Article

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Using the Health and Retirement Study for Research on the Impact of the Working Conditions on the Individual Life Course

Abstract: The aim of this paper is to evaluate the utility of the Health and Retirement Study (HRS) for studying the impact of working conditions on individuals' health, well-being and labor supply decisions at older ages. I provide a brief overview of the information on working conditions that is currently available in the HRS and discuss implications for studies on the effects of working conditions on the individual life course. I conclude with a discussion of how recent and projected trends in the U.S. workforce are reflected in the current HRS survey content.

Keywords: health; health and retirement study; well-being and labor supply; working conditions

1 Introduction

The aim of this paper is to evaluate the utility of the Health and Retirement Study (HRS) for studying the impact of working conditions on individuals' health, well-being and labor supply decisions at older ages. In this paper, I take a broad view of working conditions, including job demands, contractual arrangements, and any other characteristics of the work environment such as schedule flexibility or the ability to telecommute. Work has long been recognized as an important social

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determinant of health (e.g., Marmot 2005; Lovejoy et al. 2021). Recent evidence suggests there is substantial variation in non-wage job attributes across different demographic groups and across the wage distribution (e.g., Hamermesh 1999; Pierce 2001; Monaco and Pierce 2015; Maestas et al. 2017, 2018). Moreover, there is evidence that recent *changes* in the nature of work have been unequally distributed across groups: Lopez Garcia, Maestas, and Mullen (2020) show that, while cognitive job demands increased and physical job demands decreased overall between 2003 and 2018, the increase in cognitive demands was concentrated among workers with low education while the decrease in physical demands was concentrated among those with high education. Even more recently, the COVID-19 pandemic likely accelerated the adoption of certain working conditions, such as telecommuting, with unequal effects across occupation groups (e.g., Dingel and Neiman 2020; Davis, Ghent, and Gregory 2021). Future changes in working conditions are likely to be affected by factors as various as technological innovation, climate change and evolving tax policy (e.g., Acemoglu 2002; Acemoglu and Manera 2020; Autor, Levy, and Murnane 2003; Lundren et al. 2013).

I begin by providing a brief overview of the information on working conditions that is currently available in the HRS or can be added by merging information from occupational databases. Next, I discuss implications for two strands of literature on the effects of working conditions on the individual life course: (1) studies of how job demands and health interact to determine work capacity and labor supply outcomes; and (2) studies of the long run effects of working conditions on health and well-being at older ages. Finally, I conclude with a discussion of how recent and projected trends in the U.S. workforce are reflected in the current HRS survey content.

2 Measuring Working Conditions in the Health and Retirement Study

In many ways, the HRS is an ideal data set to study how working conditions interact with health and labor supply outcomes in later life. It is a rich panel survey that, since 1992, has followed individuals ages 51 and older every two years, periodically refreshing the sample to keep it representative of Americans in that age group. As a result one can track contemporaneously changes in health and working conditions throughout respondents' late working life and (for health) after retirement. There are two ways of measuring working conditions in the HRS: (1) using a limited set of self-reported variables in the HRS survey itself; and (2) using occupation codes to link to a comprehensive set of objective measures available in occupational databases such as the O*NET. I discuss each set of variables in turn below.

Before we describe the contents of the HRS, it is useful to discuss some terminology. When eliciting information on working conditions, respondents are generally asked to describe their personal experiences working in a specific role, or *position*, for a given employer. Each individual has their own position working in a given organization. *Jobs* are collections of positions with the same title and work activities, or tasks, for individuals who work in the same organization (i.e., for the same employer). *Occupations* are "collections of work roles with similar goals that require the performance of distinctive activities and the applications of specialized skills or knowledge to accomplish these goals" (Ford 2020). Researchers often use the terms jobs and occupations interchangeably even though they represent different hierarchical levels of the organization of work. Below I will use job to refer to self-reported working conditions in the HRS and occupation to refer to aggregated, "objective" information available from occupational databases such as the Occupational Information Network (O*NET) or the more recent Occupational Requirements Survey (ORS). Note the latter measures are objective in the sense that they are derived from other individuals' ratings of working conditions, whether they be job analysts or other job incumbents (though, of course, self-reported working conditions may more accurately reflect individuals' experiences working in their own job, within an occupation).

