Preventive Medicine 114 (2018) 180–187

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Food insecurity, comorbidity, and mobility limitations among older U.S. adults: Findings from the Health and Retirement Study and Health Care and Nutrition Study

Nicholas J. Bishop[a,*], Kaipeng Wang[b]

[a] School of Family and Consumer Sciences, College of Applied Arts, Texas State University, 601 University Drive, San Marcos, TX 78666, USA
[b] School of Social Work, College of Applied Arts, Texas State University, 601 University Drive, San Marcos, TX 78666, USA

ARTICLE INFO

Keywords:
Food insecurity
Comorbidity
Mobility limitation

ABSTRACT

Both food insecurity and comorbidity have been identified as precursors to functional limitation in older adults, yet whether food insecurity modifies the progression from chronic disease to disability has not been assessed. We examined 5986 respondents age 50 and older drawn from the 2012–2014 Health and Retirement Study (HRS) and 2013 Health Care and Nutrition Study (HCNS). Mobility limitations reported in 2014 and change in mobility limitations from 2012 to 2014 were regressed on measures of food insecurity, number of chronic conditions, and their interaction terms using Poisson regression. Around 17.3% of the sample was identified as food insecure. In 2012, respondents reported an average of 1.9 (SD = 1.5) chronic conditions and 2.4 mobility limitations (SD = 3.0). In 2014, individuals reported an average of 2.5 (SD = 3.1) mobility limitations. Food insecurity was associated with a greater number of mobility limitations (IRR = 1.20, 95% CI: 1.11–1.29, $p < .001$) and more rapid increase in mobility limitations over the two-year observational period (IRR = 1.06, 95% CI: 1.00–1.11, $p = .047$). Food security status also modified the association between comorbidity and both mobility limitation outcomes, with the food secure exhibiting a stronger positive association between chronic conditions and mobility limitations than the food insecure. The food insecure tended to have more mobility limitations than the food secure when few chronic conditions were reported. Our results suggest that food insecurity is associated with prevalence and change in mobility limitations among older adults.

1. Introduction

Identifying potentially modifiable risk factors in the progression from chronic disease to disability can reduce the personal and societal costs related to population aging. Chronic diseases, typified by long durations and generally slow progression, are disproportionately prevalent among older adults, with 80% having at least one chronic disease and 77% having multiple chronic diseases (Lochner and Cox, 2013). Multiple chronic conditions, described as comorbidity or multimorbidity, adds complexity to the course of treatment and increases likelihood of functional dependency (Wolff et al., 2005). Currently around 18% of adults age 45–64 and around 27% of adults age 65 or older report a disability related to physical mobility (Courtney-Long et al., 2015), with both increasing age and chronic disease being identified as common risk factors (Brown and Flood, 2013). The disablement process is a useful theoretical framework describing the progression from chronic disease to disability. The process begins when disease pathology manifests into diagnosable chronic disease, in turn producing functional limitations that can develop into restrictions in capacity to carry out essential activities (Verbrugge and Jette, 1994).

As social and environmental factors are hypothesized to modify the disablement process (Verbrugge and Jette, 1994), food insecurity may represent a risk factor that influences the progression from chronic disease to functional limitation. Food insecurity refers to "limited or uncertain availability of nutritionally adequate and safe food or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (Anderson, 1990). A total of 17.3% of adults aged 40 and older are food insecure in the U.S., higher than the overall rate of 12.7% (Coleman-Jensen et al., 2017; Strickhouser et al., 2015). Research suggests a robust association between food insecurity and indicators of limitation and disablement including limitations in activities of daily living (ADL) and instrumental activities of daily living (IADLs) (Lee and Frongillo, 2001), disability as measured by self-reported ability to do daily activities (Brewer et al., 2010), as well as both pre-frailty and

* Corresponding author.
E-mail address: n_b110@txstate.edu (N.J. Bishop).

https://doi.org/10.1016/j.ypmed.2018.07.001
Received 5 January 2018; Received in revised form 29 June 2018; Accepted 2 July 2018
Available online 09 July 2018

frailty (Pérez-Zepeda et al., 2016; Smit et al., 2013). Food insecurity has also been linked to multiple chronic conditions among older adults, including but not limited to lung disease, cardiovascular diseases, diabetes, and hypertension (Ahn et al., 2014; Redmond et al., 2016; Seligman et al., 2010; Vaccaro and Huffman, 2017; Venci and Lee, 2018; Vozoris and Tarasuk, 2003).

Existing research supports that food insecurity increases the risk of functional limitation and disability, but whether food insecurity acts as a risk factor that modifies the progression from comorbidity to functional limitation as described by the disablement process remains unexamined. First, food insecurity likely has a direct impact on the ability to physically function due to inadequate dietary content of macronutrients such as protein associated with muscle mass and function (Bartali et al., 2012; Beasley et al., 2010; Gregorio et al., 2014; Houston et al., 2008; Inzitari et al., 2011). In addition, we hypothesize that food insecurity may modify the disablement process by moderating the association between comorbid chronic conditions and functional limitations. Food insecurity has been associated with increased levels of biomarkers indicating inflammation and immune system activation (Gowda et al., 2012), with inflammation being a risk factor for both morbidity (Franceschi and Campisi, 2014) and mobility limitations (Penninx et al., 2004) among older adults. Thus, food insecurity may increase the risk of experiencing mobility limitations directly, as well as play a role in the progression from chronic disease to functional limitation. To our knowledge, food insecurity has yet to be explored as a risk factor related to the disablement process.

