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Original Reports

Prevalence and Profile of High-Impact Chronic Pain in the United States

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Abstract: The multidimensional nature of chronic pain is not reflected by definitions based solely on pain duration, resulting in high prevalence estimates limiting effective policy development. The newly proposed concept of high-impact chronic pain (HICP) incorporates both disability and pain duration to identify a more severely impacted portion of the chronic pain population yet remains uncharacterized at the population level. As such, we used the 2011 National Health Interview Survey (N = 15,670) to 1) assess the likelihood of disability in the overall chronic pain population, 2) estimate the prevalence of HICP, and 3) characterize the disability, health status, and health care use profile of this population in the United States. Overall, chronic pain, defined as pain experienced on most days or every day in the previous 3 months, was strongly associated with an increased risk of disability after controlling for other chronic health conditions (odds ratio = 4.43; 95% confidence interval = 3.73−5.26), where disability was more likely in those with chronic pain than in those with stroke or kidney failure, among others. HICP affected 4.8% of the U.S. adult population, or approximately 10.6 million individuals, in 2011. The HICP population reported more severe pain and more mental health and cognitive impairments than persons with chronic pain without disability, and was also more likely to report worsening health, more difficulty with self-care, and greater health care use. HICP clearly represents a more severely impacted portion of the chronic pain population. Understanding this heterogeneity will contribute to developing more effective legislation promoting safe and cost-effective approaches to the prevention and treatment of chronic pain.

***Perspective:** HICP is a powerful new classification that differentiates those with debilitating chronic pain from those with less impactful chronic pain. By addressing the multidimensionality of chronic pain, this classification will improve clinical practice, research, and the development of effective health policy.*

***Key words:** High-impact chronic pain, National Health Interview Survey, disability, prevalence, health outcomes.*

Chronic pain is a major global health issue[9] with immense social and economic impacts[4,8] but has proven difficult to operationalize.[25] Chronic pain is often defined by pain duration,[1,13,23,25,26] where pain persisting 3 to 6 months or more because onset can yield prevalence estimates for chronic pain ranging from 19 to 43%, or ≤116 million Americans.[10,12,15,19,26] Although conceptually appealing, this hotly debated[7]

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approach does not consider the multidimensional nature of chronic pain, namely, the presence of activity limitations and participation restrictions,[5,17,30-36] classifications recognized by the World Health Organization.[37] To address this shortcoming, the U.S. National Pain Strategy proposed the concept of high-impact chronic pain (HICP) to better identify those with significant levels of life interference (ie, work, social, and/or self-care activities).[24,36] Although prior epidemiological surveys have assessed pain impact using questions that ask how much pain interferes with life activities,[11,36] it is possible that individuals with severe pain may have difficulty distinguishing the increased effort required to carry out important life activities from the actual incapacity to participate in these activities. As such, we used an alternative approach to untether the pain experience from its impact; activity limitations/participation restrictions were assessed using general disability questions that do not refer to the pain experience. We operationalized HICP as having pain on most/every day in the previous 3 months with ≥1 concomitant activity limitation/participation restriction. The chronic pain without limitations (CPWL) group, however, had pain on most days/every day in the previous 3 months without activity limitations/participation restrictions. We used nationally representative data from the 2011 National Health Interview Survey (NHIS) to assess the prevalence, psychosocial characteristics, health status, and health care use of the HICP and CPWL populations, as well as to determine the degree of contribution made by other chronic health conditions on activity limitations/participation restrictions.

Methods

Data Source

The NHIS is a multistage probability health monitoring survey, collected according to a complex sample design incorporating stratification, clustering, and multistage sampling, that is conducted by the U.S. Census Bureau for the National Center for Health Statistics.[22] Targeting the U.S. civilian noninstitutionalized population, the 2011 survey is based on personal interview responses from 101,875 individuals from 40,496 families in 39,509 households. Individuals living in long-term care facilities, correctional facilities, and active duty Armed Forces personnel were excluded. The NHIS is composed of multiple core components including the Sample Adult file. In general, the Sample Adult section is intended to gather more detailed information from selected adults about themselves. A total of 40,496 adults were eligible for the Sample Adult questionnaire, and data from 33,014 adults were collected, representing a conditional response rate of 81.6%. Approximately one-half of the total adult sample was randomly selected to receive the Adult Functioning and Disability Supplement (AFD), for a total of 15,670 individuals included in this analysis (Fig 1). Full eligibility criteria, sources, and methods of selection of participants for the 2006−2015 NHIS are available at https://www.cdc.gov/nchs/data/nhis/2006var.pdf. The AFD assessed functioning and disability in domains including sensory, motor, communication, cognitive, emotional, pain, and fatigue. Data from the 2011 NHIS were used because 2011 the most recent year where the AFD contained items referring to specific activity limitations/participation restrictions.

Demographic Variable Recoding

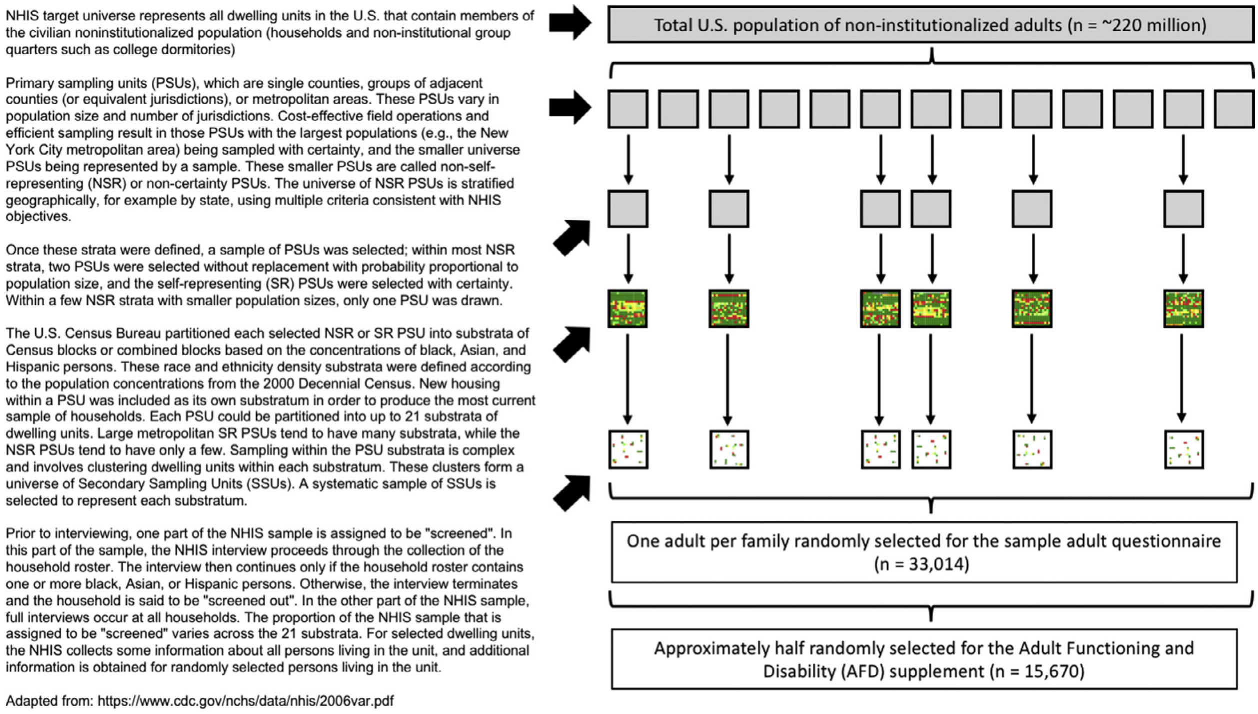
In some cases, NHIS variables were recoded to identify specific subgroups. Age and body mass index (BMI), both coded as continuous variables (AGE_P and BMI, respectively), were recoded into discrete categories. Ethnicity was recoded from 2 separate NHIS ethnicity items (MRACRP12 and HISPAN_I) to include 7 ethnicities: white, black/African American, Hispanic, American Indian/Inuit, Asian Indian, Asian, or multiple/unspecified. Marital status (R_MARITL) was recoded such that individuals who were married and living with a partner or unmarried but living with a partner were categorized as married/living with partner. Individuals who identified as divorced, separated, or married but not living with a partner were categorized as divorced/separated. All other marital status subcategories were not recoded. Table 1 includes all NHIS questions used in this analysis.

