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Occurrence and Characteristics of Chronic Pain in a Community-Based Cohort of Indigent Adults Living With HIV Infection

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Abstract

Pain is common among people living with HIV/AIDS (PLWHA), but little is known about chronic pain in socioeconomically disadvantaged HIV-infected populations with high rates of substance abuse in the post-antiretroviral era. This cross-sectional study describes the occurrence and characteristics of pain in a community-based cohort of 296 indigent PLWHA. Participants completed questionnaires about sociodemographics, substance use, depression and pain. Cut-point analysis was used to generate categories of pain severity. Of the 270 participants who reported pain or the use of a pain medication in the past week, 8.2% had mild pain, 38.1% had moderate pain, and 53.7% had severe pain. Female sex and less education were associated with more severe pain. Depression was more common among participants with severe pain than among those with mild pain. Increasing pain severity was associated with daily pain and with chronic pain. Over half of the participants reported having a prescription for an opioid analgesic. Findings from this study suggest that chronic pain is a significant problem in this high risk, socioeconomically disadvantaged group of patients with HIV disease and high rates of previous or concurrent use of illicit drugs.

Keywords

HIV; substance use disorders; chronic pain; pain qualities; opioid analgesics

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Disclosures

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Introduction

As a result of advances in antiretroviral treatment, Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS) has shifted from a terminal illness to a chronic condition. Therefore, in developed countries, treatment of HIV-infected individuals is increasingly focused on disease and symptom management.^{44, 54} Based on a limited amount of recent epidemiologic data, pain is one of the most frequently reported symptoms in HIV-infected individuals and has a deleterious effect on quality of life (QOL).^{4, 6, 21, 38, 40, 45, 76} Pain in HIV/AIDS patients can result from multiple etiologies, including direct effects of HIV on the nervous system, antiretroviral therapy, opportunistic infections, or other conditions unrelated to HIV.^{24, 28, 66}

Estimates of pain prevalence in samples of HIV-infected individuals range from 25% to 80%.^{7, 19, 22, 24, 36, 37, 66, 76} However, most studies on HIV-related pain were done prior to the initiation of highly effective antiretroviral therapy and assessed pain in clinic or hospital-based samples. In the most recent study of HIV pain,⁴ 55% of patients reported pain and of those with pain, 82% described their pain as “severe” or “very severe.” Notably, patients using illicit drugs and those with certain psychiatric disorders were excluded from this study despite high rates of these conditions among people living with HIV disease.

The domestic HIV/AIDS epidemic is increasingly concentrated among people of low socioeconomic status, members of ethnic minority groups, and women.³³ Findings suggest that these groups have higher rates of pain and are more likely to experience undertreatment of their pain.^{6, 8, 19, 68, 72} While disparities in prescribing opioid analgesics for pain have not been studied in patients with HIV, several studies found that African-American and Hispanic patients were less likely than White Americans to receive opioid analgesics in a variety of healthcare settings and for different types of pain.^{10, 13, 47, 48, 70, 71} Despite this trend, only one study was found that evaluated the occurrence and characteristics of pain in an indigent sample of patients^{41, 42} and to our knowledge, no studies have focused on indigent populations with HIV disease.

Pain is common among persons with co-existing substance use disorders.^{30, 60, 63} Approximately 19% to 32% of patients with HIV disease have a co-existing substance use disorder.^{25, 79} Results from a recent study suggest that HIV-infected patients with co-occurring psychological and substance use disorders experience higher levels of pain compared to those without disorders.⁷³ In addition, patients with injection drug use as a risk factor for HIV compared to those with other risk factors for transmission report higher rates of pain¹⁸ and exhibit increased likelihood of undertreatment.⁸

No studies were found that described the occurrence and detailed characteristics of chronic pain in a representative sample of socioeconomically disadvantaged HIV-infected patients with high rates of substance use and mental health disorders. The purpose of this study was to describe the occurrence, characteristics, and correlates of pain in a community-based cohort of indigent adults living with HIV infection.

Materials and Methods

Participants

Participants in the Pain Study were recruited from the pre-existing Research on Access to Care in the Homeless (REACH) study, a longitudinal cohort of indigent HIV-positive adults in San Francisco.^{57, 82} The majority of the REACH cohort was assembled using probability sampling and recruiting from homeless shelters, free-meal programs, and single-room occupancy hotels charging less than \$600 per month that occurred in three waves (1996–

1997, 1999–2000, 2003–2004). Participants who tested positive for HIV were invited to enroll into the REACH study and those who agreed to participate were followed quarterly (i.e. at 3-month intervals). Recruitment for the Pain Study occurred from September 2007 to June 2008, at which time the REACH cohort included a total of 337 active members. All active REACH participants were eligible for the Pain Study, regardless of pain status. Of those, 87.8% (n=296) agreed to participate and completed the baseline interview, which provided the data for this paper. All protocols for the Pain Study and REACH Study were approved by the Institutional Review Board at University of California, San Francisco (UCSF) and all participants provided written informed consent prior to participation.

