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Do panel surveys make people sick? US arthritis trends in the Health and Retirement Study

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Abstract

Researchers have long viewed large, longitudinal studies as essential for understanding chronic illness and generally superior to cross-sectional studies. In this study, we show that (1) age-specific arthritis prevalence in the longitudinal Health and Retirement Study (HRS) from the United States has risen sharply since its inception in 1992, and (2) this rise is almost surely spurious. In periods for which the data sets are comparable, we find no such increase in the cross-sectional National Health Interview Survey (NHIS), the primary source for prevalence data of chronic conditions in the US. More important, the upward trend in the HRS is not internally consistent: even though prevalence in the HRS rises sharply between 1992 and 1996 for 55–56 year-olds, the prevalence for that age group plummets to its 1992 level among the new cohort added in 1998 and then rises rapidly again between 1998 and 2002. We discuss possible reasons for these discrepancies and demonstrate that they are not due to sample attrition in the HRS.

Keywords: Arthritis prevalence; Survey methods; USA

Introduction

In recent decades, governments around the world have spent considerable sums of money on long-term panel surveys (usually annual or biannual observations on the same survey respondents). These costs are usually rationalized by important research questions that cannot be adequately addressed with cross-sectional data. Panel surveys, therefore, provide social scientists with a new arsenal of data for studying the role of health across the life course. In the United States, probably the most important health-related data collection in the past decade has been the Health and Retirement Study (HRS), which is a National Institute on Aging study designed to track a cohort of individuals from working ages into retirement, collecting economic, demographic and biomedical information every two years.

In theory, panel surveys should (after adjusting for issues such as sample attrition) yield the same estimates of disease prevalence as found in cross-sectional data. Whether or not a 55-year-old has arthritis on a given date, for instance, should not depend on whether his/her data is obtained from a longitudinal or cross-sectional study. However, researchers rarely analyze such comparisons. In this brief, we bring to light a novel (and, we argue, spurious) feature of the HRS, namely sharp increases in age-specific prevalence of arthritis. Although other diseases often draw more attention in the public eye, arthritis is possibly the most economic-

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ally important chronic disease for people approaching retirement. Arthritis is both highly prevalent (Centers for Disease Control, 2001a, b; Manton, Corder, & Stallard, 1993) and costly (Centers for Disease Control, 1999; Lubeck, 1995; Pugner, Scott, Holmes, & Hieke, 2000; Rice, 1992; Yelin, Callahan, & National Arthritis Data Work Group, 1995). And as the population ages, arthritis (particularly osteoarthritis) is likely to grow in importance as a public health concern. Understanding policy-relevant questions such as the effect of arthritis-induced disability on the retirement decision necessitate a data source that can be trusted to yield reliable information over time.

Methods

Data

The original HRS cohort consists of a random sample of the non-institutionalized US population aged 51–61 in 1992 (The Health and Retirement Study, 2003; Rand Center for the Study of Aging. Rand Population Program, 2002). The HRS has been repeated every two years subsequent to 1992, and preliminary data from the sixth wave (2002) is now available. In 1998, additional cohorts added to the HRS made it representative of the entire US population aged 51 and over. The NHIS consists of annual cross-sections of the US non-institutionalized population and samples about 100,000 adults aged 18 and over each year (National Center for Health Statistics, 1994).

The outcome variable under study in each sample is self-reported arthritis, with no distinction made between osteoarthritis and rheumatoid arthritis. The HRS question is "Has a doctor ever told you that you have arthritis?", which remains constant over the survey waves (The Health and Retirement Study, 2003). Arthritis is one of eight general chronic conditions queried in the HRS (the others are heart disease, respiratory disease, diabetes, hypertension, stroke, cancer and psychological disorders).

The NHIS underwent a major design change in 1997. Prior to 1997, a primary respondent answered questions for all adults in the household. The question was, "Tell me if anyone in the family has had any of these conditions [arthritis being one]…" (National Center for Health Statistics, 1994). Starting in 1997, proxy reporting was dropped and each adult in the household was asked, "During the past 12 months, have you had pain, aching, stiffness or swelling in or around a joint?" (National Center for Health Statistics, 2002). Thus, the NHIS went from an emphasis on physician diagnosis of disease to a symptom-based approach to indicate arthritis.