Operational Definitions of Chronic Pain Groups

The operational definition of chronic pain in the HICP and the CPWL groups involved the PAIN_2 question in the AFD: "In the past 3 months, how often did you have pain? Would you say never, some days, most days, or every day?" (Table 1). HICP was defined as pain on most days or every day in the previous 3 months accompanied by ≥1 activity limitation/participation restriction from among 8 relevant questions from the AFD, whereas CPWL was operationally defined as pain experienced on most days or every day in the previous 3 months without activity limitations/participation restrictions. The 8 items assessed the respondents' capacity (ie, do the activity, don't do the activity, unable to do the activity) to engage in the following activities: 1) working outside the home to earn an income, 2) going to school or achieving your education goals, 3) participating in leisure or social activities, 4) getting out with friends or family, 5) doing household chores such as cooking and cleaning, 6) using transportation to get to places you want to go, 7) participating in religious activities, and 8) participating in community gatherings (Table 1). Individuals were considered to have an activity limitations/participation restriction if they indicated that they were unable to do ≥1 of the activities. The total population incorporates those with CPWL, HICP, and those without pain on most days/every day in the previous 3 months.

Statistical Analysis

All analyses were performed using the integrated complex samples analysis procedures in the SPSS



NHIS target universe represents all dwelling units in the U.S. that contain members of the civilian noninstitutionalized population (households and non-institutional group quarters such as college dormitories)

Primary sampling units (PSUs), which are single counties, groups of adjacent counties (or equivalent jurisdictions), or metropolitan areas. These PSUs vary in population size and number of jurisdictions. Cost-effective field operations and efficient sampling result in those PSUs with the largest populations (e.g., the New York City metropolitan area) being sampled with certainty, and the smaller universe PSUs being represented by a sample. These smaller PSUs are called non-self-representing (NSR) or non-certainty PSUs. The universe of NSR PSUs is stratified geographically, for example by state, using multiple criteria consistent with NHIS objectives.

Once these strata were defined, a sample of PSUs was selected; within most NSR strata, two PSUs were selected without replacement with probability proportional to population size, and the self-representing (SR) PSUs were selected with certainty. Within a few NSR strata with smaller population sizes, only one PSU was drawn.

The U.S. Census Bureau partitioned each selected NSR or SR PSU into substrata of Census blocks or combined blocks based on the concentrations of black, Asian, and Hispanic persons. These race and ethnicity density substrata were defined according to the population concentrations from the 2000 Decennial Census. New housing within a PSU was included as its own substratum in order to produce the most current sample of households. Each PSU could be partitioned into up to 21 substrata of dwelling units. Large metropolitan SR PSUs tend to have many substrata, while the NSR PSUs tend to have only a few. Sampling within the PSU substrata is complex and involves clustering dwelling units within each substratum. These clusters form a universe of Secondary Sampling Units (SSUs). A systematic sample of SSUs is selected to represent each substratum.

Prior to interviewing, one part of the NHIS sample is assigned to be "screened". In this part of the sample, the NHIS interview proceeds through the collection of the household roster. The interview then continues only if the household roster contains one or more black, Asian, or Hispanic persons. Otherwise, the interview terminates and the household is said to be "screened out". In the other part of the NHIS sample, full interviews occur at all households. The proportion of the NHIS sample that is assigned to be "screened" varies across the 21 substrata. For selected dwelling units, the NHIS collects some information about all persons living in the unit, and additional information is obtained for randomly selected persons living in the unit.

Adapted from: https://www.cdc.gov/nchs/data/nhis/2006var.pdf

Total U.S. population of non-institutionalized adults (n = ~220 million)

One adult per family randomly selected for the sample adult questionnaire (n = 33,014)

Approximately half randomly selected for the Adult Functioning and Disability (AFD) supplement (n = 15,670)

Figure 1. Flowchart representing the NHIS sampling procedure for the 2011 survey.

software package (SPSS v. 22; IBM, Armonk, NY). Responses to questions from the Sample Adult core and the AFD were merged using the sample weighting variable WTFA-AFD (from the 2011 AFD data file) as well as the STRAT_P and PSU_P variables (from the 2011 Sample Adult core), accounting for stratification and clustering, respectively. The merged datasets represent a weighted population size of approximately 220.3 million noninstitutionalized adults. Descriptive statistics (mean ± standard error) were used to characterize groups according to demographic and psychosocial variables. In most cases, data are presented as a percent of the specified group representing the variable of interest, extracted from cross-tabulation tables. Given that odds ratios (ORs) reflect the effect of a putative predictor on the likelihood that a specified outcome will occur, binomial logistic regression was used to determine ORs for various outcomes. To adjust for potential confounding, we controlled for demographic variables such as age, sex, ethnicity, marital status, region, and BMI in all cases. In addition, we also controlled for chronic health conditions where indicated. Owing to the categorical nature of NHIS items addressing sex, ethnicity, marital status, and region, they were included into the logistic regression analysis as categorical covariates. Given that age and BMI were reported in the NHIS as continuous variables (ie, whole numbers between a specified range), these factors were included into the logistic regression analysis as continuous factors, with the exception of the demographic analysis illustrated in Table 2, where age and BMI were treated as categorical factors. The reference categories for sex, ethnicity, marital status, and region were male, white, married/living with partner, and Northeast, respectively. For the chronic health condition analyses indicated in Table 3, each health condition–related OR also controlled for the remaining 14 chronic health conditions. In these cases, the reference category was set to no (ie, never been told by a doctor or health professional that I have the condition). Occasionally, a survey respondent failed to answer a given question, accounting for no more than 1 or 2 individuals or less per category (ie, total population/HICP/CPWL). As such, these responses were removed from the analysis of that question.

Results

Prevalence of Chronic Pain and HICP in the U.S. Adult Population

In 2011, 4.8% of the United States adult population (10.6 million persons) met our criteria for HICP defined as pain present on most days or every day over the previous 3 months and having ≥1 major activity limitation/participation restriction (Table 2). Almost 3 times as many individuals—29.9 million individuals or 13.6% of the adult population—experienced chronic pain without activity limitations/participation restrictions (CPWL). Taken together, approximately 18.4% of the adult population, or >40 million adults, reported experiencing pain on most days or every day in the previous 3 months.

Demographic Profile

The demographic profile of the CPWL and HICP populations is shown in Table 2. Compared with those without pain, individuals with chronic pain (ie, CPWL and HICP together) were more likely to be female (OR = 1.16, 95% confidence interval [CI] = 1.03–1.30).