Setting and procedures

Study activities took place at the UCSF Clinical and Translational Research Institute's Tenderloin Clinical Research Center (TCRC), a University-affiliated, community based research field site in the Tenderloin neighborhood in San Francisco. At the baseline visit for the Pain Study, participants completed two interviews: a 45-minute interview about pain, health service utilization related to pain, analgesic use and misuse of prescription opioid analgesics; and the alcohol and drug modules of the Diagnostic Interview Schedule IV (DIS-IV).^{12, 59} Pain Study procedures took place within one calendar week of the REACH quarterly visit, which involved a 45-minute interview including questions about sociodemographic characteristics, antiretroviral use, health status, depression, and current illicit drug and alcohol use. Participants had their blood drawn for laboratory tests including CD4 count, performed by Quest Diagnostics (San Jose, CA), and HIV viral load, performed using the HIV-1 Amplicore Monitor Version 1.5 ultrasensitive assay (Roche Molecular Systems, Alameda, California, USA). All interviews were conducted by trained interviewers and participants were reimbursed \$20 for the baseline Pain Study visit and \$30 for the REACH quarterly visit.

Measures

Sociodemographic characteristics—Participants self-reported age, monthly income, sex at birth (male or female), race/ethnicity (African-American, white, or mixed/other) and education (less than high school versus a high school degree or higher).

Clinical characteristics

Engagement in Primary Care: Participants were asked if they had a Primary Care Provider (PCP), defined as a Medical Doctor, Nurse Practitioner, or Physician Assistant who provides regular care to manage HIV disease and/or other chronic medical conditions. Participants who reported having a PCP were asked if they had visited the clinic where they see their PCP in the past 90 days.

HIV: Participants were classified into two groups for CD4 count measured at the time of the study visit and CD4 count nadir since entry into the REACH study (<200 or ≥200 cells/uL). Participants were classified according to their HIV viral load measured at the study visit (≥50 or <50 copies/mL). Participants reported their use of anti-retroviral medications and were categorized as using any prescribed antiretroviral medication or no prescribed antiretroviral medication.

Beck Depression Inventory (BDI): The Beck Depression Inventory (BDI) version II⁵ is a 21-item scale that is a valid and reliable measure of depression in diverse populations.⁶⁷ The BDI detects depression with a sensitivity of 100% and a specificity of 87%.⁶⁵ Each item on the BDI is rated using a 0 to 3 scale. Items are summed to yield a total score that can range from 0 to 63. Based on previously established cutoff scores,⁵ participants were classified as

having none or mild depression (BDI scores of 0 to 19) or moderate or severe depression (BDI scores of ≥ 20).

Pain intensity, interference, qualities, attribution, frequency, and duration—

Participants were recruited into the Pain Study regardless of pain status. The following screening question was used to determine who should answer additional questions about pain: “Have you experienced any pain or taken any medicine for pain during the past week?” Participants who responded affirmatively completed all of the pain measures.

Cause(s) of Pain: Participants self-reported whether they thought their current pain was attributable to any of four causes: HIV or AIDS, a side effect of any medication, a physical assault, and/or their living conditions (e.g., being homeless). Participants responded yes or no to each cause.

Pain duration and frequency: Participants reported how long ago their pain started (<1 week, 1 week, 2 weeks to 1 month, 1 to 5 months, 6 months to a year, or more than one year) and were classified as having chronic pain if their pain started 6 months or more prior to the interview. Participants were asked about frequency of pain over the past 3 months (daily, a couple of times a week, a couple of times a month, or less than once a month) and were classified as experiencing daily pain versus less than daily pain. Additionally, participants reported the number of days in the past week they experienced pain that interfered with their mood and/or activities and were classified as experiencing interfering pain on all 7 days in the prior week versus fewer than 7 days.

Brief Pain Inventory (BPI): Participants who answered affirmatively to the screening question completed a modified version of the BPI¹⁴ that assessed pain intensity at the time of interview as well as average and worst pain intensity over the past week using 0 (“no pain”) to 10 (“pain as bad as you can imagine”) numeric rating scales (NRS). The degree to which pain interfered with seven activities (i.e., general activity, mood, walking ability, sleep, enjoyment of life, normal work, and relations with others) over the past week was assessed using a 0 (“does not interfere”) to 10 (“interferes completely”) NRS. Participants shaded a body-map¹⁷ to indicate the locations of pain. Maps were coded using a template that divided the body into 45 sections,⁵³ which were collapsed into 16 body regions.⁶² The BPI was validated for use in patients with chronic non-malignant pain,^{26, 34, 69} including neuropathic pain,^{43, 80} in HIV-infected patients,⁴⁶ and in patients with substance abuse histories.^{50, 81}

