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Racial and Socioeconomic Disparities in Disabling Chronic Pain: Findings from the Health and Retirement Study

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Abstract

The U.S. National Pain Strategy calls for increased population research on “high impact chronic pain,” i.e., longstanding pain that substantially limits participation in daily activities. Using data from the nationally-representative Health and Retirement Study (HRS), we investigated the prevalence of high-impact chronic pain in U.S. adults over age 50 overall and within population subgroups. We also explored sociodemographic variation in pain-related disability within specific activity domains. Data are from a subsample of HRS respondents (n=1,925) who were randomly selected for a supplementary pain module in 2010. Our outcome was operationalized as pain duration of ≥7 months and a disability rating of ≥7 (0 to 10 scale) in at least one domain: family/home, leisure, social activities, work, or basic activities. Overall, 8.2% (95% C.I. = 6.7 to 10.1%) of adults over age 50 met criteria for high-impact chronic pain. This proportion rose to 17.1% (95% C.I. = 12.3 to 23.4%) among individuals in the lowest wealth quartile. Prevalence

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differences by education, race/ethnicity and age were not significant. Arthritis and depression were significantly associated with high-impact pain in multivariable analysis. Among adults with *any* chronic pain, African Americans and individuals in the lowest wealth quartile reported more pain-related disability across activity domains.

INTRODUCTION

Approximately one-third of Americans experience chronic pain, a condition that costs society over $500 billion each year.[18] A seminal 2011 report from the Institute of Medicine (IOM) presented chronic pain as a pressing public health issue and offered recommendations to improve its prevention and treatment. These recommendations formed the basis for a comprehensive National Pain Strategy (NPS), developed with input from experts in pain management, research, insurance, and policy.[29] One NPS objective is to improve decision-making via the collection and analysis of epidemiologic data on “high-impact chronic pain,” i.e., pain experienced for over six months that causes substantial limitations in work, social, and/or self-care activities. This definition identifies those unable to maintain normal activities due to chronic pain, and who have experienced pain longer than the three-month threshold typically used to indicate the transition from acute to chronic pain.[18]

Many conditions that may cause high-impact chronic pain are age-related, including osteoarthritis, diabetic neuropathy, and post-stroke pain.[12] Studies conducted among individuals over age 50 demonstrate a strong link between chronic pain and decrements in physical, psychological, cognitive and social functioning.[7,9,37] Chronic pain also increases the likelihood of falls.[42] Pain may be more closely linked to disability in older adults than in their younger counterparts,[10] and chronic pain can impede the ability of older adults to remain independent.[31] Prior prevalence estimates of chronic pain in U.S. older adults range from 16% to 31%.[19,37,38] However, these estimates are based on definitions that did not consider pain’s duration and/or impact on the activity domains specified in the NPS definition of high-impact chronic pain.

While high-impact chronic pain is found throughout the midlife and older population, it may disproportionately affect African American adults and those of low socioeconomic status (SES). Disparities across a wide range of health-related outcomes disadvantaging these subgroups of Americans have been observed over decades of research.[1] Health inequalities may be most pronounced in midlife and early old age,[1] owing to an accelerated aging process thought to result from social disadvantage and chronic stress.[13,20] Both socioeconomic and racial/ethnic minority status are linked to the chronic pain experience and its treatment, for reasons that include greater vulnerability to chronic conditions, exposure to occupational hazards, and reduced access to care.[43, 14, 16, 26] Although non-Hispanic whites typically report a similar or higher overall prevalence of chronic pain compared to other groups,[19,35,38] African Americans and Hispanics tend to report greater pain severity[15,16] and African Americans report more pain-related disability.[14,35,37] Lower educational attainment and fewer economic resources are also associated with chronic pain and pain severity;[15,35,37,38] however, socioeconomic patterns are not consistent across studies.[19]

The goal of the present study is to conduct secondary data analysis to estimate the population prevalence of high-impact chronic pain, as recommended in the 2016 National Pain Strategy. We assess whether the prevalence of high-impact pain in community-dwelling Americans over age 50 varies across groups defined by race/ethnicity and SES (indicated by education and household wealth), as well as gender and age. We also examine potential health correlates of high-impact chronic pain. Finally, we assess variation in pain intensity and impact by race/ethnicity and SES among those who report *any* chronic pain, to explore differences in the pain experience across the entire range of pain impact.