Table 1. NHIS Items Used in This Analysis

Question Identifier	Instrument Variable Name	Subscale	Question	Time Frame	Table
HHC.110_00.000	SEX	SamAdult	Sex	Not applicable	1
HHC.420_00.000	AGE_P	SamAdult	Age	Current	1
HHC.180_00.000	HISPAN_1	SamAdult	Hispanic subgroup detail	Not applicable	1
HHC.200_01.000	MRACBPI2	SamAdult	Race coded to single/multiple race group	Not applicable	1
FSD.010_00.000	EDUC	PERS	Highest level of school completed	Current	1
FID.250_00.000	R_MARITL	SamAdult	Are you now married, widowed, divorced, separated, never married, or living with a partner?	Current	1
AHB.200_02.000	BMI	SamAdult	BMI	Current	1
UCF.000_00.000	REGION	SamAdult	Region	Current	1
ACN.201_04.000	KIDWKYR	SamAdult	During the past 12 months, have you been told by a doctor or other health professional that you had weak/failing kidneys? Do not include kidney stones, bladder infections or incontinence.	Previous 12 months	2
ACN.031_05.000	STREV	SamAdult	Have you ever been told by a doctor or other health professional that you had a stroke?	Ever	2
ACN.031_06.000	EPHEV	SamAdult	Have you ever been told by a doctor or other health professional that you had emphysema?	Ever	2
ACN.201_03.000	CBRCHYR	SamAdult	During the past 12 months, have you been told by a doctor or other health professional that you had chronic bronchitis?	Previous 12 months	2
ACN.201_05.000	LIVYR	SamAdult	During the past 12 months, have you been told by a doctor or other health professional that you had any kind of liver condition?	Previous 12 months	2
ACN.290_00.000	ARTH	SamAdult	Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?	Ever	2
ACN.160_00.000	DIBEV	SamAdult	Have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?	Ever	2
ACN.031_03.000	MIEV	SamAdult	Have you ever been told by a doctor or other health professional that you had a heart attack (also called myocardial infarction)?	Ever	2
ACN.031_01.000	CHDEV	SamAdult	Have you ever been told by a doctor or other health professional that you had coronary heart disease?	Ever	2
ACN.031_04.000	HRTEV	SamAdult	Have you ever been told by a doctor or other health professional that you had any kind of heart condition or heart disease (other than the ones I just asked about)?	Ever	2
ACN.031_02.000	ANGEV	SamAdult	Have you ever been told by a doctor or other health professional that you had angina pectoris?	Ever	2
ACN.010_00.000	HYPEV	SamAdult	Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?	Ever	2
ACN.080_00.000	AASMEV	SamAdult	Have you ever been told by a doctor or other health professional that you had asthma?	Ever	2
ACN.130_00.000	CANEV	SamAdult	Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?	Ever	2
AFD.500_00.000	PAIN_2	Func/Dis	In the past 3 months, how often did you have pain? Would you say never, some days, most days, or every day?	Past 3 months	2
AFD.520_00.000	PAIN_4	Func/Dis	Thinking about the last time you had pain, how much pain did you have? Would you say a little, a lot, or somewhere in between?	Last time with pain	3

(*continued on next page*)

Table 1. (*Continued*)

Question Identifier	Instrument Variable Name	Subscale	Question	Time Frame	Table
ACN.250_00.000	JNTSYMP	SamAdult	During the past 30 days, have you had any symptoms of pain, aching, or stiffness in or around a joint? Please do NOT include the back or neck.	Previous 30 days	3
ACN.300_00.000	PAINNECK	SamAdult	The following questions are about pain you may have experienced in the past 3 months. Please refer to pain that lasted a whole day or more. Do not report aches and pains that are fleeting or minor. During the past 3 months, did you have. . .Neck pain?	Previous 3 months	3
ACN.310_00.000	PAINLB	SamAdult	The following questions are about pain you may have experienced in the past 3 months. Please refer to pain that lasted a whole day or more. Do not report aches and pains that are fleeting or minor. During the past 3 months, did you have...Low back pain?	Previous 3 months	3
ACN.320_00.000	PAINLEG	SamAdult	The following questions are about pain you may have experienced in the past 3 months. Please refer to pain that lasted a whole day or more. Do not report aches and pains that are fleeting or minor. Did this pain spread down either leg to areas below the knees?	Previous 3 months	3
ACN.331_01.000	PAINFACE	SamAdult	The following questions are about pain you may have experienced in the past 3 months. Please refer to pain that lasted a whole day or more. Do not report aches and pains that are fleeting or minor. During the past 3 months, did you have...Facial ache or pain in the jaw muscles or the joint in front of the ear?	Previous 3 months	3
ACN.331_02.000	AMIGR	SamAdult	The following questions are about pain you may have experienced in the past 3 months. Please refer to pain that lasted a whole day or more. Do not report aches and pains that are fleeting or minor. During the past 3 months, did you have...Severe headache or migraine?	Previous 3 months	3
AFD.590_00.008	QOL_2H	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Participating in religious activities?	Current	4
AFD.590_00.009	QOL_2I	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Participating in community gatherings?	Current	4
AFD.590_00.005	QOL_2E	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Getting out with friends or family?	Current	4
AFD.590_00.007	QOL_2G	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Using transportation to get to places you want to go?	Current	4
AFD.590_00.006	QOL_2F	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Doing household chores such as cooking and cleaning?	Current	4
AFD.590_00.004	QOL_2D	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Participating in leisure or social activities?	Current	4
AFD.590_00.003	QOL_2C	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Going to school or achieving your education goals?	Current	4
AFD.590_00.002	QOL_2B	Func/Dis	For each of the following activities, please tell me if you do the activity, don’t do the activity, or are unable to do the activity. Working outside the home to earn an income?	Current	4
AFD.450_00.000	DEP_1	Func/Dis	How often do you feel depressed? Would you say daily, weekly, monthly, a few times a year, or never?	Past to current	5
AFD.460_00.000	DEP_2	Func/Dis	Do you take medication for depression?	Current	5

(*continued on next page*)

Table 1. (*Continued*)

