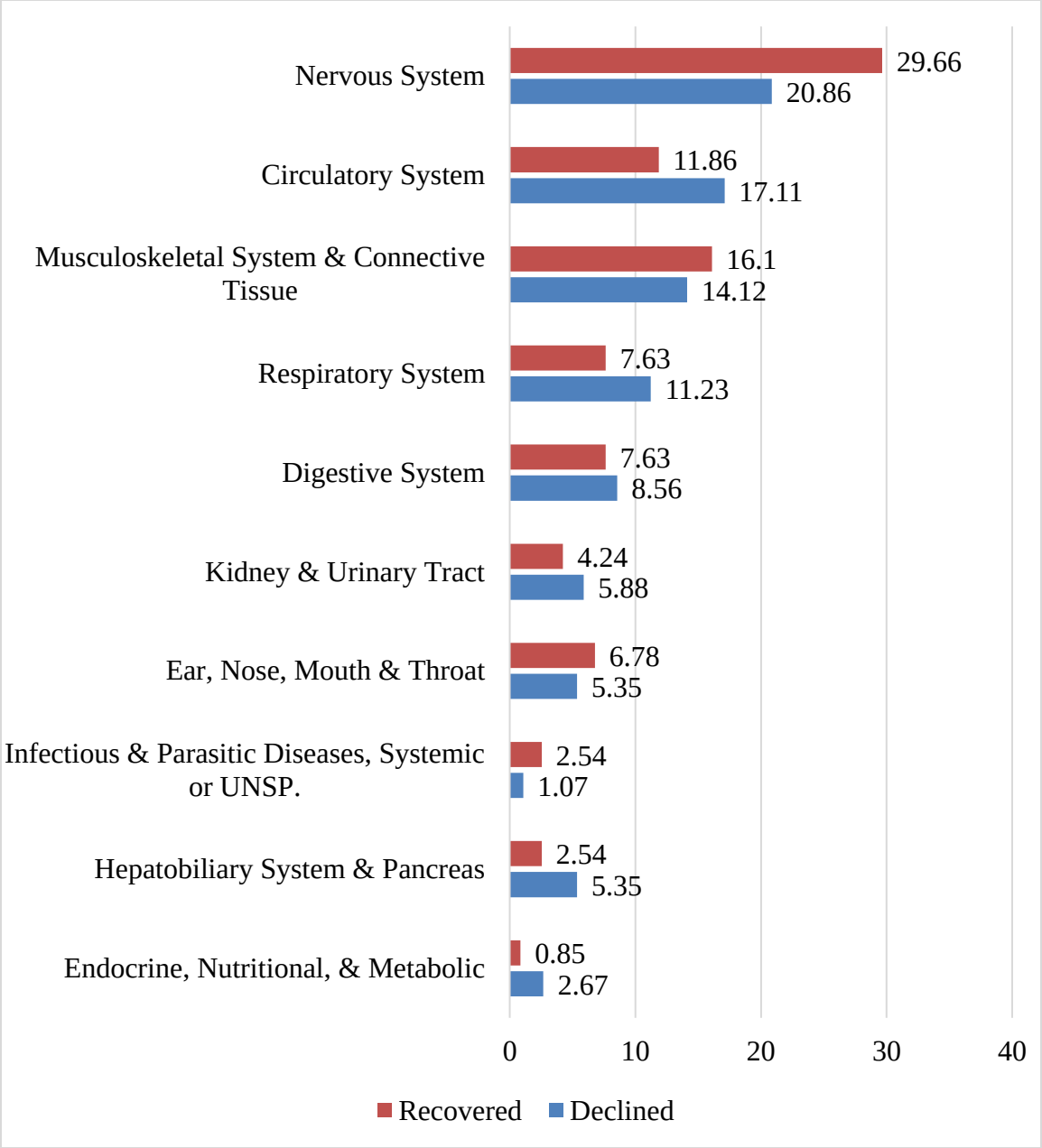

Figure 17 - Proportion of most frequent major diagnostic categories after hospitalization over 12-year period by ADL status (recovered (red) versus declined (blue)).

RESULTS OF DESCRIPTIVE ANALYSES FOR 30-DAY READMISSION

Figure 18 shows the percentage of 30-day hospital readmission and no 30-day hospital readmission among participants with English interview (N=35) versus Spanish

interview (N=270). Prevalence of 30-day hospital readmission did not differ across interview language (p=0.808). Specifically, among participants who had an English interview, approximately 15% experienced a 30-day hospital readmission. Whereas approximately 16% experienced a 30-day hospital readmission among those who had a Spanish interview.

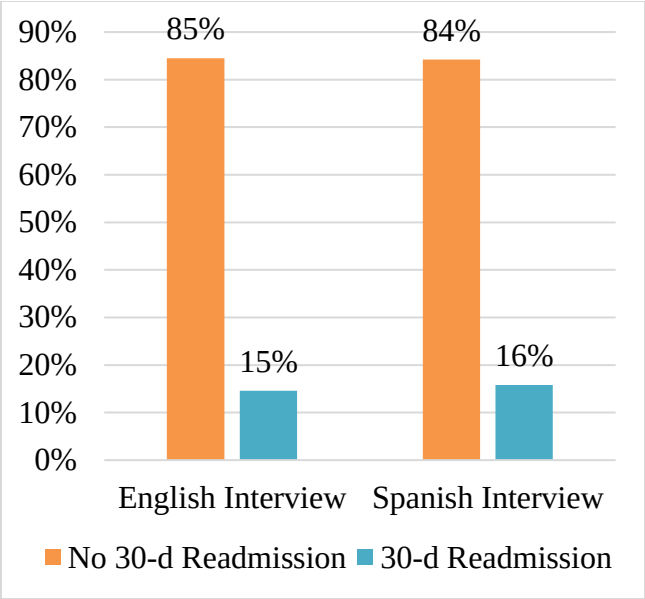

Figure 18 - Percentage of 30-day hospital readmission among participants with English interview (N=14) versus Spanish interview (N=86).

Table 19 shows the descriptive characteristics among those hospitalized by 30-day hospital readmission status. Approximately 15.7% (N=48) of those who were hospitalized experienced a 30-day hospital readmission. Overall, the participants did not differ in characteristics but differed in having depressive symptoms and average Charlson Comorbidity Index across those who did and did not experience a 30-day readmission.

Table 18: Overall descriptive characteristics by 30-day hospital readmission status among hospitalized older Mexican Americans (N=305).

	No 30-day readmission	**30-day readmission**	***p***
Total observations, N (%)	257 (84.3)	48 (15.7)	-
Variables			
Demographic + Socioeconomic Factors			
Age (years), mean ± SD	82.8 ± 4.9	83.1 ± 4.2	0.669
Sex, %			0.702
Male	34.6	37.5	-
Female	65.4	62.5	-
Education (years), mean ± SD	4.5 ± 3.9	4.6 ± 3.7	0.771
Income (USD), median (IQR)	$23,140 (20,353-26,893)	$23,445 (20,380-28,824)	0.381
Health Factors			
BMI (kg/m^2), mean ± SD	27.7 ± 4.8	27.8 ± 4.7	0.862
Depressive symptoms (CES-D ≥16), %	19.5	33.3	0.032
Cognitive impairment (MMSE <21), %	32.3	37.5	0.482
Any ADL (yes), %	38.1	45.8	0.316
Charlson Comorbidity Index, mean ± SD	9.6 ± 7.7	18.4 ± 8.7	<.0001
Physical/Built + Socio-Cultural Environmental Factors			
Spanish interview, %	88.7	87.5	0.808
Foreign-born, %	40.9	39.6	0.869
Married, %	34.6	25.0	0.193
Lonely (no), %	70.4	60.4	0.169-
Neighborhood concentration ≥60th PCTL, %	38.9	39.6	0.930
Healthcare Factors			
Provider institute, %			0.580
Medical school affiliated	64.6	60.4	-
Non-medical school affiliated	35.4	39.6	-
Provider type, %			0.112
Primary care physician	40.9	43.8	-
Specialists	1.6	6.3	-
Other	57.6	50.0	-
Reason for hospitalization, %			0.668
Medical	72.0	75.0	-
Surgery	28.0	25.0	-
Length of stay (> 4 days), %	50.6	60.4	0.211

Discharge destination, %			0.159
Home	18.3	27.1	-
Institutionalized	81.7	72.9	-

Notes: Values are presented as mean + standard deviation (SD) or N (%). Categorical variables were tested using Chi-square test, continuous variables tested using t-test, and Fisher's exact test was used for BMI.

SD=Standard Deviation; BMI=body mass index; kg=kilograms; m=meters; CES-D=Center for Epidemiological Studies Depression Scale; MMSE=Mini-Mental State Examination; ADL=Activities of Daily Living; PCTL=percentile

RESULTS OF LONGITUDINAL ANALYSES FOR ADL RECOVERY

Table 20 presents the results of the generalized estimated equations models of disability function recovery over 12-years of follow-up with interaction analysis of hospitalization. Appendix B Table B3 displays the bivariate correlations used to identify confounders (education, depressive symptoms, Charlson comorbidity index, physical function status, interview language). The full model building process can be viewed in Appendix C Table C2.

There were 6 models built to examine the relationship between hypothesized SDOH and disability recovery after hospitalization for the main analysis (presented as probability). Model 1 included time and previous hospitalization status (yes/no). Model 2 includes demographic and socioeconomic factors (age, female, total years of education, median household income); Model 3 includes Model 2 plus health factors [(BMI (kg/m^2), depressive symptoms (CES-D $\geq$16), cognitive impairment (MMSE >21), physical function status (moderate and high SPPB versus low SPPB), Charlson Comorbidity Index ($\geq$3)]; Model 4 includes Model 3 plus physical/built and socio-cultural environmental factors [Spanish interview, nativity status (foreign-born versus U.S.-born), neighborhood concentration (>60^{th} percentile)]; and Model 5 includes Model 4 plus healthcare characteristics [provider institution (medical school affiliated versus non-medical school affiliated hospital) and discharge destination (home versus institutionalized)]. Model 6 (not

shown here) includes Model 5 plus the interaction term between neighborhood concentration level and sex; however no significant interaction was found (p=0.374).

The main analysis that the hypothesized SDOH (sex) was not associated with the probability of recovering in disability after hospitalization. These findings were similar to the subset analyses. The subset analysis using only participants with a hospitalization (N=305) showed sex was not associated with disability recovery after hospitalization over a 12-year period. The subset analysis using only participants without a hospitalization (N=838) showed sex was not associated with disability recovery over a 12-year period.

Table 19: Generalized estimating equations models for disability recovery among older Mexican American Medicare Beneficiaries over 12-years of follow-up (N=1,143).

Predictor variables	Model 5 β (SE, p-value)
Time	0.04 (0.08, p=0.572)
Admitted to hospital	-0.04 (0.28, p=0.887)
Female	-0.47 (0.26, p=0.116)
Notes: Model 5 controls for time, age, total years of education, median household income, BMI (kg/m^2), depressive symptoms (CES-D $\geq$16), cognitive impairment (MMSE >21), Charlson Comorbidity Index ($\geq$3), hospitalization, Spanish interview, nativity status non-medical school affiliated hospital), and discharge destination (institutionalized versus home) β = beta estimate; SE = standard error	

The full multivariate models of the subset analysis can be viewed in Appendix C Tables. Table 21 shows the full multivariate model (presented as odds ratio) among only those with a hospitalization (N=305) controlling for time, age, total years of education, median household income, BMI (kg/m^2), depressive symptoms (CES-D $\geq$16), cognitive impairment (MMSE >21), physical function status (moderate and high SPPB versus low SPPB), Charlson Comorbidity Index (>3), Spanish interview, nativity status (foreign-born versus U.S.-born), neighborhood concentration (>60^{th} percentile), provider institution

(medical school affiliated versus non-medical school affiliated hospital), and discharge destination (home versus institutionalized). Additional findings show that age, baseline lower-body physical function (SPPB), and discharge destination predicted disability recovery after hospitalization. Older age decreased the odds of recovering in disability after hospitalization by 8% (95 CI = 0.87-0.99). Having a moderate and high physical function increased the odds of recovering in disability after hospitalization by 2.14 times (95% CI = 1.18-3.87) and 3.53 times (95% CI = 1.64-7.59) compared to those with low physical function at baseline. Participants who were discharged home had 2.58 increased odds of recovering in disability after hospitalization compared to those who were discharged to an institution (95% CI = 1.18-5.67).

Table 20: Subset analysis of generalized estimating equations models for disability recovery after hospitalization among Mexican American Medicare Beneficiaries over a 12-year period (N=305).