METHODS

Study population

Since 1992, the Health and Retirement Study (HRS) has conducted biannual telephone and face-to-face surveys of a nationally-representative sample of community-dwelling Americans over age 50.[40] HRS was approved by the University of Michigan Institutional Review Board and informed consent was obtained from each respondent. HRS uses a multi-stage area probability sample design, involving stratification, clustering, and oversampling of African American and Hispanic adults. From over 20,000 HRS respondents surveyed in 2010, HRS investigators selected a random subsample of 1,925 self-respondents who were subsequently screened for the presence of pain using an item asking whether during the past year they had experienced pain that lasted one week or longer. Respondents answering yes to this question (N=778) were then given the following instructions: “If you have had more than one week-long or longer episode of pain in the past year, please think about the one that was most severe. The remaining questions will be about that episode of pain.” They were next asked a series of questions about pain duration, intensity and impact. Because of the random selection process, Pain Module respondents are representative of the larger HRS sample and—with the use of HRS-provided sampling weights—of the U.S. population of midlife and older adults.

Pain-related outcomes

Domain-specific pain impact and “high impact chronic pain”—Using items from the Pain Disability Index,[44] respondents rated the impact of pain on a 0–10 scale (0=no disability and 10=total disability) in the following seven areas: family and home responsibilities; recreation/leisure activities; social activities with friends; paid and non-paid work activities; frequency and quality of sex life; “doing basic things for yourself” (e.g., showering, fixing meals, getting dressed, driving); and “essential activities” (eating, breathing, sleeping). In addition, one yes/no question was asked about the financial impact of pain: “Due to your pain did you have financial difficulty such that it interfered with your ability to pay for things you need?”

Respondents were categorized as having *high-impact chronic pain* based on the NPS definition[29] if they reported a pain episode of ≥ 7 months duration (response categories did not permit identification of those with pain for 6 months), *and* if they had a mean pain impact score of ≥ 7 in *one or more* of the following domains: family and home, recreation/leisure, social activities, paid and non-paid work, and basic daily activities. Although the

HRS pain measures differ from those included in the NPS (e.g., NPS-suggested questions assess duration of participation restrictions with ordinal response categories ranging from never to always), the operational definition used in the present study is consistent with the NPS in that it captures adults with long-lasting pain that substantially interferes with daily life in at least one major life domain. Our cutoff score of 7 for pain impact was chosen based on similar thresholds used elsewhere to operationalize severe pain intensity or impact.[19,29,35]

Pain intensity—Respondents were asked, in reference to their most severe pain episode in the last year: "On a 0–10 scale, how would you rate your pain on average?"

Demographic correlates

Age, sex, race (non-Hispanic black, non-Hispanic white, Hispanic, other), *education* (less than high school, high school diploma or equivalent, more than high school) and quartiles of *total household wealth (1st: < $16,000; 2nd: < $131,000; 3rd: < $410,700, 4th:≥$410,700)*, based on a variable in the data set that represents the sum of household assets and liabilities, incorporating spouse data.[8]

Health correlates

Several health factors associated with chronic pain in prior studies were examined: *Self-reported doctor-diagnosis of the following chronic conditions (yes/no)*: arthritis, cancer, diabetes, heart disease, high blood pressure, and lung disease. *Smoking status*: current vs. former/never smoker. *Obesity*: Body Mass Index ≥ 30 (obese)[36] vs. <30, based on self-reported weight and height. *Depression (yes/no):* A score ≥ 4 on the 8-item Center for Epidemiologic Studies Depression Scale (CES-D), indicating a clinically significant level of depressive symptoms.[41]

Statistical analysis

Analyses were conducted using Stata/SE 14.2. Data were weighted to reflect the U.S. population of community-dwelling adults 51 years and older using respondent-level weights provided by HRS. Standard errors were adjusted for the clustering and stratification inherent to the HRS sampling design. Health and demographic variables had <1% missing data with the exception of obesity (2% missing). Pain impact variables were missing less than 2.5% of cases with the exception of impact on sex life (8% missing). These were not imputed.