Question Identifier	Instrument Variable Name	Subscale	Question	Time Frame	Table
AFD.410_00.000	ANX_1	Func/Dis	How often do you feel worried, nervous or anxious? Would you say daily, weekly, monthly, a few times a year, or never?	Previous 3 months	5
AFD.420_00.000	ANX_2	Func/Dis	Do you take medication for these feelings?	Current	5
AFD.540_00.000	TIRED_1	Func/Dis	In the past 3 months, how often did you feel very tired or exhausted? Would you say never, some days, most days, or every day?	Previous 3 months	5
AFD.300_00.000	COG_SS	Func/Dis	Do you have difficulty remembering or concentrating? Would you say no difficulty, some difficulty, a lot of difficulty, or are you unable to do this?	Current	5
FHS.500_00.000	PHSTAT	Pers	Would you say your health in general is excellent, very good, good, fair, or poor?	Current	5
AHS.060_00.000	AHSTATYR	SamAdult	Compared with 12 months ago, would you say your health is better, worse, or about the same?	12 months ago	5
AFD.360_00.000	UB_SS	Func/Dis	Do you have difficulty with self-care, such as washing all over or dressing? Would you say no difficulty, some difficulty, a lot of difficulty, or are you unable to do this?	Current	5
AHS.050_00.000	BEDDAYR	SamAdult	During the past 12 months, about how many days did illness or injury keep you in bed more than half of the day? (Include days while an overnight patient in a hospital.)	Previous 12 months	5
AAU.211_02.000	AHCSYR9	SamAdult	During the past 12 months, have you seen or talked to any of the following health care providers about your own health? A general doctor who treats a variety of illnesses (a doctor in general practice, family medicine, or internal medicine).	Previous 12 months	5
AAU.211_01.000	AHCSYR8	SamAdult	During the past 12 months, have you seen or talked to any of the following health care providers about your own health? A medical doctor who specializes in a particular medical disease or problem (other than obstetrician/gynecologist, psychiatrist or ophthalmologist)?	Previous 12 months	5
AAU.141_05.000	AHCSYR5	SamAdult	During the past 12 months, have you seen or talked to any of the following health care providers about your own health? A physical therapist, speech therapist, respiratory therapist, audiologist, or occupational therapist.	Previous 12 months	5
AAU.141_01.000	AHCSYR1	SamAdult	During the past 12 months, have you seen or talked to any of the following health care providers about your own health? A mental health professional such as a psychiatrist, psychologist, psychiatric nurse, or clinical social worker.	Previous 12 months	5
AAU.300_00.000	ASRGNOYR	SamAdult	Including any times you may have already told me about, how many different times have you had surgery during the past 12 months?	Previous 12 months	5
AAU.240_00.000	AHERNOYR	SamAdult	During the past 12 months, how many times have you gone to a hospital emergency room about your own health? (This includes emergency room visits that resulted in a hospital admission.)	Previous 12 months	5
AAU.250_00.000	AHCHYR	SamAdult	During the past 12 months, did you receive care at home from a nurse or other health care professional?	Previous 12 months	5

Table 2. Sociodemographic Distribution of the CPWL and Populations Compared With the Total Adult U.S. Population

	Total Adult Population		*CPWL*			*HICP*				
	Estimated Number (millions)	*Prevalence, % (SE)*	*Estimated Number (millions)*	*Prevalence, % (SE)*	*Percentage Within Population, % (SE)*	*Estimated Number (millions)*	*Prevalence, % (SE)*	*Percentage Within Population, % (SE)*	*OR (95% CI) for Factor if CPWL/HICP vs No Pain**	*OR (95% CI) for Factor if HICP vs CPWL**
Total adult population	220.3	100	29.9	13.6 (0.4)	100	10.6	4.8 (0.2)	100	N/A	N/A
Sex										
Male	106.7	48.4 (0.5)	13.7	6.2 (0.3)	45.7 (1.4)	4.6	2.1 (0.2)	43.3 (2.0)	RC	RC
Female	113.6	51.6 (0.5)	16.3	7.4 (0.3)	54.3 (1.4)	6.0	2.7 (0.1)	56.7 (2.0)	1.16 (1.03–1.30)	0.98 (0.80–1.22)
Age, y										
18–24	28.6	13.0 (0.4)	1.6	0.7 (0.1)	5.4 (0.7)	0.3	0.1 (0.1)	2.6 (0.9)	RC	RC
25–44	78.5	35.6 (0.5)	8.8	4.00.2)	29.3 (1.3)	1.5	0.7 (0.1)	14.6 (1.4)	2.17 (1.55–3.03)	2.66 (1.26–5.63)
45–64	76.3	34.6 (0.5)	12.7	5.8 (0.3)	42.6 (1.4)	5.9	2.7 (0.2)	55.8 (2.2)	4.21 (3.03–5.85)	7.29 (3.56–14.95)
≥ 65	36.8	16.7 (0.4)	6.8	3.1 (0.1)	22.8 (1.0)	2.9	1.3 (0.1)	27.1 (1.9)	4.22 (3.01–5.92)	6.04 (2.90–12.58)
Ethnicity										
White	150.3	68.3 (0.5)	23.8	10.8 (0.3)	79.6 (1.0)	7.6	3.5 (0.2)	71.8 (1.7)	RC	RC
Black/African American	25.5	11.6 (0.4)	2.5	1.1 (0.1)	8.3 (0.7)	1.7	0.8 (0.1)	15.6 (1.3)	0.68 (0.58–0.81)	1.76 (1.29–2.39)
Native American	1.4	0.7 (0.1)	0.2	0.1 (<0.1)	0.7 (0.2)	0.2	0.1 (<0.1)	1.7 (0.4)	1.28 (0.84–1.96)	2.86 (1.39–5.90)
Asian Indian	2.2	1.0 (0.1)	<0.1	<0.1 (<0.1)	0.3 (0.1)	<0.1	<0.1 (<0.1)	0.3 (0.3)	0.34 (0.14–0.80)	3.61 (0.85–15.31)
Asian	8.2	3.7 (0.2)	0.5	0.2 (<0.1)	1.6 (0.3)	<0.1	<0.1 (<0.1)	0.8 (0.2)	0.35 (0.25–0.50)	0.59 (0.28–1.21)
Hispanic	31.6	14.3 (0.4)	2.7	1.2 (0.1)	9.0 (0.7)	1.0	0.5 (0.1)	9.5 (1.1)	0.50 (0.42–0.58)	1.20 (0.81–1.78)
Multiple/unspecified	1.1	0.5 (0.1)	0.2	0.1 (<0.1)	0.6 (0.2)	<0.1	<0.1 (<0.1)	0.3 (0.2)	1.13 (0.56–2.29)	0.80 (0.21–3.06)
Education										
Up to grade 12, no diploma	31.1	14.10.4)	4.5	2.1 (0.1)	15.1 (0.9)	3.0	1.4 (0.1)	28.2 (1.9)	2.25 (1.85–2.73)	2.50 (1.75–3.56)
High School diploma	101.6	46.1 (0.6)	15.1	6.9 (0.3)	50.5 (1.4)	5.6	2.6 (0.1)	52.9 (2.0)	1.58 (1.37–1.81)	1.55 (1.17–2.06)
Bachelor's/associate's degree	65.0	29.5 (0.5)	8.0	3.6 (0.2)	26.7 (1.2)	1.7	0.8 (0.1)	16.1 (1.5)	RC	RC
Master's/doctorate/professional degree	21.4	9.7 (0.3)	2.2	1.0 (0.1)	7.3 (0.7)	0.3	0.1 (<0.1)	2.5 (0.6)	0.67 (0.53–0.86)	0.55 (0.31–0.98)
Unknown	1.2	0.5 0.1)	0.1	0.1 (<0.1)	0.4 (0.2)	<0.1	<0.1 (<0.1)	0.3 (0.2)	1.05 (0.38–2.87)	0.76 (0.15–3.86)
Marital status										
Married/living with partner	131.9	59.9 (0.5)	19.3	8.8 (0.3)	64.5 (1.2)	5.5	2.5 (0.2)	51.6 (2.2)	RC	RC
Divorced/separated	27.9	12.7 (0.3)	4.8	2.2 (0.1)	16.0 (0.9)	2.6	1.2 (0.1)	24.1 (1.7)	1.34 (1.17–1.54)	1.63 (1.23–2.17)
Widowed	12.4	5.6 (0.2)	2.3	1.0 (0.1)	7.7 (0.6)	1.3	0.6 (0.1)	11.9 (1.2)	1.10 (0.92–1.32)	1.49 (1.00–2.22)
Never married	47.7	21.7 (0.4)	3.5	1.6 (0.1)	11.7 (0.8)	1.3	0.6 (0.1)	12.2 (1.4)	0.77 (0.64–0.93)	1.73 (1.23–2.45)
Unknown	0.3	0.1 (<0.1)	<0.1	<0.1 (<0.1)	0.1 (0.1)	<0.1	<0.1 (<0.1)	0.2 (0.1)	0.78 (0.26–2.32)	0.71 (0.09–5.61)
BMI										
Normal (<24.9)	71.5	32.5 (0.5)	7.6	3.5 (0.2)	25.4 (1.2)	2.2	1.0 (0.1)	20.9 (1.7)	RC	RC
Overweight (25.0–29.9)	75.9	34.5 (0.5)	9.7	4.4 (0.2)	32.6 (1.2)	3.4	1.5 (0.1)	31.6 (2.1)	1.09 (0.93–1.27)	0.94 (0.68–1.30)
Obese (≥ 30)	72.9	33.1 (0.5)	12.6	5.7 (0.2)	42.0 (1.2)	5.1	2.3 (0.1)	47.5 (2.1)	1.67 (1.45–1.92)	1.14 (0.87–1.51)