Predictor variables	Multivariate model OR (95% CI)
Time	1.00 (0.73-1.38)
Female	0.69 (0.40-1.20)
Notes: Model 5 controls for time, age, total years of education, median household income, BMI (kg/m^2), depressive symptoms (CES-D $\geq$16), cognitive impairment (MMSE >21), Charlson Comorbidity Index ($\geq$3), hospitalization, Spanish interview, nativity status (foreign-born versus U.S.-born), provider institution (medical school affiliated versus non-medical school affiliated hospital), and discharge destination (institutionalized versus home) OR=Odds ratio; CI=Confidence interval	

RESULTS OF LONGITUDINAL ANALYSES FOR 30-DAY READMISSION

Table 19 presents the results of the generalized estimating equations models of 30-day hospital readmission as a function of demographic, socioeconomic, physical/built, socio-cultural environmental factors, and healthcare factors. The model shows that for

every increase in Charlson Comorbidity Index, there was a 13% increase in odds of 30-day hospital readmission (95% CI = 1.09-1.17).

Table 21: Generalized estimating equations models for 30-day hospital readmission among hospitalized older Mexican American Medicare Beneficiaries (N=305).

Predictor variables	Full Model OR (95% CI)
Time	1.44 (0.94-2.21)
Demographic + Socioeconomic Factors	
Age (years)	0.94 (0.87-1.02)
Female sex	1.11 (0.53-2.33)
Education (years)	1.02 (0.93-1.12)
Health Factors	
BMI (kg/m^2)	1.01 (0.94-1.09)
Depressive symptoms (CES-D $\geq$16)	2.01 (0.89-4.51)
Cognitive impairment (MMSE<21)	1.41 (0.63-3.18)
Having any ADL (yes)	0.86 (0.39-1.92)
Charlson Comorbidity Index	**1.13 (1.09-1.17)**
Physical/Built + Socio-Cultural Environmental Factors	
Spanish interview	0.53 (0.16-1.77)
Healthcare Factors	
Length of stay (> 4 days)	1.03 (0.96-1.11)
Discharge destination	
Home	0.99 (0.39-2.53)
Institutionalized	Reference

Notes: An OR> 1 indicates increased odds of 30-day readmission; An OR <1 indicates decreased odds of 30-day readmission. Significant predictors of disability are bolded and highlighted in light grey.

CI = Confidence Interval; BMI = body mass index measured in kilograms/meters-squared; CES-D Center for Epidemiologic Studies Depression; ADL = activities of daily living, PCTL=percentile

Main findings

Our findings show that hypothesized social determinants of health sex (female versus male) did not predict disability recovery after acute hospitalization over a 12-year period. This was further confirmed by our subset analysis. Our analysis of only hospitalized participants shows that interview language (Spanish versus English) did not predict 30-day

hospital readmission among Mexican American Medicare Beneficiaries. Additional findings show that age, age decreased the odds of disability recovery after hospitalization, while having moderate or high physical function and being discharged home increased the odds of disability recovery after hospitalization. Lastly, having a higher Charlson Comorbidity Index increased the odds of 30-day hospital readmission.

Chapter 7

SUMMARY AND DISCUSSION

The purpose of this project was three-fold: 1) to estimate the predictors of physical function recovery over a 12-year period; 2) to identify social determinants of health that predict physical function recovery after acute hospitalization over a 12-year period; and 3) to evaluate the effect of social determinants of health on disability recovery and 30-day readmission after acute hospitalization among older Mexican American Medicare Beneficiaries over a 12-year period. Our main findings show:

1) Experiencing a hospitalization decreased the odds of physical function recovery over time compared to those who did not experience a hospitalization.

2) Nativity status (foreign-born versus U.S.-born) did not predict physical function recovery over a 12-year period.

3) Hypothesized social determinants of health (e.g., being foreign-born or not feeling lonely) did not predict physical function recovery after hospitalization.

4) Neighborhood concentration level ($\geq 60^{th}$ percentile versus $<60^{th}$ percentile of Hispanic composition) did not moderate the relationship between loneliness status and physical function recovery after acute hospitalization.

5) Hypothesized social determinants of health (female sex versus male) did not predict disability recovery after acute hospitalization.

6) Interview language (Spanish versus English) did not predict 30-day hospital readmission among those who experienced a hospitalization.

Our additional findings show various factors to be associated with functional recovery over time and after hospitalization and with 30-day hospital readmission. For

example, Aim 1 found that older age, being female, higher BMI (kg/m^2), having cognitive impairment, decreased the odds recovering in physical function over a 12-year period. After conducting subset analyses for Aim 2, age decreased the odds of recovering in physical function after hospitalization. After conducting subset analyses for Aim 3, age decreased the odds of disability recovery after hospitalization, while having moderate or high physical function and being discharged home increased the odds of disability recovery after hospitalization. Lastly, having a higher Charlson Comorbidity Index increased the odds of 30-day hospital readmission.

The discussion is based on each Specific Aims and the tested hypotheses followed by the conclusion, study limitations and strengths, and future implications.

Aim 1: Examination of patterns of physical function transitions and predictors of physical function recovery among older Mexican Americans over a 12-year period.

The purpose of the first Aim was to examine patterns of physical function transitions and predictors of physical function recovery among older Mexican Americans over a 12-year period using the Hispanic-EPESE survey linked with the Medicare claims data from the CMS and U.S. Census Bureau. It was hypothesized that participants who experienced a hospitalization would be less likely to recover in physical function than participants who did not experience a hospitalization and foreign-born participants would be more likely to recover in physical function than U.S.-born participants over a 12-year period.

Our main findings show that 1) experiencing a hospitalization decreased the odds of physical function recovery over time compared to those who did not experience a hospitalization; and 2) nativity status (foreign-born versus U.S.-born) did not predict physical function recovery over time. Additional findings show older age, being female,

higher BMI (kg/m^2), having cognitive impairment, and having Charlson comorbidity index ≥3 was associated with physical function recovery over time.

Hospitalization and physical function recovery

After adjusting for confounders and known predictors of physical function, hospitalization decreased the odds of recovering in physical function by 47% (95% CI = 0.36-78) compared to those who did not experience a hospitalization. This finding is in agreement with studies that examine functional transitions and the risk of hospitalization among older adults. For example, a study reported that older adults who remained stable or improved in function from prehospitalization to hospital discharge had an increased odds of achieving total functional recovery 1 month after hospital discharge [127]. Studies that examine hospitalization and functional transitions among older adults are often assessed using self-reported disability measures, such as activities of daily living, around the time of hospitalization. Research using objective measures of physical function recovery are scarce but necessary for early clinical detection of functional recovery prior to disability, especially since there is more literature related to hospitalization and disability transitions.

Nativity status (foreign-born versus U.S.-born) and physical function recovery

Our study found that being foreign-born was not associated with physical function recovery over a 12-year period. This is not in agreement with previous research that found nativity status plays a role in physical function trajectories [41], which may be explained by differences in functional outcomes across research studies. For example, functional research among older adults tend to examine functional decline or disability onset rather than functional recovery.

Other studies have reported Hispanics who were born in Mexico tend to have better health compared to U.S.-born white populations [10]. However, it has been suggested that the foreign-born Latinos' health decreases the longer they reside in the

U.S., which may be more attributable to structural factors than behavioral factors [102]. Our study did support this theory and found other biological factors to be related to functional health rather than sociodemographic or cultural factors. Also, our study included adults over the age of 75 and the average was 82.9 $\pm$ 4.7 years, which may already include those physically resilient enough to survive and those without disability previously observed among foreign-born Mexican Americans between the ages of 65-74 years [10]. Participants who experience physical function recovery and its influential factors should be explored to reduce disability, decrease healthcare costs, and increase the health span later in life.

Additional predictors of physical function recovery

Our multivariate model for physical function recovery showed physiological influence on physical function recovery over a 12-year period. Older age, being female, having a higher BMI (kg/m^2), having cognitive impairment, and having a Charlson Comorbidity score $\geq$3 were associated with physical function recovery over a 12-year period.

Our study found that increasing age decreased the odds of physical function recovery by 13% (95% CI=0.84-0.91) among older Mexican Americans over a 12-year period. This aligns with decades of research that shows there is an age effect on physical function over time. Although our study did not capture rate of physical function decline by age categories, it has been reported that physical function declines at a faster rate for older adults compared to younger and middle-aged adults [34]. Also, efforts to intervene in functional decline may need to occur over life transitions in conjunction with age (e.g., retirement) to reduce onset of disability.

Our study also found that female participants had a decreased odds of recovering in physical function by 27% (95% CI=0.54-0.98) compared to male participants. It is theorized this difference in functional health is attributed to the type of employment found

earlier in life among Mexican Americans. For example, younger Hispanic males may be more likely to work physically demanding jobs and have an increased risk of mortality, leaving the female spouse to adopt caregiver responsibilities [7]. This may increase their risk of functional limitations and disability alongside increased longevity [12,56]. This may explain why older females are at risk of living with more years of functional limitations or disability later in life [128,129].

Our study found that having a higher BMI (kg/m^2) was negatively associated with physical function recovery over time [OR=0.96 (95% CI=0.93-0.99)]. Literature regarding BMI among older adults is mixed. For example, it has been reported that older adults with a higher BMI have a "protective effect", while other research shows older adults with a higher BMI has a negative association with health outcomes. For example, Ferrante et al. (2016) found a 7% increase in the likelihood of functional recovery for every unit increase in BMI among older adults who survived ICU admission, which may be due to increased muscle mass among patients [90]. However, among older Mexican Americans, being categorized as underweight or obese has been shown to increase the odds of frailty [130]. It is unclear why differences between BMI criteria and physical health occur among older adults, and more efforts are needed to understand this underlying mechanism [131].

Additional findings show that having cognitive impairment decreased the odds of physical function recovery by 44% (95% CI=0.39-0.81) over a 12-year period. Cross-sectionally, a previous study found strong performance in cognition assessments to be associated with higher scores of physical performances among community-dwelling older adults [132]. Also, at baseline we reported that cognitive impairment differed across baseline physical function status (36.2% versus 18.4%, $p<0.001$). Previous literature has shown cognitive impairment to be associated with the development of physical impairment and mobility disability among older adults [133,134]. Although research regarding cognitive function among the older Hispanic population is emerging, this area warrants

further research given that a previous study has reported the probability of becoming cognitively impaired or physically impaired to be similar after 2 years of observation [135].

Lastly, our results show that having an Charlson Comorbidity Index >3 decreased the odds of physical function recovery by 20% compared to those with a Charlson Comorbidity Index of <3 (OR=0.80, 95% CI= 0.58-1.10). This finding is expected as chronic conditions and multimorbidity often predict health outcomes and mortality among older adults, and this physiological observation has been foundational in creating disablement models. For example, a medical condition, like diabetes, which is highly prevalent among Latinos, could lead to high blood pressure and physical disabilities and be worsened by limited access to medical care [136]. A life course approach is needed to understand the underlying mechanisms behind certain chronic conditions and functional transitions that affect structural adaptations for a population at great risk of disability, like Mexican Americans.

Aim 2: Identification of the social determinants of health that predict physical function recovery after an acute hospitalization over a 12-year period.

The purpose of the second Aim was to examine social determinants of health that predict physical function recovery after acute hospitalization among older Mexican Americans over a 12-year period using the Hispanic-EPESE survey linked with the Medicare claims data from the CMS and U.S. Census Bureau. It was hypothesized that nativity status, loneliness status, and neighborhood concentration would be associated with physical function recovery after hospitalization. However, the present study did not confirm these hypotheses. Our findings were confirmed by subset analyses.

Nativity status and physical function recovery after hospitalization

Our study did not find an association with nativity status and physical function recovery after hospitalization. It has been suggested that nativity status may play a role in the behavior and health-related attitudes that alter the rate towards disability onset among older Mexican Americans [137]. Also, Mutambudzi et al. (2019) reported that older Mexican Americans born in Mexico had a decreased risk of being in the low- and high-declining physical function trajectory groups compared to older U.S.-born Mexican Americans over time [50]. However, our descriptive findings did not result in any significant differences in the prevalence of physical function recovery status or hospitalization status across nativity status. This is similar to that previous research has reported nativity status and age of migration was not associated with hospitalization among older Mexican Americans [138]. Also, regardless of nativity status, the prevalence of having health insurance among immigrated Mexicans appears to increase as age increase (92.7% for ages 80+ vs 59.3% for ages 60-64) [7]. In theory, nativity status and time of migration may affect the functional health of older Mexican Americans since access to non-labor-intensive jobs or access to medical care might differ depending on when they arrived in the U.S [7]. However, with the increased prevalence in access to medical care after age 65, there may be a diminished relationship between nativity status and functional health after being hospitalized older Mexican Americans.