We first estimated the prevalence of high-impact chronic pain in the population, both overall and within subgroups defined by race/ethnicity, education, household wealth, age, and gender. Next, we used bivariate logistic regression models to examine the association between each demographic and health variable and the presence of high-impact chronic pain. We then entered the main predictors of interest – race/ethnicity, education, and wealth – into an initial multiple logistic regression model (Model 1), with high-impact chronic pain (yes versus no) as the outcome and age and gender as covariates. In a subsequent model (Model 2), health indicators were added.

To assess whether health variables, as a group, explained some of the association between sociodemographic factors and high-impact chronic pain, we compared the design-adjusted

Wald tests for sociodemographic factors (race/ethnicity, education, and wealth) between Models 1 and 2. A change from statistical significance to non-significance would suggest that health variables helped to explain this relationship. Goodness of fit for both models was tested using Archer and Lemeshow's design-adjusted test; a non-significant F statistic suggests an adequate fit.[2]

To examine group differences (defined by education, wealth, and race/ethnicity) in mean pain intensity, we selected all respondents who reported a pain episode lasting "2 to 3 months" or longer. Within this subsample, we also assessed the mean impact of pain on seven activity domains and on the ability to pay for needs. These analyses were not limited to the subgroup of individuals with "high impact chronic pain", as everyone in that subgroup, by definition, already had at least one domain highly impacted (≥7 on a 0–10 scale) by pain. Instead, for this analysis, we specifically chose all people who were likely to have chronic pain and then assessed differences using the entire potential range of impact (0 to 10). Pairwise comparisons were made among groups with an adjusted alpha (.01) to account for multiple comparisons. Analyses incorporated survey weights and the complex sample design.

RESULTS

In the U.S. population over 50 years of age, 8.2% (95% C.I. = 6.7 to 10.1%) met criteria for high-impact chronic pain in 2010 (Table 1). Differences in prevalence among White (8.0%), Black (9.2%), and Hispanic adults (9.1%) were non-significant (p=0.92). A trend toward declining prevalence with increasing education was observed (p=0.06); from 11.2% among adults without a high school diploma to 6.3% in adults with education beyond high school. Prevalence decreased significantly (p <.001) with increasing wealth, from 17.1% in the bottom wealth quartile to 5.6% in the highest. Prevalence was higher among those 65 and older (8.9%) compared to those under 65 (7.7%), but this difference was not significant (p=.54).

A number of health conditions had a significant (p<.05) bivariate relationship with high-impact chronic pain (Table 2): arthritis (OR=7.67), cancer (OR=1.94), depression (OR=3.30), diabetes (OR=1.61), heart disease (OR=1.94), high blood pressure (OR=1.70), lung disease (OR=2.72), and smoking (OR=2.01).

Results from the initial multiple logistic regression model are displayed in Table 3. Compared to U.S. adults in the lowest wealth quartile, those in the highest three quartiles had significantly lower odds of having high-impact chronic pain, controlling for race/ethnicity, education, age, and gender. The Wald F test for wealth was significant (F(3,54)=9.06, p=.000), indicating a significant overall association of this variable with pain. No significant association was evident for race/ethnicity, education, age or gender.

When health predictors were added (Model 2), the Wald F statistic for wealth was reduced (F(3,54)=3.68, p=.017), suggesting that health factors partially explain the association between wealth and pain. Adjusting for sociodemographic and other health variables, the only health conditions retaining statistical significance were arthritis (OR=6.65; p <.001) and depression (OR=1.92; p =.011). The non-significant F statistics for Archer and Lemeshow's design-adjusted test indicate acceptable fit for both models.