Pain Qualities Assessment Scale (PQAS): The PQAS³² assesses 16 qualities of pain (i.e., sharp, hot, dull, cold, sensitive, tender, itchy, shooting, numb, electrical, tingling, cramping, radiating, throbbing, aching, heavy), 2 global domains (pain intensity and unpleasantness), and 2 spatial domains (deep and surface). Participants rated each quality of pain as experienced over the past week on a 0 (no sensation/intensity) to 10 (most sensation/intensity imaginable) NRS. The PQAS was validated in patients with pain from diabetic neuropathy, carpal tunnel syndrome, osteoarthritis, and low back pain.^{27, 31, 32, 75, 78} Individual PQAS items were summarized into three subscale scores by computing the mean score for the qualities in each subscale: (1) paroxysmal pain (shooting, sharp, electric, hot, and radiating); (2) surface pain (itchy, cold, numb, sensitive, and tingling); and (3) deep/dull pain (aching, heavy, dull, cramping, and throbbing).⁷⁵

Analgesic medications and pain treatment

Opioid analgesics: Participants were asked to identify all of the prescribed opioid analgesics that they used in the past 90 days. To assist with recall, participants were shown a

poster with names and pictures of opioid analgesics on the market at the start of the Pain Study. Individual opioid analgesics were classified as long-acting agents (e.g., controlled release oxycodone, controlled release morphine) or short-acting agents (e.g., acetaminophen with hydrocodone, acetaminophen with codeine, hydromorphone). Participants' medications were classified as a 4-level variable: no prescribed opioid, only short-acting opioid(s), only long-acting opioid(s), or both short- and long-acting opioids.

Non-opioid analgesics and co-analgesic medications: Participants were asked about any use, in the past 90 days, of prescribed analgesic medications (yes or no) in the following classes: non-steroidal anti-inflammatory drugs (NSAIDs), anticonvulsants, tricyclic antidepressants (TCAs), non-TCA antidepressants, benzodiazepines, and muscle relaxants. Participants were given a list of medicines within each class to assist recall. Because medical use of marijuana is legal in California when acquired with a cannabis card signed by a clinician,⁹ participants were asked about use of marijuana for pain control with the question "During the past 90 days, have you used any marijuana to treat physical pain?" Those who endorsed use of marijuana for pain control were asked if they obtained marijuana with a cannabis card prescribed by a clinician.

Pain relief scores: Participants who took pain medications were asked to rate the percentage of pain relief they experienced using a 0% (no relief) to 100% (complete relief) rating scale.

Treatment from a pain specialist: Participants were asked whether they received any treatment from a pain specialist or pain clinic in the past 90 days (yes or no).

Tobacco use—Nicotine cigarette use was assessed with items adapted from the 2005 California Tobacco Survey (CTS): Adult Interview.² Participants were classified as "ever smokers" if they reported smoking at least 100 cigarettes in their lifetime and "current smokers" if they had smoked at least 100 cigarettes and currently smoked every day or some days.

Alcohol and illicit substance use and use disorders

Current alcohol and illicit substance use: Regarding alcohol, participants were asked the number of days they drank in the past 30 days and the average number of drinks per day on a typical day of drinking. One drink was defined as a 12 oz. can of beer, a 5 oz. glass of wine, or a 1.5 oz. shot of hard liquor. Participants were categorized as recent daily drinkers if they consumed an average of 2 or more drinks per day (men) or 1 or more drinks per day (women) during the previous 30 days. Participants were asked about the use of crack/cocaine, methamphetamine, and heroin and were classified as current users if they responded affirmatively for past 90-day use.

Diagnostic Interview Schedule 1V (DIS-IV): The Diagnostic Interview Schedule IV (DIS-IV)^{29, 58} was used to determine lifetime diagnosis of alcohol use disorders (AUD) and substance use disorders (SUD), including psychiatric disorders of abuse and/or dependence as defined by the Diagnostic and Statistical Manual of Mental Disorders IV.³ The DIS-IV is a valid and reliable instrument for the detection of AUD and SUDs.²⁹ For alcohol, participants were classified as having a lifetime history of an AUD versus no history of an AUD. Detailed data were collected for the following illicit drugs: cocaine/crack, amphetamines, and heroin/opiates. For each drug category, participants were classified using a three-level variable: lifetime history of a SUD, lifetime history of use (using an illicit drug in any class more than 5 times) but no SUD, or no history of use or SUD.