Loneliness status and physical function recovery after hospitalization

Our study did not find loneliness status was associated with physical function recovery among older Mexican American Medicare Beneficiaries. This may be due to the fact that only self-reported loneliness status was used to describe social relationships and there are multiple pathways to examine social relationships (e.g., social isolation, social integration, negative social partnerships). Loneliness is related to the social network but often has an independent effect on health outcomes [139]. Self-reported loneliness can be

telling of the quality of social support available in an individual social context, especially when it comes to the needs of older adults.

Mendoza-Nunez et al. (2017) reported having low family and external social support networks increased the odds almost fourfold for the risk of developing functional limitations and dependency compared to those with higher social support networks among older Mexican Americans [105]. A study among Portuguese adults reported that not having social support predicted functional decline during hospitalization, whereas baseline functional assessment did not predict the risk of functional decline during hospitalization [140].

A social assumption is that a person's emotional response and behavior may be shaped by the structure of their social institutions, which is why loneliness status rather than factors related to spatial social context (e.g., social isolation) was examined [139]. Examining self-reported loneliness status challenges the context of the social structure—especially since older Mexican Americans tend to live with other relatives and may participate in research studies with a proxy [103]. Montez-de-Oca et al. (2015) reported that Mexican families partake in extended household arrangements to help assist older relatives financially, emotionally, and medically during the aging process [7]. Approximately 81% of the hospitalzed participants analyzed in our study were discharged home rather than being institutionalized (19%). This may explain why self-reported loneliness was not associated with physical function recovery after hospitalization.

Neighborhood concentration level and physical function recovery after hospitalization

To examine the spatial aspect of social relationships, we examined the role of neighborhood concentration level on physical function recovery after hospitalization. Previous research has shown older Mexican Americans residing in highly concentrated Hispanic neighborhoods have better health outcomes, which may be attributed to

community support among Hispanics [27]. However, we did not find any association between neighborhood concentration level on physical function recovery after hospitalization. Thus, our findings do not confirm certain theories, such as the barrio advantage of Mexican American neighborhoods [30]. Most of our study sample did not live in a highly concentrated neighborhood (40.6%), and future studies should examine the context of neighborhood conditions to provide better detail on functional limitations and disability progression for older adults [143].

Aim 3: Evaluation of the effect of social determinants of health on disability recovery and 30-day readmission after acute hospitalization over a 12-year period.

The purpose of the third Aim was to examine the effect of social determinants of health on disability recovery and 30-day readmission after hospitalization among older Mexican Americans over a 12-year period using the Hispanic-EPESE survey linked with the Medicare claims data from the CMS and U.S. Census Bureau. It was hypothesized that 1) sex (female versus male) would be associated with ADL disability recovery and that neighborhood concentration level would moderate this relationship; and 3) interview language (Spanish versus English) would predict 30-day hospital readmission. However, the present study did not confirm these hypotheses. Our findings were confirmed by subset analyses.

Sex (female versus male) and disability recovery after hospitalization

Our study did not find an association with sex (female versus male) and disability recovery after hospitalization. This is not in agreement with a previous study that examined factors associated with functional recovery among older intensive care unit survivors; however, another longitudinal study did not find sex to be associated with function after hospitalization [90,144]. Ferrante et al. (2016) reported that females had a 58% decrease

in the likelihood of functional recovery 6 months after hospitalization [90]. However, the study observed a higher prevalence of functional recovery after hospitalization (52.3%) compared to our study (38.7%) among mostly non-Hispanic white participants (88.5%). These differences could also be attributed to differences in observational periods or disability state prior to hospitalization. For example, our participants who recovered in disability after hospitalization differed significantly in prevalence of baseline ADLs compared to those who did not recover in disability after hospitalization (22.9% versus 49.7%, $p<0.001$). This high prevalence of disability may decrease the individual likelihood of recovering in disability after any major event. Further, Gill et al. (2021) found no relationship between risk of disability development with intervening events that occurred more than a month away of disability onset [145]. In other words, participants who developed any disability, had persistent disability, had disability with nursing home admission, and had a higher median number of hospitalization or restricted activity events than those who did not present disability. Future studies should examine the risk of hospitalization on disability transitions prior to disability state since it hospitalization is highly predictive of moving from no disability-to-severe disability and mild disability-to-no disability among older adults [83].

Neighborhood concentration and disability recovery after hospitalization

Our study did not find an association with neighborhood concentration levels and disability recovery after hospitalization. Among older Mexican Americans, neighborhood factors have been related to health outcomes, like frailty, self-reported health, and mortality [30,111,123]. However, there is little research regarding neighborhood factors and functional recovery that research deemed warranted considering the neighborhood effect on general health [146]. Researchers who study neighborhood-health have called for better neighborhood play areas, but older adults may be less likely to use playgrounds or newer resources (e.g., schools) in the area [147]. In terms of examining function, additional

conditions may need to be considered to describe neighborhood context. For example, neighborhood social cohesion or perceived danger rather than percentage of race/ethnicity composition [148]. This may be an area of interest for researchers who study community-based interventions to implement telehealth functional assessments and medical needs among older adults where environmental context is unknown [149].

Also, discharge destination may be a more important factor to consider when examining functional recovery after hospitalization given that patients are discharged to an institution may already have declining functional health prior to hospitalization. Research regarding influence of discharge destination among older adults is mixed. Previous research reporting participants with lower function tend are less likely to be discharged home [141]. However, Li et al. (2020) examined ADL recovery trajectory 6-months after discharge among initially functional independent older inpatients [142]. It was reported that post-discharge residence (home versus institutionalized) decreased odds of disability recovery 6-months after discharge (OR=0.39, 95% CI=0.17,0.86). Interestingly, our study found those who were discharged home had an increased odds of disability recovery after hospitalization 2.68 times (95% CI = 1.21-5.90). The top 3 reasons for hospitalization included diseases related to nervous system (83%), respiratory system (7%), and cardiovascular system (9.4%) [142]. Whereas our study found the top 3 reported medical conditions were nervous system (29.6%), circulatory system (11.9%) followed by a musculoskeletal system and connective tissue problem (16.1%). This difference in medical conditions may play a larger role in predicting disability status after hospitalization.

Interview language (Spanish versus English) and 30-day hospital readmission

Our study did not find an association with interview language (Spanish versus English) and 30-day hospital readmission. Approximately 85% of our study population conducted interviews in Spanish. Previous research among older Mexican Americans has reported that Spanish interview language increased the odds of being hospitalized by 53%

[150]. It has previously been reported that Spanish-speaking older adults may experience discomfort in talking about plan of care and this can act as a barrier to healthcare [151], which should be considered when developing health interventions to increase functional improvements.

Other SDOH may be more predictive of hospital readmission depending on certain comorbidities. For example, Meddings et al. (2016) found ADLs, wealth, and social support predicted 30-day readmission depending on pneumonia, heart failure, or myocardial infarction among Medicare recipients [60]. Also, our study found Charlson Comorbidity Index was a significant predictor of 30-day readmission. This may be due to the burden of comorbidities among older adults after hospitalization. For example, Gill et al (2021) found exposure to hospitalization after becoming critically increased the odds of not experiencing functional recovery by three-fold compared to the odds of recovering, and after hospitalization, one-third of participants did not recover in disability after hospitalization [145].

Conclusion

Social determinants of health have previously predicted differences in functional status and health outcomes for older Mexican Americans, but our study has uncovered that SDOH like nativity status, self-reported loneliness, neighborhood concentration level, and interview language do not seem to affect functional status over time or after a hospitalization among Mexican American Medicare Beneficiaries. Among older adults, additional participant characteristics and complications from illnesses may need to be further explored to understand mechanisms that affect functional transitions later in life to promote functional maintenance or recovery. There is also a chance that time to disability recovery observation was too long. For example, it has been reported that 56.8% regained independence 6-months post-discharge, but disability recovery was highest 1st month after

discharge then rate of recovery declined over time [142]. This may have also underestimated the effect of participant characteristics of functional status, especially if participants passed away or were lost to follow-up which is a common issue for longitudinal studies among older adults.

Limitations

The present study has some limitations that warrant discussion. First, the generalizability is limited to older Mexican Americans from Southwestern states who are Medicare Beneficiaries, which may not be representative of older minority adults in other regions or without health insurance. Second, participants excluded from each Aim tended to be less healthy compared to those included for analysis. This may underestimate the findings of this project. For example, Mexican American participants of the Hispanic-EPESE who are lost to follow-up may travel to Mexico to pass away. Third, there is potential reverse causality bias and participants' physical health may determine where they live, social resources, and previous hospitalizations.

Also, the current study excluded participants who did not transition in physical function or did not have healthcare measures, such as those who passed away or did not have continuous enrollment for one year. Prior research shows that risk of mortality is greater for those who transition to worse physical function over time [48]; thus, future studies should aim to capture mortality over the late life span. We were unable to identify physical function at the exact time of hospital admission and discharge, but evidence from population-based studies indicates long-term decline or recovery in physical function after hospitalization is possible [61,85,152]. Lastly, our study was limited to fixed neighborhood context variables, but it may be more insightful to look at change in neighborhood over time and model for clustering effects, which we were also unable to achieve due to reduced power.

Strengths

This project has some strengths, as well. First, the Hispanic-EPESE is a large, longitudinal cohort study of community-dwelling older Mexican Americans, an underserved population that are aging rapidly. Second, this study used objective measures of physical function and linkage of multiple data sets to capture additional social determinants of health, like healthcare and environmental characteristics. Previous studies are often limited to self-reported measures at time of healthcare use, which may represent those who have already fallen ill. Lastly, we addressed The NIA Strategic Directions of 2020-2025 and Healthy People 2030 call to increase knowledge about factors and mechanisms that affect the dynamic aging process [14,15].

Future implications

This project has implications for multiple professions, such as providers and communities aiming to maintain social engagement and physical health among older minority populations. Our study showed functional transitions are dynamic and functional recovery after hospitalization is achievable among Mexican American Medicare Beneficiaries. By linking longitudinal data with the Medicare claims data and U.S. Census files, we were able to identify precise factors related to functional transitions before healthcare utilization, as well as the patterns of functional transitions after an acute hospitalization over time. Future studies should consider precise factors when developing community or home-based interventions to promote physical function maintenance and improvement among this vulnerable population [153]. Our study shows certain factors that could be collected in electronic health records to help develop strategies to promote functional recovery and reduce hospital-associated disability, as well as certain social

determinants of health that may not be more influential than need factors [18,19]. Lastly, more research on the transitions of objective measures of physical function along the physical function trajectory are needed from longitudinal studies to identify the onset of severe impairments or disability. It remains essential to examine function as life expectancies continue to grow for all populations to ensure adequate health planning and identifying those who may need more social services.

APPENDIX A

Appendix A: Operationalized variables from CMS files and RESDAC description

Table A.1. Operationalized variables from CMS files and RESDAC description.

Table A.1. Operationalized variables from CMS files and RESDAC description [117].

Variable	Definition	SAS Code	Description	Source
Participant ID/linkage	N/A	BENE_ID DSYSRTKY	MedPAR: The unique CCW identifier for a beneficiary. Carrier/OUTSAF: This field contains the key to link data for each beneficiary across all claim files.	MedPAR, Carrier, OUTSAF
Medicaid eligibility	With state-buy-in coverage anytime during a year.	BENE_ENROLLMT_REF_YR	Reference year of the enrollment data	MBSF
Primary diagnosis	Primary diagnosis included initial diagnosis at the time of hospital admission.	ADMTG_DGNS_CD	Beneficiary's initial diagnosis at the time of admission from ICD-9, ICD-10 codes, MS-DRG, RUGs, HHRG.	MedPAR
Comorbidity	The Charlson Comorbidity Index was used to create the weighted comorbidity score.	DGNS_1_CD	The diagnosis code identifying the beneficiary's principal diagnosis (up to 25 codes)	MedPAR, OUTSAF, Carrier
Provider type	Primary care physician (general practice, family medicine, and	SRVC_PRVDR_TYPE_CD	Description of the type of provider (i.e., doctor or facility) responsible	Carrier, OUTSAF

	internal medicine), nurse practitioner, and specialists (neurologists, psychiatrist, geriatric psychiatrist, and neuropsychiatrist)		for treating a patient	
All-cause hospitalization	Any short or long-term hospital with >1 one day between admission and discharge date on the hospital claims. The last hospitalization within a year prior to successor-record date was used.	ADMSN_DT DSCHRG_DT	Date the beneficiary was admitted for Inpatient care or the date that care started Date on which the beneficiary was discharged or died	MEDPAR
Length of stay	Duration (days) of index hospitalization	LOS_DAY_CNT	Count in days of the total length of a beneficiary's stay in a hospital or SNF	MedPAR
Reason for hospitalization	Reason for hospitalization included medical/elective versus surgery/non-elective	IP_ADMSN_TYPE_CD	The type and priority of the beneficiary's admission to a facility for the Inpatient hospital stay.	MedPAR, Carrier

Number of hospitalizations	Any acute hospital admission in a given year using admission dates	STAY_FINL_ACTN_CLM_CNT	Number of claim records (final action) included in the stay	MedPar
Discharge destination	Discharge destination was derived from facility codes and include either a home or institutional discharge destination (e.g., Board and Care, Transitional Living, Intermediate Care, Skilled Nursing Facilities, Acute Unit of Own Facility).	DSCHRG_DSTNTN_CD	Destination of the beneficiary upon discharge from a facility; also denotes death or skilled nursing facility (SNF)/still patient situations	MedPAR, OUTSAF
Type of facility/provider institute	Included medical school affiliated hospital versus non-medical school affiliated hospital using medical school affiliation code	MDCL_SCHL_AFLTN_CD	Type of affiliation that a hospital has with a medical school	MedPAR, Carrier
Hospital 30-day readmission	Readmission was defined as admission to an acute	ADMSN_DT	Date the beneficiary was admitted for Inpatient	MedPAR

	care hospital in the 30 days after discharge from the acute care index hospitalizatio n, and was identified as a hospital readmission within a year prior to successor-record date		care or the date that care started	

Abbreviations: CMS=Center for Medicaid and Medicare; MBSF= Master Beneficiary Summary Files; MedPAR=Medicare Provider and Analysis and Review; OUTSAF= Outpatient Standard Analytic Files; CMS=Centers for Medicare and Medicaid Services; ICD-9/10=International Classification of Diseases 9th or 10th; MS-DRG= Medicare Severity-Diagnosis Related Groups; RUGs=Resource Utilization Group; HHRG= Home Health Resource Group

Appendix B

Appendix B: Bivariate correlations among variables

Table B.1. Correlation analysis for Aims 1 and 2 (N=1,109).