Figures 1 and 2 show differences by race/ethnicity and wealth in mean ratings of average pain intensity and impact on specific domains, among individuals experiencing pain for at least 2–3 months. Pain intensity and impact across all domains decreased monotonically with increasing wealth, with statistically significant pairwise contrasts found between the highest quartile and the two lowest quartiles. White adults reported significantly less average pain than Black or Hispanic adults. Across activity domains, Black adults reported the highest pain impact, and Hispanic adults second-highest, though contrasts did not always reach significance. The impact of chronic pain tended to decrease with increasing education (Supplementary Figure 1), with some significant pairwise comparisons between respondents who completed "more than high school" and other groups. Only 1% of individuals in the highest wealth quartile and 12% of White adults with chronic pain reported that pain affects their ability to "pay for needs." In contrast, nearly half (45%) of adults in the lowest wealth quartile and more than one-third of Black (35%) and Hispanic (38%) adults reported that it does so (Supplementary Table 1).

DISCUSSION

Chronic pain is typically reported to affect about one-third of the U.S. population. We found that high-impact chronic pain – defined not by pain intensity but by its protracted duration and substantial negative impact on daily life - affects 8% of the U.S. population over age 50. This estimate falls within the 6% to 14% range for severe, disabling pain that has been reported in previous population studies.[27, 45] Present findings help identify priority groups for efforts to alleviate the burden of chronic pain in the middle-aged and older population.

Our analysis revealed striking wealth disparities in high-impact chronic pain, with the percentage of adults living with the condition greatest among those with the least wealth. Although high impact pain was more common among women, Black adults, individuals with a high school education or less, and adults over age 65 than their respective counterparts, differences were nonsignificant. Among people with *any* chronic pain (i.e., 2 to 3+ months' duration), average pain intensity and pain-related disability were greater among Black than White respondents, and decreased as wealth increased.

Wealth differences

To our knowledge, this is only the second U.S. population-based study to link household wealth, an indicator of a person's financial resources amassed over a lifetime,[33] with disparities in chronic pain. Compared to income, wealth may more accurately reflect the economic resources of older people, who are less likely to be in the paid labor force,[33] and is less subject to gender, race and cohort effects than education.[3] Using 1998–2010 HRS data, Grol-Prokopczyk[15] also reported wealth-based disparities in pain prevalence and pain-related disability. While highly informative, these findings are based on three general pain items (e.g., "Are you often troubled with pain?") that capture neither pain's duration nor its impact on specific life domains.

Our work extends Grol-Prokopczyk's by revealing that midlife and older adults with more wealth are less likely to experience high-impact chronic pain using a definition informed by the NPS. Moreover, among people with *any* chronic pain, we found that pain interference across multiple life domains (family/home, recreation, social activities, paid and unpaid work, sexual behavior, and basic and essential daily activities) decreases monotonically with increasing wealth. We propose that the observed wealth differences likely stem from the web of factors that have been posited to explain the relationship between SES and pain.[5]

Biological factors include an increasing likelihood of poor health as wealth decreases.[34] We found that the relationship between wealth and pain was attenuated after accounting for chronic diseases and risk factors for these conditions (smoking and obesity). *Psychological* risk factors for pain, such as mood disorders, stress and a history of trauma, are also more prevalent among people with fewer economic resources.[32, 33, 23] In our study, depression was strongly associated with the high-impact pain, though the association was weaker when wealth was in the model, indicating overlap of the two conditions.

Certain *environmental* factors linked to wealth can influence the development of chronic pain and its impact. These include past or current occupational hazards, such as physically taxing jobs offering low autonomy.[32] Pain over the life course may also inhibit wealth accumulation, as pain is associated with work-related disability.[21] Wealth enables modification of one's living environment to facilitate functioning (e.g., replacing steps with a ramp, moving to a more accessible home, hiring assistance). It allows individuals with chronic pain to pay for conveniences that enable leisure activities like travel.

Wealthier older adults benefit from past and current access to higher-quality *health care*, which may prevent the onset of chronic pain or curtail its downstream consequences on daily functioning.[26] Also, non-pharmacological treatments that are potentially efficacious for reducing pain's impact (e.g., mindfulness training)[6] may not be covered by insurance, placing such therapies out of reach for many older Americans.[28] Among older adults with *any* chronic pain, almost half of individuals in the lowest wealth quartile, and 35% of African Americans, reported that pain impacted their ability to "pay for needs"–suggesting that even in a population largely insured through Medicare, chronic pain presents a financial hardship.

