Report on Stress Measurement in the Health and Retirement Study: Evaluation and Recommendations for Improvement

To: Health and Retirement Study Data Monitoring Committee
From: Alexandra Crosswell, Madhuvanthi Suresh, Eli Puterman, Tara Gruenewald, Jinkook Lee, & Elissa Epel (members of the NIA Stress Measurement Network[1])
Re: Stress Measures in the Health and Retirement Study
Date: May 13, 2016

Purpose: The purpose of this report is to provide an assessment of the stress measures in the Health and Retirement Study (HRS), to recommend potential removal of measures, and improvement of existing stress measures. We have attempted to ground this report in three key questions:

a) Has this measure been useful based on published research?
b) Is there a strong theoretical rationale to keep this domain or specific measure?
c) What are the next steps in HRS measurement and analysis to advance the field of stress and aging?

Methods: We reviewed published HRS papers that conducted analyses on stress measures in order to assess how proliferative the HRS stress measures have been, and summarized the findings. To determine which measures should be considered measures of stress we used a framework of stress domains developed by the Stress Measurement Network. After conducting the review, we gathered insights from the Stress Measurement Network leadership on key theoretical stress measurement components (EE, AC) and researchers who have worked extensively with the HRS stress measures (EP, TG). As requested by the Committee, we also included social support measures in this report.

Summary: HRS has developed a significant battery of psychosocial measures that positions the study to be one of the premier sources of knowledge for the study of how psychosocial factors, including stress experience, shapes health and well-being as individuals age. Although there are other studies with more comprehensive psychosocial assessments, these studies are limited in other ways (e.g. MIDUS participants are only surveyed every 10 years). HRS is well positioned to be the leader in psychosocial determinants of aging, thus we strongly recommend keeping the vast majority of stress measures in HRS.

We have three major recommendations for the Committee to consider in terms of the stress measurement battery and minor recommendations throughout the report:

1) There is potential to **remove any of the eighteen[2] psychological measures** that are stable across time (e.g. personality traits such as extraversion, neuroticism, hostility, and

[1] Through a collaboration of experimental and population-based scientists, the National Institute on Aging Stress Measurement Network (R24 AG048024) aims to advance three initiatives: (1) Support pilot and validation studies for the development of innovative stress measurement tools; (2) Create a "toolbox" of stress measures for researchers; and (3) Harmonize measures of stress across large-scale surveys and facilitate the addition of stress measures into extant and future population-based longitudinal studies.

optimism) as well as retrospective measures (e.g. maternal warmth, lifetime experiences of discrimination). Stable measures do not need to be repeated at multiple time points going forward, or at least, not closer than 10 years between assessments (to capture stages of life rather than bi-yearly change). A thorough statistical evaluation of the stability of the full battery of psychosocial measures in HRS should be undertaken to assess which measures may be removed or given less frequently. Removing stable personality trait measures would allow for the addition of stress measures that do change over time.

2) There is the potential to **improve the stress measurement battery** by adding better assessment (including validated measures) of the experience of certain types of stress known to be important for health. The current battery is mostly focused on exposures with less focus on perception. We suggest in certain cases including the perception of stress for major events, not just the exposure to it. We suggest adding better measures of caregiving stress, perceived global stress, daily stress and response, childhood adversity, and social support. We describe the rationale within the report and in some cases suggest specific measures in the Appendices.

3) To increase the use of the stress measures in HRS by the research community, **further expansion of the excellent source document for the Psychosocial Questionnaire should be supported**, as the current document describes the measures used in the 2004 and 2006 waves, but not in future years. Thus, there are stress-related scales that were added in future years and have no source or description available.

We present many other recommendations in this report about how stress measurement in HRS could be enhanced. We also think it is important to recommend **how future researchers can take advantage of the existing data.** Importantly, most studies are cross sectional, and **too few take advantage of the longitudinal measurement.** While there is a solid body of work documenting relations between various stress exposures to these outcomes, most of this work is examining main effects, and there is a tremendous amount of variance to be explained to show why highly exposed people stay healthy. There are invaluable opportunities to examine mediation models, and moderators, to better understand **resilience to stress exposures**, using positive psychosocial resource measures in HRS (e.g. optimism, social support). There is also an opportunity to examine measures of positive health (with biomarkers, and well-being measures, beyond just the absence of disease). To further the science of stress on health, there are opportunities to compare measures of stress to each other, as well as to create cumulative models of exposure. This will help other global studies of aging to better focus on which exposures are most 'toxic' and which to measure in future studies.

We made this report specific in order to be most helpful to the Steering Committee. We would appreciate suggestions from the Committee on whether parts of this report might be useful as a publication.

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[2] Hopelessness, optimism, cynical hostility, control/mastery, agreeableness, extraversion, conscientiousness, neuroticism, openness to new experience, self-acceptance, anger, self-control, order, industriousness, traditionalism, virtue, sense of responsibility, need for cognition. See details here.

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[3] A consensus-driven framework that captures the different dimensions of stress currently measured in stress scales (not specific to HRS). We used this framework when reviewing HRS stress measures to guide thinking on which aspects of stress are being captured (e.g. objective vs. subjective, timing of stress assessment, length of stress assessment window, and stressor characteristics) in each measure.

I. HRS published papers that have used stress measures

We reviewed HRS published manuscripts that used stress measures as the predictor. Our initial step was to compile all measures in HRS that capture an aspect of stress, and place them into categories, or stress 'domains'. Stress domains are the areas of life the measure assesses, or the content of the stressful circumstance (e.g. discrimination, work stress, trauma). The Stress Measurement Network created the list of stress domains. We conducted a literature search within each domain, identifying all the published HRS papers that had used a measure within that domain. To identify the relevant manuscripts, we used the HRS online bibliography tool, PubMed, and GoogleScholar.

Basic results from this search process are presented in Table 1. Overall there were 108 unique studies that conducted analyses with stress measures in HRS data. The majority of studies focused on the domains loneliness, work stress, and discrimination; the most commonly used scales were the UCLA-R Loneliness Scale, Karasek's job demand scale and the Everyday Discrimination Scale.

Table 1: Number of HRS publications by stress domain

Domain	**Scales/Measures**[4]	**Validated?**	**# of studies**	**# of items**
Traumatic /Stressful Life Events	Lifetime Trauma List (Krause, 2004)	Yes	6	10
	Social Readjustment Rating Scale (Holmes & Rahe, 1967)	Yes	1	42
	Event History Questionnaire (unknown source)	No	2	13
Chronic burden	Caregiving (unknown source)	No	11	9
	Ongoing chronic stressors (8 items; severity and duration of ongoing problems in health, finance, work, housing, relationships, physical/emotional in spouse/child, drug/alcohol use, caregiving; Troxel, 2003)[5]	No	11	8
Childhood Adversity	Maternal warmth (3 items; i.e. effort/ attention from mother; unknown source)	No	0	3
	Lifetime Trauma List (Krause, 2004; 3 items <18yrs)	Yes	3	3
	7-item Childhood Event History questionnaire (i.e. family financial troubles, missing school, parents, health conditions in 1996 wave only; 1-item trouble w/ police in 2008, 2010 waves; unknown source)	No	1	7
Discrimination	Everyday Discrimination Scale (Williams, 1997)	Yes	10	6
	Major Lifetime Discrimination (Williams, 1997)	Yes	2	7
	Chronic Work Discrimination Scale (6 items, i.e. unfairly given tasks, watched more closely at work,	No	5	6

[4] For further detail of measures, and how items changed between different waves, please see Tara Gruenewald's working document on Stress Measurement in the HRS Family of Studies by contacting her directly at gruenewa@usc.edu. A description of this working document is provided in Appendix 5.

[5] This same scale is used in CARDIA, and should be used in HRS sister studies for harmonization across samples.

	supervisor's slurs on women/racial groups, work twice as hard as others, ignored by boss, unfairly humiliated; Williams, 1997)			
Loneliness/ Social Isolation	Revised UCLA Loneliness scale (Russell, 1996)	Yes	16	4
	Single item from Center for Epidemiologic Studies Depression scale (CESD; "felt lonely much of the time over the past week;" Radloff, 1977)	Yes	5	1
	Objective loneliness/social network index (i.e. do you have any children, friends, other immediate family, or live with a spouse/partner unknown source	No	2	5
Work Stress/ Dissatisfaction	Job demand Scale (Karasek, 1998)	Yes	10	15
	Work-Life Balance Questionnaire (e.g. put job before family, personal responsibilities, energy/time constraints; MacDermid, 2000)	No	1	12
	Effort-reward Imbalance (Siegrist, 1996)	Yes	3	12
Social Strain and Unsupportive Relationships	Supportive and conflictual qualities of social relationships (targets: friends, spouse, children; e.g. item: How much can you rely on them if you have a serious problem?; unknown source)	No	8	24
	2003 HRS Diabetes Care Profile (i.e. level and quality of support from family/friends for diabetes care and general help; unknown source)	No	3	19
Environment /Neighborhood Disorder /Lack of Cohesion	Neighborhood Physical Disorder Scale (unknown source)	No	3	8
	Perceived Social Cohesion (unknown source)	No	3	3
	Perceived Neighborhood Safety (unknown source)	No	6	4

The **outcomes** that were examined in the studies we reviewed can be placed into six categories: psychological (e.g. affect, life satisfaction, depression, perception of aging), cognitive functioning (e.g. episodic memory, cognitive impairment), economic (e.g. wealth, debt, income, disability, financial risk-taking, retirement plans), health behaviors (e.g. smoking, alcohol consumption, sleep), physical health (e.g. self-reported morbidity, mortality, self-rated health, activities of daily living, physician visits), biomarkers (e.g. BMI, blood pressure, cytokines), as well as demographic variables (e.g. race, marital status, education).

Out of the 108 manuscripts reviewed in this report, the majority had psychological (n=54) and/or physical health (n=39) outcomes. Twelve studies examined the impact of stress on economic outcomes, 2 on cognitive outcomes, 18 on biomarkers, 15 on health behaviors, and 12 reported on how stress varied across sociodemographic groups. The most frequently studied outcomes overall were depressive symptoms, blood pressure, alcohol consumption, mortality, and self-reported physical health. Table 2 lists the number of studies within each outcome domain that used specific scales from Table 1 to give a picture of which stress domains have been linked to which outcomes most frequently. We hope future researchers interested in analyzing HRS data will use this as a guide in terms of what relationships have yet to be examined—cross-sectionally or longitudinally. A detailed description of each study we reviewed is presented in Appendix 2.

Table 2: Number of HRS publications by outcome category and stress scale

		Outcomes						
Stress domains	**Scales**	**Psycho -logical**	**Cog Function**	**Health Behaviors**	**Physical Health**	**Bio-markers**	**Economic**	**Total**
Trauma/Stressful Life Events	Lifetime Trauma List	3	0	0	1	0	1	5
	Social Readjustment Rating scale	1	0	0	0	0	0	1
	Event History Questionnaire	1	0	1	0	0	0	2
Chronic Burden	Caregiving	5	0	0	3	3	1	12
	Ongoing Chronic Stressors	8	0	2	3	1	1	15
Childhood Adversity	Maternal warmth scale (added in 2008 wave)	0	0	0	0	0	0	0
	Lifetime Trauma List (3 items)	1	0	0	1	2	0	4
	Childhood Event History Questionnaire	0	0	0	0	1	0	1
Discrimination	Everyday Discrimination Scale	7	0	1	4	3	1	16
	Major Lifetime Discrimination	1	0	0	2	0	0	3
	Work Discrimination Scale	1	0	0	0	2	3	6
Loneliness/ Social Isolation	Revised UCLA Loneliness scale	9	0	1	7	2	0	19
	CESD (1 item on loneliness)	1	0	1	4	0	1	7
	Objective loneliness	2	0	0	1	0	0	3
Work Stress/ Dissatisfaction	Job Demand Scale	6	2	0	1	1	2	12
	Work-Life Balance Questionnaire	0	0	0	0	0	1	1
	Effort-reward Imbalance	2	0	0	1	0	1	4
Social Strain and Unsupportive Relationships	Supportive & Conflictual Qualities of Social Relationships	5	0	0	5	0	0	10
	2003 HRS diabetes care profile	1	0	0	3	3	0	7
Neighborhood Physical Disorder/ Lack of Cohesion	Neighborhood Physical Disorder Scale	2	0	2	1	0	0	5
	Perceived Social Cohesion	0	0	0	3	1	0	4
	Perceived Neighborhood Safety	0	0	1	3	0	0	4
Total		53	2	9	42	18	11	**135**

Next, we summarize the findings from HRS publications that have examined the impact of stress, and divided our summaries by outcome category. We provide brief suggestions on each specific area, and then a set of overall reflections on the future use of HRS stress measures.

Psychological. Forty-three studies examined the relationship between stress exposures and the following psychological outcomes: *loneliness, depressive symptoms, life satisfaction,*

subjective appraisals of marital relations, eudemonia, mental health diagnosis, affect, sense of control, conscientiousness, emotional stability, anxiety, anger, personal mastery, and perceived constraints. In sum, experiencing stress was positively associated with increases in interpersonal problems, negative affect, mental health diagnoses, and lower levels of life satisfaction and sense of control.

It is widely known that stress exposure puts one at risk of poor relations and mental illness episodes. This set of findings on the HRS sample is an impressive demonstration on the range of mental and cognitive outcomes that are associated with stress exposures. The next generation of studies could examine factors that promote resilience to these negative effects, look at longitudinal patterns, and how mental health outcomes are interrelated (e.g. a depression diagnosis leading to decreased marital relations).

Cognitive Functioning. Two studies examined the relationship between stress and cognitive functioning. Cognitive function was assessed over the phone using a mini mental state exam that focused on brief tasks to assess memory (e.g. immediate and delayed recall of word lists) and general mental status (count backwards as quickly as possible from 86). The items in the cognitive battery were adapted from the Telephone Interview of Cognitive Status (TICS; Brandt et al., 1988). A full description and critique of the measures is provided by Lachman & Spiro (2002). Only two studies have been published that report on the relationship between stress and cognition, likely because the cognitive battery is heavily focused on knowledge and orientation items, which are most useful for identifying those with some degree of cognitive impairment, as compared to having sensitivity to and demonstrating the range of cognitive functioning in non-impaired adults. Results from the two studies showed that experiencing greater job strain and lower job control was associated with poorer episodic memory at retirement, and an accelerated rate of cognitive decline (Andel et al., 2015; Fisher et al., 2014). There are currently no published studies examining the relationship between domains of stress exposure, other than work stress, and cognitive functioning, a potential area for exploration.

Health Behaviors. Thirteen studies examined the relationship between stress and health behaviors. Health behavior outcomes were*: sleep, alcohol use, smoking, and physical activity*. Consistent with previous literature, experiencing greater stress, as measured by more traumatic events, greater perception of discrimination across the life-course, higher levels of loneliness, and high levels of neighborhood physical disorder and lower neighborhood safety, was associated with worse health behaviors (i.e. worse sleep quality and duration, increased alcohol use and smoking behaviors, and decreased physical activity; Perreira & Sloan, 2001; Sutin et al., 2014, Theeke, 2010; Chen-Edinboro et al., 2014; Latham & Williams, 2015; Tucker-Seely et al., 2009). Of note, there are no published studies on the association between work stress, early adversity, or social support, and health behaviors using HRS data.

The relationship between stress and health behaviors is an understudied but critical pathway determining longevity patterns. We encourage further analyses on life-course relations between stress exposures (both childhood, and adult events) with chronic health behaviors.

Physical Health. Thirty-seven studies examined the relationship between stress and physical health. Physical health outcomes were: *self-reported health, self-reported illness diagnosis, mortality, physician visits, overnight hospital visits, functional impairment, and activities of daily living (ADL).* Experiencing more traumatic events, higher levels of

discrimination, high levels of loneliness, greater work stress, high levels of neighborhood physical disorder, greater childhood adversity, lower neighborhood safety, and lower social support were associated with worse physical health overall (i.e. greater physician visits or hospital overnights, greater chronic illness, decreased ADLs, worse self-reported health, increased mortality risk, worse functional impairment, and an increased risk for stroke, heart conditions, cancer, arthritis, and diabetes (Gawronski et al., 2014; Luo et al., 2012; Stephan et al., 2015, Sutin et al., 2015; Xu, 2010; Ayalon & Gum, 2015; Chen & Feeley, 2014; Coyle, 2012; Gerst-Emerson & Jayawardhana, 2015; Luo et al., 2012; Perissinotto et al., 2012; Shiovitz-Ezra & Ayalon, 2010; Theeke, 2009; Theeke, 2010; McGonagle et al., 2015; Mercan, 2014; Bozo & Guarnaccia, 2010; Forjaz, 2000; Ha et al., 2015; Mondesir, 2013; Nicklett et al., 2013; Okura et al., 2009; Sullivan, 2011; Ward, 2013; Freedman et al., 2011; Kim et al., 2014; Kim et al., 2013; Latham et al., 2013; Sun et al., 2011; Montez et al., 2014).