(continued on next page)

Table 2. (*Continued*)

	Total Adult Population		CPWL			HICP				
	Estimated Number (millions)	Prevalence, % (SE)	Estimated Number (millions)	Prevalence, % (SE)	Percentage Within Population, % (SE)	Estimated Number (millions)	Prevalence, % (SE)	Percentage Within Population, % (SE)	*OR (95% CI) for Factor if CPWL/HICP vs No Pain**	*OR (95% CI) for Factor if HICP vs CPWL**
Region										
Northeast	38.2	17.4 (0.4)	5.0	2.3 (0.2)	16.6 (1.2)	1.7	0.8 (0.1)	16.1 (1.6)	RC	RC
West	52.2	23.7 (0.5)	6.9	3.1 (0.2)	23.1 (1.1)	1.9	0.9 (0.1)	17.7 (1.5)	1.11 (0.92−1.33)	1.19 (0.79−1.79)
Midwest	51.7	23.5 (0.6)	7.2	3.3 (0.2)	24.2 (1.3)	2.7	1.2 (0.1)	25.7 (2.0)	1.05 (0.86−1.28)	1.15 (0.79−1.66)
South	78.1	35.5 (0.6)	10.8	4.9 (0.2)	36.0 (1.3)	4.3	2.0 (0.1)	40.4 (2.3)	1.12 (0.94−1.32)	0.89 (0.62−1.28)

Abbreviations: SE, standard error; N/A, not applicable; RC, reference category for each demographic factor.

* Complex samples logistic regression model included sex, age, ethnicity, education, marital status, BMI and region.

Those with HICP, however, were no more likely to be female than those with CPWL (OR = 0.98, 95% CI = 0.80−1.22). Advancing age increased the likelihood of having chronic pain (compared with no pain) and HICP (compared with CPWL). This effect is particularly evident in individuals >45 years of age. Although individuals of white ethnicity comprised the majority of the total population as well as the chronic pain population, those of African American (OR = 1.76, 95% CI = 1.29−2.39), native American (OR = 2.86, 95% CI = 1.39−5.90), and Asian Indian (OR = 3.61, 95% CI = 0.85−15.31) descent had an increased likelihood of HICP compared with CPWL. In terms of education, those with chronic pain (vs no pain) and HICP (vs CPWL) were more likely to have achieved no more than a high school diploma. Although the majority of those in the total population, as well as those with CPWL and HICP, were married or living with a partner, those who were divorced/separated, widowed, or never married had an increased likelihood of HICP. Obesity increased the likelihood of experiencing chronic pain (OR = 1.67, 95% CI = 1.45−1.92); however, obesity did not increase the likelihood of HICP compared with CPWL (OR = 1.14, 95% CI = 0.87−1.51). Compared with those living in the Northeast, those from other regions were no more likely to have chronic pain or HICP. Overall, the HICP population was more likely >45 years of age, predominantly white (but with a larger proportion of African Americans, native Americans, and Asian Indians vs the CPWL population), of lower educational level, and have higher rates of divorce/separation.

Comorbid Chronic Health Conditions

The HICP population bore a substantially greater illness burden than the CPWL population. For each of 15 chronic health conditions (Table 3), a greater proportion of the HICP population reported having been told by a doctor or other health professional that they had the health condition compared with the CPWL population. Moreover, individuals with HICP were more likely than the CPWL population to have emphysema, a liver condition, weak/failing kidneys, chronic bronchitis, arthritis, diabetes, or asthma, or to have had a stroke (Table 3). Compared with the CPWL population, those with HICP were about as likely to report having had cancer, a heart condition, coronary heart disease, hypertension, a heart attack, or angina, or to be obese (Table 3).

Considering that the defining characteristics of the HICP population were chronic pain with activity limitations/participation restrictions, we assessed whether activity limitations/participation restrictions were explained by comorbid chronic health conditions. Controlling for demographic variables as well as other chronic health conditions, the OR for the presence of limitations in those with no pain/occasional pain versus those with pain on most days or every day was 4.23 (95% CI = 3.55−5.03), indicating that regardless of the presence of other chronic health conditions, individuals experiencing frequent pain were much more likely to have limitations than those with no/occasional pain. For added perspective, the OR for activity limitations/participation

Table 3. Prevalence of Comorbid Health Conditions and ORs for Activity Limitations/Participation Restrictions

		Total Adult Population		CPWL		HICP		
	OR (95% CI) for Activity Limitations in Total Adult Population*	Estimated Number (millions)	Prevalence, % (SE)	Estimated Number (millions)	Percentage Within Population (SE)	Estimated Number (millions)	Percentage Within Population (SE)	OR (95% CI) for Health Condition if HICP vs CPWL*
Chronic pain (pain most/every day)	4.23 (3.55–5.03)	40.6	18.4 (0.4)	N/A	N/A	N/A	N/A	N/A
Weak/failing kidneys	3.64 (2.46–5.39)	4.4	2.0 (0.1)	1.1	3.6 (0.5)	1.1	10.5 (1.3)	1.66 (1.05–2.61)
Stroke	3.04 (2.17–4.26)	5.8	2.7 (0.2)	1.2	3.9 (0.5)	1.3	12.7 (1.5)	2.17 (1.40–3.36)
Arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia	2.19 (1.86–2.59)	49.5	22.5 (0.4)	15.2	50.8 (1.4)	7.3	68.3 (1.9)	1.54 (1.20–1.98)
Emphysema	2.05 (1.32–3.18)	4.1	1.8 (0.1)	1.0	3.3 (0.5)	1.2	11.3 (1.3)	1.71 (1.04–2.81)
Diabetes	1.70 (1.37–2.12)	20.0	9.1 (0.3)	4.1	13.7 (0.9)	3.0	27.7 (1.7)	1.49 (1.12–1.98)
Chronic bronchitis	1.52 (1.11–2.10)	9.3	4.2 (0.2)	2.2	7.5 (0.8)	1.7	15.7 (1.4)	1.57 (1.11–2.21)
Heart condition/disease	1.40 (1.09–1.80)	16.3	7.4 (0.3)	3.8	12.7 (0.9)	2.2	20.3 (1.8)	1.20 (0.85–1.69)
Asthma	1.35 (1.10–1.65)	27.6	12.5 (0.3)	4.8	16.2 (0.9)	2.7	25.0 (1.8)	1.39 (1.04–1.86)
Liver condition	1.35 (0.78–2.33)	2.8	1.3 (0.1)	0.7	2.5 (0.4)	0.7	6.1 (0.9)	1.70 (1.03–2.83)
Cancer/other malignancy	1.29 (1.01–1.66)	18.1	8.2 (0.3)	3.9	12.9 (0.9)	1.9	18.1 (1.5)	1.23 (0.91–1.66)
Obese (BMI ≥ 30)	1.23 (1.05–1.44)	72.9	33.1 (0.5)	12.6	42.0 (1.2)	5.1	47.5 (2.1)	1.06 (0.84–1.32)
Coronary heart disease	1.22 (0.84–1.77)	10.0	4.5 (0.2)	2.4	8.2 (0.7)	1.5	14.1 (1.5)	0.97 (0.63–1.50)
Hypertension	1.20 (1.00–1.44)	64.1	29.1 (0.4)	13.5	45.1 (1.3)	6.5	60.6 (2.1)	1.09 (0.86–1.37)
Heart attack	1.06 (0.68–1.64)	7.3	3.3 (0.2)	1.7	5.6 (0.5)	1.0	9.9 (1.2)	0.94 (0.61–1.44)
Angina pectoris	0.77 (0.47–1.28)	4.5	2.1 (0.1)	1.2	3.8 (0.5)	0.8	7.2 (1.2)	0.99 (0.57–1.72)