2.1 Self-Reported Working Conditions

There are many parts of the HRS survey that have information on occupation(s) and/or working conditions, including the core survey, the life history mail survey (LHMS), the psychosocial leave-behind questionnaire (LBQ), and experimental modules. These sections of the survey collectively cover current and past jobs, although the specific information collected on current and past jobs is not necessarily the same. I start by describing the information available in the HRS core survey, and follow with descriptions of the LHMS, LBQ and experimental modules. I conclude this subsection with a brief discussion of which dimensions of working conditions may be of particular interest to understanding outcomes for older workers and how these dimensions overlap with the variables currently in the HRS.

In addition to detailed information on working respondents' hours, earnings, and other compensation, the core HRS survey includes several questions eliciting self-reported characteristics of the respondent's current job in each survey wave, including certain cognitive, physical, sensory, and social job demands. Table 1 displays non-wage characteristics describing respondents' current job that have been collected since 1992. Respondents are asked to rate either the fraction of the time (all, most, some or none) that each statement is true or their level of agreement

Table 1: Non-wage characteristics of CURRENT job from HRS core survey.

A. Consistently Available Items, 1992–2020	
Survey item	**Scale**
*My job requires lots of physical effort	Time
*(My job requires) lifting heavy loads.	Time
*(My job requires) stooping, kneeling or crouching.	Time
*(My job requires) good eyesight.	Time
(My job requires) intense concentration or attention.	Time
(My job requires) skill in dealing with other people.	Time
My job requires me to work with computers.	Time
My job requires me to do more difficult things than it used to.	Agreement
*My job involves a lot of stress.	Agreement
In decisions about promotion, my employer gives younger people preference over older people.	Agreement
My co-workers make older workers feel that they ought to retire before age 65.	Agreement
My employer would let older workers move to a less demanding job with less pay if they wanted.	Agreement
B. Items available for 1992 only	
Survey item	**Scale**
(My job requires me to) analyze data or information.	Time
My job requires me to keep up with the pace set by others.	Time
My job requires that I learn new things.	Time
I have a lot of freedom to decide how I do my own work.	Time
The people I work with are helpful and friendly.	Time
I could do my job a lot better if I received training to update my job skills.	Agreement
My job requires a very good memory.	Agreement
My pay is fair considering what other people in this line of work are paid.	Agreement
How much pay I receive depends entirely on how well I do my job.	Agreement

Response options for the time scale are: (1) all or almost all of the time; (2) most of the time; (3) some of the time; (4) none of the time. Response options for the agreement scale are: (1) strongly agree; (2) agree; (3) disagree; (4) strongly disagree. After 1992, a response option (5) was added for "does not apply." Starred (*) items are available in the RAND HRS longitudinal file (Bugliai et al., 2021).

(strongly agree, agree, disagree, strongly disagree) for a series of statements about their job requirements and personal experiences in their current job, as well as employer policies regarding work at older ages. Interestingly, the original 1992 section on respondents' current job included several questions on that disappeared from the next wave's survey and only reappeared 1998–2012 for respondents reporting a work-limiting health condition and asking about their past job ("Now I would like to go back to your work before your health began to limit your ability to work and ask about the demands of your work at that time."). Panel A of Table 1 presents survey items about respondent's current job that are consistently available 1992–2020, and Panel B presents items about current job available for 1992 only.

The core survey does include some information about respondents' past jobs. Specifically, in their first survey respondents are asked how many other employers (besides their current job) the respondent has worked for at least five years, and for the most recent three positions, they are asked about: their start and stop dates, industry, occupation, weeks worked, earnings, why they left the job, details about pension benefits, and (until 1996) exposure to dangerous chemicals and other hazards. The user-friendly RAND HRS longitudinal file includes years of tenure, occupation and industry codes for the job with the longest held tenure among all reported jobs in the HRS, including those in any waves the respondent was working and the retrospective job history (Bugliari et al. 2021).