Stress and physical health outcomes have been well studied in HRS. These studies provide the basis for examining the 'off-diagonals'next —the people who have similar exposures but do not develop the risk factors or disease.

Biomarkers. Fourteen studies examined the relationship between stress and biomarkers. Biomarker outcomes were: body mass index (BMI), glycemic control, blood pressure, C-reactive protein (CRP), telomere length, and conserved transcriptional response to adversity (CTRA) gene expression. Experiencing discrimination, reporting higher levels of loneliness, and reporting greater work stress was associated with higher blood pressure and greater hypertension risk (Mezuk et al., 2011; Sutin et al., 2015). There were positive associations between reporting experiences of everyday discrimination and neighborhood physical disorder and increased BMI (Sutin & Terracciano, 2013; Sutin et al., 2014; Grafova et al., 2008). Everyday discrimination and childhood adversity were associated with higher levels of circulating C-reactive protein (CRP; Sutin et al., 2014; Lin et al., 2015); CRP is a marker of inflammation, and chronically high inflammation is predictive of cardiovascular disease risk. A higher level of loneliness was associated with up-regulation of genomic pattern indicative of a conserved transcriptional response to adversity (CTRA; Cole et al., 2015). This genomic profile is characterized by an up-regulation of pro-inflammatory genes and down regulation of innate antiviral and antibody-related genes in peripheral blood leukocytes (Cole, 2013). Greater childhood adversity (but not adult adversity exposures alone) was related to shorter telomere length, an indicator of cellular aging (Puterman et al., *under review*). Lower social support was associated with worse glycemic control in people with Type II diabetes (Mondesir, 2013; Nicklett et al., 2013; Okura et al., 2009).

HRS biomarker outcomes are a more recent addition to HRS, and data are starting to be well utilized. Further analyses on biomarkers can address both how stress and economic factors shape biomarkers, and how well biomarkers predict disease and mortality. Research on biomarkers is moving toward using algorithms (Belsky et al., 2015); these multivariate models of health status *before* disease should be created in HRS as well.

Economic. Ten studies examined the relationship between stress and economic outcomes. Economic outcomes were: *financial risk-taking, accumulated/household wealth, assets, debt, expenditure, social security disability insurance, retirement plans, and household income.* Experiencing higher stress, measured by greater traumatic events, higher levels of discrimination, loneliness, and work stress, was associated with financial behaviors—less

frequent risk-taking in financial investments, and lower probability of applying for social security disability insurance, earlier retirement plans, as well as lower household wealth, and lower household income (Bucciol & Zarri, 2015; Wallace et al., 2013; Burkhauser et al., 2011; Burkhauser et al., 2012; Messe, 2012; Rippon et al., 2015; Theeke, 2007; Hurd & McGarry, 1993; Johnson, 2004; Kosloski et al., 2001; Nicholas, 2014). There were no studies published that examined the effect of the stress domains social support, neighborhood physical disorder, or childhood adversity on economic factors.

There is valuable untapped potential of HRS to uncover novel relationships between stress exposure and response at difference phases of the lifecourse with financial behaviors in adulthood and retirement. While educational level is likely the most important contextual factor for determining economic and psychological well-being, there is a tremendous amount of variance within educational levels that could be further understood.

II. Overall commentary on HRS published papers

We have several reflections after reviewing this large set of publications.

1) **Longitudinal analyses are scarce but the best use of HRS**. First, the majority of analyses conducted are cross-sectional. One tremendous value HRS offers to researchers is the longitudinal nature of the data. Researchers examining psychosocial variables should be encouraged to conduct prospective, time course analyses to take full advantage of the repeated measurement dataset. Mediation analyses using observational data can offer a higher standard for the types of questions addressed, so they are more information than bivariate associations.

2) **Comparative analyses between exposure measures, and cumulative analyses, within or between types of exposures, has not been undertaken. Such analyses would advance the field**. Different exposures may have different impacts. Further, cumulative exposures should have the greatest predictive power for aging related health outcomes. Despite this, we are not aware of any studies that have examined cumulative exposures in HRS. There is one such study we know of, that we have done (Puterman, Epel and colleagues, *under review*) that examined childhood and adult exposures in relation to salivary telomere length.

Researchers have yet to examine the **relative impact of stress measures against each other** (i.e. in the same model, do they each predict unique variance?), or the predictive ability of these stress measures compared to other predictors of health (i.e. age, smoking). The Stress Measurement Network has funded Eli Puterman and David Rehkopf of Stanford University to conduct such a project comparing stress measures to each other and other relevant predictors in predicting mortality. They are using random forest plots a bootstrapping procedure that compare all the measures in their relative importance to each other in predicting mortality. His initial results indicate that childhood adversity and several psychological traits, including perceived mastery and constraints, are as important as economic and employment histories in predicting mortality in HRS. Future studies should conduct these same analyses with other health outcomes, and economic outcomes. These types of comparative analyses could be undertaken in other nationally representative datasets in the US and other countries in HRS related family of studies. This would provide a better sense of what is universal, cultural, and whether there are policy relevant implications from the study of stress exposures.

3) **Despite the broad inclusion of stress measures, there are few publications on stress measures in HRS.** Compared to the vast number of studies that have been published using HRS data, the number of studies that have taken advantage of the stress variables remains

small (4.8% [6] of all HRS published studies since 2006, when the psychosocial assessment battery was significantly enhanced). Efforts to make the use of this data easier, and to get the word out about this extensive dataset, should be considered.

4) **HRS offers a unique and invaluable opportunity to examine sources of resilience to stress and positive health.** Future studies should go beyond showing exposure and outcomes but rather aim to identify how highly exposed people stay well. Another opportunity with HRS is to focus on predicting positive health (through biomarkers, absence of disease, wellness measures like vitality) not just disease outcomes.

5) **It is difficult to quantify any lack of relationships between stress measures and outcomes**. We were concerned our report may be missing key findings that were not published because they were null findings. To address this, we reached out to authors of HRS manuscripts to ask them to anonymously report null findings. The email addresses of the 70 authors of stres-related HRS publications were found using the corresponding author information in the publication or via Google Scholar. The email asked them to provide information on analyses that were analyzed but not published due to null findings via an anonymous Qualtrics questionnaire. They were sent reminder emails one week later. The core question they had to answer was: "What associations have you examined between psychosocial variables and health and/or economic outcomes in HRS data that resulted in null findings?" We provided a list of psychosocial variables and outcomes for reference. Fourteen researchers responded. These responses are pictured in Figure 1. In sum, the responses were not especially informative; highlighting the problem in most areas of science – the lack of communicating null results. HRS could consider developing an online platform where researchers are required to summarize null findings.

Figure 1: Responses to anonymous survey on null findings

Text Response
View none
View No null associations were found in my research works using the HRS dataset
View We have used the UCLA loneliness scale in a series of studies that have been published. In our study of mortality (Luo et al., 2012), we found demographics, loneliness, health behaviors, and depression predicted mortality but frequency of contact with friends and family did not.
View I did not use any of the measures listed below.
View I tested Karasek's job demand scale and hypertension but found mostly null associations. I also tested the workplace discrimination scale and hypertension but found no association. We've also looked at employment history and life satisfaction as an outcome and not found any associations.
View I tested association between perceived discrimination and cognitive function but found no significant correlation
View I tested association between work-related stress extrapolated from the O*Net occupational information to mimic the Karasek job demands and job control measures and episodic memory. The results were small in magnitude but significant.
View I have examined associations using the UCLA Loneliness Scales as well as Extent of neighborhood physical disorder and Perceived social cohesion. However, I cannot remember when I did analyses (3 years ago) what the null findings were. It's been too long since I did the analyses and I previously had no reason to track or remember null findings. My apologies for not being able to help with your inquiry.
View I have no unpublished null findings to report.
View I tested the short-form UCLA loneliness scale and the following health variables: self-reported health, self-reported hypertension and clinically measured hypertension from the biomarker sample. I have also tested a social index made up of 6-9 indicator variables. It would be extremely helpful to have a measure of objective isolation or recommendations for creating such a measure from HRS variables.
View I do not have any null findings that are not reported in my published papers.
View I tested the following for association with gene expression biomarkers in the HRS RNA collection pilot study reported in PMID: 26246388. We found no significant association with gene expression for CESD Life Satisfaction
View I tested the association between a number of O*Net job characteristics, including level of routine cognitive, non-routine cognitive, and physical demand of respondents' lifetime jobs and their Medicare spending as well as utilization for a number of medical conditions and found no relationships.
View I tested the effect of "Support from family" on "Loneliness" or "Well-being" but found no significant effect. Please refer to page 152 of the following article: Chen, Y., & Feeley, T. H. (2014). Social support, social strain, loneliness, and well-being among older adults: An analysis of the Health and Retirement Study*. Journal of Social and Personal Relationships, 31(2), 141-161. doi: 10.1177/0265407513488728 (Lead Article)

[6] This was calculated by dividing the number of studies that used stress measures by the total # of publications in the HRS online bibliography since 2006, when the psychosocial batter was added to HRS (i.e. 97/2022 x 100 = 4.8%).

III. Recommendations to improve stress measurement in HRS

Recommendation 1: Consider removing Social Readjustment Scale

Objective stress exposure is captured using the Krause (2004) Lifetime Trauma List and the Event History Questionnaire[7]. Together these are 23 items that capture severe life events, such as death of a spouse/child, victim of a physical attack, and divorce. The Lifetime Trauma List was given as part of the HRS psychosocial questionnaire every 4 years from 2004-2014; the Event History Questionnaire was given in 1998, 2002, 2004, and 2006. The Lifetime Trauma List response options are yes/ no and if yes, what year the event most recently happened, whether the event happened in the last week, month or year, and the sequence of the event occurrence if multiple events happened. Out of the 23 events listed in both scales, there are several that overlap and thus could be considered for removal. Because the Event History Questionnaire is not listed as given after 2006, we assume that it was removed from HRS. If so, we agree with this decision. If not, we would recommend removing duplicate items.

In addition, we recommend removing the Social Readjustment Scale to make room for newer content. This scale was developed based on the theory that all major 'life adjustments' whether negative or positive result in the same systemic disruption that leads to worse health and well-being over time (Holmes & Rahe, 1967). Evidence has not supported this theory, as positive events generally have not been shown to be negatively impactful in the long term.

Recommendation 2: Consider adding in domain specific subjective experience questions

Traditional models of stress have focused on exposure to a major stressful event (e.g. death of a loved one). In recent decades, the understanding and measurement of stress have become more sophisticated and nuanced. Researchers have found that it is not just mere exposure to a stressful event that matters for the long-term impact of that event to take hold. Factors about the stressful experience, such as how long it lasts, the perceived severity of the experience, and when in one's life course it occurred, are important in understanding the impact of the experience. For example, there has been an explosion of literature demonstrating that stressful experiences that occur in childhood have profound impacts on health and well-being in adulthood (Anda et al., 2009). (Of note, HRS is poised to answer recent critiques of this literature that suggest it is important to take into account experiences that occur in young adulthood when examining the relationship between early life stress and adult health outcomes.) Therefore, we suggest the addition of a handful of items to capture subjective information about objective experiences. Subjective stress includes the appraisal and perceptions of stress in the environment, and affective or emotional responses to social-environmental stressors. We suggest that for each major life event/ trauma a participant endorses, participants then answer additional items on the severity of the experience, peak stress perception (i.e. "at it's worst, how stressful or upsetting was it?"), and length of time of impact. Specific item wording could be developed or taken from existing measures such as the Stress and Adversity Inventory (STRAIN) tool, which is a computer-based system for assessing cumulative life stress (Slavich & Epel, 2010).

Recommendation 3: Assessment of caregiving experience need improvement

Knowledge from studies of stress-induced disease show that it is not exposure alone that tends to predict disease, but rather it is when the stress becomes 'toxic' or overwhelming to the

[7] We were unable to locate the original citation or source for this scale.

individual. In the most widely accepted cognitive model of stress (Folkman and Lazarus), a perception of stress occurs when demands outweigh resources. Demands and resources are operationalized in many ways. In terms of caregiving stress, this tends to be a balance between the level of demand of the situation (how taxed one feels, how many hours of caregiving, how severe the patient's symptoms are) vs. resources (feelings one can cope well, the appraisal that one has what it takes in terms of time, social support, finances, and other resources).

Caregiving is currently measured in HRS through a 9-item questionnaire that focuses on exposure to caregiving by capturing the amount of time spent caregiving for spouse/ partner, grandkids, and/or parents/ in-laws[8]. There are no subjective measures of caregiving burden, i.e. how the caregiver's life has been affected by providing care or how burdensome caregiving has been.

We recommend the addition of a scale to capture perception of caregiver burden / psychological overload of caregivers. There is a proliferation of measures for caregiving burden. Many of the measures tap similar constructs, and to our knowledge the measures have not been compared head to head in the same study. After reviewing the measures we suggest using the Zarit Burden Scale for Family Caregivers to capture caregiver burden. It is a 12-item scale that captures the perception of burden or subjective stress associated with caregiving (full scale in Appendix 3).

Additionally, we recommend the modification of the caregiver objective exposure measures to include a **clearer definition of caregiving** (caring for a child or adult with a diagnosed psychiatric or physical disability, illness, chronic health condition, or degenerative disease), a focus on being the 'primary' caregiver *and* asking about hours spent, and broadening *who* the caregiving recipient is beyond grandchild, spouse, and parents. We recommend 6 items written by Elissa Epel, who has researched caregivers extensively (see Appendix 3 for items).

Recommendation 4: Childhood stress measures should be expanded

Childhood adversity is currently measured using three items from the Krause (2004) Lifetime Trauma List asking whether the following things happened prior to age 18: redo a school year, parent drank or used drugs so often that it caused family problems, physical abuse by a parent. This questionnaire was administered every 4 years from 2004-2014. This is not a comprehensive assessment of childhood experiences.[9] We recommend including a validated measure such as the Childhood Trauma Questionnaire (CTQ), which is a well-validated tool to assess maltreatment in early life. The 28-item questionnaire comprises 5 empirically derived scales of emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect, and takes 5 minutes to complete. We recommend that this measure only needs to be completed once (i.e., does not need to be repeated for existing panel members given retrospective nature of reporting). Although there is debate about whether or not retrospective reporting of childhood

[8] Current caregiving items are the following (most items are yes/no answers): 1yr+ of care for grandkids; who do parents live with; given 50+ hrs in last 12 months personal help to parents/in-laws; given 100+ hrs in last 2 years personal help to parents/in-laws; 100+ hrs in last 12 months of care for grandkids; 100+ hrs in last 2 years with personal needs to parents; help parents w/ household chores, errands, transportation.

[9] Note that retrospective recall of maternal warmth is also assessed. Maternal warmth is traditionally thought of as a stress buffer than a stress exposure measure. The items are: How much time and attention did your mother give you when you needed it?; How much effort did your mother put into watching over you and making sure you had a good upbringing?; How much did your mother teach you about life? Response scale: a lot, some, a little, not at all. These were included in 2008 and 2010.

experiences are influenced by current mood or mental health status, our reading of the literature is that research supports the relative accuracy of retrospective reporting.

Recommendation 5: Measures of stable psychological characteristics may be removed

Measures of psychological characteristics may be able to be removed if statistical evaluation of stability of these measures over time is conducted to confirm that we would not be missing important developmental changes in later adulthood. There is a long, extensive battery of psychological variables (18 scales), with many trait characteristics that are measured every two years. We recommend the Committee supports a project for statistically examining whether these psychological characteristics fluctuate over time. For those that do not change, you may be able to remove them in favor of factors that are changing. Characteristics that may be stable over time include trait measures (e.g. optimism, hostility, extraversion, neuroticism) as well as retrospective measures (e.g. maternal warmth, lifetime experiences of discrimination). Whether or not these factors change in response to major life change relevant to this sample (i.e. retirement, death of spouse) should be taken into account. Removing the repeated measurement of stable characteristics would make room for adversity questionnaires that do fluctuate over time. This would enable researchers to take full advantage of the longitudinal design. From a stress perspective, we would anticipate the following domains to be important to capture at each time point because they do change: daily hassles, major events, global perception of stress, loneliness and social isolation, interpersonal relationships, and work-related stress (if not retired).