Table B.2. Additional correlation analysis for Aim 2 (N=299).

Table B.3. Correlation analysis for Aim 3, examining disability recovery (N=1,143).

Table B.4. Correlation analysis for Aim 3, examining 30-day hospital readmission (N=305).

Table B.1.: Correlation analysis for Aims 1 and 2 (N=1,109).

Variable	Loneliness status	Nativity status	Neighborhood concentration > 60th PCTL	Hospitalization	Physical function recovery
Age	-0.069	0.088	0.081	-0.009	-0.215
Sex	-0.108	-0.101	0.013	0.024	-0.071
Education	0.059	-0.272	0.0003	-0.065	0.140
Household income	-0.048	0.034	-0.369	0.0001	-0.048
BMI	-0.012	0.040	-0.077	0.016	-0.068
CES-D ≥16	-0.422	0.123	0.032	0.067	-0.131
CES-D (continuous)	-0.501	-	-	-	-
MMSE <21	-0.074	0.091	0.046	0.019	-0.172
Charlson comorbidity index (≥3)	-0.036	0.005	0.016	0.431	-0.113
Spanish interview	0.086	0.233	0.123	0.046	-0.071
Marital status	0.205	0.006	0.067	-0.059	0.053
Loneliness status	1.000	-	-	-	-
Nativity status	-0.088	1.000	-	-	-
Neighborhood concentration ≥ 60th PCTL	0.018	0.127	1.000	-	-
Hospitalization	0.046	-0.005	-0.013	1.000	-
Physical function recovery	0.065	-0.040	-0.047	-0.133	1.000

Notes: Highlighted grey indicates significant correlation (p-value<0.05)

Table B.2.: Additional correlation analysis for Aim 2 (N=299).

Variable	Loneliness status	Nativity status	Neighborhood concentration ≥ 60th PCTL	Physical function recovery
Provider institution	0.004	-0.009	-0.117	-0.018
Reason for hospitalization	0.013	-0.028	-0.057	-0.073
Length of stay	0.106	0.106	-0.016	-0.061
Discharge destination	-0.091	0.075	0.002	-0.206
Notes: Highlighted grey indicates significant correlation (p-value<0.05)				

Table B.3.: Correlation analysis for Aim 3, examining disability recovery (N=1,143).

Variable	Sex	Provider Institution	Hospitalization	Disability recovery
Age	0.019	-0.0967	-0.000	-0.217
Education	0.085	0.010	-0.07	0.101
Household income	-0.043	-0.138	0.004	0.076
BMI	0.088	0.041	0.011	0.039
CES-D ≥16	0.129	0.070	0.077	-0.076
MMSE <21	-0.029	-0.093	0.022	-0.187
Physical function (SPPB)	-0.120	0.061	-0.070	0.206
Any ADL	0.105	0.066	0.036	-0.218
Charlson comorbidity index (≥3)	-0.083	-0.136	0.436	-0.115
Spanish interview	-0.076	0.035	0.044	-0.067
Marital status	-0.399	-0.035	-0.059	0.029
Loneliness status	-0.0978	-0.011	-0.048	0.067
Nativity status	-0.103	-0.010	-0.007	0.025
Neighborhood concentration ≥ 60th PCTL	0.013	-0.125	-0.019	-0.080
Reason for hospitalization	-0.008	0.041	-	0.008
Length of stay (>4 days)	0.093	-0.032	-	0.007
Discharge destination	0.034	-0.023	-	0.190
Sex	1.000	-	-	-
Provider institution	0.008	1.000	-	-
Hospitalization	0.026	-	1.000	-
Disability recovery	-0.026	0.006	-0.135	1.000
Notes: Highlighted grey indicates significant correlation (p-value<0.05)				

Table B.4.: Correlation analysis for Aim 3, examining 30-day hospital readmission (N=305).

Variable	Spanish interview	30-day Hospital Readmission
Age	-0.081	0.025
Sex	-0.135	-0.022
Education	-0.256	0.017
Household income	-0.102	0.050
BMI	0.055	0.010
CES-D ≥16	-0.011	0.123
MMSE <21	0.035	0.040
Physical function (SPPB)	0.002	-0.060
Any ADL	0.058	0.057
Charlson comorbidity index	0.113	0.374
Marital status	0.100	-0.075
Loneliness status	0.091	-0.079
Nativity status	0.172	-0.009
Neighborhood concentration ≥ 60th PCTL	0.098	0.005
Reason for hospitalization	-0.077	-0.025
Length of stay	-0.002	0.169
Discharge destination	0.003	-0.081
Provider institution	0.035	0.032
Spanish interview	1.000	-0.014
Notes: Highlighted grey indicates significant correlation (p-value<0.05)		

Appendix C

Appendix C: Long-format tables

Table C.1. Full model building of generalized estimating equations models for physical function recovery after hospitalization over 12-years of follow-up among older Mexican American Medicare Beneficiaries (N=1,109).

Table C.2. Full model building of generalized estimating equations models for disability recovery after hospitalization over 12-years of follow-up among older Mexican American Medicare Beneficiaries (N=1,143).

Table C.3. Subset analysis of generalized estimating equations models for physical function recovery after hospitalization among Mexican American Medicare Beneficiaries with a hospitalization only (N=299).

Table C.4. Subset analysis of generalized estimating equations models for disability recovery after hospitalization among Mexican American Medicare Beneficiaries with a hospitalization only (N=305).

Table C.1: Generalized estimating equations models for physical function recovery after hospitalization over 12-years of follow-up among older Mexican American Medicare Beneficiaries (N=1,109).

Predictor variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Time	**0.84 (0.74-0.96)**	**1.17 (0.99-1.39)**	**1.21 (1.02-1.44)**	**1.22 (1.03-1.45)**	**1.22 (1.03-1.45)**
Admitted to hospital	**0.50 (0.36-0.70)**	**0.48 (0.34-0.68)**	**0.53 (0.36-0.76)**	**0.50 (0.33-0.78)**	0.48 (0.20-1.14)
Demographic + Socioeconomic Factors					
Age (years)	-	**0.87 (0.84-0.91)**	**0.87 (0.84-0.91)**	**0.87 (0.84-0.91)**	**0.87 (0.83-0.91)**
Female	-	**0.68 (0.51-0.92)**	**0.73 (0.54 - 0.98)**	**0.73 (0.54-0.98)**	**0.73 (0.54-0.98)**
Education (years)	-	**1.07 (1.03-1.10)**	1.03 (0.99-1.07)	1.03 (0.99-1.07)	1.03 (0.99-1.07)
Health Factors					
BMI (kg/m^2)	-	-	**0.96 (0.93-0.99)**	**0.96 (0.93-0.98)**	**0.96 (0.93-0.98)**
Depressive symptoms (CES-D $\geq$16)	-	-	**0.62 (0.40-0.98)**	0.62 (0.38-1.01)	0.62 (0.38-1.01)
Cognitive impairment (MMSE <21)	-	-	**0.56 (0.39-0.81)**	**0.56 (0.39-0.81)**	**0.55 (0.38-0.81)**
Charlson Comorbidity Index					
<3	-	-	Reference	Reference	Reference
$\geq$3	-	-	0.80 (0.58-1.09)	0.81 (0.59-1.11)	0.81 (0.59-1.10)
Physical/Built + Socio-Cultural Environmental Factors					
Spanish interview	-	-	-	0.74 (0.50-1.09)	0.74 (0.50-1.10)
Foreign-born	-	-	-	1.02 (0.71-1.47)	1.02 (0.71-1.46)
Foreign_born*admitted to hospital	-	-	-	Not significant	Not significant
Lonely (no)	-	-	-	0.97 (0.65-1.20)	0.98 (0.66-1.45)
Not lonely*admi	-	-	-	Not significant	Not significant

tted to hospital					
Neighborhood concentration $\geq 60^{th}$ PCTL	-	-	-	0.89 (0.65-1.20)	0.88 (0.64-1.19)
Healthcare Characteristics					
Provider institute					
Non-medical school affiliated					Reference
Medical school affiliated					0.74 (0.38-1.43)

Notes: Significant predictors of physical function recovery are bolded and highlighted in light grey. Foreign-born and loneliness status include

OR = odds ratio; CI = Confidence Interval; BMI = body mass index measured in kilograms/meters-squared; CES-D Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; SPPB = Short Physical Performance Battery, PCTL=Percentile

Not shown here: Model 6 = Model 5 + interaction effect of lonely*neighborhood concentration ($p>.05$)

Table C.2: Generalized estimating equations models for disability recovery after hospitalization over 12-years of follow-up among older Mexican American Medicare Beneficiaries (N=1,143).

Predictor variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Time	0.82 (0.72-0.93)	1.02 (0.88-1.18)	1.03 (0.89-1.20)	1.05 (0.90-1.22)	1.05 (0.90-1.22)
Admitted to hospital	**0.54 (0.41-0.71)**	**0.67 (0.43-1.04)**	0.73 (0.45-1.18)	0.75 (0.46-1.21)	0.96 (0.56-1.66)
Demographic + Socioeconomic Factors					
Age (years)	-	**0.91 (0.88-0.94)**	**0.92 (0.89-0.95)**	**0.92 (0.89-0.95)**	**0.92 (0.89-0.95)**
Female	-	0.99 (0.73-1.34)	1.07 (0.78-1.47)	1.06 (0.77-1.46)	1.06 (0.77-1.46)
Female*admitted to hospital	-	Not significant	Not significant	Not significant	Not significant
Education (years)	-	**1.04 (1.00-1.07)**	1.00 (0.96-1.03)	0.99 (0.96-1.03)	0.99 (0.96-1.03)
Income (USD)	-	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Health Factors					
Depressive symptoms (CES-D ≥16)	-	-	1.14 (0.78-1.65)	1.13 (0.78-1.64)	1.16 (0.80-1.68)
Cognitive impairment (MMSE <21)	-	-	**0.57 (0.42-0.77)**	**0.56 (0.42-0.77)**	**0.56 (0.41-0.76)**
Charlson Comorbidity Index					
<3	-	-	Reference	Reference	
≥3	-	-	0.86 (0.65-1.14)	0.87 (0.66-1.15)	0.86 (0.65-1.15)
Baseline physical function					
Low	-	-	Reference	Reference	Reference
Moderate	-	-	1.26 (0.93-1.71)	1.24 (0.92-1.68)	1.24 (0.92-1.68)
High	-	-	**2.60 (1.83-3.69)**	**2.61 (1.83-3.71)**	**2.60 (1.85-3.75)**
Physical/Built + Socio-Cultural Environmental Factors					
Spanish interview	-	-	-	0.71 (0.49-1.05)	0.70 (0.48-1.04)

Neighborhood concentration $\geq 60^{th}$ PCTL	-	-	-	0.85 (0.64-1.13)	0.83 (0.63-1.11)
Healthcare Characteristics					
Provider institute					
Non-medical school affiliated	-	-	-	-	Reference
Medical school affiliated	-	-	-	-	0.85 (0.50-1.44)
Discharge destination					
Home	-	-	-	-	Reference
Institutionalized	-	-	-	-	**0.37 (0.18-0.79)**

Notes: An OR> 1 indicates increased odds of disability recovery; An OR <1 indicates decreased odds of disability recovery. Significant predictors of disability are bolded and highlighted in light grey.