In 2015, the HRS added the Life History Mail Survey (LHMS) component to collect detailed information on respondents' lives before they entered the panel. Although the 2015 survey focused on respondents' residential and educational histories, in 2017, the LHMS collected information on respondents' employment histories. The 2017 LHMS asked respondents to fill out a table with all the "places you have worked for one year or more after you finished your full-time education." The table included space for 10 jobs; respondents with more than 10 jobs were instructed to provide information on their first 10 jobs. For each job, the table includes space to enter: type of employer or business, job title, start year, end year, whether the job was full- or part-time, and what the respondent did after leaving this job (options include: started next job; worked short-term job(s); cared for/ started a family; unemployed; medical leave/disability; and other [specify]).

After completing the job history, respondents were asked about "the job you held between the ages of 30 and 40 that you consider to be the most important (e.g., longest duration, best paying, most satisfying)." For their most important job, respondents were asked: which employer or business was that, whether the respondent worked for someone else on that job or whether they were self-employed or a partner in a business, the city and state of the employer/business, their job title, industry, earnings (per hour, week, month or year), whether they were covered on that job by a union or employee-association contract, and whether they still work for that employer/business or, if they left, why (responses include: moved to a higher paying job; moved to a job with a better future; moved to a more satisfying job; moved to a job that better matched my skills; moved or relocated; to take care of or start a family; to continue education; I had poor health/a disability; I was laid off, let go or replaced; I retired; other (please specify)). Finally, respondents were asked to report several non-wage characteristics of their most important job, reproduced in Table 2. Note that none of the survey items for most important job are exactly comparable with the core survey items for current job, and the HRS might benefit from harmonizing these two components of the survey.

Table 2: Non-wage characteristics of MOST IMPORTANT job from 2017 life history mail survey.

Survey Item
The job was physically demanding.
I had very little freedom to decide how I did my work.
At work, I felt I had control over what happened in most situations.
I had a lot to say about what happened on my job.
The people I worked with could be relied on when I needed help.
I learned useful skills in this job.
My skills were not a good match for this job.
The job was interesting and enjoyable.

Response options are: (1) strongly disagree; (2) disagree; (3) agree; (4) strongly agree; and (5) does not apply. Most important job refers to "the job you held between the ages of 30 and 40 that you consider to be most important (e.g., longest duration, best paying, most satisfying)."

In addition to questions in the core survey and LHMS, a number of other self-reported non-wage job characteristics are available in other parts of the HRS. Starting in 2004, a psychosocial leave-behind questionnaire was added to the HRS on a rotating basis to half the sample (i.e., every four years) and includes some questions about respondents' jobs such as: perceptions of their job's social status and their current ability to meet the overall, physical, mental and impersonal demands of their current main job; several questions about current work-life balance; and overall job satisfaction. In 2021, the HRS fielded a one-time mailout survey on COVID-19 that included questions about respondents' ability to work from home, experiences with close physical contacts with co-workers or other people, and comparisons of their physical effort, stress, enjoyment and risk at work, as well as work-life balance, to before the pandemic. There has been a lot of speculation that the pandemic likely accelerated trends in the ability to telecommute, and the HRS may wish to consider adding a permanent question on telecommuting to its core module.

Finally, every wave, the HRS randomly includes at the end of the core survey one of approximately 10 experimental modules that may contain sporadic information about certain working conditions for a subsample of respondents. For example, a 2012 experimental module on "Worksite Health Promotion" included questions on whether the respondent's work organization offered a compressed work week, part-time work or job sharing, telecommuting, phased retirement, on-site professional help with comfort (e.g., ergonomics) or the possibility for job redesign. In addition, a 2018 experimental module on "Working Longer" administered to respondents under age 65 asked, "If you wanted to, would your current employer allow you to work from home at least occasionally?" as well as a series of

questions about how the presence of certain job characteristics would affect respondents' stated probability of working past age 70.