Recommendation 6: Two domains of stress are missing: Daily stress and stress response, and global perceived stress

There are two domains of stress that are not currently captured in HRS: daily experiences of and responses to stress, and global perceived stress. The emotional response to daily stress, referred to often as affective reactivity or stress sensitivity, has been shown to predict mental health outcomes up to 10 years later (Charles et al., 2013), and predicts worse health even when major events were included in the model (DeLongis et al., 1982). Dave Almeida's scale, the Daily Inventory of Stressful Events (DISE; Almeida et al., 2002; included in Appendix 3 for context), is the gold standard daily stress assessment battery though it traditionally is captured over 7-10 days, making it difficult to scale in population based studies. The Stress Measurement Network is currently working with him to develop a short version/ subset of items that he recommends using in global studies of aging.

A global measure of subjective stress is also missing. Global perceived stress may include feeling "stressed," and experiencing cognitive appraisals relevant to the experience of stress such as unpredictability, lack of control or threat/ lack of safety. The most commonly used scale to capture global perceived stress is the Perceived Stress Scale (Cohen, 1998). The Stress Measurement Network is currently developing its own global perceived stress scale that adds in a contextual component to ground the appraisals in. This new scale called the Subjective Stress in Context (SSiC) scale is under active development; the ultimate goal is to have it inserted into population-based studies.

We are conscious of the need to keep measures short. We have decided to include all our recommendations in this report for what is needed to complete or improve the stress measurement battery. We welcome further discussion with the committee in terms of what we would prioritize if you are not able to add all these measures in.

Recommendation 7: We suggest adding to existing current measures of social support

Social support is currently measured using the 24-item social relationships questions (source not reported). These questions capture positive (e.g. "X understands you", "you can rely on X if serious problem occurs") and negative (e.g. "X criticizes you", "X lets you down") social support from spouse/partner, children, other family members, and friends. It was given in 2006, 2008, and 2010. This scale is widely used, though in our opinion, there are measures that better capture social support. We recommend seeking advice from an expert in this area to consider whether a more validated scale should replace it. Two commonly used and liked scales are the ISEL (Cohen & Hoberman, 1983) and Social Provisions Scale (Cutrona & Russell, 1987). We know that the HRS psychosocial measure are developed with harmonization in mind and thus removing an existing scale may make cross-country analysis more difficult, thus we suggest adding an additional social support scale instead of replacing it.

IV. Ways to increase usage of existing stress data in HRS

Expansion of the Psychosocial Measures Documentation Report to include recent years would enhance usability of existing data. The existing HRS psychosocial documentation report is comprehensive and helpful for understanding which psychosocial scales are in the 2004 and 2006 waves of data collection. To our knowledge, this document has not been updated to include future waves when indeed there were additions made to the psychosocial questionnaire. For example, there were more job-related questions added after 2006 that are about the experience of work and stress related to work, but there is no documentation around where these specific items came from, how they were developed, who put them in, or what researchers should do with them. Without clarity around how to use scales and individual items, the items go underused, or worse, used and interpreted incorrectly. We encourage HRS to keep supporting the development of the tremendously helpful handbook.

A formal document listing all of the *stress* variables that are in HRS is needed. Currently, there is no way for researchers to know about all the great measures collected in HRS related to stress. Eli Puterman (Appendix 4) and Tara Gruenewald (Appendix 5) have both created products that may be used for this purpose if finalized and placed on the HRS website.

In conclusion, there are several key products that should be created to make the use of HRS stress data easier. One large piece of this will be accomplished with the completion of Tara Gruenewald & Jinkook Lee's stress harmonization project (funded by the NIA supported Stress Measurement Network). This will facilitate complex analyses including examining stress variables across the HRS family of studies, longitudinal patterns to understand what sets people on the path of worse health over time, protective factors that buffer the stress-health relationship, and comparing stress measures to each other and to other known predictors of declining health (e.g. age). The inclusion of harmonized stress data on the Gateway to Global Aging website (https://g2aging.org/) will be a tremendous service to the research community.

V. Future Directions

HRS is positioned to be a leading population-based cohort study for researchers interested in exploring how exposures to and experiences of stress influence health, well-being, and economic outcomes. It is a model worldwide to studies of aging already. The dataset currently includes an impressive array of psychological, and stress-related measures. We recommend further developing tools that can help researchers take advantage of the wealth of data on the main HRS website. Members of our Stress Measurement Network are already working on two specific projects (Tara Gruenewald & Eli Puterman) that we think will help in

this regard, and we would look forward to partnering with HRS to make them accessible to your audience.

There are several novel directions the stress field is going that we want to make you aware of for you to consider in future iterations of HRS. First, responses to acute stress (heightened physiological reactivity and prolonged recovery in particular) predict worse health longitudinally, including greater risk of heart disease. Currently there is no way to capture acute stress reactivity profiles in a scalable way. We anticipate that in the coming years this will be solved through the development and validation of a technology-driven acute stress paradigm that can be delivered online without the need for study staff. This would allow large studies to capture stress reactivity and examine on a large scale how stress reactivity profiles differ by group, changes over time, predict health outcomes, and what moderates these associations.

Second, other computer-mediated tasks that capture aspects of chronic stress that cannot be self-reported (e.g. threat appraisal, unconscious processes like bias to negative stimuli) are currently being developed. These are particularly important for groups of people in which traditional self-report measures of chronic stress may not accurately capture their experience. As an example, individuals who recently immigrated to the United States may report low levels of perceived stress because *in comparison* to others or to their previous life, they are 'less stressed,' but the language barriers, discrimination, and lack of stable employment may indeed be stressful. Thus, capturing unconscious processes related to chronic stress would allow us to capture the experiences of stress that may be difficult to self-report. Finally, the Stress Measurement Network is working on a new self-report measure of global perceived stress that seeks to capture feelings of stress in contexts that people live – home, neighborhoods, social relationships – that are not trait level, but instead capture a general sense of overwhelm. We feel that this type of measure is missing from current work on stress. Our hope is to validate the measure and work with leads of large cohort studies to implement it into studies in 2017. We would look forward to an opportunity to present this short scale to the HRS Data Monitoring Committee in the coming months.

The authors of this manuscript and the leaders of the NIA funded Stress Measurement Network look forward to continued communication with your group about this report and stress measurement in general. Please do let us know if there are aspects of this report that you think are worthy of publishing for the broader community of aging and stress researchers. Thank you for the opportunity to work with HRS.

Appendix

Appendix 1: Stress Typology
Appendix 2: Summary of publications that have used stress measures in HRS by stress domain
Appendix 3: Potential additions to HRS stress measures
Appendix 4: Data matrix of HRS stress measures by typology
Appendix 5: Summary of HRS data harmonization project (PIs: Tara Gruenwald, Jinkook Lee)

Appendix 1: Stress Typology

NIA Stress Measurement Typology Working Document – Draft date: 4/1/2015
Authors: George M. Slavich, Ph.D., Thomas W. Kamarck, Ph.D., Eli Puterman, Ph.D. Elissa S. Epel, Ph.D.

This typology provides a broad overview of the major attributes that are assessed by existing measures of psychosocial stress. This typology was developed in order to permit comparisons between different measurement strategies that have been used across studies. Any given self-report or interview-based measure of psychosocial stress can be said to assess one or more of the following attributes.

SUBJECTIVE STRESS VS. OBJECTIVE STRESSORS (i.e., What was measured?)

Subjective Stress (Includes: Appraisal and Perceptions of Stress in the Environment and Affective/Emotional Responses to Social-Environmental Stressors)

1) **Global Subjective Stress** (i.e., Perceived Stress, may include feeling "stressed," but also core cognitive appraisals relevant to the experience of stress such as unpredictability, lack of control, or threat/lack of safety)
2) **Domain-Specific Subjective Stress** (e.g., ratings of job strain, relationship strain, discrimination, caregiving stress, etc.)
3) **Stressor-Linked Emotional/Affective Responses or Intrusive Thoughts**

*** Intentionally excluded from the above categories are measures of General State or Trait Mood or Emotion. These are listed below under modifiers / mediators of the stress response.*

Objective Exposure to Acute or Chronic Stressors

1) **Daily Hassles** (e.g., acute experiences that do not meet threshold for being a "event")
2) **Acute Life Events** (e.g., break-up, job loss, financial loss, fight, move, health event, etc., that are identified by participants or an interviewer as having happened, and that are episodic in nature)
3) **Chronic Difficulties** (e.g., health, marital, financial, employment, reproduction, legal problems, etc., that are identified by participants or an interviewer as having happened, and that last at least a month

TIMING OF STRESS ASSESSMENT (i.e., When did the assessment occur in relation to the experience?) – Applies to both Subjective Stress & Objective Stressors

- The broad categories are "childhood" and "adulthood" or some combination of the two
- In actuality, the timing of assessment is a continuous variable – for example, the number of days or years between when the experience occurred and when it was assessed

LENGTH OF STRESS ASSESSMENT WINDOW (i.e., What amount of time was covered by the assessment?) – Applies to both Subjective Stress & Objective Stressors (More than one may apply, e.g., daily ratings can occur over the past month)

1) Momentary ratings (i.e., past 10 minutes, past hour)
2) Daily ratings

3) Past week, month, year, lifetime, etc.
4) Reporting window does not include current time

STRESSOR CHARACTERISTICS (i.e., What was it like?) – Applies to both Subject Stress & Objective Stressors. Ability to answer these questions depends a lot on measurement strategy. Information may not be available for some or several categories.

1) **Severity** (on a continuous scale, from low-to-high severity)
2) **Life Domain** (i.e., Education, Work, Reproductive Health, Housing, Money, Crime, Legal, Health, Intimate Relationships, Friend Relationships, Children, Death, Possessions,
3) **Social/Psychological Features** (i.e., Interpersonal Loss, Physical Threat/Danger, Humiliation, Entrapment, Role Change/Disruption, Social Status Threat, Blocked Opportunity, Sustenance)
4) **Focus** (i.e., Subject-Focused, Joint-Focused, Network-Focused, Population-Focused)
5) **Origin** (i.e., Event Initiated a Difficulty, Event Originated from a Difficulty)
6) **Dependence** (i.e., Extent to which the person caused the Stressor)

MODIFIERS and MEDIATORS OF STRESS EXPOSURE / EXPERIENCE (i.e., What is the impact affected by?)

1) **Health Behaviors** (i.e., Exercise, Diet, Sleep Quality, Sleep Duration)
2) **Relationship Characteristics** (i.e., Quality of partner relationship, Availability of Confidant(s), Quality of Confidant Relationship(s), Social Network Size, Social Role Diversity)
3) **SES and Childhood SES**
4) **Individual differences**
    a. **Coping Style** (e.g., COPE, WOC, Emotion regulation styles – suppression, expression, rumination)
    b. **Personality Styles** (e.g., Big 5, Optimism, Autonomy, Mastery, Stress sensitivity)
    c. **Psycho-Affective Traits**: Depression (CES-D, Anxiety (STAI), Mood (PANAS), Worry, Aggression (BPAQ), Anger, Hostility (CMH), Reactive Responding, Life Satisfaction, Rumination, Intrusive Thoughts/Cognitive Interference, Perceived Loneliness / Isolation Hopelessness, Psychological Well Being

Appendix 2: Summary of publications that have used stress measures in HRS by stress domain. Last updated 5/1/2016.

Health and Retirement Study - Domain: Traumas & Stressful Life Events							
Article title	**First author**	**Year**	**Stress Measurements**	**How are scales scored?**	**Main stress results**	**Outcome Category**	**Specific Outcomes**
Self- and other-oriented potential lifetime traumatic events as predictors of loneliness in the second half of life	Palgi	2012	10 items of 22-item lifetime trauma list (Krause, 2004)	3 items targeted before 18yr; sum of overall traumatic event; Calculated self vs. other-oriented PTLE, time at which event occurred	PLTE positively linked to loneliness in 2nd half of life	Psychological	Loneliness
Potentially traumatic events and serious life stressors are prospectively associated with frequency of doctor visits and overnight hospital visits	Gawronski	2014	10-item measure of lifetime traumas (Krause, 2004) → summed, high score represents higher exposure to PTE/SLS	PTE/SLS --> created quartiles in case threshold/discontinuous effects	Traumatic events, serious life stressors assoc. with negative health outcomes, 8% increase in doctor visits, 18% increase in number of nights spent at hospital	Physical Health	Doctor / Overnight Hospital Visits
What Impacts Life Satisfaction Of Aging Adults Following Stressful Life Events?: An Examination Of The Buffering Effect Of Personal Resources	Barragan	2015	Lifetime trauma list (10 SLE items); Social readjustment rating scale (100-0)	Death of spouse, divorce, marital separation, death of close family member, personal injury/illness, marriage, retirement, change in living conditions/residence, change in financial state	Change in income was most common SLE; as life satisfcation declined, more SLEs experienced; black elders experience more SLE than white	Psychological	Life Satisfaction
Polygenic risk, stressful life events and depressive symptoms in older adults: a polygenic score analysis	Musliner	2015	Event history questionnaire	Items related to health, job loss, bereavement, other significant LE correspond to stress measures on Social Readjustment Rating Scale; 13 items; participant experienced at lease one SLE during previous 2 years	Odds of reporting ≥4 depressive symptoms was 2x higher in individuals who experienced at lease 1 SLE	Psychological	Depressive symptoms
Life events and alcohol consumption among mature adults: a longitudinal analysis	Perreira	2001	Event history questionnaire	Health events (heart attack, hospital stay, stroke, etc), employment events (new job, unemployed, disabled, retirement), family events (marriage, divorce, spouse death)	Changes in drinking behaviour related to life events occuring in 6-yr period; divorce, retirement assoc. w/ increased drinking; hospitalizaiton/diagnosed w/ new chronic condition assoc. w/ decreased drinking	Health Behaviors	Alcohol Consumption / Drinking Behavior
The shadow of the past: Financial risk taking and negative life events	Bucciol	2015	Lifetime trauma list	Child death, physical attack, illness/accident (respondent, partner or child)	Victim of physical attack, loss of child = assoc. w/ lower and <frequent investments in risky assets; child loss effect is long-lasting, physical attack disappears after some years	Economic	Financial Risk-taking
"Health and Wealth in Early Retirement" in , *Lifecycle Events and Their Consequences: Job Loss, Family Change, and Declines in Health*	Wallace	2013	Lifetime trauma list	At any time in life (data used was only from the past 2 years), experienced SLE?	Rate at which retirees experience cognitive/physical shocks impacts their annuitized net wealth	Economic	Annuitized Net Wealth
Trigger Events and Financial Outcomes Among Older Households	Wallace	2010	10 trigger events from lifetime trauma list (Krause, 2004)	Changes in living arrangements, cognition, health, family structure	Widowhood, cognitive decline, health decline	Psychological, Economic	Family Structure, Cognitive Decline, Health Decline, Net Wealth, Social Security Wealth, Insurance

Health and Retirement Study - Domain: Traumas & Stressful Life Events

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Self- and other-oriented potential lifetime traumatic events as predictors of loneliness in the second half of life	Palgi	2012	10 items of 22-item lifetime trauma list (Krause, 2004)	3 items targeted before 18yr; sum of overall traumatic event; Calculated self vs. other-oriented PTLE, time at which event occurred	PLTE positively linked to loneliness in 2nd half of life	Psychological	Loneliness
Potentially traumatic events and serious life stressors are prospectively associated with frequency of doctor visits and overnight hospital visits	Gawronski	2014	10-item measure of lifetime traumas (Krause, 2004) → summed, high score represents higher exposure to PTE/SLS	PTE/SLS --> created quartiles in case threshold/discontinuous effects	Traumatic events, serious life stressors assoc. with negative health outcomes, 8% increase in doctor visits, 18% increase in number of nights spent at hospital	Physical Health	Doctor / Overnight Hospital Visits
What Impacts Life Satisfaction Of Aging Adults Following Stressful Life Events?: An Examination Of The Buffering Effect Of Personal Resources	Barragan	2015	Lifetime trauma list (10 SLE items); Social readjustment rating scale (100-0)	Death of spouse, divorce, marital separation, death of close family member, personal injury/illness, marriage, retirement, change in living conditions/residence, change in financial state	Change in income was most common SLE; as life satisfcation declined, more SLEs experienced; black elders experience more SLE than white	Psychological	Life Satisfaction
Polygenic risk, stressful life events and depressive symptoms in older adults: a polygenic score analysis	Musliner	2015	Event history questionnaire	Items related to health, job loss, bereavement, other significant LE correspond to stress measures on Social Readjustment Rating Scale; 13 items; participant experienced at lease one SLE during previous 2 years	Odds of reporting ≥4 depressive symptoms was 2x higher in individuals who experienced at lease 1 SLE	Psychological	Depressive symptoms
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The shadow of the past: Financial risk taking and negative life events	Bucciol	2015	Lifetime trauma list	Child death, physical attack, illness/accident (respondent, partner or child)	Victim of physical attack, loss of child = assoc. w/ lower and <frequent investments in risky assets; child loss effect is long-lasting, physical attack disappears after some years	Economic	Financial Risk-taking
"Health and Wealth in Early Retirement" in , *Lifecycle Events and Their Consequences: Job Loss, Family Change, and Declines in Health*	Wallace	2013	Lifetime trauma list	At any time in life (data used was only from the past 2 years), experienced SLE?	Rate at which retirees experience cognitive/physical shocks impacts their annuitized net wealth	Economic	Annuitized Net Wealth
Trigger Events and Financial Outcomes Among Older Households	Wallace	2010	10 trigger events from lifetime trauma list (Krause, 2004)	Changes in living arrangements, cognition, health, family structure	Widowhood, cognitive decline, health decline	Psychological, Economic	Family Structure, Cognitive Decline, Health Decline, Net Wealth, Social Security Wealth, Insurance