Abbreviations: SE, standard error; N/A, not applicable.

* Complex samples logistic regression model included sex, age, ethnicity, education, marital status, BMI, and region, as well as all other chronic health conditions.

Table 4. Pain Characteristics in the CPWL and HICP Populations

	CPWL		HICP		
PAIN INTENSITY	ESTIMATED NUMBER (MILLIONS)	PREVALENCE, % (SE)	ESTIMATED NUMBER (MILLIONS)	PREVALENCE, % (SE)	OR (95% CI) FOR PAIN FACTOR IF HICP VS CPWL*
A little	3.6	22.4 (1.7)	0.6	7.3 (1.2)	RC
In between	6.9	42.6 (1.8)	2.7	34.6 (2.4)	2.19 (1.59–3.01)
A lot	5.6	34.7 (1.7)	4.6	57.9 (2.5)	4.72 (3.40–6.55)
Pain locations					
Severe headache/migraine	8.3	27.8 (1.1)	4.4	41.1 (2.0)	2.19 (1.64–2.92)
Leg to below knees	8.6	45.4 (1.7)	5.1	64.2 (2.4)	1.80 (1.39–2.34)
Low back	19.0	63.5 (1.3)	7.9	74.5 (1.8)	1.67 (1.34–2.08)
Joints	21.0	70.2 (1.3)	8.9	83.7 (1.9)	1.66 (1.14–2.42)
Neck	11.5	38.3 (1.3)	5.4	51.0 (2.4)	1.30 (0.98–1.72)
Jaw muscle/joint	3.3	11.0 (0.8)	2.0	18.5 (1.5)	1.08 (0.79–1.47)
No. of pain locations					
0 (pain location not specified)	2.3	7.7 (0.6)	0.5	4.5 (1.1)	RC
1–3	13.8	46.1 (1.4)	3.2	30.2 (1.9)	0.97 (0.50–1.88)
4–6	13.8	46.2 (1.3)	7.0	65.4 (2.0)	1.79 (0.96–3.33)

Abbreviations: SE, standard error; RC, reference category.

* Complex samples logistic regression model included sex, age, ethnicity, education, marital status, BMI, and region.

restrictions in those reporting frequent pain was compared with those reporting chronic health problems; the OR for the presence of activity limitations/participation restrictions in those with chronic pain (OR = 4.23, 95% CI = 3.55–5.03) was greater than the likelihood of activity limitations/participation restrictions in all other chronic health conditions, including those reporting weak/failing kidneys (OR = 3.64, 95% CI = 2.46–5.39) or a stroke (OR = 3.04, 95% CI = 2.17–4.26), among others (Table 3). Taken together, those with chronic pain were more likely to have activity limitations/participation restrictions than those with other chronic health conditions.

Pain Characteristics

The operational definitions of both CPWL and HICP are based on pain frequency over the previous 3 months. However, considering the multidimensional nature of chronic pain, we also explored pain intensity and the number of bodily locations of pain. Table 4 indicates the proportion of the HICP and CPWL populations in the 3 categories defined by pain intensity (ie, a little pain, in between a little and a lot, a lot of pain). The HICP population was much more likely to report moderate and severe pain than the CPWL population (OR = 2.19, 95% CI = 1.59–3.01 and OR = 4.72, 95% CI = 3.40–6.55, respectively). Respondents were also asked about pain in 6 bodily regions including joint(s), low back, legs, neck, jaw/ear, and migraine/severe headache. The HICP population was more likely than the CPWL population to report severe headache/migraine and pain in the legs, low back, and joints but was equally likely to report pain in the neck or face. Those with HICP were about as likely as the CPWL population to report pain in 1 to 3 locations (OR = 0.97, 95% CI = 0.50–1.88) but somewhat more likely to report pain in 4 to 6 locations (OR = 1.79, 95% CI = 0.96–3.33; Table 4). A proportion of both the CPWL and the HICP populations reported pain that did not refer to any of the 6 listed locations, likely owing to the limited number of possible pain locations available in the survey (ie, no item referencing pain of cutaneous or visceral origin). These individuals were classified as having 0 pain locations (ie, pain location not specified). Overall, the HICP population carries a more severe pain burden than those with CPWL.

Activity Limitations/Participation Restrictions

Activity limitations/participation restrictions were based on the respondent's engaging in 8 major life activities (Table 5). Most individuals in the HICP population reported being unable to work outside the home (83.2 ± 1.7%), whereas substantial proportions of the HICP population also reported being unable to go to school or to attain educational goals (42.0 ± 2.1%), engage in leisure or social activities (27.1 ± 1.9%), and perform household chores (25.3 ± 1.9%), among others. In terms of the number of limitations/restrictions per individual, 32.1 ± 2.0% reported having 2 or 3 limitations/restrictions and 22.8 ± 1.8% reported having ≥4 limitations/restrictions (Table 5). Some of the limitations/restrictions may not be mutually exclusive (ie, leisure/social activities, friend/family outings, and community activities), potentially increasing the estimated number of limitations/restrictions per individual. Taken together, almost 85% of the HICP population was unable to work, and approximately 55% of the HICP population reported having ≥2 major activity limitations/participation restrictions in their daily life.

Mental Health, Fatigue, and Cognitive Impairment

Individuals with HICP had a much greater likelihood to report daily or weekly depression than those with CPWL

Table 5. Activity Limitations/Participation Restrictions in the HICP Population

	HICP	
Activity Limitations (unable to do the activity)	Estimated Number (millions)	Prevalence, % (SE)
Religious activities	1.3	12.2 (1.4)
Community activities	1.8	17.1 (1.4)
Friend/family outings	2.2	20.4 (1.7)
Using transport	2.6	24.9 (1.9)
Household chores	2.7	25.3 (1.9)
Leisure/social activities	2.9	27.1 (1.9)
Educational goals	4.5	42.0 (2.1)
Work outside home	8.9	83.2 (1.7)
No. of activity limitations		
1	4.8	45.1 (2.1)
2–3	3.4	32.1 (2.0)
≥4	2.4	22.8 (1.8)

Abbreviation: SE, standard error.