Racial differences

In both unadjusted and adjusted analysis, we found no significant difference in the odds of experiencing high-impact chronic pain for Black or Hispanic adults compared to Whites. After controlling for socioeconomic variables in her aforementioned analysis of HRS data, Grol-Prokopczyk[15] found no Hispanic-White difference in being "often troubled with pain"–a more general indicator of chronic pain than used in the present study–and a Black advantage in this regard. Among individuals with *any* chronic pain in our study, White adults reported lower average pain intensity than other groups, which is congruent with Grol-Prokopczyk's finding that White adults were least likely to report severe pain. We also found that White adults experienced less pain-related disability in most activity domains compared to Black adults, with fewer White-Hispanic differences.

Overall, our study adds to evidence[15,35,37] suggesting that socioeconomic disadvantage has a stronger negative impact on the prevalence of chronic pain than race/ethnicity per se. However, Meghani & Chittami[25] rightly caution against the conclusion that “race does not matter but wealth does,” given that race is a key determinant of SES. White Americans as a group have vastly more accumulated wealth than Black Americans,[3] due in large part to institutional discrimination and segregation in housing.[46] In the present study, African American and Hispanic respondents together made up only 3% of the top wealth quartile compared with 36% of the lowest (see Supplementary Table 2). Given the strong link between wealth and pain-related disability observed in the present study, our findings suggest that racial inequalities in wealth— along with other established factors such as inequitable pain care[14] – may be a major contributor to the pain burden among older African Americans.

Age differences

As in prior studies,[27,37] we found that the prevalence of high-impact chronic pain does not rise sharply from middle to older adulthood. Although many painful conditions are more prevalent in older adulthood, others (e.g., fibromyalgia, migraine) are more common in middle age,[24,39] and the onset of certain age-associated conditions like arthritis often occurs in midlife. Also, work and family demands tend to peak during midlife, potentially increasing the impact of pain on these aspects of daily life. In light of recent evidence presented by Grol-Prokopczyk, however, it should be acknowledged that a lack of age differences in cross-sectional studies can be misleading, as mortality selection may mask age-related increases in chronic pain prevalence.[15]

Association with health variables

After adjusting for covariates, people with arthritis had nearly seven times the odds of experiencing high-impact chronic pain than those without arthritis. Our findings therefore support expanding efforts to prevent and manage this debilitating illness, including dissemination of evidence-based physical activity and other arthritis self-management interventions.[17]

Limitations

As noted, the survey items used to identify people with high-impact chronic pain did not align perfectly with the NPS definition[29] (e.g., pain of ≥ 7 months duration, instead of 6, was examined). Also, when answering items, respondents were instructed to consider their most severe episode of pain lasting one week or longer. Because of this wording, our findings may overestimate the usual impact of chronic pain in the lives of Americans over age 50. The subgroup with *any* chronic pain, in which we assessed differences in domain-specific interference, included those with pain of “2 to 3 months” duration. Because chronic pain is typically defined as pain lasting ≥ 3 months, we may have included some respondents in this analysis whose pain was not chronic per the usual definition.

Other limitations include the fact that the Hispanic subgroup was small, resulting in large standard errors. Moreover, Hispanic Americans are a heterogeneous group and acculturation and country of origin could affect the pain experience.[16] We did not examine interactive effects of race, SES, and gender, and age on pain outcomes, though there is evidence that complex patterns are present in the links between these factors and health outcomes.[4] We encourage exploration of these intersections in future investigations. Last, we are unable to estimate pain prevalence among Asian Americans, a diverse and growing group of older adults. Limitations notwithstanding, the publicly-available Health and Retirement Study dataset has notable strengths including a sampling design that permits extrapolation to the U.S. population of the same age group and high-quality economic data.