Health and Retirement Study - Domain: Discrimination

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
The relationships between major lifetime discrimination, everyday discrimination, and mental health in three racial and ethnic groups of older adults	Ayalon	2011	Everyday discrimination	Frequency of 5 everyday discriminatory events (treated w/ less courtesy/respect, received poorer services, etc.); response range 1-6 (higher = >exposure); calculated prescence of one or more events, mean frequence score across 5 events	45% of black older adults report major lifetime discrimination, compared to 30% of general population; white reported highest life satisfaction, lowest depressive symptoms; everyday discrimination relates to mental health indicators	Psychological	Life Satisfaction, Depression
The Importance of State Anti-Discrimination Laws on Employer Accommodation and the Movement of their Employees onto Social Security Disability Insurance	Burkhauser	2011	Disability onset, workplace discrimination	"Do you have impairment/health problems that limits kind/amount of paid work", "temporary condition, <3months?"	Disability accommodation at workplace reduces worker's probability of applying to social security disability insurance by 30% over 5yr, 21% over 10yr	Economic	Social Security Disability Insurance
The Importance of Anti-Discrimination and Workers' Compensation Laws on the Provision of Workplace Accommodations Following the Onset of a Disability	Burkhauser	2012	Workplace discrimination	No discrimination items; mostly investigates ADA facilities at the workplace	Anti-disc laws increased accommodations to workers w/ non-work-related disabilities; not for pre-existing laws	Economic	Disability
The relationships among perceived discrimination, self-perceptions of aging, and depressive symptoms: a longitudinal examination of age discrimination	Han	2014	Everyday discrimination, perceived age discrimination	"treated w/ less courtesy/respect", "poorer services received", "people act as if you are not smart", "people act as if afraid of you", "you are threatened/harrassed"; response range 1-6; age disc; responses to question of attribution (reason)	Changes in perceived discrimination assoc. w/ changes in depressive symptoms over 4 years; negative self-perceptions of aging mediated relationship	Physical Health, Psychological	Self-Perceptions of Aging, Depression
Perceived Discrimination, Cumulative Disadvantage and the Life Course: Women's mental health in retirement/old age	Jacob	2005	Workplace discrimination	Whether experienced any type of workplace discrimination in the time period in question (i.e., either in the last five years or since the time of the last interview); type of disc: age, race, disability, marital status, AIDS, health status, nationality, religion, sex	Perceived discrimination in workplace impacts mental health status of women in retirement age (depression)	Psychological	Depression
A Longitudinal Study of Social Status, Perceived Discrimination, and Physical and Emotional Health Among Older Adults	Luo	2012	Everyday discrimination, lifetime major events	Everyday (minor experiences of unfair treatment; "treated w/ less courtesy/respect", "poorer services received", "people act as if you are not smart", "people act as if afraid of you", "you are threatened/harrassed"), scaled 1-6; lifetime experience ("unfairly dismisssed from job", "unfair reasons for not hired for job", "unfairly denied promotion", unfairlty been prevented from moving into neighborhood bc of landlord/realtor refused to sell/rent house/apartment", "unfairly denied bank loan", "unfairly stopped, searched, questioned, physically threatened/abused by police"; yes/no response)	Blacks w/ separated/divorce/widowed & lower household assets have higher perceived discrimination levels than whites (married/partnered, >assets); perceived disc. Negatively assoc. w/ health changes, stronger effects on emotional health than major disc. events	Descriptive, Psychological, Physical Health	Race, Depression, Self-Rated Health, Chronic Conditions
Job Strain, Workplace Discrimination, and Hypertension Among Older Workers: The Health and Retirement Study	Mezuk	2011	Workplace discrimination: 6-item scale	In past 12-month period (e.g., how often are you unfairly given the tasks at work that no one else wants to do? How often do you feel that you have to work twice as hard as others? How often do you feel ignored or not taken seriously by your boss?).; scale score 1-6	Workplace discrimination not associ. w/ hypertension	Biomarkers	Blood Pressure
Do discriminatory attitudes to older workers at work affect their retirement intentions?	Messe	2012	Work discrimination regarding promotion	Probability to work fulltime after 62, gender; strong preference for leisure	Feeling passed over for promotions plays role in predicting retirement plans in women	Economic	Retirement Plans

Health and Retirement Study - Domain: Discrimination

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Greater Perceived Age Discrimination in England than the United States: Results from HRS and ELSA	Rippon	2015	Everyday discrimination	"treated w/ less courtesy/respect", "poorer services received", "people act as if you are not smart", "people act as if afraid of you", "you are threatened/harrassed"; response range 1-6	Perception of age disc. Significantly higher in England than US; perceived disc and older age, lower levels of household wealth	Physical Health, Economic	Perception of Age, Household Wealth
Discrimination in Healthcare Settings is Associated with Disability in Older Adults: Health and Retirement Study, 2008 2012	Rogers	2015	Everyday discrimination	Receiving poorer service/treatment than others by doctors, hospitals: never, less than a year = infrequent; >1x per year=frequent)	12.6% experienced disc infrequently, 5.9% frequently; 29% frequent developed new/ worsened disability over 4 years	Physical Health	Activities of Daily Living
How Old Do You Feel? The Role of Age Discrimination and Biological Aging in Subjective Age	Stephan	2015	Perceived age discrimination	Everyday disc (being treated w/ less respect than others, receiving poorer service); what disc experience was due to (why; i.e. age?); 0 or 1 if bc age	Perceived age disc assoc. w/ older subjective age	Physical Health	Perception of Age
Perceived Discrimination and Physical, Cognitive, and Emotional Health in Older Adulthood	Sutin	2015	Everyday discrimination, attributable to personal characteristics	Characteristics: ancestry, sex, age, weight, race, physical disability, appearance, sexualorientation	Disc based on age, weight, physcial disability, appearance assoc. w/ poor subjective health, >disease burden, < life satisfaction, >loneliness	Psychological, Biomarkers, Physical Health	Life Satisfaction, Loneliness, Blood Pressure, Diabetes, Cancer, Heart Condition, Stroke, Arthritis
Perceived weight discrimination and C-reactive protein	Sutin	2014	Everyday discrimination, attributable to personal characteristics	Characteristics: weight, ancestry, sex, age, race, physical disability, other physical aspects, sexual orientation	9.4% reported disc bc of weight; CRP and weight disc assoc. mediated by BMI; overweight/obese weight disc assoc. w/ higher circulating CRP until BMI=31	Biomarkers	C-Reactive Protein, BMI
Perceived Sex Discrimination Amplifies the Effect of Antagonism on Cigarette Smoking	Sutin	2014	Everyday disc; reasons for disc	"How often do you experience discrimination based on your gender?" The response scale ranged from 1 (not at all) to 4 (a lot); everyday (1-6 score)	Among women who perceived sex disc, every standard deviation increase in antagonism was assoc. w/ 2.5x >risk of smoking	Health Behaviors	Smoking
Perceived Weight Discrimination and Obesity	Sutin	2013	Everyday discrimination, attributable to personal characteristics	Characteristics: weight, ancestry, sex, age, race, physical disability, other physical aspects, sexual orientation	8% pts reported weight disc; Weight disc pts 2.5x more likely to become obese by follow-up; pts obese at baseline 3x to remain obese at follow-up	Biomarkers	BMI
Discrimination and health: A longitudinal study	Xu	2010	Everyday discrimination, major experiences of lifetime discrimnation	Everyday: (a) "You are treated with less courtesy or respect than other people;" (b) "You receive poorer service than other people at restaurants or stores;" (c) "People act as if they think you are not smart;" (d) "People act as if they are afraid of you;" and (e) "You are threatened or harassed." (1-6 score); Major lifetime disc: (a) "Have you ever been unfairly dismissed from a job?" (b) "For unfair reasons, have you ever not been hired for a job?" (c) "Have you ever been unfairly denied a promotion?" (d) "Have you ever been unfairly prevented from moving into a neighborhood because the landlord or a realtor refused to sell or rent you a house or apartment?" (e) "Have you ever been unfairly denied a bank loan?" and (f) "Have you ever been unfairly stopped, searched, questioned, physically threatened or abused by the police?"	Females have <odds of experiencing disc; high education levels more likely to report major disc events; >everyday disc related to poorer individuals' change in health; higher total household assets/total number of members experience <disc	Physical Health, Descriptive	Self-Rated Health, Gender

Health and Retirement Study - Domain: Loneliness & Social isolation

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Accelerated increase and decrease in subjective age as a function of changes in loneliness and objective social indicators over a four-year period: results from the health and retirement study	Ayalon	2015	Psychosocial q'naire items: # of social relationships, freq of social contact (social network); R-UCLA	Social relationships (0-4 range), freq (1-6), loneliness (1-3)	Decrease in loneliness over 2 waves led to accelerated decrease in subjective age	Physical Health	Age Perception
Associations of loneliness in older married men and women	Ayalon	2013	Self-reported psychosocial questionnaire R-UCLA	Loneliness (score 1-3 for lack companionship, left out, isolated; range 1-9)	Subjective appraisals of the relationship with spouse play major role in one's sense of loneliness; loneliness has reciprocal assoc. w/ marital relationship	Psychological	Subjective Appraisals of Marital Relations
Loneliness as a Specific Risk Factor for Depressive Symptoms: Cross-sectional and longitudinal analyses	Cacioppo	2006	3-item scale for loneliness; R-UCLA questionnaire	Loneliness (score 1-3 for lack companionship, left out, isolated; range 1-9); R-UCLA (20 items, range 1-4)	Loneliness assoc. w/ more depressive symptoms, marital status, social support, hostility, perceived stress	Psychological	Depression
Association of Alcohol Use and Loneliness Frequency Among Middle-Aged and Older Adult Drinkers	Canham	2015	R-UCLA, 2008 Psychosocial and Lifestyle Questionnaire	11 items, range 1-3	Loneliness assoc. w/ reduced alcohol consumption frequency	Health Behaviors	Alcohol Consumption
Social support, social strain, loneliness, and well-being among older adults: An analysis of the Health and Retirement Study	Chen	2014	R-UCLA loneliness scale (V3)	Range (1-3)	Support from spouse/partner and friends reduced loneliness, strain from s/p, friends, children, fam increased loneliness	Psychological, Physical Health	Life Satisfaction, Self-reported Health Status
Longitudinal study of loneliness and depression as predictors of health in mid- to later life, United States	Chlipala	2008	HRS Module 6: Loneliness, Stress, and Social Support/Social Burden; R-UCLA	20 items: 4 items relating to loneliness, 4 items relating to stress, 6 items relating to social support, and 6 items relating to social burden, range 1-3	Loneliness correlates w/ depression	Psychological	Depression
Loneliness, eudaimonia, and the human conserved transcriptional response to adversity (CTRA)	Cole	2015	R-UCLA, 2008 Psychosocial and Lifestyle Questionnaire	"Lack companionship," "left out", and "isolated from others.", range 1-3	CTRA gene expression to be up-regulated in association with loneliness	Psychological, Biomarkers, Physical Health	Eudaimonia, PAX gene (CTRA), Chronic Illness
The effects of loneliness and social isolation on hypertension in later life: Including risk, diagnosis and management of the chronic condition	Coyle	2014	R-UCLA, 2008 Psychosocial and Lifestyle Questionnaire	"Lack companionship," "left out", and "isolated from others.", range 1-3	Social isolation increases the odds of having hypertension among both men and women; undiagnosed or uncontrolled high BP among women	Biomarkers	Blood Pressure
Social isolation, loneliness and health among older adults	Coyle	2012	Social Isolation was measured using a 10-item scale (social network); R-UCLA Loneliness Scale	SI scale (nymeric count of social ties, freq of contact, participation in social activites; "Lack companionship," "left out", and "isolated from others.", range 1-3	Loneliness and social isolation were not highly correlated with one another; Loneliness assoc. w/ mental health problems, SI related to reporting health as poor/fair	Physical Health, Psychological	Self-Reported Health (+mental health)

Health and Retirement Study - Domain: Loneliness & Social isolation

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Loneliness as a public health issue: the impact of loneliness on health care utilization among older adults	Gerst-Emerson	2015	3-item loneliness scale developed by Hughes et al. (R-UCLA)	The LB questionnaire:how much of the time they felt that they (1) lacked companionship, (2) felt left out, (3) felt isolated from others; range 1-3	Chronic loneliness related to physician visits	Physical Health	Physician Visits
Loneliness Matters: A Theoretical and Empirical Review of Consequences and Mechanisms	Hawkley	2010	R-UCLA Loneliness Scale	"I feel isolated," "There are people I can talk to," and "I feel part of a group of friends."	All-cause mortality over a 4-year follow-up is predicted by loneliness, the effect = greater in chronically than situationally lonely adults	Physical Health	Mortality (All-Cause)
A Short Scale for Measuring Loneliness in Large Surveys: Results from Two Population-Based Studies	Hughes	2004	R-UCLA loneliness scale	20 items (see below image); "I feel isolated," "There are people I can talk to," and "I feel part of a group of friends."	Loneliness and social isolation are modestly related w/ distinct qual and quant aspects	Descriptive	
Loneliness, health, and mortality in old age: A national longitudinal study	Luo	2012	R-UCLA loneliness scale	20 items; "isolated," "people I can talk to," and "feel part of a group of friends."	Loneliness assoc. w/ increased mortality risk over 6yr period; loneliness both affected and was affected by depressive symptoms and functional limitations over time	Physical Health, Psychological	Mortality, Depressive Symptoms
Self- and other-oriented potential lifetime traumatic events as predictors of loneliness in the second half of life	Palgi	2012	R-UCLA loneliness scale	How often do you feel: 'You lack companionship?'; 'Left out?'; 'Isolated from others?'), reversed coded on a three-point scale: 1 (often), 2 (some of the time), 3 (hardly ever or never)	PLTE is positively related to loneliness; number of PLTE occurred until adulthood = strongest predictor of loneliness in second half of life	Psychological	Potential Lifetime Traumatic Events
Loneliness in older persons: a predictor of functional decline and death	Perissinotto	2012	R-UCLA loneliness scale	'You lack companionship?'; 'Left out?'; 'Isolated from others?'	Lonely subjects were more likely to experience decline in activities in daily living (ADL), mobility; more difficulty w/ tasks, climbing	Physical Health	Activities in Daily Living
Situational versus chronic loneliness as risk factors for all-cause mortality	Shiovitz-Ezra	2010	Center for Epidemiologic Studies Depression Scale (CES-D) -- took 1 item	"They felt lonely much of the time over the past week" (yes/no)	Situational loneliness had greater risk for all cause mortality;"chronically lonely" had a slightly greater mortality risk than situational	Physical Health	Mortality (All-Cause)
Use of Direct Versus Indirect Approaches to Measure Loneliness in Later Life	Shiovitz-Ezra	2012	R-UCLA (indirect); Center for Epidemiologic Studies Depression Scale (direct)	>5 score = lonely in R-UCLA	57% reported loneliness in direct of which none considered lonely in indirect	Descriptive	
Predictors of Loneliness in U.S. Adults Over Age Sixty-Five	Theeke	2009	Center for Epidemiologic Studies Depression Scale (CES-D) -- took 1 item	Never lonely (not lonely at time one or time two): Scores of 0 = 0.; Briefly lonely (lonely at time one or time two): Scores of 1 or 2 = 1.; Chronically lonely (lonely at both times one and time two): Scores of 3 = 2.	19.3% lonely; marital status, self-report of health, number of chronic illnesses, gross motor impairment, fine motor impairment, and living alone were predictors of loneliness	Physical Health, Descriptive	Self-reported Health, Chronic Illness, Marital Status
Sociodemographic and Health-Related Risks for Loneliness and Outcome Differences	Theeke	2007	Center for Epidemiologic Studies Depression Scale (CES-D) -- took 1 item	Never lonely (not lonely at time one or time two): Scores of 0 = 0. Briefly lonely (lonely at time one or time two): Scores of 1 or 2 = 1 Chronically lonely (lonely at both times one and time two): Scores of 3 = 2.	Non-marital status primary predictor of loneliness, followed by self-report health status, lower educational level, functional impairment, increasing number of chronic illnesses, younger age, lower income, and less people living in the household	Economic, Descriptive, Physical Health	Household Income, Marital Status, Education, Age, Gender, Chronic Illness, Functional Impairment
Sociodemographic and health-related risks for loneliness and outcome differences by loneliness status in a sample of U.S. older adults	Theeke	2010	Center for Epidemiologic Studies Depression Scale (CES-D) -- took 1 item	Never lonely (not lonely at time one or time two): Scores of 0 = 0. Briefly lonely (lonely at time one or time two): Scores of 1 or 2 = 1 Chronically lonely (lonely at both times one and time two): Scores of 3 = 2.	Non-married status = primary predictor of self-report loneliness; poorer health status, < educational level, functional impairment, > # of chronic illnesses, younger age, < income, < people living in the household. Chronically lonely reported less exercise, more tobacco use, < alcohol use, > increase in number of chronic illnesses, > depression scores, > physician contacts and > average number of nights in a nursing home than those who were never lonely or briefly lonely.	Descriptive, Physical Health, Health Behaviors, Psychological	Age, Gender, Marital Status, Education, Chronic Illness, Functional Impairment, Self-Reported Health, Alcohol Use, Tobacco Use, Clinic Visits, Depression