(43.7 ± 2.2% vs 18.0 ± 1.0%, respectively; OR = 3.85, 95% CI = 3.01–4.93). Only 8.9% of the total population experienced daily/weekly depression (Table 6). Likewise, the HICP population was also much more likely to be taking antidepressant medication than those with CPWL (33.3 ± 1.7% vs 14.8 ± 1.0%, respectively; OR = 3.13, 95% CI = 2.48–3.95). Similarly, the HICP population was more likely to experience daily or weekly anxiety (54.7 ± 2.1% vs 30.6 ± 1.2%, respectively; OR = 3.30, 95% CI = 2.62–4.15) and to take anxiety medications (36.8 ± 2.0% vs 15.7 ± 1.0%, respectively; OR = 3.41, 95% CI = 2.69–4.33) compared with the CPWL population. Those with HICP were also more likely than the CPWL to report fatigue on most days or every day (59.1 ± 2.1% vs 31.4 ± 1.2%, respectively; OR = 3.46, 95% CI = 2.76–4.33) and to have difficulty remembering/concentrating (47.6 ± 2.2% vs 20.8 ± 1.1%, respectively; OR = 3.18, 95% CI = 2.51–4.02; Table 6).

Health Status

Compared with the CPWL population, the HICP population had a greater likelihood of reporting worsening health over the previous 12 months (OR = 2.92, 95% CI = 2.30–3.70; Table 6). Moreover, the HICP population was less likely to report their current health status as very good or excellent, and much more likely to report it as fair or poor (Table 6). Although most of the CPWL and the total populations reported no difficulties with self-care, approximately 33% of the HICP population reported at least some difficulty with self-care (Table 6). Indeed, the HICP population was much more likely to report being unable to maintain self-care than the CPWL population (OR = 11.99, 95% CI = 2.74–52.46). The HICP population had a much greater likelihood of spending ≥11 days in bed over the previous 12 months compared with the CPWL population (64.9% vs 24.6%, respectively; OR = 5.03, 95% CI = 3.96–6.38; Table 6).

Health Care Use

Health care use includes services for all health conditions, including pain. The HICP population was more likely to consult health professionals including general doctors, specialists, physical/occupational therapists, and mental health professionals (Table 6). Although the majority of all 3 populations reported no surgical procedures and no emergency room visits in the previous 12 months (Table 6), a greater portion of the HICP population reported ≥2 surgical procedures compared with the CPWL group (10.7% vs 3.9%, respectively; OR = 2.93, 95% CI = 1.71–5.04) and ≥2 emergency room visits over the previous 12 months (30.3% vs 11.9%, respectively; OR = 2.77, 95% CI = 2.01–3.81). Finally, whereas only 2.3% and 2.9% of the total adult and CPWL populations, respectively, received home care in the previous 12 months, >15% of the HICP population required home care (Table 6). As such, the HICP population was much more likely than the CPWL population to have received home care from a health professional in the previous year (OR = 5.14, 95% CI = 3.30–7.99).

Discussion

As evidenced by its nomenclature, chronic pain has traditionally been defined by pain duration.[1,10,12,13,15,23,25,26] Using this approach, our prevalence estimate of the overall chronic pain population is approximately 18.4% of the adult population, or >40 million people. Although this estimate is similar to some estimates,[12,15,19] it is much lower than others,[10,26] likely owing to methodological aspects of data collection in those studies as well as how chronic pain was operationalized. More important, whereas pain enduring ≥3 months certainly constitutes a significant burden to the sufferer, not everyone is impacted equally.[5,30-36] To address this variability in outcomes, some studies have further stratified the chronic pain population according to pain severity, where greater severity is generally associated with poorer outcomes.[3,6,18-20] However, it has been long agreed that several other factors interact with pain characteristics to produce negative outcomes, including affective distress, life control, and, crucially, functional disability.[14,27,28,31,34,35] As proposed in the U.S. National Pain Strategy,[24] the inclusion of disability (ie, activity limitations/participation restrictions) into the standard chronological definition of chronic pain is meant to differentiate those with debilitating chronic pain from those with less impactful chronic pain. Responding to the National Pain Strategy's call for better information on the prevalence and impact of chronic pain in the U.S. population, we used nationally representative data to show that chronic pain (ie, pain on most days or every day over the previous 3 months) is strongly associated with an elevated risk of developing activity limitations/participation restrictions such as the inability to work for a living; go to school; or engage in social, community or religious activities. Our use of general measures of disability not related to pain rather than pain-related interference constitutes an important advancement over

Table 6. **Mental Health Status, General Health Status, and Health Care Use in the CPWL and HICP Populations**

	Total Adult Population		*CPWL*		*HICP*		
	Estimated Number (millions)	*Prevalence, % (SE)*	*Estimated Number (millions)*	*Percentage Within CPWL Population (SE)*	*Estimated Number (millions)*	*Percentage Within HICP Population (SE)*	*OR (95% CI) for Health Factor if HICP vs CPWL**
Mental and cognitive health							
Depression (experienced daily/weekly)	19.6	8.9 (0.3)	5.4	18.0 (1.0)	4.6	43.7 (2.2)	3.85 (3.01–4.93)
Taking medication for depression	18.4	8.3 (0.3)	4.4	14.8 (1.0)	3.5	33.3 (1.7)	3.13 (2.48–3.95)
Anxiety (experienced daily/ weekly)	40.6	18.4 (0.4)	9.2	30.6 (1.2)	5.8	54.7 (2.1)	3.30 (2.62–4.15)
Taking medication for anxiety	20.5	9.3 (0.3)	4.7	15.7 (1.0)	3.9	36.8 (2.0)	3.41 (2.69–4.33)
Fatigue (experienced most/ every day)	30.7	13.9 (0.3)	9.4	31.4 (1.2)	6.3	59.1 (2.1)	3.46 (2.76–4.33)
Cognitive difficulty (remembering/ concentrating)	26.6	12.1 (0.3)	6.2	20.8 (1.1)	5.1	47.6 (2.2)	3.18 (2.51–4.02)
Health status compared with 12 months ago							
Better	38.9	17.6 (0.4)	5.3	17.8 (1.1)	1.5	14.1 (1.6)	1.18 (0.86–1.61)
Same	163.1	74.0 (0.4)	19.3	64.4 (1.3)	5.0	46.7 (2.2)	RC
Worse	18.3	8.3 (0.3)	5.3	17.7 (1.0)	4.2	39.2 (2.0)	2.92 (2.30–3.70)
Current health status							
Excellent	64.7	29.4 (0.4)	4.0	13.4 (0.9)	0.3	2.5 (0.7)	0.41 (0.22–0.76)
Very good	69.5	31.5 (0.5)	8.1	27.2 (1.2)	0.7	6.3 (1.0)	0.48 (0.32–0.74)
Good	57.8	26.3 (0.4)	10.6	35.3 (1.2)	2.1	19.4 (1.6)	RC
Fair	21.6	9.8 (0.3)	5.7	19.1 (1.0)	4.6	43.6 (2.0)	3.83 (2.92–5.04)
Poor	6.4	2.9 (0.2)	1.4	4.8 (0.5)	3.0	28.0 (1.8)	9.51 (6.71–13.47)
Difficulty with self-care							
No difficulty	212.2	96.3 (0.2	28.6	95.7 (0.5)	7.1	66.6 (2.0)	0.13 (0.09–0.18)
Some difficulty	6.1	2.8 (0.2)	1.1	3.8 (0.5)	2.5	23.5 (1.7)	RC
A lot of difficulty	1.1	0.5 (0.1)	0.1	0.4 (0.2)	0.6	5.8 (0.9)	1.86 (0.77–4.47)
Unable	0.9	0.4 (0.1)	<0.1	0.1 (<0.1)	0.4	4.0 (1.0)	11.99 (2.74–52.46)
Had ≥ 11 bed days in the past 12 months	12.9	17.3 (0.6)	3.4	24.6 (1.7)	4.1	64.9 (2.5)	5.03 (3.96–6.38)
Health care use							
Health professional consultations, past 12 months							
General doctor	147.2	66.8 (0.5)	23.5	78.4 (1.1)	9.2	86.4 (1.6)	1.52 (1.10–2.09)
Medical specialist	59.6	27.0 (0.5)	13.6	45.3 (1.4)	6.3	58.9 (2.2)	1.74 (1.41–2.15)
Physical/occupational therapist etc	19.2	8.7 (0.3)	5.2	17.3 (0.9)	3.1	29.2 (1.8)	2.19 (1.74–2.75)
Mental health professional	17.6	8.0 (0.3)	3.5	11.5 (0.9)	2.8	26.2 (1.7)	3.39 (2.61–4.40)
No. of surgical procedures, past 12 months							
None	191.6	87.0 (0.3)	23.6	79.0 (1.1)	7.6	71.4 (2.0)	0.89 (0.68–1.16)
1	22.8	10.4 (0.3)	5.1	17.1 (1.0)	1.9	18.0 (1.6)	RC
≥ 2	5.8	2.7 (0.2)	1.2	3.9 (0.5)	1.1	10.7 (1.4)	2.93 (1.71–5.04)
No. of times in emergency room/emergency department, past 12 months							
None	175.6	79.8 (0.4)	21.1	70.5 (1.3)	5.6	53.0 (2.1)	0.80 (0.61–1.07)
1	28.3	12.9 (0.3)	5.3	17.6 (1.1)	1.8	16.7 (1.5)	RC
≥ 2	16.3	7.4 (0.3)	3.6	11.9 (0.9)	3.2	30.3 (2.0)	2.77 (2.01–3.81)
Received home care from health professional, past 12 months	5.0	2.3 (0.1)	0.9	2.9 (0.4)	1.6	15.2 (1.8)	5.14 (3.30–7.99)