A natural question arises as to which working conditions the HRS *should* be measuring on a consistent basis. Using data from the American Working Conditions Survey (AWCS), Maestas et al. (2017) find that older workers (ages 50+) are more likely than younger workers (ages 25–49) to rate having control over how one does one's work and the ability to work at one's own pace as an essential or very important attribute when thinking about possible work in the future. The HRS stopped collecting information on these job attributes after 1992 (see Table 1, Panel B), though the LHMS includes questions about autonomy at work (Table 2). Using experimental data, Maestas et al. (2018) find that older workers are willing to forgo more in earnings than younger workers in exchange for the ability to set one's own schedule, avoid heavy physical activity, choose how to do one's work, and avoid team-based performance evaluation. The HRS consistently asks about physical effort on the job (Table 1, Panel A), but not the other attributes in this list. In 1992, it asked respondents to rate their agreement with the statement "How much pay I receive depends entirely on how well I do my job," but no longer collects that item (Table 1, Panel B). To my knowledge, there is no question capturing schedule flexibility in the HRS.

Finally, as noted below, issues with selection and measurement make it difficult to draw causal conclusions about the short- and long-run effects of working conditions on health, but researchers hypothesize that cognitively stimulating work likely serves as a protective factor against the risk of dementia. Currently, the HRS does not collect much information about cognitive aspects of work other than "intense concentration or attention" (Table 1, Panel A); it may benefit from adding more cognitive dimensions, or resurrecting previous measures such as the requirement to "learn new things" or for "a very good memory" (Table 1, Panel B).

2.2 Using Occupation Codes to Link to Objective Measures of Working Conditions in Occupational Databases

Because the HRS includes only a limited set of self-reported working conditions in each survey wave, as well as concerns about the potential endogeneity of self-reported measures, many researchers have used occupation codes to merge in "objective" measures of working conditions from occupational databases. The Occupational Information Network (O*NET) is currently the database most widely used by HRS researchers. It contains comprehensive information about nearly 800 occupations classified at the six-digit level using Standard Occupation

Classification (SOC) codes, and can be linked to the HRS using restricted data on detailed occupations classified using three-digit Census occupation codes (see below for more details). See Section 3 below for some examples of recent papers using data on working conditions from the O*NET merged with survey data from the HRS.

The O*NET was developed by the U.S. Bureau of Labor Statistics (BLS) in the early 2000s to replace the Dictionary of Occupational Titles (DOT), which suffered from an overrepresentation of manufacturing jobs, variables that were based on limited observations and incomplete materials, use of print-based codes that did not align with the SOC system and its limited ability to identify transferable skills across occupations (Tippins and Hilton 2010). Information about occupational tasks, work activities, knowledge, education and training is obtained from surveys of job incumbents, and information on occupational ability and skill requirements is determined by teams of trained occupational analysts, using summary information about relevant tasks, knowledge, and work activities and following standardized procedures (Fleisher and Tsacoumis 2012). O*NET data collection is ongoing and performed in cycles; approximately 10 percent of occupations are re-rated each year, and new occupations are added as needed. Archived data releases going back to 2003 are publicly available online.[1]

Table 3 illustrates the breadth of information in O*NET about the abilities (defined as "relatively enduring attributes of an individual's capability for performing a particular range of different tasks") needed to perform occupations. O*NET identifies 52 abilities broadly applicable to jobs in the "world economy," and grouped into four domains: cognitive, physical, psychomotor, and sensory. For each ability, analysts rate the importance of the ability for the performance of the occupation's associated tasks and work activities, and the required level of ability needed to carry out those tasks and work activities. Importance is rated on a scale of 1–5, where 1 = "Not Important," 2 = "Somewhat Important," 3 = "Important," 4 = "Very Important," and 5 = "Extremely Important." The required level of ability is rated on a scale from 0 to 7, where 0 means not relevant (i.e., the ability was rated "not important" for the job) and 7 is the highest possible level. Each ability or skill has three scale anchors that give an example of a job-related activity that could be done at that level. (For example, the ability Arm-Hand Steadiness has anchors at levels 2, 4, and 6 corresponding to the degree of arm-hand steadiness needed to "light a candle," "thread a needle," and "cut facets in a diamond," respectively.) Final level and importance ratings of each ability for each occupation are averages of the ratings provided by the raters.