Health and Retirement Study - Domain: Work strain/stress & Dissatisfaction

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Job strain and trajectories of change in episodic memory before and after retirement: results from the Health and Retirement Study	Andel	2015	Job demands was computed by averaging items required level of selective attention, required ability to shift back and forth between two or more tasks, consequence of error, importance of being exact or accurate. Job control subfactors decision authority (average of independence, freedom to make decisions, frequency of decision-making, impact of decisions on co-workers or company results) and skill discretion (achievement) were summed to create an overall job control factor.	0-100 scale; Karasek &Theorell demands/control model	< job control, > job strian associated with sig poorer episodic memory at retirement & accelerated rate of decline in epis. Memory after retirement	Cog function	Episodic Memory (free-recall)
The Impact of Job Stress on Smoking and Quitting: Evidence from the HRS	Ayyagari	2010	Dichotomous stress variable (strongly agree, 0)	"My job involves a lot of stress"; range 1-4	Job stress positively assoc. w/ continuing to smoke among recent smokers	Health Behaviors	Smoking
Worker Adaptation and Employer Accommodations Following the Onset of a Health Impairment	Daly	1996	Job demands	(1) job is physically demanding, i.e., requires physical effort, lifting heavy loads, or stooping, kneeling, or crouching; (2) job is mentally demanding, i.e., requires intense concentration or good eyesight; (3) job requires one to keep a pace set by others; (4) job requires interaction with people.	Employees who do not receive direct accomodation for health limitation often adapt by altering job demands or by changing jobs	Economic	ADA Disability
Mental Work Demands, Retirement, and Longitudinal Trajectories of Cognitive Functioning	Fisher	2014	Job demands: measured using 10 items from Occupational Information Network (O*NET) database (work activities, the level of various mental processes required by one's job)	Assessed work activities such as analyzing data or information, developing objectives and strategies, making decisions and solving problems, evaluating information, and thinking creatively; range 1-7 (behaviorally anchored rating scale)	Working in occupation characterized by higher levels of mental demands associated w/ higher levels of cognitive functioning before retirement, & slower rate of cognitive decline after retirement	Cog function	Cognitive Functioning (Episodic Memory, Mental Status)
The Relationship Between Job Characteristics and Retirement	Hurd	1993	Physical and mental requirements, job flexibility	F82: a. '(My job requires) lots of physical effort. (PHYSICAL) b... lifting heavy loads. (LIFTING) c... stooping, kneeling, or crouching. (BENDING) d... good eyesight. (EYES) e... intense concentration or attention. (ATTENTION) f... skill in dealing with other people. (PEOPLE) g... me to work with computers. (COMPUTERS) h... me to analyze data or information. (DATA) j... me to keep up with the pace of others. (PACE) k... me to do the same things over and over. (REPETITtON) m... that I learn new things. (LEARN) n. I have a lot of freedom to decide how I do my own work, (FREEDOM) p. The people I work with are helpful and friendly.' (COWORKERS) F83: b. My job requires me to do more difficult things than it used to. (DIFFICULT) c. My job requires a very good memory. (MEMORY) d. My job involves a lot of sutss. (STRESS)	Physical/mental job demands have a relatively low influence on prospective retirement; job flexibility and financial aspects are >important	Economic	Retirement Plans
Trends in Job Demands Among Older Workers, 1992-2002	Johnson	2004	Job requirements survey	How often jobs require "lots" of physical effort, lifting heavy loads; stooping, kneeling, or crouching; good eyesight; intense concentration or attention; skill in dealing with other people; and work with computers (range 1-4/all-none); whether agree that job requires them "to do more difficult things than it used to" and that it "involves a lot of stress." (range 1-4/agree-disagree)	Reductions in job demands mean workers are able to delay retirement and work till later age than in the past; now more non-physical demands like intense concentration	Economic	Retirement Plans
The Role of Job-Related Rewards in Retirement Planning	Kosloski	2001	Effort-reward imbalance, demand-control; social relationships assessment; self-expression/ ascendance assessment	"Even if I didn't need the money, I would probably keep on working." (range 1-4); "Do you think of work as important mainly because of the money, or of money as less important than the work itself?" (range 1-3/money-work); (a) "The people I work with are helpful and friendly," (b) "In decisions about promotion, my employer gives younger people preference over older people," and (c) "My coworkers make older workers feel that they ought to retire before age 65." (range 1-4); (a) "My job requires skill in dealing with other people," (b) "My job requires me to keep up with the pace set by others," and (c) "My job requires that I learn new things." (range 1-4)	Jobs high in ascendance related to increased retirement planning; high intrinsice rewards, positive social relations related to less planning	Economic, Descriptive, Physical Health	Retirement Plans, Social Relationships, Age, Gender, Marital Status, Race, Self-Reported Health

Health and Retirement Study - Domain: Work strain/stress & Dissatisfaction

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Work stress and depressive symptoms in older employees: Impact of national labour and social policies	Lunau	2013	Effort-reward imbalance, demand-control	Effort: "my job is physically demanding", "I am under constant time pressure due to a heavy workload"; Reward: "I receive the recognition I deserve for my work", "considering all my efforts and achievements, my salary/earnings is/are adequate", "my job promotion prospects/prospects for job advancement are poor", "my job security is poor", "I receive adequate support in difficult situations"; Low control: "I have very little freedom to decide how I do my work", "I have an opportunity to develop new skills"; range (1-4)	Risk of depressive symptoms higher among those with ER imbalance and low work control	Psychological	Depressive Symptoms
Individual and Work Factors Related to Perceived Work Ability and Labor Force Outcomes	McGonagle	2015	Psychosocial Work-satisfaction Questionnaire using items from Karasek's job demand scale; O*NET	"I have too much work to do everything well" (role overload), "In my work I am free from conflicting demands that others make" (reversed; role conflict), "I am under constant time pressure due to a heavy workload" (time pressure), and "My work is physically demanding" (physical demands) (range 1-4); 23 items on O*NET; "I have a lot to say about what happens on my job."(range 1-4); 3 items for coworker support e.g. s "My coworkers listen to me when I need to talk about work-related problems." (range 1-4); 4 items for supervisor support e.g. "My supervisor is helpful to me in getting the job done." (range 1-4)	Job demands related to work ability perceptions, not associated consistently with health and sense of control	Psychological, Physical Health, Economic	Sense of Control, Positive Affectivity, Conscientioussness, Emotional Stability, Health Status, Retirement
A Research Note on the Relationship Between Long Working Hours and Weight Gain for Older Workers in the United States	Mercan	2014	ONLY USED WORK HOURS	n/a	Older workers who work >59hr/wk are more likely to gain wait than those who work <59hrs/wk	Biomarkers, Health Behaviors, Physical Health, Descriptive	BMI, Smoking, Alcohol Consumption, Self-reported Health, Mortality, Gender, Race
Job Strain, Workplace Discrimination, and Hypertension Among Older Workers: The Health and Retirement Study	Mezuk	2011	Occupational stress & satisfaction using 15-item Karasek job demand scale (Psychosocial Work-satisfaction Questionnaire)	Job stress (6 items-job effort and degree of control over workflow,), job satisfaction (9 items-opportunities for promotion and recognition for achievements); range (1-4)	High job strain was associated with lower likelihood of hypertension among whites	Biomarkers	Blood Pressure
Job Strain, Depressive Symptoms, and Drinking Behavior Among Older Adults: Results From the Health and Retirement Study	Mezuk	2011	Psychosocial Work-satisfaction Questionnaire using 15-item index from Karasek's job strain scale	E.g. "I receive the recognition I deserve for my work"; "I have very little freedom to decide how I do my work"; job stress (6 items), job satisfaction (9 items); range 1-4	High job strain assoc. w/ elevated depressive symptoms; job strain unrelated to moderate/heavy drinking	Psychological	Depressive Symptoms
Lifetime Job Demands, Work Capacity at Older Ages, and Social Security Benefit Claiming Decisions	Nicholas	2014	Occupational info network (O*NET); work-life balance questionnaire	Non-Routine Cognitive Analytical: analyze data, creative thinking, interpreting information; Non-Routine Cognitive Interpersonal: develop relationships, guide and coach others; Routine Cognitive Analytical: repeat physical or mental activities, importance of accuracy, structured job; Routine Manual: pace determined by machinery, operating machines other than vehicles or computers, repetitive motions; Non-Routine Manual: maneuvering/driving vehicles or equipment, use hands, manual dexterity, spatial orientation	Non-routine cognitive analytic and physical demands assoc. w/ worse health, earlier labor force exit and > use of social sec disability insurance	Economic	Social Security Disability Insurance
Job Characteristics and the Psychological Well-being of Older Workers	Shattuck	2007	Psychosocial Work-satisfaction Questionnaire using 15-item index from Karasek's job demand scale	job flexibility, job stress, and the workplace climate's friendliness to older workers	Job flexibility, stress and workplace climate's friendliness to older workers assoc. w/ depressive symptoms in 62-73yo; move to <demanding jobs showed decreases in dep. Symptoms	Psychological	Depressive Symptoms
Depressive symptoms and psychosocial stress at work among older employees in three continents	Siegrist	2012	ERI, demand/control scale	ERI (2 measuring 'effort', and 5 assessing 'reward' at work were included); demand/control (2 Likert items)	Psychosocial work stress is risk factor for depressive symptoms in older employees	Psychological	Depressive Symptoms
Job Characteristics and Leisure Physical Activity	Wu	2000	Standard Occupation Classification Manual - Job's physical requirements, Level of stress associated w/ job	"My job requires lots of physical effort", "My job involves a lot of stress"; range (1-4/disagree-agree)	Blue collar workers engage in more vigorous physical exercise that white collar workers with the same physically demanding job level	Health Behaviors	Physical Activity

Health and Retirement Study - Domain: Social Support, social strain and unsupportive relationships

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Activities of daily living, social support, and future health of older Americans	Bozo	2010	Psychosocial questionnaire (positive/ negative social support)	5 items: spousal support (3 items: pt's degree of satisfaction w/ time they spend together w/ spouse, amount of time they spend w/ each other in free time, how important their marriage is for them), family support (pt's degree of satisfaction w/ their family life), friend support ((pt's degree of satisfaction w/ their friendships)	Activities of daily life protected against future illness; if recipient is in need of support and depending on the support source, older adults may/may not benefit from support	Physical Health	Activities of Daily Living, chronic illness (Diabetes, Cancer, Hypertension, Lung Disease, Heart Condition, Stroke, Arthritis)
Acculturation and depression in older Mexican American adults: The role of social support	Caballero	2012	Psychosocial questionnaire (positive/ negative social support)	Quality of support and amount of contact with people of 4 different social ties: participant's spouse/partner, children, family, and friends; 3 positively worded items and 4 negatively worded items, range 1-4/lot-not at all; how often each participant either met, spoke on the phone, or emailed with their children, family, and friends; spouse/partner social tie, participants were instead asked about closeness rather than amount of contact since it would be assumed that the participant and their spouse/partner live together; overall network size, and overall social support		Psychological	Depression
Social Supports as Enabling Factors in Nursing Home Admissions: Rural, Suburban, and Urban Differences	Cohen	2015	Enabling factors assessment	Proximity/co-residential status of children: co-residential children (respondent lives with at least 1 child), live close (at least 1 child w/in 10 mi), far (at least 1 child but 0 w/in 10 mi), and 0 living children; no good friends nearby; infrequent visits with neighbors (<1x per month)	Rural elders report greater social support than non-rural	Descriptive	Location of Residence
Comparative Models of the Impact of Social Support on Psychological Distress in Cancer Patients, United States	Forjaz	2000	Satisfaction level with neighborhood, marriage, friendships, and family life; enjoyability of time spent with spouse+D3	Marital status, number of children living with participant, frequency of contact with children away from home, presence of relatives and good friends in neighborhood, freq of contact with neighborhood friends & relatives, number of hours of volunteer work	Perception/degree of satisfaction of social support has overall beneficial effect on individuals independent of their level of stress	Psychological, Physical Health	Stress, Subjective Appraisal, Cancer
The Effects of Positive and Negative Support From Children on Widowed Older Adults' Psychological Adjustment: A Longitudinal Analysis,	Ha	2010	Psychosocial questionnaire (positive/ negative social support)	Positive: "How much do your children make you feel loved and cared for?" and "How much are they willing to listen when you need to talk about your worries or problems?"; Negative: "How much do you feel they make too many demands on you?" and "How much are they critical of you or what you do?" (range 1-5)	> positive support from children 6m after widowhood assoc. w/ < depressive symptoms 18m FU; >negative support assoc. w/ >anxiety & >anger	Psychological	Depressive Symptoms, Anxiety, Anger
Reciprocal Effects Between Health and Social Support in Older Adults Relationships With Their Children and Friends	Ha	2015	Psychosocial questionnaire (positive/ negative social support), frequency of social contact	Freq of contact: ''On average, how often do you "meet", "speak on the phone", "exchange letters or email with any of your [children, friends]?'' range (1-6); Positive: ''How much do they really understand the way you feel about things?'', ''How much can you rely on them if you have a serious problem?'', ''How much can you open up to them if you need to talk about your worries?'' range (1-4); ''How often do they make too many demands on you?'', ''How much do they criticize you?'', ''How much do they let you down when you are counting on them?'', ''How much do they get on your nerves?'' range (1-4)	Older adults' poor health assoc. w/ < contact and < positive interactions w/ friends & w/ > negative interactions with their adult children/friends	Physical Health	Self-Reported health

Health and Retirement Study - Domain: Social Support, social strain and unsupportive relationships

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Illness-related diabetes social support and glycemic control among middle aged and older adults	Mondesir	2013	Diabetes Care Profile (2003 HRS Diabetes study)	"How much would you agree that you can count on your family or friends to help and support you a lot with each particular diabetic care" for 8 conditions: 1) following meal plan; 2) taking medicine; 3) taking care of feet; 4) getting enough physical activity; 5) testing sugar; 6) going to the doctor/ nurse; 7) keeping weight under control; and 8) handling feeling about diabetes?'' (range 1-5)	Illness-related diabetes social support & glycemic control are related in females	Physical Health, Biomarkers	Diabetes, Glycemic Control
Functional declines, social support, and mental health in the elderly: Does living in a state supportive of home and community-based services make a difference?	Muramatsu	2010	Non-spouse support availability	"Are you receiving instrumental support from non-spouse family or friends?", and if not, "Suppose in the future, you needed help with basic personal care activities like eating or dressing. Do you have relatives or friends [besides your (husband/wife/partner)] who would be willing and able to help you over a long period of time?"	Living in state supporting home/community-based services for seniors w/ disabilities, have lower depression, esp those without informal support	Psychological	Depression
Direct Social Support and Long-term Health Among Middle-Aged and Older Adults With Type 2 Diabetes Mellitus	Nicklett	2013	Diabetes Care Profile (2003 HRS Diabetes study)	"I can count on my family or friends to help and support me a lot with… [regimen component]." The regimen included following a recommended eating plan, taking medicine, checking feet regularly for wounds/sores, engaging in regular physical activity, testing blood sugar, health care providers, and keeping one's weight under control, range (1-5)	> direct social support assoc. w/ improved health outcomes over time, taking medicines, going to health care providers	Physical Health, Biomarkers	Diabetes, Glycemic Control
Association between Cognitive Function and Social Support with Glycemic Control in Adults with Diabetes Mellitus	Okura	2009	Diabetes Care Profile (2003 HRS Diabetes study)	"How much would you agree that you can count on your family or friends to help and support you a lot with each particular diabetic care (following meal plan, taking medicine, taking care of feet, getting enough physical activity, testing sugar, going to the doctor or nurse, keeping weight under control, and handling feeling about diabetes)?", range (1-5)	> levels of social support for diabetes care ameliorated negative relationship between cognitive impairment and worse glycemic control	Physical Health, Biomarkers, Psychological	Diabetes, Glycemic Control, Cognitive Function
Three essays on socioeconomic status, social support, and the Health and Retirement Study	Sullivan	2011	Traumatic events, including social support	Widowhood	Becoming widowed is assoc. w/ 50% increase in mortality risk	Physical Health	Mortality
The gender gap in depressive symptoms among elders in the United States and Japan: Social support, coresidence and somatic health as mediating factors, United States	Tiedt	2011	Psychosocial questionnaire (positive/ negative social support), freq of social contact	"How much understands your feelings, reliable, open up to them, criticize, let you down, get on your nerves"	Household relationships were more prominent as predictors of depressive symptoms in Japan than the United States	Psychological	Depressive Symptoms
Sense of Control and Self-Reported Health in a Population-Based Sample of Older Americans: Assessment of Potential Confounding by Affect, Personality, and Social Support	Ward	2013	Psychosocial questionnaire (positive/ negative social support)	Questions: how much people around you understood your feelings? Could be relied upon to help with serious problems? Could be confided in? -- spouse, children, other family, friends	Social support did not alter the strength of the relationship between high personal mastery and < likelihood of reporting fair/poor health	Physical Health, Psychological	Self-Reported health, Actvities of daily living, Personal Mastery, Perceived Constraints, Affect