OR = odds ratio; CI = Confidence Interval; BMI = body mass index measured in kilograms/meters-squared; CES-D = Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; SPPB = Short Physical Performance Battery; USD=United States Dollar

Not shown here: Model 6 = Model 5 + interaction effect of sex*neighborhood concentration ($p>0.05$)

Table C.3: Subset analysis of generalized estimating equations models for physical function recovery after hospitalization among Mexican American Medicare Beneficiaries with a hospitalization only (N=299).

Predictor variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Time	0.86 (0.62-1.18)	1.14 (0.76-1.77)	1.17 (0.80-1.72)	1.23 (0.83-1.85)	1.26 (0.84-1.87)
Sociodemographic Factors					
Age (years)	-	**0.90 (0.82-0.98)**	0.92 (0.84-1.00)	**0.91 (0.83-0.99)**	**0.91 (0.83-0.99)**
Female	-	0.68 (0.37-1.25)	0.77 (0.41-1.45)	0.80 (0.42-1.49)	0.80 (0.43-1.51)
Education (years)	-	0.99 (0.91-1.06)	0.96 (0.89-1.03)	0.96 (0.89-1.03)	0.96 (0.89-1.03)
Health Factors					
BMI (kg/m^2)	-	-	0.96 (0.89-1.03)	0.97 (0.90-1.04)	0.97 (0.90-1.03)
Depressive symptoms (CES-D $\geq$16)	-	-	0.54 (0.20-1.42)	0.58 (0.22-1.53)	0.60 (0.22-1.60)
Cognitive impairment (MMSE <21)	-	-	0.61 (0.30-1.33)	0.58 (0.28-1.19)	0.55 (0.27-1.15)
Charlson Comorbidity Index					
<3	-	-	Reference	Reference	Reference
$\geq$3	-	-	0.47 (0.22-1.03)	0.51 (0.23-1.13)	0.48 (0.21-1.08)
Physical/Built + Socio-Cultural Environmental Factors					
Spanish interview	-	-	-	0.78 (0.26-2.36)	0.80 (0.26-2.43)
Foreign-born	-	-	-	1.42 (0.72-2.80)	1.45 (0.73-2.87)
Lonely (no)	-	-	-	1.52 (0.70-3.18)	1.56 (0.71-3.43)
Neighborhood concentration $\geq 60^{th}$ PCTL	-	-	-	0.68 (0.35-1.35)	0.65 (0.33-1.31)
Healthcare Characteristics					
Provider institute					

Non-medical school affiliated					Reference
Medical school affiliated					0.70 (0.35-1.42)

Notes: Significant predictors of physical function recovery are bolded and highlighted in light grey.

OR = odds ratio; CI = Confidence Interval; BMI = body mass index measured in kilograms/meters-squared; CES-D Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; SPPB = Short Physical Performance Battery, PCTL=Percentile

Not shown here: Model 6 = Model 5 + interaction effect of lonely*neighborhood concentration ($p>.05$)

Table C.4: Subset analysis of generalized estimating equations models for disability recovery after hospitalization among Mexican American Medicare Beneficiaries with a hospitalization only (N=305).

Predictor variables	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Time	0.81 (0.62-1.05)	1.01 (0.74-1.38)	1.01 (0.74-1.37)	1.02 (0.75-1.40)	1.01 (0.73-1.38)
Demographic + Socioeconomic Factors					
Age (years)	-	**0.90 (0.84-0.97)**	**0.93 (0.86-0.99)**	**0.92 (0.86-0.99)**	**0.93 (0.87-0.99)**
Female	-	0.74 (0.44-1.23)	0.74 (0.42-1.27)	0.73 (0.42-1.25)	0.69 (0.40-1.20)
Education (years)	-	0.98 (0.92-1.05)	0.95 (0.89-1.02)	0.95 (0.89-1.02)	0.95 (0.89-1.02)
Income (USD)	-	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Health Factors					
Depressive symptoms (CES-D $\geq$16)	-	-	1.48 (0.76-2.87)	1.48 (0.76-2.86)	1.58 (0.80-3.14)
Cognitive impairment (MMSE <21)	-	-	0.71 (0.40-1.24)	0.70 (0.39-1.24)	0.69 (0.38-1.24)
Charlson Comorbidity Index					
<3	-	-	Reference	Reference	
$\geq$3	-	-	0.88 (0.40-1.93)	0.90 (0.41-1.97)	0.76 (0.17-1.34)
Baseline physical function					
Low	-	-	Reference	Reference	Reference
Moderate	-	-	**2.13 (1.19-3.89)**	**2.13 (1.19-1.66)**	**2.14 (1.19-3.84)**
High	-	-	**3.60 (1.72-7.55)**	**3.59 (1.71-7.57)**	**3.66 (1.72-7.79)**
Physical/Built + Socio-Cultural Environmental Factors					
Spanish interview	-	-	-	0.84 (0.35-1.97)	0.83 (0.35-1.99)
Neighborhood concentration $\geq 60^{th}$ PCTL	-	-	-	0.92 (0.53-1.58)	0.89 (0.52-1.54)
Healthcare Characteristics					

Provider institute					
Non-medical school affiliated	-	-	-	-	Reference
Medical school affiliated	-	-	-	-	0.99 (0.56-1.77)
Discharge destination					
Institutionalized	-	-	-	-	Reference
Home	-	-	-	-	**2.68 (1.21-5.90)**

Notes: An OR> 1 indicates increased odds of disability recovery; An OR <1 indicates decreased odds of disability recovery. Significant predictors of disability are bolded and highlighted in light grey.

OR = odds ratio; CI = Confidence Interval; BMI = body mass index measured in kilograms/meters-squared; CES-D = Center for Epidemiologic Studies Depression Scale; MMSE = Mini-Mental State Examination; SPPB = Short Physical Performance Battery; USD=United States Dollar

Not shown here: Model 6 = Model 5 + interaction effect of sex*neighborhood concentration ($p>0.05$)

Bibliography

1. Ostir, G. V.; Markides, K.S.; Black, S.A.; Goodwin, J.S. Lower body functioning as a predictor of subsequent disability among older Mexican Americans. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **1998**, *53*, 491–495, doi:10.1093/gerona/53A.6.M491.
2. Guralnik, J.M.; Simonsick, E.M.; Ferrucci, L.; Glynn, R.J.; Berkman, L.F.; Blazer, D.G.; Scherr, P.A.; Wallace, R.B. A short physical performance battery assessing lower extremity function: Association with self-reported disability and prediction of mortality and nursing home admission. *Journals Gerontol.* **1994**, *49*, doi:10.1093/geronj/49.2.M85.
3. Freiberger, E.; De vreede, P.; Schoene, D.; Rydwik, E.; Mueller, V.; Frändin, K.; Hopman-Rock, M. Performance-based physical function in older community-dwelling persons: A systematic review of instruments. *Age Ageing* **2012**, *41*, 712–721, doi:10.1093/ageing/afs099.
4. Freire, A.N.; Guerra, R.O.; Alvarado, B.; Guralnik, J.M.; Zunzunegui, M.V. Validity and reliability of the short physical performance battery in two diverse older adult populations in Quebec and Brazil. *J. Aging Health* **2012**, *24*, 863–878, doi:10.1177/0898264312438551.
5. Katz, S.; Downs, T.D.; Cash, H.R.; Grotz, R.C. Progress in development of the index of ADL. *Gerontologist* **1970**, *10*, 20–30, doi:10.1093/geront/10.1_Part_1.20.
6. World Health Organization Social determinants of health Available online: https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1 (accessed on Sep 14, 2021).
7. Vega, W.; Markides, K.S.; Angel, J.L.; Torres-Gil., F.M. *Challenges of Latino Aging in the Americas*; Springer: New York, 2015;
8. NHIS - Data, Questionnaires and Related Documentation Available online: https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm (accessed on Mar 1, 2022).
9. Okoro, C.A. Prevalence of Disabilities and Health Care Access by Disability Status and Type Among Adults — United States, 2016. *MMWR. Morb. Mortal. Wkly. Rep.* **2019**, *67*, 882–887, doi:10.15585/MMWR.MM6732A3.
10. Melvin, J.; Hummer, R.; Elo, I.; Mehta, N. Age patterns of racial/ethnic/nativity differences in disability and physical functioning in the United States. *Demogr Res* **2014**, *31*, 497–510, doi:10.4054/DemRes.2014.31.17.Age.
11. Velasco-Mondragon, E.; Jimenez, A.; Palladino-Davis, A.G.; Davis, D.; Escamilla-Cejudo, J.A. Hispanic health in the USA: A scoping review of the literature. *Public Health Rev.* **2016**, *37*, 1–27, doi:10.1186/s40985-016-0043-2.
12. Garcia, M.A.; Reyes, A.M. Prevalence and Trends in Morbidity and Disability Among Older Mexican Americans in the Southwestern United States, 1993– 2013.

Res Aging **2018**, *40*, 311–339, doi:10.1177/0164027517697800.

13. Verbrugge, L.M.; Jette, A.M. The Disablement Process. *Soc. Sci. Med* **1994**, *38*, 1–14.

14. Social Determinants of Health - Healthy People 2030 | health.gov Available online: https://health.gov/healthypeople/objectives-and-data/social-determinants-health (accessed on Mar 1, 2022).

15. Institute on Aging, N.; Institutes of Health, N.; Department of Health, U.; Services, H. The National Institute on Aging: Strategic Directions for Research, 2020-2025.

16. Kritchevsky, S.B.; Forman, D.E.; Callahan, K.E.; Ely, E.W.; Kevin, P.; Mcfarland, F.; Pérez-stable, E.J.; Schmader, K.E.; Studenski, S.A.; Williams, J.; et al. Pathways , Contributors , and Correlates of Functional Limitation Across Specialties : Workshop Summary. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2019**, *74*, 534–543, doi:10.1093/gerona/gly093.

17. Fimognari, F.L.; Palleschi, L. Functional recovery in hospitalized elderly adults. *J. Am. Geriatr. Soc.* **2012**, *60*, 1795–1796, doi:10.1111/j.1532-5415.2012.04124.x.

18. Cantor, M.N.; Thorpe, L. Integrating data on social determinants of health into electronic health records. *Health Aff.* **2018**, *37*, 585–590, doi:10.1377/hlthaff.2017.1252.

19. Cottrell, E.K.; Dambrun, K.; Cowburn, S.; Mossman, N.; Bunce, A.E.; Marino, M.; Krancari, M.; Gold, R. Variation in Electronic Health Record Documentation of Social Determinants of Health Across a National Network of Community Health Centers. *Am. J. Prev. Med.* **2019**, *57*, S65–S73, doi:10.1016/j.amepre.2019.07.014.

20. Krogstad, J.M.; Noe-Bustamante, L. Facts about U.S. Latinos for Hispanic Heritage Month | Pew Research Center Available online: https://www.pewresearch.org/fact-tank/2021/09/09/key-facts-about-u-s-latinos-for-national-hispanic-heritage-month/ (accessed on Mar 2, 2022).

21. U.S. Census Bureau QuickFacts: United States Available online: https://www.census.gov/quickfacts/fact/table/US/RHI725219#RHI725219 (accessed on Mar 2, 2022).

22. Noe-Bustamante, L.; Lopez, M.H.; Krogstad, J.M. US Hispanic population reached new high in 2019, but growth slowed Available online: https://www.pewresearch.org/fact-tank/2020/07/07/u-s-hispanic-population-surpassed-60-million-in-2019-but-growth-has-slowed/ (accessed on Jul 2, 2021).

23. Hispanic Health | VitalSigns | CDC Available online: https://www.cdc.gov/vitalsigns/hispanic-health/index.html (accessed on Mar 19, 2022).

24. González, H.M.; Tarraf, W.; Gouskova, N.; Gallo, L.C.; Penedo, F.J.; Davis, S.M.; Lipton, R.B.; Argüelles, W.; Choca, J.P.; Catellier, D.J.; et al. Neurocognitive function among middle-aged and older hispanic/latinos: Results from the hispanic community health study/study of latinos. *Arch. Clin. Neuropsychol.* **2015**, *30*, 68–

77, doi:10.1093/arclin/acu066.

25. Elfassy, T.; Aiello, A.E.; Schneiderman, N.; Haan, M.N.; Tarraf, W.; González, H.M.; Gellman, M.; Florez, H.J.; Luchsinger, J.A.; Wright, C.B.; et al. Relation of Diabetes to Cognitive Function in Hispanics/Latinos of Diverse Backgrounds in the United States. *J. Aging Health* **2019**, *31*, 1155–1171, doi:10.1177/0898264318759379.