Currently, HRS researchers who want to merge occupational variables from the O*NET must do so by cross-walking SOC codes used in the O*NET to Census

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1 https://www.onetcenter.org/db_releases.html.

Table 3: O*NET abilities by domain.

Cognitive	Physical	Psychomotor	Sensory
Oral comprehension	Static strength	Arm-hand steadiness	Near vision
Written comprehension	Explosive strength	Manual dexterity	Far vision
Oral expression	Dynamic strength	Finger dexterity	Visual color discrimination
Written expression	Trunk strength	Control precision	Night vision
Fluency of ideas	Stamina	Multi-limb coordination	Peripheral vision
Originality	Extent flexibility	Response orientation	Depth perception
Problem sensitivity	Dynamic flexibility	Rate control	Glare sensitivity
Deductive reasoning	Gross body coordination	Reaction time	Hearing sensitivity
Inductive reasoning	Gross body equilibrium	Wrist-finger speed	Auditory attention
Information ordering		Speed of limb movement	Sound localization
Category flexibility			Speech recognition
Mathematical reasoning			Speech clarity
Number facility			
Memorization			
Speed of closure			
Flexibility of closure			
Perceptual speed			
Spatial orientation			
Visualization			
Selective attention			
Time sharing			

codes used in the HRS, which can be a delicate enterprise, especially if merging over several waves. The HRS classifies occupations using 1980 Census codes for the 1992–2004 waves, 2000 Census codes for 2004–2010, and 2010 Census codes for 2010 onwards. Some generous researchers have posted crosswalks on their websites.[2] Moreover, merging variables from occupational databases requires obtaining restricted data on detailed occupation codes from the HRS. An effort to create a public resource linking historical occupational information from the O*NET to HRS survey data is currently underway and will likely increase both the number of studies examining working conditions in the HRS and the consistency of such measures across studies (Helppie-McFall et al. 2021).

In addition to the O*NET, another occupational database worth mentioning is the more recent Occupational Requirement Survey (ORS), also developed by BLS. Despite its widespread use, the O*NET has been criticized for being overly complex with significant duplication in content, its use of job incumbents instead of expert analysts for most of its content, and not providing sufficient detail about *functional* abilities needed to perform occupations (Handel 2016 Tippins and Hilton 2010). The ORS was developed by BLS to provide occupational information better suited to understanding whether individuals meet the functional requirements for certain occupations. Final data for Wave I of the ORS, collected between 2015 and 2018, are available now and include physical, environmental and educational requirements. Data collection for Wave II, which expands the set of measures to include cognitive and mental requirements, began in August 2018, with five years of data collection planned, through mid-2023; preliminary data are posted will be updated periodically until final data collection is complete. Note that while the pandemic affected the mode of observation (discontinuing personal visits), BLS instructed its field economists to consider pandemic-related changes to be temporary unless the establishment reported that the changes were permanent for all workers in that occupation.

3 Implications for Studying Interactions Between Job Demands and Health to Determine Work Capacity and Labor Supply Outcomes

Many studies have documented that individual declines in health and functional abilities correlate with early exit from the labor force. These studies use a range of

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2 See https://sites.google.com/site/phudomiet/research/ for a consistent occupation crosswalk between the 1992–2004, 2006–2008 and 2010 HRS survey waves, as well as an occupation crosswalk between the CPS, Census and O*NET for 1976–2004.