Implications

Reducing the prevalence of high-impact chronic pain in the United States is a Healthy People 2020 goal.[45] This type of pain results when individuals are unable to sufficiently manage their pain and/or environment. Fortunately, there is a solid evidence base of interventions that can reduce pain's impact on daily functioning, independent of addressing its underlying cause. For example, cognitive behavioral therapy for pain improves function and reduces distress by teaching self-management skills.[11] Although few older adults with chronic pain currently receive such non-pharmacologic treatments,[11,22] access may be expanded via new delivery modes (e.g., internet) and greater reimbursement by insurers. Ultimately, such changes may help curb widespread opioid misuse and overuse.[30]

Conclusion

We found that 8.2% of Americans over age 50 experience high-impact chronic pain, which has marked adverse effects on functioning and quality of life. Among older adults in the bottom wealth quartile, this proportion more than doubles. Efforts to reduce high-impact chronic pain should be directed toward socioeconomically vulnerable groups to minimize disability and suffering.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Perspective

High-impact chronic pain is unequally distributed among midlife and older U.S. adults. Efforts to reduce the burden of disabling chronic pain should prioritize socioeconomically vulnerable groups, who may have the least access to multi-modal pain treatment to improve function.

Highlights

- The National Pain Strategy calls for population research on high-impact chronic pain.
- We assessed the prevalence of such pain in the U.S., overall and by race and SES.
- About 8% of U.S. adults over age 50 have high-impact chronic pain.
- Wealth was more strongly associated with high-impact pain than race/ethnicity.
- In adults with any chronic pain, Black adults had most disability across domains.

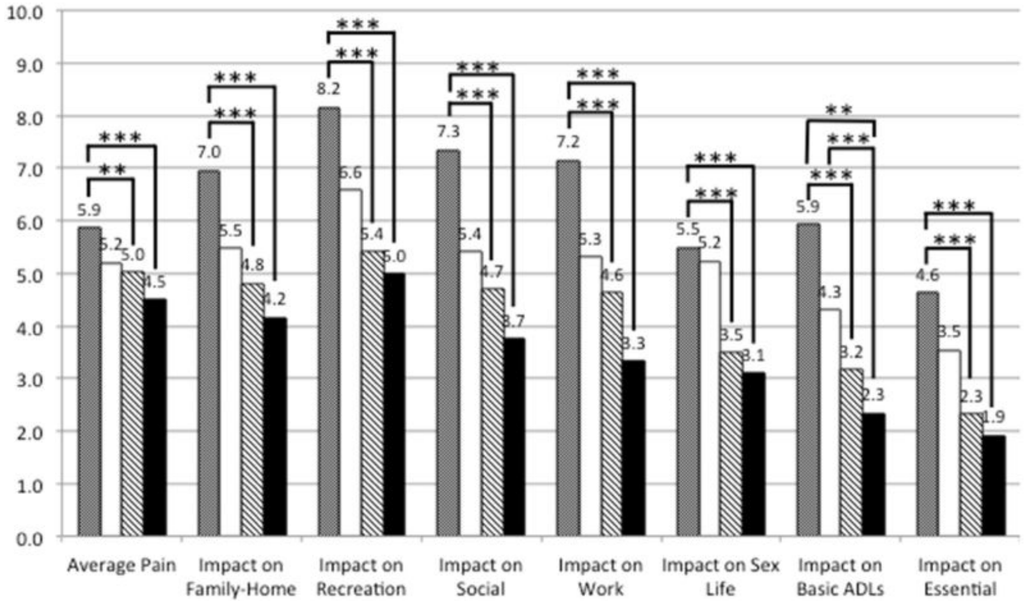

Figure 1.

Average pain intensity and domain-specific impact by race/ethnicity

Race/ethnicity (White non-Hispanic, Black non-Hispanic, Hispanic)

■ White ☐ Black ▨ Hispanic

Brackets indicate statistically significant pairwise comparison, * p < .05, ** p < 0.01, *** p < 0.001