26. Arredondo, E.M.; Sotres-alvarez, D.; Stoutenberg, M.; Davis, M.; Crespo, N.C.; Carnethon, M.R.; Castañeda, S.F.; Isasi, C.R.; Espinoza, R.A.; Daviglus, M.L. From the Hispanic Community Health Study / Study of Latinos. *Am. J. Prev. Med.* **2016**, *50*, 500–508, doi:10.1016/j.amepre.2015.08.029.Physical.

27. Angel, J.L.; Angel, R. Age at Migration, Social Connections, and Well-Being Among Elderly Hispanics. *J. Aging Health* **1992**, *4*, 480–499.

28. Markides, K.S.; Gerst, K. Immigration, aging, and health in the United States. In *Handbook of Sociology of Aging*; In R. A. Settersten & J. L. Angel (Eds.), Ed.; Springer: New York, NY, 2011; pp. 103–116.

29. Guralnik, J.M.; Fried, L.P.; Salive, M.E. Disability as a public health outcome in the aging population. *Annu. Rev. Public Health* **1996**, *17*, 25–46, doi:10.1146/annurev.pu.17.050196.000325.

30. Eschbach, K.; Ostir, G. V.; Patel, K. V.; Markides, K.S.; Goodwin, J.S. Neighborhood context and mortality among older Mexican Americans: Is there a barrio advantage? *Am. J. Public Health* **2004**, *94*, 1807–1812, doi:10.2105/AJPH.94.10.1807.

31. Insitute of Medicine (US) Committe Models of Disability and Rehabilitation. In *Enabling America: Assessing the Role of Rehabilitation Science and Engineering*; Brandt, E., Pope, A., Eds.; National Academies Press (US): Washington, DC, 1997.

32. Ferrucci, L.; Cooper, R.; Shardell, M.; Simonsick, E.M.; Schrack, J.A.; Kuh, D. Age-related change in mobility: Perspectives from life course epidemiology and geroscience. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2016**, *71*, 1184–1194, doi:10.1093/gerona/glw043.

33. Deer, R.R.; Dickinson, J.M.; Baillargeon, J.; Fisher, S.R.; Raji, M.; Volpi, E. A phase I randomized clinical trial of evidence-based, pragmatic interventions to improve functional recovery after hospitalization in geriatric patients. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2019**, *74*, 1628–1636, doi:10.1093/gerona/glz084.

34. Peeters, G.; Dobson, A.J.; Deeg, D.J.H.; Brown, W.J. A life-course perspective on physical functioning in women. *Bull. World Health Organ.* **2013**, *91*, 661–670, doi:10.2471/BLT.13.123075.

35. Guralnik, J.M.; Ferrucci, L.; Simonsick, E.M.; Salive, M.E.; Wallace, R.B. Lower-Extremity Function in Persons over the Age of 70 Years as a Predictor of Subsequent Disability. *N. Engl. J. Med.* **1995**, *332*, 556–562, doi:10.1056/nejm199503023320902.

36. Gómez Montes, J.F.; Curcio, C.L.; Alvarado, B.; Zunzunegui, M.V.; Guralnik, J. Validity and reliability of the Short Physical Performance Battery (SPPB): A pilot study on mobility in the Colombian Andes. *Colomb. Med.* **2013**, *44*, 165–171, doi:10.25100/cm.v44i3.1181.

37. Rikli, R.E.; Jones, C.J. Development and validation of a functional fitness test for community- residing older adults. *J. Aging Phys. Act.* **1999**, *7*, 129–161, doi:10.1123/japa.7.2.129.

38. Perera, S.; Mody, S.H.; Woodman, R.C.; Studenski, S.A. Meaningful change and responsiveness in common physical performance measures in older adults. *J. Am. Geriatr. Soc.* **2006**, *54*, 743–749, doi:10.1111/j.1532-5415.2006.00701.x.

39. Kwon, S.; Perera, S.; Pahor, M.; Katula, J.A.; King, A.C.; Groessl, E.J.; Studenski, S.A. What is a meaningful change in physical performance? Findings from a clinical trial in older adults (The LIFE-P study). *J. Nutr. Heal. Aging* **2009**, *13*, 538–544, doi:10.1007/s12603-009-0104-z.

40. Brown, J.D.; Lo-Ciganic, W.H.; Shao, H.; Pahor, M.; Manini, T.M. Trajectories of short physical performance battery are strongly associated with future major mobility disability: Results from the life study. *J. Clin. Med.* **2020**, *9*, 1–10, doi:10.3390/jcm9082332.

41. Pebley, A.R.; Goldman, N.; Andrasfay, T.; Pratt, B. Trajectories of physical functioning among older adults in the US by race, ethnicity and nativity: Examining the role of working conditions. *PLoS One* **2021**, *16*, 1–22, doi:10.1371/journal.pone.0247804.

42. Owusu, C.; Margevicius, S.; Schluchter, M.; Koroukian, S.M.; Berge, N.A. Short Physical Performance Battery, Usual Gait Speed, Grip Strength and Vulnerable Elders Survey Each Predict Functional Decline among Older Women with Breast Cancer. *J. Geriatr. Oncol.* **2017**, *8*, 356–362, doi:doi:10.1016/j.jgo.2017.07.004.

43. Peek, M.K.; Ottenbacher, K.J.; Markides, K.S.; Ostir, G. V. Examining the disablement process among older Mexican American adults. *Soc. Sci. Med.* **2003**, *57*, 413–425, doi:10.1016/S0277-9536(02)00367-2.

44. Hall, K.S.; Cohen, H.J.; Pieper, C.F.; Fillenbaum, G.G.; Kraus, W.E.; Huffman, K.M.; Cornish, M.A.; Shiloh, A.; Flynn, C.; Sloane, R.; et al. Physical performance across the adult life Span: Correlates with age and physical activity. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2017**, *72*, 572–578, doi:10.1093/gerona/glw120.

45. Hämäläinen, P.; Suni, J.; Pasanen, M.; Malmberg, J.; Miilunpalo, S. Changes in physical performance among high-functioning older adults: A 6-year follow-up study. *Eur. J. Ageing* **2006**, *3*, 3–14, doi:10.1007/s10433-006-0018-0.

46. Mutambudzi, M.; Chen, N.W.; Howrey, B.; Garcia, M.A.; Markides, K.S. Physical Performance Trajectories and Mortality among Older Mexican Americans. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2019**, *74*, 233–239, doi:10.1093/gerona/gly013.

47. Cheng, Y.; Goodin, A.J.; Pahor, M.; Manini, T.; Brown, J.D. Healthcare

Utilization and Physical Functioning in Older Adults in the United States. *J. Am. Geriatr. Soc.* **2020**, *68*, 266–271, doi:10.1111/jgs.16260.

48. Files, D.C.; Neiberg, R.; Rushing, J.; Morris, P.E.; Young, M.P.; Ayonayon, H.; Harris, T.; Newman, A.; Rubin, S.; Shiroma, E.; et al. Influence of Prehospital Function and Strength on Outcomes of Critically Ill Older Adults. *J. Am. Geriatr. Soc.* **2018**, *66*, 525–531, doi:10.1111/jgs.15255.

49. Villani, E.R.; Vetrano, D.L.; Franza, L.; Carfì, A.; Brandi, V.; Volpato, S.; Corsonello, A.; Lattanzio, F.; Ruggiero, C.; Onder, G.; et al. Physical performance measures and hospital outcomes among Italian older adults: results from the CRIME project. *Aging Clin. Exp. Res.* **2021**, *33*, 319–327, doi:10.1007/s40520-020-01691-0.

50. Mutambudzi, M.; Chen, N.W.; Howrey, B.; Garcia, M.A.; Markides, K.S. Physical Performance Trajectories and Mortality among Older Mexican Americans. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2019**, *74*, 233–239, doi:10.1093/gerona/gly013.

51. Disability and Health Data System Comparison Report | NCBDDD | CDC Available online: https://dhds.cdc.gov/CR?ReportType=Years&LocationId=59&StratCatId=RACE&YearId=RECENT&CompareColumns=YR4,YR3,YR2,YR1&ShowCategoryIds=DISEST&SearchString=&ShowReportOptions=false&CategoryFilterId=&StratFilterId=&ShowCI=true&ShowWN=true&HideMissingDataRows=false (accessed on Aug 2, 2021).

52. Okoro, C.A. Prevalence of Disabilities and Health Care Access by Disability Status and Type Among Adults — United States, 2016. *MMWR. Morb. Mortal. Wkly. Rep.* **2019**, *67*, 882–887, doi:10.15585/MMWR.MM6732A3.

53. Freedman, V.A.; Spillman, B.C.; Andreski, P.M.; Cornman, J.C.; Crimmins, E.M.; Kramarow, E.; Lubitz, J.; Martin, L.G.; Merkin, S.S.; Schoeni, R.F.; et al. Trends in Late-Life Activity Limitations in the United States: An Update from Five National Surveys. *Demography* **2013**, *50*, 667–671, doi:doi:10.1007/s13524-012-0167-z.

54. Dong, L.; Freedman, V.A.; Sánchez, B.N.; Mendes De Leon, C.F. Racial and ethnic differences in disability transitions among older adults in the United States. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2019**, *74*, 406–411, doi:10.1093/gerona/gly052.

55. Census - Table Results Available online: https://data.census.gov/cedsci/table?q=disability Hispanics&tid=DECENNIALSF32000.PCT067H (accessed on Mar 20, 2022).

56. Angel, R.J.; Angel, J.L.; Hill, T.D. Longer lives, sicker lives? Increased longevity and extended disability among Mexican-origin elders. *Journals Gerontol. - Ser. B Psychol. Sci. Soc. Sci.* **2015**, *70*, 639–649, doi:10.1093/geronb/gbu158.

57. Verbrugge, L.M. *Disability Experience and Measurement*; 2016; Vol. 28; ISBN 0898264316.

58. Reuben, D.B. What's Wrong With ADLs? *J. Am. Geriatr. Soc.* **1995**, *43*, 936–937.

59. Palmer, M.; Harley, D. Models and measurement in disability: An international review. *Health Policy Plan.* **2012**, *27*, 357–364, doi:10.1093/heapol/czr047.

60. Meddings, J.; Reichert, H.; Smith, S.N.; Iwashyna, T.J.; Langa, K.M.; Hofer, T.P.; McMahon, L.F. The Impact of Disability and Social Determinants of Health on Condition-Specific Readmissions beyond Medicare Risk Adjustments: A Cohort Study. *J. Gen. Intern. Med.* **2017**, *32*, 71–80, doi:10.1007/s11606-016-3869-x.

61. Boyd, C.M.; Ricks, M.; Fried, L.P.; Guralnik, J.M.; Xue, Q.L.; Xia, J.; Bandeen-Roche, K. Functional decline and recovery of activities of daily living in hospitalized, disabled older women: The women's health and aging study. *J. Am. Geriatr. Soc.* **2009**, *57*, 1757–1766, doi:10.1111/j.1532-5415.2009.02455.x.

62. Fried, T.R.; Bradley, E.H.; Williams, C.S.; Tinetti, M.E. Functional disability and health care expenditures for older persons. *Arch. Intern. Med.* **2001**, *161*, 2602–2607, doi:10.1001/archinte.161.21.2602.

63. Altman, B.M. Definitions, concepts, and measures of disability. *Ann. Epidemiol.* **2014**, *24*, 2–7, doi:10.1016/j.annepidem.2013.05.018.

64. NHE Fact Sheet | CMS Available online: https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NHE-Fact-Sheet (accessed on Mar 13, 2022).

65. National Inpatient Hospital Costs: The Most Expensive Conditions by Payer, 2017 #261 Available online: https://www.hcup-us.ahrq.gov/reports/statbriefs/sb261-Most-Expensive-Hospital-Conditions-2017.jsp (accessed on Mar 13, 2022).

66. STATISTICAL BRIEF #533: Concentration of Healthcare Expenditures and Selected Characteristics of High Spenders, U.S. Civilian Noninstitutionalized Population, 2018 Available online: https://meps.ahrq.gov/data_files/publications/st533/stat533.shtml (accessed on Mar 13, 2022).

67. Rönneikkö, J.K.; Mäkelä, M.; Jämsen, E.R.; Huhtala, H.; Finne-Soveri, H.; Noro, A.; Valvanne, J.N. Predictors for Unplanned Hospitalization of New Home Care Clients. *J. Am. Geriatr. Soc.* **2017**, *65*, 407–414, doi:10.1111/jgs.14486.