Abbreviations: SE, standard error; RC, reference category.

* Complex samples logistic regression model included sex, age, ethnicity, education, marital status, BMI, and region.

previous work. Here, respondents were simply asked about their capacity to engage in certain activities rather than the degree to which pain interferes with these tasks. By not requiring an individual with severe pain to distinguish the increased effort required to carry out important life activities from the actual incapacity to participate in these activities, our findings reflect a more clinically relevant assessment of impact. Moreover, this approach also allows us to directly compare the impact of chronic pain with the impacts of several other chronic health conditions, including stroke, kidney failure, cancer, and heart disease. We not only demonstrate that individuals with chronic pain are much more likely to have disabilities than those without pain on most days or every day but also show that disability is more likely in the chronic pain population than in any other chronic health condition assessed, including stroke, kidney failure, cancer, diabetes, and heart disease. A potential limitation of using general disability questions rather than more specific pain-related interference questions may be that the disability is owing to other chronic health conditions rather than pain. However, our analyses controlled for the presence of >15 chronic health conditions, strongly suggesting that general disability questions may indeed reflect the impact of chronic pain.

In 2011, approximately one-quarter of the overall chronic pain population in the United States had HICP, or chronic pain with ≥1 activity limitation/participation restriction. The overall prevalence of HICP was 4.8%, or approximately 10.6 million adults. That this estimate is considerably lower than estimates based on pain interference[11,36] is not unexpected. Indeed, considering the stringent criteria for social role disability used in this assessment, our estimate reflects the most severely impacted portion of the chronic pain population. The application of more inclusive disability criteria would likely result in considerably higher prevalence estimates. Indeed, the CPWL population likely includes a sizable portion of individuals with varying degrees of social role disability who do not meet the stringent requirements used in this study. Although it is possible that some people with CPWL may progress to HICP at some point in the future, our approach seems to identify a smaller but more heavily burdened portion of the population. Compared with those with CPWL, the HICP population experienced poorer overall health outcomes. The most prevalent limitation in the HICP population was incapacity to work outside the home. The impacts of lost work are apparent both for the individual (ie, loss of self-worth, income, and lower quality of life), as well as for society (ie, lost productivity, higher health care expenditures). Accordingly, the HICP population also exhibited higher levels of anxiety, depression, fatigue, and cognitive difficulty than those with CPWL. The HICP population tended to report more severe pain, markedly poorer health outcomes, and dramatically more health care use than those with CPWL. Importantly, as discussed elsewhere in this article, the disabilities characterizing the HICP population seem to be more closely related to the frequent pain than the presence of other chronic health conditions. Nonetheless, a substantial proportion of the CPWL population also reported important pain and mental health impacts that should not be ignored; as discussed, CPWL may progress to HICP owing to ongoing pain duration or other factors.

Although this study expands our understanding of the population health impact of CPWL and HICP, the cross-sectional nature of the survey precludes any assessment of potential contributory and/or causal factors to the development of CPWL or HICP. Furthermore, it is possible that alternative stratifications of some variables (ie, demographics, health-related outcomes) may have altered certain logistic regression outcomes. However, considering that our analytical strategy yielded prevalence estimates and other measures mirroring previous studies also using NHIS data, we are confident in the relevance of our findings. Other potential limitations include the external validity of our results. The results described in this study are based on a large-scale, nationally representative health survey. As such, they can be expected to accurately represent the U.S. noninstitutionalized, adult population. However, individuals such as veterans, the incarcerated, and those in residential care facilities are not represented. Although the prevalence estimates described herein do not include these populations, there is no reason to expect that the health-related impact of chronic pain would be any less burdensome. Although the survey response rates were high (81.6%), there is potential for selection bias. Indeed, prior research has found survey respondents to be somewhat healthier than nonrespondents.[16,29] However, nonresponse bias, whereby respondents fail to respond to some or all questions, is generally understood to be modest in face-to-face interview paradigms compared with other types of surveys.[2] Moreover, adjustments for nonresponse were made before the NHIS data were released and is reflected in the sample weights provided by NHIS.[21]

Overall, our findings demonstrate that defining HICP with binary questions addressing social role limitations without reference to pain identifies the most severely disabled segment of the chronic pain population, a segment representing >10 million American adults. As such, preventing the development of disability in this population should be a public health priority. Considering the heterogeneity in health-related and quality of life–related outcomes within the chronic pain population, stratification of the CPWL and HICP populations in clinical research and practice will lead to an improved understanding of the risk factors, causes, and consequences of chronic pain. Of significant interest would be risk factors associated with the transition from CPWL to HICP. In addition, considering the ongoing opioid epidemic, improved understanding of opioid use and analgesic efficacy in these populations is required. From a policy perspective, the incorporation of World Health Organization recommendations[37] (ie, activity limitations/participation restrictions) into the stratification of chronic pain will permit greater cogency and relevance to potential legislative outcomes. In short, this article evaluates an assessment of HICP that does not refer to pain-related interference with life activities and highlights the role of disability as a key indicator of pain impact. This knowledge may not only serve to refine clinical research and streamline treatment, it also provides much-needed information to policymakers.

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