health measures available in the HRS, including diagnosed health conditions (e.g., Bound, Schoenbaum, and Waidmann 1995; Bound, Stinebrickner, and Waidmann 1999; Dwyer and Mitchell 1999; Coile 2004; McGarry 2004; Smith 2005), limitations in (instrumental) activities of daily living (e.g., Freedman et al. 2004; Sturm, Ringel, and Andreyeva 2004; Freedman et al. 2008), and self-reports of whether one's health limits the kind or amount of paid work one can do (e.g., Kapteyn, Smith and van Soest 2008; Schimmel Hyde and Stapleton 2012). The latter measure is most closely related to the World Health Organization's definition of disability as the state arising from the *interaction* of an individual's health and their personal, social, economic, and institutional environment (WHO 2002), and has been shown to be correlated with more objective measures of health conditions and functional status as well as disability insurance claiming (Bound 1991; Burkhauser and Daly 1996; Burkhauser, Houtenville, and Tennant 2014). At the same time, Kapteyn, Smith and van Soest (2007) showed that different groups may use systematically different standards when assessing their own ability to work, and Maestas, Mullen, and Rennane (2019) demonstrated the sensitivity of self-assessed work limitation to question order, framing and inclusion criteria. Moreover, a binary measure of work-limiting health status does not readily identify those individuals on the *margins* of being able to work, whether due to a specific employer-provided accommodation or a more general adjustment in working conditions.

More recently, several studies using the HRS have examined how individuals' job characteristics affect labor force exit. Aaron and Callan (2011) and Angrisani et al. (2013) found conflicting results for the role of self-reported physical job strain on the timing of retirement. Belbase, Sanzenbacher, and Gillis (2015) used the O*NET to create a Susceptibility Index measuring how reliant occupations are on abilities that are susceptible to age-related decline, based on a comprehensive review of the literature; using HRS data, they found that working in a susceptible occupation is associated with early retirement. Angrisani, Kapteyn, and Meijer (2015) compared self-reported and objective measures of working conditions using HRS data linked to the O*NET and found that subjective measures tended to be related to moves from full- to part-time employment, while objective measures tended to relate more to decisions about retirement timing. Sonnega et al. (2017) also compared the role of subjective and objective measures of job demands in retirement timing using HRS data linked to O*NET; they found that both types of measures lead to roughly the same predictions for the three domains examined (cognitive, emotional and physical), though the subjective measures are stronger predictors than their objective counterparts. Importantly, Sonnega et al. (2017) applied theoretical insights from the job demands-resources model (Feldman and Beehr 2011) to the construction of measures of *mismatch* that lead to better predictors of retirement timing than either job demands or health alone. Finally, a recent paper by Lopez

Garcia, Mullen, and Wenger (2021) used data from Wave I of the ORS to create composite indices for both physical and environmental job demands, and corroborated findings from the O*NET strand of the literature that individuals in more demanding jobs are more likely to transition to retirement sooner.

A limitation of the above studies is their tendency to focus separately on individuals' abilities or job characteristics, rather than their interaction with one another. The main reason for this is lack of measures of individuals' functional abilities in the HRS that are harmonized with either subjective or objective reports of the functional requirements of jobs. Indeed, Sonnega et al. (2017) relied by necessity on imperfect comparisons between individual's personal characteristics and their job characteristics for the three domains examined (e.g., for the cognitive domain, they compared low word recall to whether the job requires intense concentration (HRS) or processing information (O*NET)). Research using novel surveys fielded in the RAND American Life Panel provides support for the idea that mismatch between individuals' abilities and occupational requirements—either in their current jobs or more generally in the national economy—plays an important role in labor force exits (Lopez Garcia, Maestas, and Mullen 2019). Including measures of individuals' functional abilities that are harmonized with the measures of job requirements (e.g., "My job requires a lot of physical effort") could help researchers identify which dimensions of working conditions are particularly vulnerable to age-specific functional decline and potential targets for public health intervention. More generally, mismatch between actual and desired working conditions (such as telecommuting, flexible scheduling and autonomy) is likely to be an important determinant of retirement timing and possible unretirement—for older workers (Maestas 2010; Maestas et al. 2017).