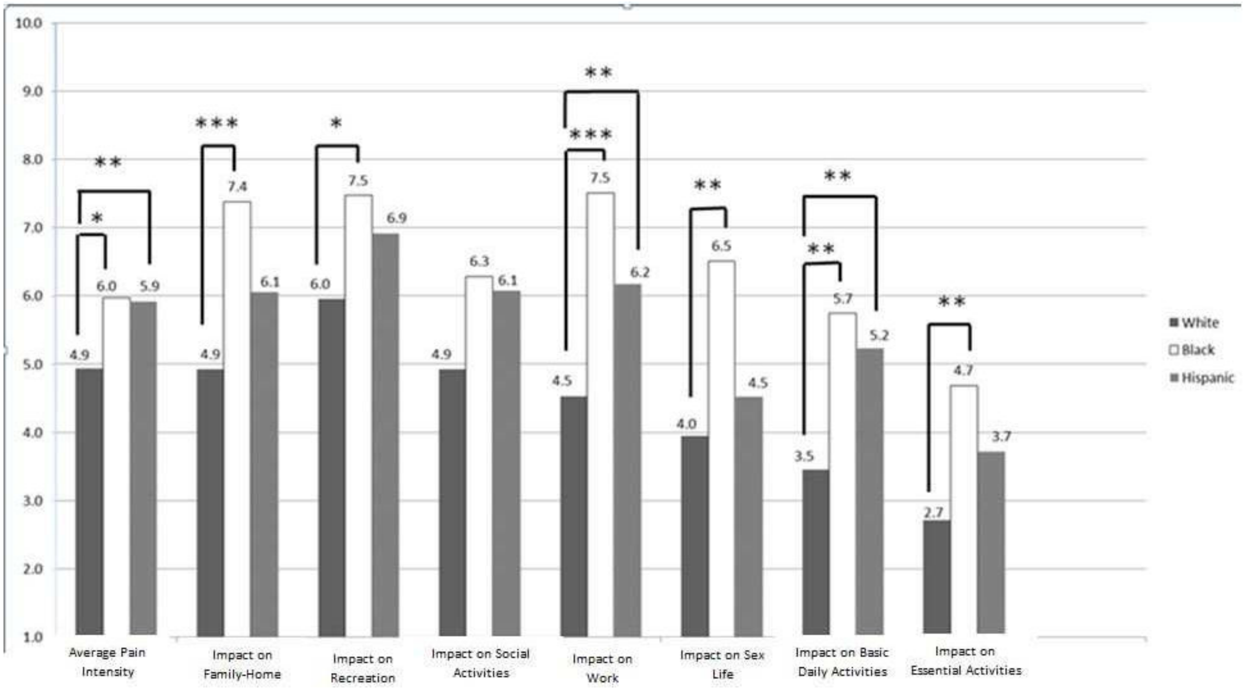

Figure 2.

Average pain intensity and domain-specific impact by household wealth quartile

Household wealth quartile

▨ Bottom Quartile □ 2nd Quartile ▨ 3rd Quartile ■ Top Quartile

Brackets indicate statistically significant pairwise comparison, ** p < 0.01, *** p < 0.001

Table 1

Prevalence of high-impact chronic pain in adults age 51+ in the United States, 2010 (unweighted n=1796)

	Population prevalence (weighted percentage) 95% Confidence Interval	**p-value for between-group differences**[a]	**N (unweighted)**
Overall	8.2 (6.7, 10.1)	–	176
Gender		.16	
Female	9.2 (7.4, 11.2)	–	112
Male	7.0 (4.9, 10.0)	–	64
Race/ethnicity		.92	
Non-Hispanic White	8.0 (6.5, 10.0)	–	114
Non-Hispanic Black	9.2 (6.1, 13.6)	–	36
Hispanic	9.1 (4.3, 18.4)	–	22
Other	8.1 (2.5, 23.0)	–	4
Education		.06	
Less than high school	11.2 (7.6, 16.2)	–	48
High school/equivalent	10.0 (6.8, 14.4)	–	64
More than high school	6.3 (4.6, 8.7)	–	64
Total household wealth quartile		.00	
Quartile 1 (lowest)	17.1 (12.3, 23.4)	–	73
Quartile 2	7.7 (4.9, 12.9)	–	38
Quartile 3	5.8 (4.0, 8.3)	–	36
Quartile 4 (highest)	5.6 (4.2, 7.4)	–	29
Age group		.54	
51–64 years	7.7 (5.5, 10.7)	–	81
65+ years	8.9 (6.9, 11.3)	–	87

[a] Rao-Scott Design-based F

Table 2

Predictors of high-impact chronic pain among U.S. adults age 51+, unadjusted logistic regression models (unweighted n=1796)

