Published papers and papers in progress

Abstract
The association between pain and self-assessed health among adults age 20 and older is examined with data from the 2003e2004 National Health and Nutrition Examination Survey, a cross-sectional nationally representative survey of the civilian, non-institutionalized US population. Models emphasize whether and how the association differs across age cohorts. 5032 respondents age 20 and older were asked about their experience with pain. Responses are used to create two different pain measures: general and sitespecific. Self-assessed health is categorized into groups that are ordered from fair/poor to excellent. Bivariate analyses and ordered logistic regressions reveal pain, measured both ways, have robust inverse associations with self-assessed health. Associations remain robust after adjusting for a series of health conditions and indicators plus demographic, socioeconomic and social support characteristics. Models test the effect of age by pain interactions on self-assessed health and confirm substantial variation across cohorts. Those of middle-age, 40e59, display the strongest association while self-assessed health is virtually unassociated among oldereold, those 80 and older. Findings suggest that the way pain impacts self-assessed health varies by age cohort. Conclusions discuss the importance of considering pain as a health condition and the implications of the findings for well-being across age cohorts.

Abstract
Background: This study contributes to dialogue on quality versus quantity of life by examining years older persons can expect to live in various states of pain.
Methods: Data from seven waves of the Health and Retirement Study; $N = 26,896$; age 55+. Estimations using the Interpolative Markov Chain approach apply probability transitions to multistate life table functions. Two estimates are interpreted: (i) population-based, which provide population averages aggregated across baseline states and (ii) status-based, which provide independent estimates by baseline state. Age- and sex-specific years with no pain, milder onlimiting, and severe or limiting pain are reported as is percent of life in states of pain.
Results: Females have higher life expectancy than males but similar expectations of pain-free life. Total life expectancy varies only slightly by baseline pain states but pain-free life expectancy varies greatly. For example, an 85-year-old female pain-free at baseline expects 7.04 more years, 5.28 being pain-free. An 85-year-old female with severe pain at baseline expects 6.42 years with only 2.66 pain-free. Percent of life with pain decreases by age for those pain-free at baseline and increases for those with pain at baseline.
Conclusion: Pain is moderately associated with quantity of or total life but substantially and importantly associated with quality of or painfree life.

Zachary Zimmer and Sara Rubin. 2020. Pain and disablement. Pp. 219-232 in Jean-Marie Robin, Yasuhiko Saito, Herman Van Oyen and Eileen Crimmins (eds.), *International Handbook of Health Expectancies*. New York: Springer.

Abstract
Pain is ubiquitously experienced. It is the most common reason for visiting a doctor, incurs enormous direct and indirect costs, and is among the strongest predictors of disability. Yet, literature linking pain and disability has been scattered and unfocused. This chapter aims to bring attention to pain as a constituent of health expectancy by situating it within a disablement process.   First pain measurement is discussed. Then, pain is linked conceptually and empirically to disability. Finally, there is an analysis using data from HRS and SHARE which demonstrates that almost everyone with severe pain reports functional limitation, and the chance that an individual with a functional limitation has a disability is greater for those with than for those without pain. The conclusion is that pain should not be ignored not only as a leading cause of disability but as a mechanism in the disablement process.

Zachary Zimmer and Anna Zajacova. 2020. Persistent, consistent and extensive: The trend of increasing pain prevalence in older Americans. *The Journal of Gerontology: Social Sciences*. 75(2): 436-447. doi:10.1093/geronb/gbx162.

Abstract
Objectives: Assess trends in pain prevalence from 1992 to 2014 among older U.S. adults and by major population subgroups, and test whether the trends can be explained by changes in population composition.
Methods: Health and Retirement Study data include information on any pain, pain intensity, and limitations in usual activities due to pain. Average annual percent change in prevalence is calculated for any and for 2 levels of pain—mild/moderate and nonlimiting and severe and/or limiting—across demographic and socioeconomic characteristics, and for those with and without specific chronic conditions. Generalized linear latent and mixed models examine trends adjusting for covariates.
Results: Linear and extensive increases in pain prevalence occurred across the total population and subgroups. The average annual percent increase was in the 2%–3% range depending upon age and sex. Increases were consistent across subgroups, persistent over time, and not due to changes in population composition. Without increases in educational attainment over time, pain prevalence increases would be even higher.
Discussion: The increases in pain prevalence among older Americans are alarming and potentially of epidemic proportions. Population-health research must monitor and understand these worrisome trends.

Zachary Zimmer, Anna Zajacova and Hanna Grol-Prokopczyk. 2020. Trends in Pain Prevalence among Adults 50 and Older across Europe, 2004 to 2015. *Journal of Aging and Health.* 32(10): 1419-1432. doi:10.1177/0898264320931665.