4 Implications for Studying the Long Run Effects of Working Conditions on Health and Other Outcomes

Most people spend a significant fraction of their waking lives working. How do the activities they perform at work impact their health, all else equal? On the one hand, grueling working conditions may lead to deteriorating health, caused by "wear and tear" accumulating over one's working life. Indeed, a growing body of research has documented associations between physically demanding occupations and negative health outcomes (e.g., Case and Deaton 2005; Costa 2000, 2005; Ravesteijn, van Kippersluis, and van 2013). On the other hand, work activities may

also represent health investments akin to exercise and reading in one's leisure time (Grossman 1972), in which case lower job demands may be associated with *worse* health outcomes ("use it or lose it"). Using data from the HRS and an instrumental variables strategy using offers of early retirement windows, Coe et al. (2012) find no clear relationship between retirement timing and later life cognition for white-collar workers (who typically have higher cognitive demands and lower physical demands than blue-collar workers) and suggestive evidence of a positive relationship for blue-collar workers. Using panel data from the Survey of Health Ageing and Retirement in Europe (SHARE), Mazonna and Perrachi (2017) find that earlier retirement is associated with improved cognitive, mental and physical health for those in more physically demanding jobs and worse health for those in less physically demanding jobs.

In many ways, the HRS is ideally suited to study the long run effects of working conditions on later life outcomes including health. The main weakness to date has been lack of comprehensive information about respondents' jobs before they entered the panel. Studies have used HRS respondents' occupational histories to examine associations between longest held occupation and measures of occupational demands constructed using occupations reported in the core surveys (e.g., Asfaw, Pana-Cryan, and Quay 2020; Nicholas, Done, and Baum 2020). However, the recent addition of the Life History Mail Survey will enable better measurement of lifetime occupational demands and working conditions (though potentially limited by a lack of reliable contemporaneous measures prior to the 2003 introduction of the O*NET database; see above for limitations of the pre-existing Dictionary of Occupational Titles).

Two additional complications arise when examining the causal effects of working conditions on health. First, it is well known that individuals select into occupations for a variety of reasons associated with current and expected health. Empirically, individuals with more education, higher wealth and better health tend to end up in jobs characterized with higher levels of cognitive demands and lower levels of physical demands (e.g., Marmot 2005; Ravesteijn, van Kippersluis, and van 2013). Accounting for selection bias arising from occupational choice is challenging in studies using observational data, regardless of the survey content.

A second, less explored drawback of the current literature is that it examines the roles of work and leisure activities separately, even though they are related. This introduces at least two countervailing biases, the net effect of which is unknown. First, someone with a physically demanding job could compensate for the physical demands of his job by exercising less in her free time; in this case regressing health on physical job demands alone will *understate* the causal effect, since unobserved private investments are inversely correlated with job demands. At the same time, if people who prefer physical activity tend to sort into physically

demanding jobs, then regressing health on physical job demands alone will *overstate* the causal effect, since unobserved private investments are positively correlated with job demands (i.e., they are more likely to exercise in their free time as well). In a systematic review Kirk and Rhodes (2011) find that white-collar workers spend more time in leisure time physical activity than blue-collar workers. Understanding how post-retirement time use relates to prior occupational history is also likely to be important in understanding the long run effects of working conditions on health). (For example, increases in screen and sedentary time after retirement have been well documented (e.g., Tourvier et al. 2010; Menai et al. 2014; Sprod et al. 2017).

The HRS includes some time use measures in its Consumption and Activities Mail Survey (CAMS). However, respondents are instructed to "double count" time spent doing more than one activity at a time, making it difficult to measure time allocation across different generalized types of activities without imposing strong assumptions. Moreover, some activities may be spread across work and leisure time without differentiation (e.g., walking). At the same time, respondents are asked how many hours they spent last week "working for pay" but not how they divided their time at work. A redesign of the CAMS time use module could alleviate these problems and open up avenues for future research on interactions between work and leisure activities and their roles in the production functions for cognitive, mental and physical health.

5 Impacts of Workforce Trends

As discussed above, the HRS has a number of strengths and weaknesses when it comes to studying the effects of working conditions on individuals' health, well-being and labor supply decisions at older ages. Below I discuss how current and projected trends in the U.S. workforce affect the utility of the HRS for studying these types of research questions.