	Odds Ratio	**(95% Confidence Interval)**	**P value**
Age 65+	1.15	(0.72, 1.83)	.546
Female	1.34	(0.89, 2.00)	.157
Race/ethnicity			
Non-Hispanic White	reference	reference	
Non-Hispanic Black	1.16	(0.77, 1.75)	.472
Hispanic	1.15	(0.51, 2.61)	.735
Other	1.01	(0.29, 3.47)	.987
Education			
High school	reference	reference	
Less than high school	1.13	(0.65, 1.98)	.662
More than high school	0.61	(0.34, 1.07)	.088
Household wealth			
Quartile 1 (lowest)	reference	reference	
Quartile 2	0.40	(0.22, 0.73)	.004
Quartile 3	0.30	(0.18, 0.50)	.000
Quartile 4 (highest)	0.29	(0.18, 0.46)	.000
Health Correlates[a]			
Arthritis	7.67	(4.27, 13.75)	.000
Cancer	1.94	(1.15, 3.26)	.014
Depression	3.30	(2.23, 4.87)	.000
Diabetes	1.61	(1.02,2.56)	.041
Heart Disease	1.94	(1.26, 2.99)	.003
High Blood Pressure	1.70	(1.12, 2.59)	.013
Lung Disease	2.72	(1.49, 4.96)	.001
Obese	1.27	(0.82, 1.98)	.283
Current smoker	2.01	(1.10, 3.67)	.024

[a] All health correlates coded as dichotomous (yes vs. no; “no” is referent group).

Table 3

Predictors of high-impact chronic pain among U.S. adults age 51+, multiple logistic regression models

	Model 1[a]		**Model 2**[b]	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**
Age 65+	1.24 (0.76, 2.03)	.384	0.78 (0.45, 1.36)	.380
Female	1.34 (0.89, 2.01)	.163	1.08 (0.69, 1.69)	.738
Race/ethnicity[c,d,e]				
Non-Hispanic White	reference	–	reference	
Non-Hispanic Black	0.73 (0.44, 1.23)	.236	0.66 (0.38, 1.16)	.146
Hispanic	0.77 (0.32, 1.82)	.541	1.28 (0.60, 2.73)	.508
Education[d,e]				
High school	reference	–	reference	
Less than high school	0.98 (0.51, 1.87)	.944	1.06 (0.56, 1.98)	.861
More than high school	0.73 (0.41, 1.31)	.284	0.88 (0.48, 1.58)	.657
Household wealth[d,e]				
Quartile 1 (lowest)	reference		reference	
Quartile 2	0.39 (0.21, 0.72)	.003	0.53 (0.28, 1.00)	.050
Quartile 3	0.28 (0.16, 0.49)	.000	0.42 (0.24, 0.73)	.003
Quartile 4 (highest)	0.27 (0.16, 0.46)	.000	0.48 (0.29, 0.79)	.004
Comorbidities	–	–		
Arthritis	–	–	6.65 (3.54, 12.49)	.000
Cancer	–	–	1.61 (0.94, 2.78)	.081
Depression	–	–	1.92 (1.17, 3.17)	.011
Diabetes	–	–	1.23 (0.75, 2.04)	.396
Heart Disease	–	–	1.42 (0.95, 2.14)	.086
High Blood Pressure	–	–	1.07 (0.68, 1.69)	.771
Lung Disease	–	–	1.50 (0.79, 2.86)	.208
Obesity			1.15 (0.72, 1.83)	.541
Current smoker			1.54 (0.84, 2.81)	.157

[a] Unweighted n= 1788

[b] Unweighted n=1736

[c] Non-Hispanic White respondents were combined with those of “Other” race/ethnicity, due to the nearly identical prevalence of high-impact chronic pain in these two groups

[d] Model 1 Wald tests for overall significance of categorical variables with ≥2 levels: Race/ethnicity: F(2,55)=0.85, p=.432 Educational attainment: F(2,55)=0.69, p=.506 Household wealth: F(3,54)=9.06, p=.000.

[e] Model 2 Wald tests: Race/ethnicity: F(2,55)=1.28, p=.286 Educational attainment: F(2,55)=0.23, p=.799 Household wealth: F(3,54)=3.68, p=.017.