Abstract
Objectives: We examine recent trends in pain prevalence among adults aged 50+ across Europe.

Methods: Data for fifteen countries from the Survey of Health, Ageing and Retirement in Europe are examined for two periods: 2004-2011; 2013-2015. Trends are shown descriptively; using a multilevel modeling strategy controlling for covariates; and modeled on a country-specific basis.
Results: Population-level pain prevalence ranges from about 30% to about 60% depending on country and year. Pain is more prevalent in women and generally increases with age. There is an increase in prevalence over time, net of age and other predictors. Prevalence increased an annual average of 2.2% between 2004 and 2011, and 5.8% between 2013 and 2015, in fully-adjusted models.
Discussion: Trends in pain prevalence have implications for disability, health care utilization, productivity, and population health. These findings are not optimistic, but align with other population-wide studies, suggesting a global trend of rising pain prevalence.

Anna Zajacova, Zachary Zimmer and Hanna Grol-Prokopczyk. Forthcoming. Pain trends among American adults 2002-2017: patterns, disparities, and correlates. Forthcoming. *Demography*. Published online October 16, 2020. Available at: https://osf.io/preprints/socarxiv/vgp95/.

Abstract

Determining long-term trends in chronic pain prevalence is critical for evaluating and shaping US health policies, but little research has examined such trends. This study (1) provides estimates of pain trends among US adults across major population groups; (2) tests whether sociodemographic disparities in pain have widened or narrowed over time; and (3) examines socioeconomic, behavioral, psychological, and medical correlates of pain trends. Regression and decomposition analyses of joint, low-back, neck, migraine, and jaw/facial pain using the 2002-2018 National Health Interview Survey for adults aged 25-84 (N=441,707) assess the trends and their correlates. We find extensive escalation of pain prevalence in all population subgroups: overall, reports of pain in at least one site increased by 10%, representing an additional 10.5 million adults experiencing pain. Socioeconomic disparities are widening over time, and psychological distress and health behaviors are among the salient correlates of the trends. This study thus comprehensively documents rising pain prevalence among Americans across the adult life span and highlights socioeconomic, behavioral, and psychological factors as important correlates of the trends. Chronic pain is an important dimension of population health and demographic research should include it when studying health and health disparities.

Andrew C. Stokes, Wubin Xie, Dielle J. Lundberg, Katherine Hempstead, Anna Zajacova, Zachary Zimmer, Dana A Glei, Ellen Meara and Samuel H Preston. Forthcoming. Obesity and the increasing prevalence of chronic pain in middle-aged US adults, 1992 to 2016. *Social Science and Medicine: Population Health.*

Abstract

Recent unprecedented increases in mortality and morbidity during midlife are often ascribed to rising despair in the US population. An alternative and less often examined explanation is that these trends reflect, at least in part, the lagged effects of the obesity epidemic. Adults in midlife today are more likely to live with obesity and have a greater cumulative exposure to excess adiposity during their lifetime than any previous generation. Prior work has demonstrated a link between obesity and mortality risk at midlife, but the mechanisms remain unclear. Pain may

represent one important pathway linking obesity to mortality trends. Pain is a debilitating condition that has increased significantly over recent decades and is associated with both morbidity and mortality, including suicide and opioid-related mortality. Evidence suggests obesity and pain may be linked, but there is little evidence of an association at the population level. In this paper, we examine to what extent increases in overweight and obesity explain the rising trends in chronic pain observed among middle-aged adults in the US from 1992 to 2016. We assess trends in both mild/moderate nonlimiting pain and severe and/or limiting pain. In doing so, we draw attention to one mechanism through which overweight/obesity may have contributed to recent population health trends. Our analysis found that increases in BMI from 1992 to 2016 may account for up to 20% of the upward trend in mild/moderate nonlimiting pain and 32% of the trend in severe and/or limiting pain for women, and 10% and 19% of the trends respectively for men.

Abstract
Chronic pain is a common, costly, and consequential health problem. However, despite some important analytic contributions, sociological research on pain has not yet coalesced into a unified subfield. We present three interrelated bodies of evidence, and illustrative new empirical findings using 2010-2018 NHIS data, to argue that pain should have a central role in sociological investigations of health. Specifically, we contend that (1) pain is a sensitive barometer of population health and wellbeing; (2) pain is emblematic of many contested and/or chronic conditions; and (3) pain and pain treatment reflect, and have wide-ranging implications for, public policy. Overall, whether we analyze pain quantitatively or qualitatively—focusing on its distribution in the population, its social causes and consequences, or its subjective meanings for individuals—pain reflects the social conditions, sociopolitical context, and health-related beliefs of a society. Pain is thus an important frontier for future sociological research.