Analyses

Characteristics of each data source limit the kinds of direct comparisons we can make. The redesign of the NHIS in 1997, especially the change in the question wording noted above, makes it impossible to follow trends over the entire period covered by the HRS, and the narrow age range of the original HRS cohort limits the number of age-specific comparisons we can make over time. Given these limitations, we conduct the following four analyses:

(1) Arthritis prevalence at ages 59–61 is calculated from 1992–2000 in the HRS. In order to show that the strong upward trend is not due to sample attrition bias, we re-compute the trend including those cases lost to follow-up, assuming that they retain their previous disease state. Since these lost cases are not allowed to acquire the disease, the estimates form a lower bound on the trend.
(2) A direct comparison is made of arthritis prevalence proportions in the HRS and NHIS for those aged 55–59 in 1992, 1994 and 1996. During this period, the questions were nearly identical between the surveys, and they remained constant over time.
(3) The trend in within-cohort prevalence for those aged 51–61 in 1992 is compared across data sets, though the 1992–1996, 1998–2000 periods must be examined separately in the NHIS due to the 1997 redesign of the NHIS. The within-cohort prevalence will naturally rise over time as the cohort ages. The NHIS estimates are weighed to follow the same change in the age distribution as found in the HRS.
(4) The additional cohorts added to the HRS in 1998 are used to examine whether the upward trend in arthritis prevalence among those aged 55–56 during the 1992–1996 continues in the new cohort sample in 1998 or whether it follows another pattern. The age group 55–56 is chosen because it is the only one present in the data that can be found in each wave of the data from 1992 to 2002.

In all analyses mentioned above, the age distribution in the NHIS is standardized to match the HRS distribution in the HRS sample in each survey year. However, because both surveys are large, random samples of the US population, age standardization has minimal effect on the prevalence estimates. Standardizing by the age distribution of the HRS has the added advantage of automatically adjusting for age-related sample attrition across the survey waves.

Finally, in all analyses, sampling weights that account for complex sampling designs in both the HRS and the NHIS are applied throughout.

Results

Fig. 1 shows the upward trend in the age-specific (59–61) prevalence of arthritis. This is the only age group that can be followed across five waves. Other analysis, not shown, shows a similar pattern across shorter intervals for other age groups. Fig. 1 also reveals that attrition bias can account for virtually none of the upward trend in prevalence, as the data series are virtually indistinguishable. However, the trend adjusted for attrition bias is only a *lower* bound. The trend might actually be steeper than indicated given different assumptions about sample attrition.

As one might expect, no similar trend is found in the NHIS. Table 1 reports that prevalence among those 55–59 in the HRS is 25.3% higher at baseline and increases from 371 to 415 cases per thousand (11.9%) between 1992 and 1996. In comparison, prevalence in the NHIS rises insignificantly from 296 to 304 (2.5%).

Table 2 shows the increase in within-cohort prevalence (which is expected to increase because the cohort is getting older) for the entire HRS cohort, looking at the 1992–1996 and 1998–2000 periods separately. This cohort was age 51–61 in 1992, and the NHIS has been age-matched to the NHIS in each year. Between 1992–1996 the prevalence rises from 344 to 458 (32.9%) in the HRS, compared to an increase from 291 to 336 (15.4%) in the NHIS. Between 1998 and 2000, the increase is from 513 to 581 (13.1%) in the HRS and from 309 to 335 (8.2%) in the NHIS.

Finally, Fig. 2 shows the prevalence of arthritis at age 55–56 for those in the 1992 and 1998 cohorts. If the trend were a function of real period effects, the sharp discontinuity would not be seen (a smooth line from 1992–2002 would result). Furthermore, the fact that 55–56 year-olds in1998 cohort begins at a similar level to the 1992 cohort implies that cohort effects are not responsible for the trends. These findings are further reinforced by the sharp increase in prevalence that occurs among those in the 1998 cohort, as the age-specific prevalence rises from 307 to 422 (37.1%).

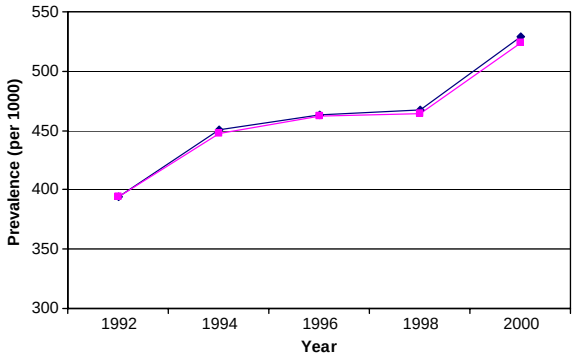

Fig. 1. Arthritis prevalence at ages 59–61, 1992–2000 (Health and Retirement Study, USA). (–♦–) Unadjusted, (–■–) adjusted for possible attrition bias.

Table 1
Arthritis prevalence in the US: age 55–59

Year	N	Prev. (/1000)	95% CI
HRS			
1992	4314	371	(357,385)
1994	4073	389	(374,404)
1996	4020	415	(400,431)
NHIS			
1992	921	296	(267,326)
1994	843	299	(268,330)
1996	407	304	(259,348)

Notes: HRS = Health and Retirement Study; NHIS = National Health Interview Survey; Prev. = Prevalence; CI = Confidence Interval. Prevalence proportions incorporate sampling weights. NHIS estimates are standardized to the HRS-based age distribution in each year.