Health and Retirement Study - Domain: Environmental/Neighborhood disorder, lack of cohesion

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Neighborhood physical disorder, social cohesion, and insomnia: results from participants over age 50 in the Health and Retirement Study	Chen	2014	Psychosocial & Lifestyle questionnaire neighborhood physical disorder	Rate the extent of neighborhood physical disorder (four items: vandalism/graffiti, rubbish, vacant/deserted houses, and perceived safety walking alone at night) and social cohesion (four items: feeling part of the area, trusting people, friendliness of people, and the availability of help if in trouble) within a distance of about 1 mile, or a 20-minute walk, from one's home; response range (1-7)	Neighborhood-level factors of physical disorder & social cohesion assoc. w/ insomnia symptoms	Health Behaviors, Descriptive	Sleep, Age, Gender, Race, Education
Neighborhood Conditions and Gender Differences in Depressive Symptoms	Clinton	2012	Perceived neighborhood physical disorder (adapted from English Longitudinal Study of Aging ELSA)	Extent to which agreed that a) vandalism and graffiti are a big problem in this area, b) people would be afraid to walk alone in this area after dark, c) this area is always full of rubbish and litter, d) there are many vacant or deserted houses or storefronts in this area; response range (1-7)	Neighborhood proportion non-family households assoc. w/ fewer depressive symptoms among women; no effect in men; vacant housing assoc. w/ more dep. Symptoms - greater effect among women	Psychological	Depressive Symptoms
Neighborhoods and Chronic Disease Onset in Later Life	Freedman	2011	2 scales for economic environment (economic advantage, disadvantage), 3 scales for social environment (immigration concentration, crime & segregation, residential stability), 3 scales for built environment (connectivity, air pollution, density)	Economic disadvantage scale: % of the total population in poverty; % of the population aged 65 years or older in poverty; % of households receiving public assistance income; unemployment rate among persons 16yr+; % of housing units without a vehicle; % of the population that was Black; immigration conc scale: % of tract that was Hispanic, foreign-born, limited English skills, Hispanic isolation scale; Residential stability (% in 2000 living in same house since at least 1995; median yrs of residence)	Neighborhood economic environment assoc. w/ heart disease onset for women; neighborhood-level social stressors assoc. w/ cancer onset for men & women	Physical Health	Heart Disease, Cancer, Stroke, Arthritis
Neighborhoods and Obesity in Later Life	Grafova	2008	2 scales for economic environment (economic advantage, disadvantage), 3 scales for social environment (immigration concentration, crime & segregation, residential stability), 3 scales for built environment (connectivity, air pollution, density)	Economic disadvantage scale: % of the total population in poverty; % of the population aged 65 years or older in poverty; % of households receiving public assistance income; unemployment rate among persons 16yr+; % of housing units without a vehicle; % of the population that was Black; immigration conc scale: % of tract that was Hispanic, foreign-born, limited English skills, Hispanic isolation scale; Residential stability (% in 2000 living in same house since at least 1995; median yrs of residence)	Economic and social environment aspects of neighborhood environ important for men; built environment aspects is salient for women	Biomarkers	BMI
Perceived neighbourhood social cohesion and myocardial infarction	Kim	2014	Perceived social cohesion, perceived social trust of the respondent's neighbourhood	"I really feel part of this area", "If you were in trouble, there are lots of people in this area who would help you", "Most people in this area can be trusted", "Most people in this area are friendly"; response range (1-7)	> perceived neighbourhood social cohesion may protect against myocardial infarction	Physical Health	Myocardial Infarction
Perceived neighborhood social cohesion and stroke	Kim	2013	Perceived social cohesion, perceived social trust of the respondent's neighborhood	"I really feel part of this area", "Most people in this area can be trusted", "If you were in trouble, there are lots of people in this area who would help you", "Most people in this area are friendly."; response range (1-7)	Higher neighborhood social cohesion assoc. w/ lower stroke risk	Physical Health	Stroke
Does Neighborhood Disorder Predict Recovery From Mobility Limitation? Findings From the Health and Retirement Study	Latham	2015	Neighborhood physical disorder assessed	4 indicators: (a) vandalism/graffiti, (b) rubbish/litter, (c) vacant/deserted homes, and (d) crime; 7-point Likert-type scale, respondents were asked to rate their perceptions of their local area (w/in 20min walk or 1mi)	Increased neighborhood disorder assoc. w/ lower odds of recovery	Physical Health, Health Behaviors, Psychological	Functional Limitations, Physical Activity, Depressive Symptoms
The Role of Neighborhood Safety in Recovery From Mobility Limitations: Findings From a National Sample of Older Americans (1996–2008)	Latham	2013	Perceived neighborhood safety	"Would you say the safety of your neighborhood is excellent, very good, good, fair or poor?"; response range (1-5/poor-excellent)	Perceived neighborhood safety is robust predictor of mobility limitation recovery	Physical Health	Functional Limitations
How Safe is Your Neighborhood? Perceived Neighborhood Safety and Functional Decline in Older Adults	Sun	2011	Perceived neighborhood safety	"Would you say the safety of your neighborhood is excellent, very good, good, fair, or poor?"; response range (1-5/poor-excellent)	Perceived neighborhood safety assoc. w/ functional decline	Physical Health	Functional Limitations, Death, Activities of Daily Living
Neighborhood Safety, Socioeconomic Status, and Physical Activity in Older Adults	Tucker-Seeley	2009	Perceived neighborhood safety	"Would you say the safety of your neighborhood is excellent, very good, good, fair, or poor?"; response range (1-5/poor-excellent)	Those who perceived their neighborhood as safe had an 8% higher mean rate of leisure-time physical activity compared to older adults who perceived their neighborhood as unsafe	Health Behaviors	Physical Activity

Health and Retirement Study - Domain: Chronic Stressors & Caregiving

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
The impact of family and non-family roles on caregiver health over time	Matzek	2011	"Did you spend a total of 50 or more hours in the past 12 months helping your parent(s)/ stepparent(s) with basic personal activities like dressing, eating, and bathing?" (1994 wave); "Did you spend a total of 100 or more hours since the previous interview/in the last two years helping your parent(s)/ stepparent(s) with basic personal activities like dressing, eating, and bathing?" (1996-2006 waves); CESD	Yes for at least one time point = included in sample;9 items	Caregivers report worse subjective physical health - BP, diabetes, lung disease, stroke, higher depressive symptoms	Biomarkers, Physical health, Psychological	Blood pressure, stroke, lung disease, diabetes, self-reported health status, depressive symptoms
Partner Caregiving in Older Cohabiting Couples	Noel-Miller	2011	# of days in the month preceding interview during which they received help from each caregiver & the approximate # of daily hours of assistance	Spouse/partner's relative care hours = [souse/partner care hours/total care hours)-(nonspouse/partner care/total care hours) x 100 (Sorenson 1987)	Cohabitors = less likely to receive partner care than married individuals	Descriptive	Marital/living status
Extent and Cost of Informal Caregiving for Older Americans With Symptoms of Depression	Langa	2004	Weekly hours and imputed costs of informal caregiving for elderly people; CESD	9 items	44% of pts reported 1-3 depressive symptoms	Psychological	Depressive symptoms
Depressive Symptoms of Caregiving Women in Midlife: The Role of Physical Health	Killian	2008	" spent 100 hours or more providing assistance to an older parent or parent-in-law for basic personal needs, such as dressing, eating, or bathing", Perceived health, CESD	Yes/no; 9 items	Providing assistance was realted to depressive symptoms	Psychological	Depressive symptoms
Cost of informal caregiving associated with stroke among the elderly in the United States	Heesoo	2014	9-item caregiving survey	Yes/no	Stroke risk attributable to weekly caregiving hours = 8.5hrs	Physical Health	Stroke
Informal Caregiving and Body Mass Index Among Older Adults	Jenkins	2007	2000 HRS caregiving items	Yes/no; 9 items	Underweight assoc. w/ sig more informal care	Biomarkers	BMI
Does Becoming an ADL Spousal Caregiver Increase the Caregiver's Depressive Symptoms?	Dunkle	2014	9-item caregiving survey; CESD	Yes/no	Men/women who become spousal caregivers have more FU depressive symptoms than non-caregivers	Psychological	Depressive symptoms
Spousal caregiving and incident hypertension	Capistrant	2012	Freq of caregiving (hrs)	14+ hours of caregiving/wk = long term CG	Increased risk of hypertension onset following caregiving	Biomarkers	Blood pressure
Does Duration of Spousal Caregiving Affect Risk of Depression Onset? Evidence from the Health and Retirement Study	Capistrant	2013	ADL, spousal caregiving	14+ hours of caregiving/wk = long term CG	Caregiving assoc. w/ significant increase in risk of depression onset	Psychological	Depressive symptoms

Health and Retirement Study - Domain: Chronic Stressors & Caregiving

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Current and long-term spousal caregiving and onset of cardiovascular disease	Capistrant	2011	ADL, spousal caregiving	14+ hours of caregiving/wk = long term CG	Caregiving sig predicted CVD incidence	Physical Health	CVD
Does Caregiving Increase Poverty among Women in Later Life? Evidence from the Health and Retirement Survey	Wakabayashi	2006	Helping parents with their personal needs (i.e., eating, dressing, and bathing) in the previous 12 months = number of weekly hours	# hours	Caregiving increases women's risks of living in households with income lower than poverty threshold	Economic	Household income
Chronic Diseases and Functional Limitations Among Older Construction Workers in the United States: A 10-Year Follow-up Study	Dong	2011	Ongoing chronic health conditions; CESD	# and how stressful	Construction workers w/ chronic disease experience worse physical health, functional limitations, and mental health than white collar workers w/ CD	Physical Health, Psychological	Self-report health, functional limitations, depressive symptoms
Distribution and Association of Chronic Disease and Mobility Difficulty accross Four Body Mass Index Categories of African-American Women	Clark	1997	Ongoing chronic stressors	# and how stressful	Chronic disease assoc. w/ higher BMI and worse mobility, smoking	Biomarkers, Health behaviors	BMI, smoking, alcohol consumption, physical activity
Measurement differences in depression: Chronic health-related and sociodemographic effects in older Americans	Yang	2008	Ongoing chronic stressors	# and how stressful	Chronic stressors (esp health) assoc. w/ higher levels of depressive symptoms (esp in Latinos)	Psychological	Depressive symptoms
Dyadic analyses of chronic conditions and distress within marriage : a gendered perspective	Thomeer	2014	Chronic conditions	# and how stressful	Perceived marital distress increases when spouse has chronic condition; exacerbated if both have chronic	Psychological	Perceived marital status
Factors Predicting the Perception of Positive Aging In the Presence of Chronic Stress	Ray-Mazumder	2013	Chronic stressors; sense of control, social support, loneliness, and optimism	# and how stressful	Low-moderate optimism more likely to predict aging as positive even in presence of chronic stress; resilient females have higher sense of control; resilient males have more social support, <lonely	Physical health, Psychological	Age-perception, social support, loneliness, optimism
Ongoing Cumulative Chronic Stressors as Predictors of Well-Being in the Second Half of Life	Palgi	2012	Ongoing cumulative chronic stressors (OCCS)	# and how stressful	Pt age & # of OCCS perceived as "very upsetting" = strong predictors of well-being	Physical Health, Psychological	Well-being
Are ongoing cumulative chronic stressors associated with optimism and pessimism in the second half of life?	Palgi	2013	Ongoing cumulative chronic stressors (OCCS), LOT-R for optimism	# and how stressful	Very upsetting OCCS assoc. w/ pessimism in midlife & young-old i.e. regulated by age	Psychological	Optimism
Health Behavior Change Following Chronic Illness in Middle and Later Life	Newsom	2011	Chronic health conditions; self-report	"Has a doctor ever told you that you had … " for: "a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems?"; "diabetes or high blood sugar?"; "cancer or a malignant tumor of any kind except skin cancer?"; "stroke?"; "chronic lung disease e.g. chronic bronchitis or emphysema?"	Smoking cessation (40% of smokers) following health condition	Health behaviors	Smoking, alcohol consumption, physical activity
Depression and the Onset of Chronic Illness in Older Adults: A 12-Year Prospective Study	Karakus		Chronic health conditions; CESD	# and how stressful	Working age elders (50-62) w/ depression at baseline more likely to develop chronic health conditions at 12yr FU	Psychological	Depressive symptoms
Functional limitations and chronic conditions predict CES-D-8 depression scores	Liu	2013	OCCS, ADL; CESD-8	# and how stressful	Large increase in depression scores if 1-3 limitations/ stressors	Psychological	Depressive symptoms
Do The Sick Retire Early? Chronic Illness, Asset Accumulation, and Early Retirement.	Wilcox-Gok	2007	OCCS	# and how stressful	Chronic illness --> fewer assets, retire later	Economic	Assets, retirement plans

Health and Retirement Study - Domain: Early Life Stress/Childhood Adversity

Article title	First author	Year	Stress Measurements	How are scales scored?	Main stress results	Outcome Category	Specific Outcomes
Associations of childhood adversity and adulthood trauma with C-reactive protein: A cross-sectional population-based study	Lin	2015	Childhood adversity, adult trauma	Child trauma: Krause (2004) items: having to do a year of school over again, having parents who drank or used drugs so often that it caused problems in the family, and being physically abused by a parent BEFORE age of 18yrs (sum of scores used); Adult trauma: Krause (2004) items: having had a child who died; having been in a major fire, flood, earthquake or natural disaster; having fired a weapon in combat or been fired upon in combat; ever having a spouse, partner, or child addicted to drugs or alcohol; having been a victim of a serious physical attack or assault; ever having a life-threatening illness or accident; and ever having a spouse or child experience a life-threatening illness or accident	Pts with childhood adversity were 3x more likely to experience trauma as an adult & had higher levels of hsCRP	Psychological, Biomarkers	Adult trauma, high-sensitivity C-Reactive Protein
Cumulative Childhood Adversity, Educational Attainment, and Active Life Expectancy Among U.S. Adults	Montez	2014	Childhood health, socioeconomic adversity indicator	Rate health while growing up, from birth to age 16, (excellent, very good, good, fair, or poor)	Adults from disadvantaged childhoods lived fewer years and spent greater time of life impaired than advantaged childhoods	Physical Health	Mortality, physical functioning
Lifespan adversity and later adulthood telomere length: Findings from the nationally representative U.S. Health and Retirement Study	Puterman	2016	Childhood adversity, adult trauma	Before the age of 18, pt's (1) family received help from relatives because of financial difficulties, (2) family ever had to relocate due to financial difficulties, (3) father ever lost his job during childhood, and (4) parents' substance or alcohol use caused problems in the home, and whether the respondent (5) ever experienced physical abuse before age 18, (6) had to repeat a year of school, and (7) got into trouble with police	Lifetime cumulative adversity predicts 6% > odds of shorter sTL, mainly due to childhood adversity	Biomarkers	Adult salivary telomere length

Appendix 3: Potential addition to HRS stress measures

Zarit Burden Scale for Family Caregivers (BSFC):
1. My life satisfaction has suffered because of the care.
2. I often feel physically exhausted.
3. From time to time I wish I could "run away" from the situation I am in.
4. Sometimes I don't really feel like "myself" as before.
5. Since I have been a caregiver my financial situation has decreased.
6. My health is affected by the care situation.
7. The care takes a lot of my own strength.
8. I feel torn between the demands of my environment (such as family) and the demands of the care.
9. I am worried about my future because of the care I give.
10. My relationships with other family members, relatives, friends and acquaintances are suffering as a result of the care.
Response scale: strongly agree, agree, disagree, strongly disagree

Caregiving exposure

1. Are you the primary caregiver for a member of your family or close friend who needs extra assistance (due to a disability, condition, illness, or old age)? We define a primary caregiver as the person who is primarily responsible for helping make medical care decisions, is emotionally invested in the person's care, and provides help such as transportation or meals.