2. Methods

2.1. Data and participants

Observations were drawn from the Health and Retirement Study (HRS), a biennial national panel survey of older Americans funded by the U.S. National Institute on Aging and U.S. Social Security Administration (grant number: NIA U01AG009740) (Hauser and Weir, 2010). The 2013 Health Care and Nutrition Study (HCNS), an off-year mail-out HRS supplement, collected information about food environment and food consumption. The University of Michigan's Institutional Review Board approved the HRS protocol. Participants were read a confidentiality statement and provided oral or implied consent when first contacted and were provided a written informed consent form at each interview (University of Michigan Institute for Social Research, 2017). The response rates for the 2012 HRS and 2013 HCNS were 89.1% and 65%, respectively.

The HCNS dataset contains 8073 observations. Participants that reported being under the age of 50 when completing the 2012 HRS (n = 431), had missing or zero population weighting values in the 2013 HCNS (n = 218), or did not respond to all items used to create the measures of food security status (n = 465), mobility limitations measured in 2012 (n = 592), or sum of chronic condition (n = 381) were excluded from analyses, resulting in an analytic sample size of 5986. The RAND HRS data file (Version P) (RAND, 2015), produced by the RAND Center for the Study of Aging with funding from the U.S. National Institute on Aging and the U.S. Social Security Administration, provided all measures of mobility limitation and participant characteristics excluding immediate word recall scores, which were drawn from the core HRS files. All measures were collected through participant self-report. Proxy response was allowed when the respondent was unable to complete the interview.

2.2. Food insecurity

Food security was assessed using the six-item short form of the U.S. Household Food Security Survey Module (U.S. Department of Agriculture, 2012). Respondents were asked to consider the food eaten in the home 12 months prior to interview and whether they could afford necessary food items. Respondents were asked if the following two questions were often, sometimes, or never true: “The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more” (1 = often true or sometimes true, 0 = never true) and “(I/we) couldn't afford to eat balanced meals” (1 = often true or sometimes true, 0 = never true). Questions were then asked if anyone in the household ever cut meal size or skipped meals because there wasn't enough money for food (1 = yes, 0 = no). If respondents said yes, they were then asked about frequency of skipping meals (1 = almost every month or some months but not every month, 0 = yes, only 1 or 2 months or no). Finally, respondents were asked if they ever ate less than they felt they should because there wasn't enough money for food (1 = yes, 0 = no) and were they ever hungry but didn't eat because there wasn't enough money for food (1 = yes, 0 = no). Responses to the items were summed then dichotomized to reflect food security (raw score 0–1) versus food insecurity (raw score 2–6; 1 = food insecure, 0 = food secure). Missing responses to any of the food security items resulted in a missing food security score.

2.3. Mobility limitations

Mobility limitations were operationalized as a count of 11 indicators of limitation in physical mobility (Nagi, 1969; Rosow and Breslau, 1966). Respondents were asked whether they had difficulty in each of the following activities: stooping or crouching, climbing one flight of stairs without resting, climbing several flights of stairs without resting, moving large objects, sitting in a chair for two hours, getting up from a chair after sitting for long periods, lifting weights > 10 pounds, raising arms above shoulder level, walking one block, walking several blocks, and picking up a dime from a table (1 = yes; 0 = no). The original HRS measures contained skip patterns such that respondents with severe limitations in simple functions were not asked questions about related and more complex physical functions. The RAND HRS version of these measures recoded missing values resulting from the skip pattern to indicate difficulty with the item. Respondents with missing information on any of the 11 items were coded as missing.

Mobility limitations represent one possible operationalization of physical functioning in older adulthood, with other popular measures including ADLs and IADLs. Mobility limitations represent an indicator of underlying physical capacity that are less dependent on built environment, social roles, and assistive technology than ADLs and IADLs (Haas, 2008; Martin et al., 2009). Also, mobility limitations are less severe physical limitations than ADLs and IADLs and represent early physical limitations that may develop into more severe disability.

2.4. Chronic conditions

Chronic conditions were measured as the sum of responses to 8 items asking whether the respondent had ever been told by a doctor that they have any of the following diseases: high blood pressure, cancer, diabetes, lung disease, heart problems, stroke, psychiatric problems, or arthritis (1 = yes, 0 = no). Respondents with missing information on any of the 8 items were coded as missing.

2.5. Covariates

Several measures collected during the 2012 interview were included as covariates in models predicting mobility limitations. Analyses controlled for respondents' gender (1 = female, 0 = male), age, race/ethnicity (White (reference), Black, Hispanic, Other), and marital status (1 = partnered or married, 0 = single, divorced, or widowed). Education (< 12 years of education, 12 years of education (reference), > 12 years of education), longest occupational tenure (white-collar (reference), blue-collar, female homemaker, other occupational tenure), retirement status (1 = retired, 0 = not retired), and household income and asset quartiles accounted for potential associations between