Discussion

All the results above indicate that the upward trend in the prevalence of arthritis in the HRS is spurious. First, the cross-sectional evidence presented from the NHIS suggests that the arthritis prevalence in this age group has remained relatively constant, rather than rising. More damaging is the evidence illustrated in Fig. 2. There we see not only a sharp discontinuity in age-specific prevalence inconsistent with the previous trend, but the suspect trend within the initial cohort repeats itself in the years 1998–2002. It is possible that there are legitimate cohort differences such that we would not expect a continuation of the previous trend, but the discontinuities are much too sharp for cohort differences to explain within such a short time interval.

Our main purpose here is not to resolve the question of what has really been happening to arthritis trends. Rather, we hope to incite additional research on the reliability and validity of epidemiological measures taken from longitudinal data sets. At this early point, we have only illuminated potential concerns. We have no ready evidence concerning *why* the problem exists. At least two puzzles need further explanation: first, why is the baseline prevalence of the HRS in 1992 so much higher than the prevalence in the NHIS; second—and more important—why does the gap between the two surveys grow sharply over time?

The higher prevalence in the HRS at baseline is due, possibly, to two factors. First, exploratory analysis (not shown here) indicates that when the NHIS is restricted

Table 2
Within-cohort arthritis prevalence: 1992–96 and 1998–2000, USA

	HRS			NHIS		
Year	N	Prev. (/1000)	95% CI	N	Prev. (/1000)	95% CI
1992–1996						
1992	9760	344	(334, 355)	2082	291	(271, 310)
1994	8830	402	(392, 414)	1797	299	(277, 320)
1996	8429	458	(448, 471)	830	336	(303, 368)
1998–2000						
1998	8085	513	(503, 526)	3935	309	(295, 324)
2000	7627	581	(570, 594)	3872	335	(320, 350)

Notes: HRS = Health and Retirement Study; NHIS = National Health Interview Survey; Prev. = Prevalence; CI = Confidence Interval. Prevalence proportions incorporate sampling weights. NHIS estimates are standardized to the HRS-based age distribution in each year. The HRS cohort consists of those aged 51–61 at the time of interview in 1992.

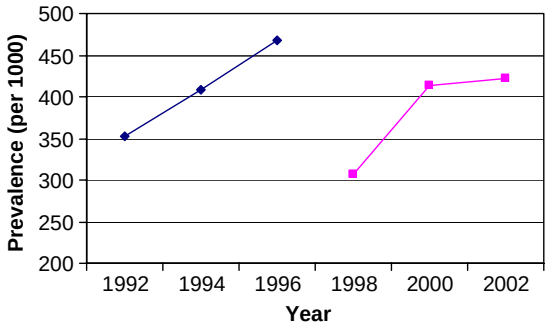

Fig. 2. Arthritis prevalence at ages 55–56, 1992–2002 (Health and Retirement Study, USA). (–◆–) Original 1992 cohort, (–■–) 1998 'Warbabies' cohort.

to self-reported (rather than proxy-reported cases), $\frac{1}{3}$ of the gap between the two surveys is eliminated. The remaining $\frac{2}{3}$ of the gap is likely explained by differences in survey design (question order, length, etc.), even though question wording is very similar prior to 1997 (The published NCHCS statistics use both self-reported and proxy-reported, just as we do in Tables 1 and 2 above). However, our exploratory analysis of demographic characteristics shows no meaningful differences between the NHIS and the HRS, which is what we would expect from nationally representative surveys.

The upward bias in the trend in the HRS is more intriguing, particularly since the effect of attrition bias is trivial. Another source of upward bias might be net immigration, which would affect the trend in the NHIS but not the HRS, since the HRS cohort is constant, while the NHIS involves taking a new cross-section each year. However, immigration in this age group is much too small to play an important role in explaining the bias. Furthermore, the new immigrants would have to have substantially lower rates of arthritis than the existing population, which also is not likely to be the case.

Another possible explanation for the bias in the trend is "panel conditioning", which means that repeated observation on the same individuals would condition them to respond positively to some types of survey questions over time. Panel conditioning has received very little research attention, though limited evidence exists for some surveys (Corder & Horvitz, 1989). Panel conditioning might exist if participation in a periodic health survey induces some individuals to seek diagnostic testing or to make inquiries of physicians about symptoms they otherwise would not mention. That the pattern in the HRS repeats when it is refreshed with new cohorts (Fig. 2) is, perhaps, the strongest evidence for some kind of panel conditioning.

In sum, longitudinal surveys hold great promise, but the notable discrepancies between the HRS and the NHIS indicate a need for further research on reconciling differences between the longitudinal and cross-sectional evidence for arthritis. Future research should also compare other important chronic conditions across these and other surveys. An exploration of biomedical, socioeconomic and demographic factors that might account for the discrepancies is also an important topic for future research.

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