2. Who is the family member you are caregiving for?

Options: Spouse/ partner, sibling, child, parent or elderly family member, other.

3. What is the nature of the primary illness that requires this person to need your care?

Options: Cancer, diabetes, heart disease, other chronic illness, physical disability or injury, mental disability or impairment, dementia, brain-related injury (e.g. tumor, stroke, traumatic brain injury), mental or psychiatric illness, or other.

4. For how long have you been caregiving?

Years ____ Months ____ (e.g. 1 year, 3 months. Note to programmer: 0 is an acceptable answer for number of years)

5. How many hours per week do you work at a paid job? If you do not have a job in addition to your role as caregiver, please write 0.

6. How many hours per week do you participate in caregiving-related activities?

Daily Inventory of Stressful Events (Almeida et al., 2002):

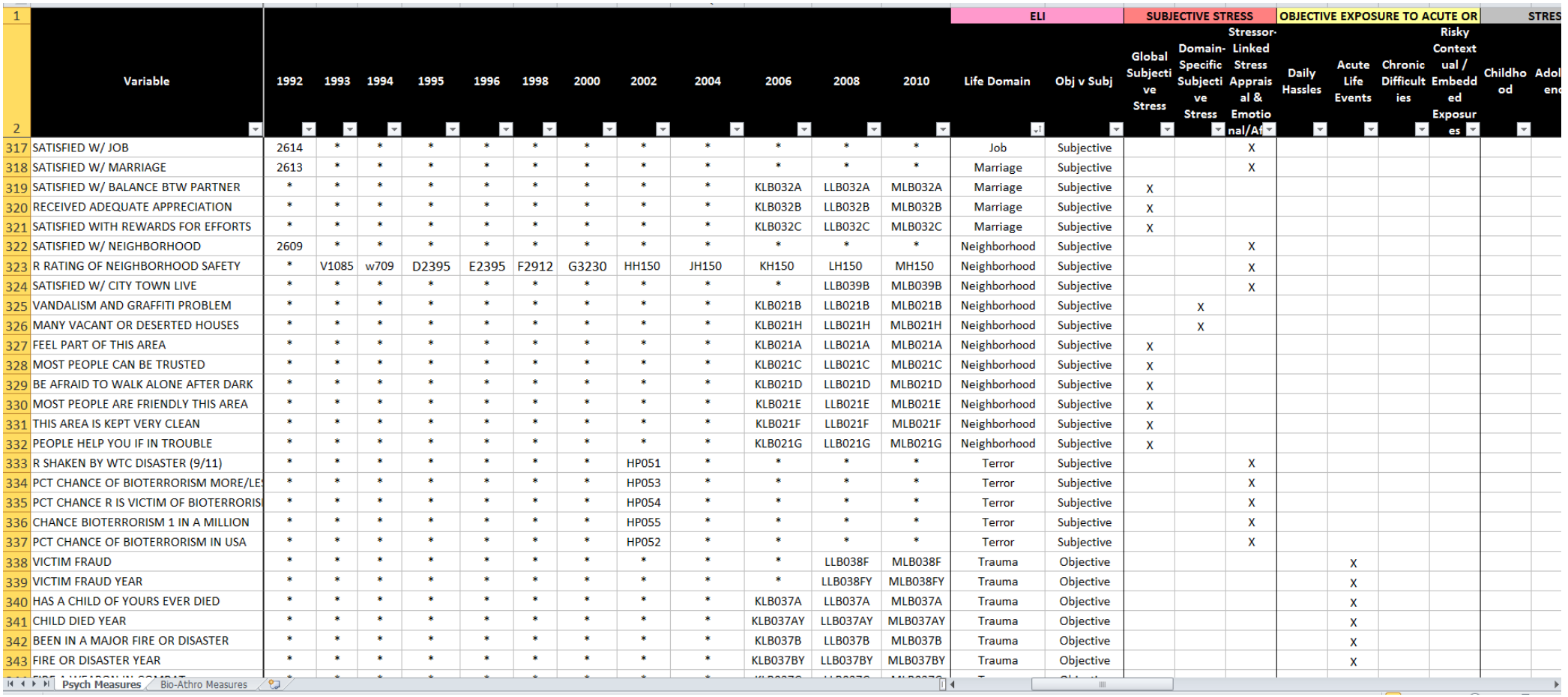
Stem Questions:
1. Did you have an argument or disagreement with anyone since this time yesterday? No Yes
2. Since (this time/we spoke) yesterday, did anything happen that you could have argued about but you decided to let pass in order to avoid a disagreement? No Yes
3. Since (this time/we spoke) yesterday, did anything happen at work or school (other than what you have already mentioned) that most people would consider stressful? No Yes
4. Since (this time/we spoke) yesterday, did anything happen at home (other than what you have already mentioned) that most people would consider stressful? No Yes
5. Many people experience discrimination on the basis of such things as race, sex, or age. Did anything like this happen to you since (this time/we spoke) yesterday? No Yes
6. Since (this time/we spoke) yesterday, did anything happen to a close friend or relative (other than what you have already mentioned) that turned out to be stressful for you? No Yes
7. Did anything else happen to you since (this time/we spoke) yesterday that most people would consider stressful? No Yes

Ask only if "yes" for following stem questions:
1. Think of the most stressful disagreement or argument you had since (this time/we spoke) yesterday. Who was that with? 1
2. Think of the most stressful incident of this sort. Who was the person you decided not to argue with? 2
3. What happened and why did you decide not to get into an argument about it? 2
4. Think of the most stressful incident of this sort. What was the basis for the discrimination you experienced—your race, sex, age, or something else? 5
5. Think of the most stressful incident of this sort. Who did this happen to? 6
6. How does this affect your job? 3
7. What kinds of things were said? 1, 2
8. When did that happen? Was that some time yesterday or today? All
9. What happened and what about it would most people consider stressful? All
10. Have you had any problems with this in the past? All
11. How long has this been going on? All
12. Does this happen often? All
13. Was there anything out of the ordinary in this? All

Appendix 4: Data matrix of HRS stress measures by Stress Typology categories

With support from the NIA, the Stress Measurement Network (in meetings prior to the formation of the Network) developed a framework that could be used called the Stress Typology (Appendix 1). The Typology outlines the different components of stress that are captured in stress measures. Eli Puterman has created an excel file that indicates whether each HRS stress measurement item captures each component from the Typology. The excel document is very large and thus only a snapshot is provided here. Finalizing this product and publishing it on the HRS website would allow researchers to examine stress through a theoretical lens versus a purely 'domain-specific' lens as they have been up to this point. This work was funded by a UCSF-sponsored Robert Wood Johnson grant ($10,000) to Eli Puterman in 2003 "Health and Retirement Study Secondary Analyses." Below is a portion of the document to demonstrate what this tools looks like. Each stress variable is coded for when it was included in HRS and whether it fits into the different categories from the Stress Typology.

														ELI		SUBJECTIVE STRESS			OBJECTIVE EXPOSURE TO ACUTE OR				STRES	
2	Variable	1992	1993	1994	1995	1996	1998	2000	2002	2004	2006	2008	2010	Life Domain	Obj v Subj	Global Subjective Stress	Domain-Specific Subjective Stress	Stressor-Linked Stress Appraisal & Emotional/Af	Daily Hassles	Acute Life Events	Chronic Difficulties	Risky Contextual / Embedded Exposures	Childhood	Adol end
317	SATISFIED W/ JOB	2614	*	*	*	*	*	*	*	*	*	*	*	Job	Subjective			X						
318	SATISFIED W/ MARRIAGE	2613	*	*	*	*	*	*	*	*	*	*	*	Marriage	Subjective			X						
319	SATISFIED W/ BALANCE BTW PARTNER	*	*	*	*	*	*	*	*	*	KLB032A	LLB032A	MLB032A	Marriage	Subjective	X								
320	RECEIVED ADEQUATE APPRECIATION	*	*	*	*	*	*	*	*	*	KLB032B	LLB032B	MLB032B	Marriage	Subjective	X								
321	SATISFIED WITH REWARDS FOR EFFORTS	*	*	*	*	*	*	*	*	*	KLB032C	LLB032C	MLB032C	Marriage	Subjective	X								
322	SATISFIED W/ NEIGHBORHOOD	2609	*	*	*	*	*	*	*	*	*	*	*	Neighborhood	Subjective			X						
323	R RATING OF NEIGHBORHOOD SAFETY	*	V1085	w709	D2395	E2395	F2912	G3230	HH150	JH150	KH150	LH150	MH150	Neighborhood	Subjective			X						
324	SATISFIED W/ CITY TOWN LIVE	*	*	*	*	*	*	*	*	*	*	LLB039B	MLB039B	Neighborhood	Subjective			X						
325	VANDALISM AND GRAFFITI PROBLEM	*	*	*	*	*	*	*	*	*	KLB021B	LLB021B	MLB021B	Neighborhood	Subjective		X							
326	MANY VACANT OR DESERTED HOUSES	*	*	*	*	*	*	*	*	*	KLB021H	LLB021H	MLB021H	Neighborhood	Subjective		X							
327	FEEL PART OF THIS AREA	*	*	*	*	*	*	*	*	*	KLB021A	LLB021A	MLB021A	Neighborhood	Subjective	X								
328	MOST PEOPLE CAN BE TRUSTED	*	*	*	*	*	*	*	*	*	KLB021C	LLB021C	MLB021C	Neighborhood	Subjective	X								
329	BE AFRAID TO WALK ALONE AFTER DARK	*	*	*	*	*	*	*	*	*	KLB021D	LLB021D	MLB021D	Neighborhood	Subjective	X								
330	MOST PEOPLE ARE FRIENDLY THIS AREA	*	*	*	*	*	*	*	*	*	KLB021E	LLB021E	MLB021E	Neighborhood	Subjective	X								
331	THIS AREA IS KEPT VERY CLEAN	*	*	*	*	*	*	*	*	*	KLB021F	LLB021F	MLB021F	Neighborhood	Subjective	X								
332	PEOPLE HELP YOU IF IN TROUBLE	*	*	*	*	*	*	*	*	*	KLB021G	LLB021G	MLB021G	Neighborhood	Subjective	X								
333	R SHAKEN BY WTC DISASTER (9/11)	*	*	*	*	*	*	*	HP051	*	*	*	*	Terror	Subjective			X						
334	PCT CHANCE OF BIOTERRORISM MORE/LE	*	*	*	*	*	*	*	HP053	*	*	*	*	Terror	Subjective			X						
335	PCT CHANCE R IS VICTIM OF BIOTERRORIS	*	*	*	*	*	*	*	HP054	*	*	*	*	Terror	Subjective			X						
336	CHANCE BIOTERRORISM 1 IN A MILLION	*	*	*	*	*	*	*	HP055	*	*	*	*	Terror	Subjective			X						
337	PCT CHANCE OF BIOTERRORISM IN USA	*	*	*	*	*	*	*	HP052	*	*	*	*	Terror	Subjective			X						
338	VICTIM FRAUD	*	*	*	*	*	*	*	*	*	*	LLB038F	MLB038F	Trauma	Objective					X				
339	VICTIM FRAUD YEAR	*	*	*	*	*	*	*	*	*	*	LLB038FY	MLB038FY	Trauma	Objective					X				
340	HAS A CHILD OF YOURS EVER DIED	*	*	*	*	*	*	*	*	*	KLB037A	LLB037A	MLB037A	Trauma	Objective					X				
341	CHILD DIED YEAR	*	*	*	*	*	*	*	*	*	KLB037AY	LLB037AY	MLB037AY	Trauma	Objective					X				
342	BEEN IN A MAJOR FIRE OR DISASTER	*	*	*	*	*	*	*	*	*	KLB037B	LLB037B	MLB037B	Trauma	Objective					X				
343	FIRE OR DISASTER YEAR	*	*	*	*	*	*	*	*	*	KLB037BY	LLB037BY	MLB037BY	Trauma	Objective					X				



Appendix 5: Project Summary of Data Harmonization for the Health and Retirement Study (HRS) and HRS Family of Studies (PIs: Tara Gruenwald & Jinkook Lee, funded by the NIA supported Stress Measurement Network)

We are currently developing a guidebook that details measures included in HRS and the international HRS family of studies that capture various forms of stress experience. The guidebook will soon be housed on the Gateway to Global Aging Data website (https://g2aging.org/). The "G2" website provides a "Concordance" webpage (https://g2aging.org/index.php?section=concordance) on which users can specify specific domains of stress they are interested in and the portal will return the specific studies and variable names for measures which capture the specified domains of stress in the HRS family of studies. The G2 stress module is not yet fully functional but interested users can obtain preliminary information on the various measures of stress in each of the studies in the HRS family of studies by visiting the website. In the future, the G2 website will directly link users to downloadable data files of stress-related measures in the HRS family of studies. The HRS and HRS Family of Studies Stress Measurement Guidebook will also detail important methodological characteristics to consider for those interested in utilizing data from multiple studies to conduct cross-national investigations of stress. The table below outlines the domains of stress assessed in each study in the HRS Family of Studies. For a draft of the guidebook, please contact Tara Gruenewald at Tara.Gruenewald@usc.edu.

Stress Domains Measured in the HRS Family of Studies

	STUDY										
STRESS DOMAIN:	**HRS**	**ELSA**	**SHARE**	**TILDA**	**JSTAR**	**KLoSA**	**CHARLS**	**MHAS**	**SAGE**	**IFLS**	**CRELES**
Stressful life events and traumas	X		X	X	X	X	X	X	X	X	X
Chronic strains	X	X							X		X
Job strain/stress	X	X	X		X	X					X
Discrimination	X										
Social strain and unsupportive relationships	X	X	X	X				X			
Social isolation and loneliness	X	X	X	X		X		X	X		X
Environmental/neighborhood disorder and lack of cohesion	X	X	X						X		

HRS = Health and Retirement Study; ELSA = English Longitudinal Study of Aging; SHARE = Survey of Health, Ageing, and Retirement in Europe; TILDA = The Irish Longitudinal Study on Aging; JSTAR = Japanese Study on Aging and Retirement; KLoSA = Korean Longitudinal Study of Aging; CHARLS = Chinese Health and Retirement Longitudinal Study; MHAS = Mexican Health and Aging Study; SAGE = Study on Global Ageing and Adult Health; IFLS = Indonesian Family Life Survey; LASI = Longitudinal Aging Study in India

References

Almeida, D. M. (2005). Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science*, 14(2), 64-68.

Almeida, D. M., Wethington, E., & Kessler, R. C. (2002). The daily inventory of stressful events an interview-based approach for measuring daily stressors. *Assessment*, 9(1), 41-55.

Anda, R. F., Dong, M., Brown, D. W., Felitti, V. J., Giles, W. H., Perry, G. S., … & Dube, S. R. (2009). The relationship of adverse childhood experiences to a history of premature death of family members. *BMC Public Health*, 9(1), 106.

Andel, R., Infurna, F. J., Rickenbach, E. A. H., Crowe, M., Marchiondo, L., & Fisher, G. G. (2015). Job strain and trajectories of change in episodic memory before and after retirement: results from the Health and Retirement Study. *Journal of Epidemiology and Community Health.* 69(5), 442-6.

Belsky, D. W., Caspi, A., Houts, R., Cohen, H. J., Corcoran, D. L., Danese, A., ... & Sugden, K. (2015). Quantification of biological aging in young adults. *Proceedings of the National Academy of Sciences*, 112(30), 4104-10.

Bozo, Ozlem; Guarnaccia, Charles A. (2010). Activities of daily living, social support, and future health of older Americans. *The Journal of Psychology* 144(1), 1-14.

Bucciol, A.; Zarri, L. (2016). The shadow of the past: Financial risk taking and negative life events. *Journal of Economic Psychology* 48, 1-16.

Burkhauser, Richard V.; Nicholas, Lauren H.; Schmeiser, Maximilian D. (2011). The Importance of State Anti-Discrimination Laws on Employer Accommodation and the Movement of their Employees onto Social Security Disability Insurance, *The University of Michigan, Michigan Retirement Research Center*, 2011-251.