5.1 The Changing Nature of Work

One of the biggest challenges to studying the long run impacts of working conditions is the lack of comprehensive historical data on job (or occupation) characteristics when job content is changing over time. As discussed above, the HRS includes a limited set of self-reported job characteristics that have been consistently collected over time (see Table 1), but these are only available for jobs observed in panel, after age 51. To construct measures of "prime age" job

characteristics one can use variables from the retrospective Life History Mail Survey (see Table 2), though these variables do not overlap well with the core survey variables and are measured on different scales. A second strategy is to merge data from occupational databases but O*NET measures may not describe well the characteristics of occupations prior to 2000 and the Dictionary of Occupational Titles, which does describe jobs before 2000, suffers from an underrepresentation of non-manufacturing occupations and other limitations. Some researchers have developed alternative historical databases that could be exploited by HRS researchers; for example, Atalay et al. (2020) created a new dataset describing routine/nonroutine cognitive/interactive/manual tasks using text from job ads between 1950 and 2000. Although the HRS is currently limited in its ability to study past changes in working conditions, with the advent of databases such as the O*NET and ORS it is well suited to examine changes throughout the 21st century.

5.2 Nontraditional Work Arrangements

Between 1995 and 2015, the share of the American workforce with income from alternative work arrangements ("gig work") rose from an estimated 10.7–15.8% of the U.S. workforce (Katz and Krueger 2019). Furthermore, Collins et al. (2019) find that the increase in gig work has been accelerating, with more than half of the estimated increase from 2000 to 2016 occurring between 2013 and 2016 alone and accounted for almost entirely by users of online labor platforms such as Uber, Lyft, Doordash, Postmates, TaskRabbit and others. Despite the growing importance of gig employment in the American economy, there has been little research on its impact on older workers and those with disabilities, who may find its flexibility especially appealing. This is mainly due to the lack of large, national surveys that allow one to identify and obtain characteristics about gig workers (Abraham et al. 2018).

　　As a result, researchers studying gig work have generally eschewed the HRS in favor of administrative records data.[3] For example, Jackson (2021) uses administrative tax data on Schedule C filers and recipients of Forms 1099-MISC and 1099-K from popular platforms to identify gig workers and examine the impact of the rise of the gig economy on a range of labor supply outcomes. Notably, Jackson (2021)

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3 An exception is Munnell, Sanzenbacher, and Walters (2019), which defines nontraditional work arrangements in the HRS as working in any job lacking both health and retirement benefits (or more narrowly, a job lacking these benefits that also has some measure of job instability).

finds that, among older workers (ages 55+), an increase in gig work is associated with a delay in receipt of Social Security retirement benefits and a reduction in receipt of Social Security Disability Insurance benefits, suggesting that, on net, the flexible work arrangements provided by gig work may enable older workers and those with disabilities to remain in the labor force longer than traditional work arrangements. However, it remains unknown just how many gig workers have or are likely to develop work-limiting disabilities and the specific ways in which they may benefit from flexible work arrangements provided by gig work or, alternatively, suffer from lack of attachment to a permanent employer if/when their health worsens. The HRS may benefit from adding questions to assess the scope of alternative work arrangements among its respondents; a 2020 report by the National Academies of Sciences, Engineering and Medicine on "Measuring Alternative Work Arrangements for Research and Policy" provides recommendations for measuring types and characteristics of alternative work arrangements (see Chapter 3) (National Academies of Sciences, Engineering, and Medicine 2020).

5.3 Effects of COVID-19 Pandemic

In March 2020, as the COVID-19 pandemic accelerated in the U.S., many employers suddenly shifted to allow (and sometimes require) certain employees to work from home full-time. The extent to which these shifts will result in a permanent expansion of telework availability is unknown. Increases in telework may have downstream effects on other occupational demands, including potential changes in the amount of sedentary work, cognitive and mental health demands, autonomy, pace and schedule flexibility. At the same time, a broad expansion of telework and general rethinking of how work tasks can be done may lead to greater employment opportunities for older workers and those with disabilities (Schur, Ameri, and Kruse 2020). The HRS currently includes only limited information about telecommuting and other flexible work arrangements with employers (see above). As a result, the ability to study long-term shifts in these types of working conditions, and their effects over time, is limited in the current configuration of the HRS.

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