68. Morris, J.N.; Howard, E.P.; Steel, K.; Schreiber, R.; Fries, B.E.; Lipsitz, L.A.; Goldman, B. Predicting risk of hospital and emergency department use for home care elderly persons through a secondary analysis of cross-national data. *BMC Health Serv. Res.* **2014**, *14*, 1–11, doi:10.1186/s12913-014-0519-z.

69. Inacio, M.C.; Jorissen, R.N.; Khadka, J.; Whitehead, C.; Maddison, J.; Bourke, A.; Pham, C.T.; Karnon, J.; Wesselingh, S.L.; Lynch, E.; et al. Predictors of short-term hospitalization and emergency department presentations in aged care. *J. Am. Geriatr. Soc.* **2021**, *69*, 3142–3156, doi:10.1111/jgs.17317.

70. Gabayan, G.Z.; Sarkisian, C.A.; Liang, L.J.; Sun, B.C. Predictors of admission after emergency department discharge in older adults. *J. Am. Geriatr. Soc.* **2015**, *63*, 39–45, doi:10.1111/jgs.13185.

71. Aliyu, M.H.; Adediran, A.S.; Washington, M. Predictors of hospital admissions in the elderly: analysis of data from the longitudinal study on aging. *J. Natl. Med. Assoc.* **2003**, *95*, 1158–1167.

72. Andersen, R.M. Revisiting the Behavioral Model and Access to Medical Care : Does it Matter ? *J. Health Soc. Behav.* **1995**, *36*, 1–10.

73. Travers, J.L.; Hirschman, K.B.; Naylor, M.D. Adapting Andersen's expanded behavioral model of health services use to include older adults receiving long-term services and supports. *BMC Geriatr.* **2020**, *20*, 1–16, doi:10.1186/s12877-019-1405-7.

74. Bradley, E.H.; McGraw, S.A.; Curry, L.; Buckser, A.; King, K.L.; Kasl, S. V.; Andersen, R. Expanding the Andersen model: The role of psychosocial factors in long-term care use. *Health Serv. Res.* **2002**, *37*, 1221–1242, doi:10.1111/1475-6773.01053.

75. Overview of Clinical Conditions With Frequent and Costly Hospital Readmissions by Payer, 2018 #278 Available online: https://www.hcup-us.ahrq.gov/reports/statbriefs/sb278-Conditions-Frequent-Readmissions-By-Payer-2018.jsp (accessed on Mar 13, 2022).

76. Community-based Care Transitions Program | CMS Innovation Center Available online: https://innovation.cms.gov/innovation-models/cctp (accessed on Mar 13, 2022).

77. Measure Details Available online: https://cmit.cms.gov/CMIT_public/ViewMeasure?MeasureId=2701 (accessed on Mar 19, 2022).

78. Basu, J.; Hanchate, A.; Bierman, A. Racial/ethnic disparities in readmissions in US hospitals: The role of insurance coverage. *Inq. J. Heal. Care* **2018**, *55*, doi:10.1177/0046958018774180.

79. Reducing Unnecessary Hospital Readmissions: The Role of the Patient Safety Organization | PSO Available online: https://pso.ahrq.gov/resources/readmission (accessed on Mar 13, 2022).

80. Feigenbaum, P.; Neuwirth, E.; Trowbridge, L.; Teplitsky, S.; Barnes, C.A.; Fireman, E.; Dorman, J.; Bellows, J. Factors contributing to all-cause 30-day readmissions: A structured case series across 18 hospitals. *Med. Care* **2012**, *50*, 599–605, doi:10.1097/MLR.0b013e318249ce72.

81. Khavjou, O.A.; Anderson, W.L.; Honeycutt, A.A.; Bates, L.G.; Razzaghi, H.; Hollis, N.D.; Grosse, S.D. National Heath Care Expenditure Associated With Disability. *Med. Care* **2020**, *58*, 826–832, doi:10.1097/MLR.0000000000001371.

82. Hoffman, J.M.; Ciol, M.A.; Huynh, M.; Chan, L. Estimating transition probabilities in mobility and total costs for medicare beneficiaries. *Arch. Phys. Med. Rehabil.* **2010**, *91*, 1849–1855, doi:10.1016/j.apmr.2010.08.010.

83. Gill, T.M.; Allore, H.G.; Gahbauer, E.A.; Murphy, T.E. Change in disability after hospitalization or restricted activity in older persons. *JAMA - J. Am. Med. Assoc.*

2010, *304*, 1919–1928, doi:10.1001/jama.2010.1568.

84. Volpato, S.; Cavalieri, M.; Sioulis, F.; Guerra, G.; Maraldi, C.; Zuliani, G.; Fellin, R.; Guralnik, J.M. Predictive value of the Short Physical Performance Battery following hospitalization in older patients. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2011**, *66 A*, 89–96, doi:10.1093/gerona/glq167.

85. Dharmarajan, K.; Han, L.; Gahbauer, E.A.; Leo-Summers, L.S.; Gill, T.M. Disability and Recovery After Hospitalization for Medical Illness Among Community-Living Older Persons: A Prospective Cohort Study. *J. Am. Geriatr. Soc.* **2020**, *68*, 486–495, doi:10.1111/jgs.16350.

86. Greysen, S.R.; Cenzer, I.S.; Boscardin, W.J.; Covinsky, K.E. Functional Impairment: an unmeasured marker of post-acute Medicare costs in seniors. *J Am Geriatr Soc* **2017**, *65*, 1996–2002, doi:10.1111/jgs.14955.

87. Barnes, D.E.; Mehta, K.M.; Boscardin, W.J.; Fortinsky, R.H.; Palmer, R.M.; Kirby, K.A.; Seth, C. Prediction of Recovery , Dependence or Death in Elders Who Become Disabled During Hospitalization. *J Gen Intern Med* **2012**, *28*, 261–268, doi:10.1007/s11606-012-2226-y.

88. Hardy, S.E.; Gill, T.M. Recovery from Disability among Community-Dwelling Older Persons. *J. Am. Med. Assoc.* **2004**, *291*, 1596–1602, doi:10.1001/jama.291.13.1596.

89. Lafrenière, S.; Folch, N.; Dubois, S.; Bédard, L.; Ducharme, F. Strategies Used by Older Patients to Prevent Functional Decline During Hospitalization. *Clin. Nurs. Res.* **2017**, *26*, 6–26, doi:10.1177/1054773815601392.

90. Ferrante, L.E.; Pisani, M.A.; Murphy, T.E.; Gahbauer, E.A.; Leo-Summers, L.S.; Gill, T.M. Factors associated with functional recovery among older intensive care unit survivors. *Am. J. Respir. Crit. Care Med.* **2016**, *194*, 299–307, doi:10.1164/rccm.201506-1256OC.

91. Sterling, M.R.; Ringel, J.B.; Pinheiro, L.C.; Safford, M.M.; Levitan, E.B.; Phillips, E.; Brown, T.M.; Goyal, P. Social determinants of health and 90-day mortality after hospitalization for heart failure in the regards study. *J. Am. Heart Assoc.* **2020**, *9*, doi:10.1161/JAHA.119.014836.

92. Barbic, S.P.; Bartlett, S.J.; Mayo, N.E. Emotional vitality: Concept of importance for rehabilitation. *Arch. Phys. Med. Rehabil.* **2013**, *94*, 1547–1554, doi:10.1016/j.apmr.2012.11.045.

93. Hill-Briggs, F.; Adler, N.E.; Berkowitz, S.A.; Chin, M.H.; Gary-Webb, T.L.; Navas-Acien, A.; Thornton, P.L.; Haire-Joshu, D. Social determinants of health and diabetes: A scientific review. *Diabetes Care* **2021**, *44*, 258–279, doi:10.2337/dci20-0053.

94. Healthy People 2020 Progress Table Available online: https://www.cdc.gov/nchs/healthy_people/hp2020/progress-tables.htm (accessed on Mar 19, 2022).

95. Carl V. Hill, P.; Pérez-Stable, E.J.; Anderson, N.B.; Bernard, M.A. The National

Institute on Aging Health Disparities Research Framework. *Ethn. Dis.* **2015**, *25*, 2015.

96. NIMHD Research Framework Details Available online: https://www.nimhd.nih.gov/about/overview/research-framework/nimhd-framework.html (accessed on Mar 19, 2022).

97. Education levels of recent Latino immigrants in the U.S. reach new highs | Pew Research Center Available online: https://www.pewresearch.org/fact-tank/2020/04/07/education-levels-of-recent-latino-immigrants-in-the-u-s-reached-new-highs-as-of-2018/ (accessed on Mar 19, 2022).

98. Gonzalez-Barrera, A.; Lopez, M.H. Statistical Profile A Demographic Portrait of Mexican-Origin Hispanics in the United States Available online: www.pewhispanic.org (accessed on Jun 22, 2022).

99. Acevedo-Garcia, D.; Osypuk, T.L.; McArdle, N.; Williams, D.R. Toward a policy-relevant analysis of geographic and racial/ethnic disparities in child health. *Health Aff.* **2008**, *27*, 321–333, doi:10.1377/hlthaff.27.2.321.

100. Vega, W.A.; Rodriguez, M.A.; Gruskin, E. Health disparities in the latino population. *Epidemiol. Rev.* **2009**, *31*, 99–112, doi:10.1093/epirev/mxp008.

101. Zhao, H.; Han, L.; Chang, D.; Ye, Y.; Shen, J.; Daniel, C.R.; Gu, J.; Chow, W.H.; Wu, X. Social-demographics, health behaviors, and telomere length in the Mexican American Mano a Mano Cohort. *Oncotarget* **2017**, *8*, 96553–96567, doi:10.18632/oncotarget.19903.

102. Garcia, M.A.; Downer, B.; Crowe, M.; Markides, K.S. Aging and Disability among Hispanics in the United States: Current Knowledge and Future Directions. *Innov. Aging* **2017**, *1*, 1–11, doi:10.1093/geroni/igx020.

103. Tibiriçá, L.; Jester, D.J.; Jeste, D. V. A systematic review of loneliness and social isolation among Hispanic/Latinx older adults in the United States. *Psychiatry Res.* **2022**, *313*, doi:10.1016/j.psychres.2022.114568.

104. Hill, T.D.; Angel, J.L.; Ellison, C.G.; Angel, R.J. Religious attendance and mortality: an 8-year follow-up of older Mexican Americans. *J. Gerontol. B. Psychol. Sci. Soc. Sci.* **2005**, *60*, 102–109, doi:10.1093/geronb/60.2.s102.

105. Mendoza-Núñez, V.M.; González-Mantilla, F.; Correa-Muñoz, E.; Retana-Ugalde, R. Relationship between social support networks and physical functioning in older community-dwelling Mexicans. *Int. J. Environ. Res. Public Health* **2017**, *14*, 1–9, doi:10.3390/ijerph14090993.

106. Boltz, M.; Resnick, B.; Chippendale, T.; Galvin, J. Testing a Family-centered Intervention to Promote Functional and Cognitive Recovery in Hospitalized Older Adults. *J Am Geriatr Soc.* **2014**, *62*, 2398–2407, doi:doi:10.1111/jgs.13139.

107. Huntley, J.; Ostfeld, A.M.; Taylor, J.O.; Wallace, R.B.; Blazer, D.; Berkman, L.F.; Evans, D.A.; Kohout, J.; Lemke, J.H.; Scherr, P.A.; et al. Established populations for epidemiologic studies of the elderly: Study design and methodology. *Aging Clin. Exp. Res.* **1993**, *5*, 27–37, doi:10.1007/BF03324123.

108. Markides, K.S.; N-W, C.; Angel, R.; Palmer, R. *Hispanic Established Populations for the Epidemiologic Study of the Elderly (HEPESE) Wave 8, 2012-2013 [Arizona, California, Colorado, New Mexico, and Texas]*; 2016;

109. Krieger, N. Overcoming the absence of socioeconomic data in medical records: Validation and application of a census-based methodology. *Am. J. Public Health* **1992**, *82*, 703–710, doi:10.2105/AJPH.82.5.703.

110. Prunet, B.; Asencio, Y.; Lacroix, G.; Bordes, J.; Montcriol, A.; D'Aranda, E.; Pradier, J.P.; Dantzer, E.; Meaudre, E.; Goutorbe, P.; et al. Maintenance of normothermia during burn surgery with an intravascular temperature control system: A non-randomised controlled trial. *Injury* **2012**, *43*, 648–652.

111. Patel, K. V.; Eschbach, K.; Rudkin, L.L.; Peek, M.K.; Markides, K.S. Neighborhood context and self-rated health in older Mexican Americans. *Ann. Epidemiol.* **2003**, *13*, 620–628, doi:10.1016/S1047-2797(03)00060-7.

112. Research, Statistics, Data & Systems | CMS Available online: https://www.cms.gov/Research-Statistics-Data-and-Systems/Research-Statistics-Data-and-Systems (accessed on Sep 23, 2021).