Burkhauser, Richard V.; Schmeiser, M.; Weathers, Robert (2012). The Importance of Anti-Discrimination and Workers' Compensation Laws on the Provision of Workplace Accommodations Following the Onset of a Disability. *Industrial and Labor Relations Review,* 65(1), 161

Capistrant, B. D., Moon, J. R., & Glymour, M. M. (2012). Spousal caregiving and incident hypertension. *American journal of hypertension*, 25(4), 437-443.

Capistrant, B. D., Moon, J. R., Berkman, L. F., & Glymour, M. M. (2012). Current and long-term spousal caregiving and onset of cardiovascular disease. *Journal of Epidemiology and Community Health*, 66(10), 951-956.

Capistrant, B. D. Berkman, L.F, & Glymour, M.M. (2014). Does duration of spousal caregiving affect risk of depression onset? Evidence from the Health and Retirement Study. *The American Journal of Geriatric Psychiatry* 22(8), 766-770.

Charles, S.T., Piazza, J.R., Mogle, J., Sliwinski, M.J., Almeida, D.M. (2013). The wear and tear of daily stressors on mental health. *Psychological Science, 24*(5), 733-741.

Chen, Y., Feeley, T. H. (2014). Social support, social strain, loneliness, and well-being among older adults: An analysis of the Health and Retirement Study. *Journal of Social and Personal Relationships* 31(2), 141-161.

Chen-Edinboro, L. P., Kaufmann, C. N., Augustinavicius, J. L., Mojtabai, R., Parisi, J. M., Wennberg, A. M., ... & Spira, A. P. (2015). Neighborhood physical disorder, social cohesion, and insomnia: results from participants over age 50 in the Health and Retirement Study. *International Psychogeriatrics*, 27(2), 289-296.

Clark, D. O., & Mungai, S. M. (1997). Distribution and Association of Chronic Disease and Mobility Difficulty across Four Body Mass Index Categories of African-American Women. *American journal of epidemiology*, 145(10), 865-875.

Cohen, S., & Hoberman, H. M. (1983). Positive events and social supports as buffers of life change stress1. *Journal of applied social psychology*, 13(2), 99-125.

Cole, S.W. (2013). Social regulation of human gene expression: mechanisms and implications for public health. *Am. J. Public Health,* 103(1), 84–S92.

Cole, S. W., Levine, M. E., Arevalo, J. M., Ma, J., Weir, D. R., & Crimmins, E. M. (2015). Loneliness, eudaimonia, and the human conserved transcriptional response to adversity. *Psychoneuroendocrinology*, 62, 11-17.

Cutrona, C. E., & Russell, D. W. (1987). The provisions of social relationships and adaptation to stress. *Advances in personal relationships*, *1*(1), 37-67.

Dong, X. S., Wang, X., Daw, C., & Ringen, K. (2011). Chronic diseases and functional limitations among older construction workers in the United States: a 10-year follow-up study. *Journal of Occupational and Environmental Medicine*, 53(4), 372-380.

Dunkle, R. E., Feld, S., Lehning, A. J., Kim, H., Shen, H. W., & Kim, M. H. (2014). Does Becoming an ADL Spousal Caregiver Increase the Caregiver's Depressive Symptoms?. *Research on aging*, 36(6), 655-682.

Fisher, G. G., Stachowski, A., Infurna, F. J., Faul, J. D., Grosch, J., & Tetrick, L. E. (2014). Mental work demands, retirement, and longitudinal trajectories of cognitive functioning. *Journal of Occupational Health Psychology*, 19(2), 231.

Ayalon, L., & Gum, A. M. (2011). The relationships between major lifetime discrimination, everyday discrimination, and mental health in three racial and ethnic groups of older adults. *Aging & mental health*, 15(5), 587-594.

Fitzgerald, J. T., Davis, W. K., Connell, C. M., Hess, G. E., Funnell, M. M., & Hiss, R. G. (1996). Development and validation of the Diabetes Care Profile. *Evaluation & the health professions*, 19(2), 208-230.

Forjaz, M. J. B. P. (2000). Comparative models of the impact of social support on psychological distress in cancer patients (Doctoral dissertation, University of North Texas).

Freedman, V. A., Grafova, I. B., & Rogowski, J. (2011). Neighborhoods and chronic disease onset in later life. *American Journal of Public Health*, 101(1), 79-86.

Gawronski, K. A., Kim, E. S., & Miller, L. E. (2014). Potentially traumatic events and serious life stressors are prospectively associated with frequency of doctor visits and overnight hospital visits. *Journal of Psychosomatic Research*, 77(2), 90-96.

Gerst-Emerson, K., & Jayawardhana, J. (2015). Loneliness as a public health issue: The impact of loneliness on health care utilization among older adults. *American Journal of Public Health*, 105(5), 1013-1019.

Grafova, I. B., Freedman, V. A., Kumar, R., & Rogowski, J. (2008). Neighborhoods and obesity in later life. *American Journal of Public Health*, 98(11), 2065-2071.

Ha, J. H., Kahng, S. K., & Choi, N. (2015). Reciprocal Effects Between Health and Social Support in Older Adults' Relationships With Their Children and Friends. *Research on Aging*, 1-22.

Han, J., & Richardson, V. E. (2015). The relationships among perceived discrimination, self-perceptions of aging, and depressive symptoms: a longitudinal examination of age discrimination. *Aging & Mental Health*, 19(8), 747-755.

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*, 11(2), 213-218.
Holmes, T. H., & Rahe, R. H. (1967). The social readjustment scale. *Journal of Psychosomatic Research*, 11, 213–218.
Hughes, M. E., Waite, L. J., Hawkley, L. C., & Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys results from two population-based studies. *Research on aging*, 26(6), 655-672.
Hurd, M., & McGarry, K. (1993). The relationship between job characteristics and retirement (No. w4558). *National Bureau of Economic Research*.
Jenkins, K. R., Kabeto, M. U., Fultz, N. H., & Langa, K. M. (2007). Informal caregiving and Body Mass Index among older adults. *Journal of Gerontological Nursing*, 33(4), 42-51.
Johnson, R. W. (2004). Trends in job demands among older workers, 1992-2002. *Monthly Lab. Rev.*, 127, 48.
Joo, H., Dunet, D. O., Fang, J., & Wang, G. (2014). Cost of informal caregiving associated with stroke among the elderly in the United States. *Neurology*, 83(20), 1831-1837.
Karakus, M. C., & Patton, L. C. (2011). Depression and the onset of chronic illness in older adults: a 12-year prospective study. *The journal of behavioral health services & research*, 38(3), 373-382.
Karasek, R., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of occupational health psychology*, *3*(4), 322.
Killian, T., Turner, J., & Cain, R. (2005). Depressive symptoms of caregiving women in midlife: The role of physical health. *Journal of Women & Aging*, 17(1-2), 115-127.
Kim, E. S., Hawes, A. M., & Smith, J. (2014). Perceived neighbourhood social cohesion and myocardial infarction. *Journal of Epidemiology and Community Health,* 68(11), 1020-1026
Kim, E. S., Park, N., & Peterson, C. (2013). Perceived neighborhood social cohesion and stroke. *Social Science & Medicine*, 97, 49-55.
Kosloski, K., Ekerdt, D., & DeViney, S. (2001). The role of job-related rewards in retirement planning. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 56(3), P160-P169.
Krause, N. (2004). Lifetime trauma, emotional support, and life satisfaction among older adults. *The Gerontologist*, *44*(5), 615-623.
Langa, K. M., Valenstein, M. A., Fendrick, A. M., Kabeto, M. U., & Vijan, S. (2004). Extent and cost of informal caregiving for older Americans with symptoms of depression. *American Journal of Psychiatry.*
Latham, K., & Williams, M. M. (2015). Does neighborhood disorder predict recovery from mobility limitation? Findings from the Health and Retirement Study. *Journal of Aging and health,* 27(8), 1415-42.
Latham, K., & Clarke, P. J. (2013). The Role of Neighborhood Safety in Recovery From Mobility Limitations Findings From a National Sample of Older Americans (1996–2008). *Research on Aging*, 35(4), 481-502.
Lin, J. E., Neylan, T. C., Epel, E., & O'Donovan, A. (2015). Associations of childhood adversity and adulthood trauma with C-reactive protein: A cross-sectional population-based study. *Brain, Behavior, and Immunity*.
Liu, Y. (2013). Functional limitations and chronic conditions predict CES-D-8 depression scores.

Luo, Y., Hawkley, L. C., Waite, L. J., & Cacioppo, J. T. (2012). Loneliness, health, and mortality in old age: A national longitudinal study. *Social Science & Medicine*, 74(6), 907-914.

Luo, Y., Xu, J., Granberg, E., & Wentworth, W. M. (2011). A longitudinal study of social status, perceived discrimination, and physical and emotional health among older adults. Research on Aging, 34(3), 275-301.

Matzek, A. E. (2011). The Impact of Family and Non-Family Roles on Caregiver Health Over Time (Dissertation).

McGonagle, A. K.; Fisher, G. G.; Barnes-Farrell, J. L.; Grosch, J. W., "Individual and Work Factors Related to Perceived Work Ability and Labor Force Outcomes," *Journal of Applied Psychology,* 100(2), 376.

Mercan, M. A. (2014). A Research Note on the Relationship Between Long Working Hours and Weight Gain for Older Workers in the United States. *Research on aging*, 36(5), 557-567.

Messe, P. J. (2012). Do discriminatory attitudes to older workers at work affect their retirement intentions?. *International Journal of Manpower*, 33(4), 405-423.

Mezuk, B., Kershaw, K. N., Hudson, D., Lim, K. A., & Ratliff, S. (2011). Job strain, workplace discrimination, and hypertension among older workers: The Health and Retirement Study. *Race and social problems*, 3(1), 38-50.

Miah, M. S., & Wilcox-Gök, V. (2007). Do the sick retire early? Chronic illness, asset accumulation and early retirement. *Applied Economics*, 39(15), 1921-1936.

Mondesir, F. L. (2013). Illness-Related Diabetes Social Support and Glycemic Control Among Middle Aged and Older Adults. Columbia, SC University of South Carolina.

Montez, J. K., & Hayward, M. D. (2014). Cumulative childhood adversity, educational attainment, and active life expectancy among US adults. *Demography*, 51(2), 413-435.

Newsom, J. T., Huguet, N., McCarthy, M. J., Ramage-Morin, P., Kaplan, M. S., Bernier, J., ... & Oderkirk, J. (2011). Health behavior change following chronic illness in middle and later life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 67(3), 279-288.

Nicholas, L. H. (2014). Lifetime Job Demands, Work Capacity at Older Ages, and Social Security Benefit Claiming Decisions. *CRR WP, 15.*, Boston, Center for Retirement Research at Boston College.

Nicklett, E. J., Heisler, M. E. M., Spencer, M. S., & Rosland, A. M. (2013). Direct social support and long-term health among middle-aged and older adults with type 2 diabetes mellitus. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 68(6), 933-943.

Noël-Miller, C. M. (2011). Partner caregiving in older cohabiting couples. *The Journals of Gerontology Series B: Psychological Sciences and Social* Sciences, 66(3), 341-353.

Okura, T., Heisler, M., & Langa, K. M. (2009). Association between cognitive function and social support with glycemic control in adults with diabetes mellitus. *Journal of the American Geriatrics Society*, 57(10), 1816-1824.

Palgi, Y. (2013). Are ongoing cumulative chronic stressors associated with optimism and pessimism in the second half of life?. *Anxiety, Stress & Coping*, 26(6), 674-689.

Palgi, Y. (2013). Ongoing cumulative chronic stressors as predictors of well-being in the second half of life. *Journal of Happiness Studies*, 14(4), 1127-1144.

Perissinotto, C. M., Cenzer, I. S., & Covinsky, K. E. (2012). Loneliness in older persons: a predictor of functional decline and death. *Archives of internal medicine*, 172(14), 1078-1084.
Perreira, K. M., & Sloan, F. A. (2001). Life events and alcohol consumption among mature adults: a longitudinal analysis. *Journal of studies on alcohol*, 62(4), 501-508.
Puterman, E., Gemmill, A., Karasek, D., Weir, D., Adler, N.E., Prather, A.A., Epel, E.S. Lifespan adversity and later adulthood telomere length: Findings from the nationally representative U.S. Health and Retirement Study. *Under review*.
Radloff, L. S. (1977). The CES-D scale a self-report depression scale for research in the general population. *Applied psychological measurement*, 1(3), 385-401.
Ray-Mazumder, S. (2013). Factors Predicting the Perception of Positive Aging In the Presence of Chronic Stress (Dissertation).
Rippon, I., Zaninotto, P., & Steptoe, A. (2015). Greater Perceived Age Discrimination in England than the United States: Results from HRS and ELSA. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 70(6), 925-933.
Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of personality assessment*, 66(1), 20-40.
Shiovitz-Ezra, S., & Ayalon, L. (2010). Situational versus chronic loneliness as risk factors for all-cause mortality. *International Psychogeriatrics*, 22(03), 455-462.
Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of occupational health psychology*, 1(1), 27.
Slavich, G.M. & Epel, E.S. The Stress and Adversity Inventory (STRAIN): An automated system for assessing cumulative stress exposure. University of California, Los Angeles; Los Angeles: 2010.
Stephan, Y., Sutin, A. R., & Terracciano, A. (2015). How old do you feel? The role of age discrimination and biological aging in subjective age. *PloS one*, 10(3), e0119293.
Stucky, B. D., Gottfredson, N. C., Panter, A. T., Daye, C. E., Allen, W. R., & Wightman, L. F. (2011). An item factor analysis and item response theory-based revision of the Everyday Discrimination Scale. *Cultural Diversity and Ethnic Minority Psychology*, 17(2), 175-185.
Sullivan, Allison R. (2011). Three essays on socioeconomic status, social support, and the Health and Retirement Study. University of Pennsylvania; Pennsylvania.
Sun, V. K., Cenzer, I. S., Kao, H., Ahalt, C., & Williams, B. A. (2012). How safe is your neighborhood? Perceived neighborhood safety and functional decline in older adults. *Journal of general internal medicine*, 27(5), 541-547.
Sutin, A. R., Stephan, Y., Carretta, H., & Terracciano, A. (2015). Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *The American Journal of Geriatric Psychiatry*, 23(2), 171-179.
Sutin, A. R., Stephan, Y., Luchetti, M., & Terracciano, A. (2014). Perceived weight discrimination and C-reactive protein. *Obesity*, 22(9), 1959-1961.
Sutin, A. R., English, D., Evans, M. K., & Zonderman, A. B. (2014). Perceived sex Discrimination amplifies the effect of antagonism on Cigarette smoking. *Nicotine & Tobacco Research*, 16(6), 794 -799.
Sutin, A. R., & Terracciano, A. (2013). Perceived weight discrimination and obesity. *PLoS One*, 8(7), e70048.

Theeke, L. A. (2009). Predictors of loneliness in US adults over age sixty-five. *Archives of psychiatric nursing*, 23(5), 387-396.
Theeke, L. A. (2010). Sociodemographic and health-related risks for loneliness and outcome differences by loneliness status in a sample of US older adults. *Research in Gerontological Nursing*, 3(2), 113-125.
Thomeer, M. B. (2014). Dyadic analyses of chronic conditions and distress within marriage: a gendered perspective (Dissertation).
Tucker-Seeley, R. D., Subramanian, S. V., Li, Y., & Sorensen, G. (2009). Neighborhood safety, socioeconomic status, and physical activity in older adults. *American journal of preventive medicine*, 37(3), 207-213.
Wakabayashi, C., & Donato, K. M. (2006). Does caregiving increase poverty among women in later life? Evidence from the Health and Retirement Survey. *Journal of Health and Social Behavior*, 47(3), 258-274.
Wallace, G. L., Haveman, R., Holden, K., & Wolfe, B. (2012). Health and Wealth in Early Retirement. In, *Lifecycle Events and Their Consequences: Job Loss, Family Change, and Declines in Health*, 261-279
Ward, M. M. (2013). Sense of control and self-reported health in a population-based sample of older Americans: assessment of potential confounding by affect, personality, and social support. *International Journal of Behavioral Medicine*, 20(1), 140-147.
Williams, D. R., Yu, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial differences in physical and mental health socio-economic status, stress and discrimination. *Journal of Health Psychology*, 2(3), 335-351.
Xu, J. (2010). Discrimination and health: A longitudinal study, Clemson University; Clemson.
Yang, F. M., & Jones, R. N. (2008). Measurement differences in depression: chronic health-related and sociodemographic effects in older Americans. *Psychosomatic Medicine*, 70(9), 993.