113. Master Beneficiary Summary File (MBSF): Cost and Utilization Segment | ResDAC Available online: https://resdac.org/cms-data/files/mbsf-cost-and-utilization (accessed on Jul 12, 2022).

114. MedPAR | ResDAC Available online: https://resdac.org/cms-data/files/medpar (accessed on Jul 12, 2022).

115. Outpatient (Fee-for-Service) | ResDAC Available online: https://resdac.org/cms-data/files/op-ffs (accessed on Jul 12, 2022).

116. Carrier (Fee-for-Service) | ResDAC Available online: https://resdac.org/cms-data/files/carrier-ffs (accessed on Jul 12, 2022).

117. Data Documentation | ResDAC Available online: https://resdac.org/cms-data/files/carrier-ffs/data-documentation (accessed on Jul 12, 2022).

118. U.S. Census Bureau American Community Survey and Puerto Rico Community Survey 2020 Subject Definitions Available online: https://www2.census.gov/programs-surveys/acs/tech_docs/subject_definitions/2015_ACSSubjectDefinitions.pdf (accessed on Jul 12, 2022).

119. Radloff, L.S. The CES-D Scale: a self reported depression scale for research in the general population. *Appl. Psychol. Meas.* **1977**, *1*, 385–401, doi:10.1177/014662167700100306.

120. Folstein, Marshal F., Folstein, Susan E., and McHugh, P.R. Mini-Mental State: A practical method for grading the cognitive state of patients for the clinician 1975, 189–198.

121. Pavasini, R.; Guralnik, J.; Brown, J.C.; di Bari, M.; Cesari, M.; Landi, F.; Vaes, B.; Legrand, D.; Verghese, J.; Wang, C.; et al. Short Physical Performance Battery and all-cause mortality: Systematic review and meta-analysis. *BMC Med.* **2016**,

14, 1–9, doi:10.1186/s12916-016-0763-7.

122. Branch, L.G.; Katz, S.; Kniepmann, K.; Papsidero, J.A. A prospective study of functional status among community elders. *Am. J. Public Health* **1984**, *74*, 266–268, doi:10.2105/AJPH.74.3.266.

123. Aranda, M.P.; Ray, L.A.; Snih, S. Al; Ottenbacher, K.J.; Markides, K.S. The protective effect of neighborhood composition on increasing frailty among older Mexican Americans: A barrio advantage? *J Aging Heal.* **2011**, *23*, 1189–1217, doi:10.1177/0898264311421961.

124. Cerrito, P.B. *SP10: From GLM to GLIMMIX-Which Model to Choose ?*; Cary, NC;

125. Sui, Y. A COMPARISON OF SOME METHODS TO ANALYZE REPEATED. **2001**.

126. Smith, T. PROC GENMOD with GEE to Analyze Correlated Outcomes Data Using SAS. 1–14.

127. Zaslavsky, O.; Zisberg, A.; Shadmi, E. Impact of functional change before and during hospitalization on functional recovery 1 month following hospitalization. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2015**, *70*, 381–386, doi:10.1093/gerona/glu168.

128. Freedman, V.A.; Wolf, D.A.; Spillman, B.C. Disability-free life expectancy over 30 years: A growing female disadvantage in the US population. *Am. J. Public Health* **2016**, *106*, 1079–1085, doi:10.2105/AJPH.2016.303089.

129. Fabius, C.D.; Parker, L.J.; Thorpe, R.J. The Influence of Race and Gender on Receiving Assistance With Daily Activities Among Older Americans. *Innov. Aging* **2022**, *6*, 1–10, doi:10.1093/geroni/igab060.

130. Rutherford, M.; Downer, B.; Li, C.-Y.; Chou, L.-N.; Al Snih Id, S. Body mass index and physical frailty among older Mexican Americans: Findings from an 18-year follow up. *PLoS One* **2022**, *17*, e0274290, doi:10.1371/journal.pone.0274290.

131. Babiarczyk B; Turbiarz A Body Mass Index in elderly people - do the reference ranges matter? *Prog Heal. Sci* **2012**, *2*.

132. Chester, J.G.; Grande, L.J.; Milberg, W.P.; McGlinchey, R.E.; Lipsitz, L.A.; Rudolph, J.L. Performance on the Clock-in-the-Box in elders: normative performance, comparison to cognitive tests, and relationship to functional performance. *Am J Med* **2011**, *124*, 662–669, doi:doi:10.1016/j.amjmed.2011.02.023.

133. Handing, E.P.; Chen, H.; Rejeski, W.J.; Rosso, A.L.; Balachandran, A.T.; King, A.C.; Kritchevsky, S.B. Cognitive Function as a Predictor of Major Mobility Disability in Older Adults: Results From the LIFE Study. *Innov. aging* **2019**, *3*, igz010, doi:10.1093/geroni/igz010.

134. Buchman, A.S.; Boyle, P.A.; Leurgans, S.E.; Barnes, L.L.; Bennett, D.A. Cognitive function is associated with the development of mobility impairments in community-dwelling elders. *Am. J. Geriatr. Psychiatry* **2011**, *19*, 571–580,

doi:10.1097/JGP.0b013e3181ef7a2e.

135. Downer, B.; Milani, S.; Wong, R. The sequence of physical and cognitive impairment and the association with mortality among unimpaired older mexican adults. *Journals Gerontol. - Ser. A Biol. Sci. Med. Sci.* **2020**, *75*, 1386–1392, doi:10.1093/gerona/glz238.

136. Markides, K.S.; Stroup-Benham, C.A.; Goodwin, J.S.; Perkowski, L.C.; Lichtenstein, M.; Ray, L.A. The effect of medical conditions on the functional limitations of Mexican-American elderly. *Ann. Epidemiol.* **1996**, *6*, 386–391, doi:10.1016/S1047-2797(96)00061-0.

137. Vásquez, E.; Zhang, W.; Dreby, J.; Lee, S.; Botoseneanu, A. Nativity, family, disability: Results from the hispanic established populations for the epidemiologic study of the elderly. *Ethn. Dis.* **2021**, *31*, 253–262, doi:10.18865/ED.31.2.253.

138. Downer, B.; Snih, S. Al; Raji, M.; Chou, L.N.; Kuo, Y.F.; Markides, K.S.; Ottenbacher, K.J. Healthcare utilization of Mexican-American Medicare beneficiaries with and without Alzheimer's disease and related dementias. *PLoS One* **2020**, *15*, 1–16, doi:10.1371/journal.pone.0227681.

139. Allen, J.; Avendano, M.; Berkman, L.F.; Davison, K.; Emmons, K.; Glass, T.A.; Glymour, M.M.; Kawachi, I.; Kress, A.M.; Krieger, N.; et al. Social Network Epidemiology. In *Social Epidemiology*; Berkman, L.F., Kawachi, I., Glymour, M.M., Eds.; Oxford University Press: New York, NY, 2014; pp. 234–289.

140. Tavares, J.P. de A.; Nunes, L.A.N.V.; Grácio, J.C.G. Hospitalized older adult: Predictors of functional decline. *Rev. Lat. Am. Enfermagem* **2021**, *29*, 1–10, doi:10.1590/1518-8345.3612.3399.

141. Sinvani, L.; Kozikowski, A.; Patel, V.; Mulvany, C.; Smilios, C.; Qiu, G.; Zhang, M.; Wolf-Klein, G.; Pekmezaris, R. Measuring functional status in hospitalized older adults through electronic health record documentation. *South. Med. J.* **2018**, *111*, 220–225, doi:10.14423/SMJ.0000000000000788.

142. Li, X.; Zheng, T.; Guan, Y.; Li, H.; Zhu, K.; Shen, L.; Yin, Z. ADL recovery trajectory after discharge and its predictors among baseline-independent older inpatients. *BMC Geriatr.* **2020**, *20*, 1–10, doi:10.1186/s12877-020-1481-8.

143. Gill, T.M.; Zang, E.X.; Murphy, T.E.; Leo-Summers, L.; Gahbauer, E.A.; Festa, N.; Falvey, J.R.; Han, L. Association Between Neighborhood Disadvantage and Functional Well-being in Community-Living Older Persons. *JAMA Intern. Med.* **2021**, *06519*, doi:10.1001/jamainternmed.2021.4260.

144. Menezes, K.V.R.S.; Auger, C.; Barbosa, J.F.S.; Gomes, C.S.; Menezes, W.R.S.; Guerra, R.O. Trajectories and Predictors of Functional Capacity Decline in Older Adults from a Brazilian Northeastern Hospital. *J. Geriatr. Phys. Ther.* **2021**, *44*, 82–87, doi:10.1519/JPT.0000000000000255.

145. Gill, T.M.; Han, L.; Gahbauer, E.A.; Leo-Summers, L.; Murphy, T.E.; Ferrante, L.E. Functional Effects of Intervening Illnesses and Injuries After Critical Illness in Older Persons. *Crit. Care Med.* **2021**, *49*, 956–966, doi:10.1097/CCM.0000000000004829.

146. Komeily, A.; Srinivasan, R.S. What is Neighborhood Context and Why does it Matter in Sustainability Assessment? *Procedia Eng.* **2016**, *145*, 876–883, doi:10.1016/j.proeng.2016.04.114.

147. Yen, I.H.; Michael, Y.L.; Perdue, L. Neighborhood Environment in Studies of Health of Older Adults. A Systematic Review. *Am. J. Prev. Med.* **2009**, *37*, 455–463, doi:10.1016/j.amepre.2009.06.022.

148. York Cornwell, E.; Cagney, K.A. Assessment of neighborhood context in a nationally representative study. *Journals Gerontol. - Ser. B Psychol. Sci. Soc. Sci.* **2014**, *69*, S51–S63, doi:10.1093/geronb/gbu052.

149. Jurivich, D.; Schimke, C.; Snustad, D.; Floura, M.; Morton, C.; Waind, M.; Holloway, J.; Janssen, S.; Danks, M.; Semmens, K.; et al. A new interprofessional community-service learning program, HATS (Health ambassador teams for seniors) to improve older adults attitudes about telehealth and functionality. *Int. J. Environ. Res. Public Health* **2021**, *18*, doi:10.3390/ijerph181910082.

150. Downer, B.; Al Snih, S.; Chou, L.N.; Kuo, Y.F.; Markides, K.S.; Ottenbacher, K.J. Differences in hospitalizations, emergency room admissions, and outpatient visits among Mexican-American Medicare beneficiaries. *BMC Geriatr.* **2019**, *19*, 1–11, doi:10.1186/s12877-019-1160-9.

151. Phung, L.H.; Barnes, D.E.; Volow, A.M.; Li, B.H.; Shirsat, N.R.; Sudore, R.L. English and Spanish-speaking vulnerable older adults report many barriers to advance care planning. *J. Am. Geriatr. Soc.* **2021**, *69*, 2110–2121, doi:10.1111/jgs.17230.

152. Gill, T.M.; Allore, H.G.; Holford, T.R.; Guo, Z. Hospitalization, restricted activity, and the development of disability among older persons. *J. Am. Med. Assoc.* **2004**, *292*, 2115–2124, doi:10.1001/jama.292.17.2115.

153. Pritchard, C.; Ness, A.; Symonds, N.; Siarkowski, M.; Broadfoot, M.; McBrien, K.A.; Lang, E.; Holroyd-Leduc, J.; Ronksley, P.E. Effectiveness of hospital avoidance interventions among elderly patients: A systematic review. *Can. J. Emerg. Med.* **2020**, *22*, 504–513, doi:10.1017/cem.2020.4.

Vita

Amy Hurtado Givan was born on March 03, 1995, to Oscar Alvarado Hurtado and Irene Rivas Hurtado in Brownwood, Texas. Amy completed her Bachelor of Science in Kinesiology with a Minor in Health Professions from Texas Tech University in Lubbock, Texas in May 2017. During her undergraduate studies, she researched the role of irisin on physical fitness among males and females, and the effect of supplementation on subjective measures of exertion and fatigue after isokinetic exercises. Mrs. Givan then completed her Master of Science in Kinesiology with a Specialization in Exercise Physiology from Southern Illinois University Edwardsville in Edwardsville, Illinois in May 2019. During her master's, she researched changes in abdominal adipose tissue before and after strength training using magnetic resonance imaging. To advance her research skills and become knowledgeable in the health of vulnerable populations, she joined the Rehabilitation Sciences doctoral program in August 2019 at the University of Texas Medical Branch in Galveston, Texas. During her doctoral studies, she has studied physical function over time among older Mexican Americans. Mrs. Givan is graduating with her PhD in Rehabilitation Sciences in the fall of 2022.

Permanent address: 1917 Meadow Drive
Crowley, Texas 76036

This dissertation was typed by Amy Givan.