Medical Outcomes Study Short Form-36 (SF-36)

The SF-36^{56, 77} is a 36-item instrument that assesses health status and was validated in the REACH cohort.⁵⁶ The SF-36 is scored from 0 to 100, with higher scores representing better outcomes. The instrument yields eight separate subscales: general health perception (GH), physical functioning (PF), role limitations because of physical health (role-physical (RP)), role limitations due to emotional health (role-emotional (RE)), bodily pain (BP), vitality (V), and mental health (MH). The instrument also yields two component summary measures (physical health component summary (PCS) and mental health component summary (MCS)), both of which have a mean of 50 and standard deviation of 10 in the United States (US) population.⁷⁷

Data analysis

All data analyses were done using Statistical Analysis System (SAS) Version 9.2 (SAS Institute, Cary, North Carolina). The sample was classified into those with and without pain using the screening question. Participants with pain were categorized into three pain intensity groups (i.e., mild, moderate, or severe) using their ratings of worst pain over the past week based on the analytic methods described by Serlin et al (1995).⁶⁴ Three-level categorical variables were created that represented all combinations of cutpoints, dividing the 0 to 10 worst pain intensity scale between 3 and 7. Multivariate analysis of variance (MANOVA) was used to analyze the relationship between the different cutpoint combinations and the set of seven interference items from the BPI. Optimal cutpoints were chosen based on the combination that yielded the largest F-ratio as determined by Pillai's trace, Wilk's lambda, and Hotelling's trace F statistics.

Differences in pain characteristics and correlates among the pain severity groups were analyzed using one-way ANOVAs and Chi square tests. For continuous variables, post-hoc comparisons of pain severity groups were done with the Scheffe procedure. For categorical variables, post-hoc contrasts were done using the Bonferroni procedure. Adjustments were not made for missing data. Therefore, the cohort for each analysis is dependent on the largest set of available data across groups. For all tests, an overall p-value of <0.05 after Scheffe or Bonferroni adjustment for multiple comparisons was considered statistically significant.

Results

Occurrence of pain and pain severity cutpoints

Of the 296 patients enrolled in this study, 91.2% (n=270) endorsed pain or the use of pain medications in the past week. Because of the relatively small percentage of participants who did not report pain or analgesic use, all of the results that follow reflect analyses with the sample of 270 participants with pain or pain medicine use in the past week. The cutpoint analysis of worst pain resulted in the following classifications: 0 to 4 is mild pain (n= 22, 8.2%), >4 to 7 is moderate pain (n=103, 38.1%), and >7 to 10 is severe pain (n=145, 53.7%).

Differences in sociodemographic and clinical characteristics among the pain severity groups

The majority of the participants were male (70.7%) with a mean age of 48.2 (SD=7.3) years (Table 1). Approximately 42% were African-Americans. Participants had a mean income of \$943/month (SD \$429) and 29.3% had less than a high school education. Except for sex at birth and education, no differences in sociodemographic characteristics were found among the pain severity groups. Post-hoc contrasts demonstrated that a higher percentage of participants in the severe pain group, compared to the mild and moderate pain groups, were

female ($p \leq 0.007$). In addition, compared to the moderate pain group, a higher percentage of participants in the severe pain group had less than a high school education ($p = 0.007$).

Almost all ($n = 259$, 95.9%) of the participants reported having a Primary Care Provider (PCP). Among those who reported having a PCP, 93.4% endorsed visiting their primary care clinic within the past 90 days.

Over one-fourth (28.6%) of the participants had a CD4 count of < 200 cells/mm³ and 74.4% were taking antiretroviral medications (Table 1). Over half (54.8%) had nadir CD4 counts of < 200 cells/mm³ since entering the parent REACH study. No differences in CD4 count or CD4 nadir were found among the pain severity groups.

Differences in pain characteristics among the pain severity groups

Participants attributed pain to an average of 1.4 (SD 1.1) causes (Table 2). Across the three pain severity groups, HIV/AIDS was the most commonly cited attribution for pain (60.4%). However, physical assault (21.5%) and living conditions (34.1%) were commonly cited causes of pain. Post-hoc contrasts showed no differences among the pain severity groups in frequencies of individual pain causes. However, participants in the severe group reported a higher number of pain causes than the other two severity groups.

Most participants (90.0%) were classified as having chronic pain (i.e., > 6 months duration) and 64.8% reported daily pain. Significant differences in the occurrence of chronic pain ($p = 0.02$) and the occurrence of daily pain ($p = 0.003$) were found among the three pain severity groups. Post-hoc contrasts demonstrated that a higher percentage of participants in the severe pain groups reported chronic pain ($p = 0.012$) than in the mild pain group. In addition, compared to the mild and moderate pain severity groups, a higher percentage of participants in the severe pain group reported that pain occurred on a daily basis (both, $p \leq 0.013$).

Significant differences in all of the pain intensity scores were found among the three pain groups (Table 2). The sample reported pain interfering with their mood and activities an average of 5.2 (SD 2.2) days per week. Participants in the severe pain group reported a significantly higher number of days of interference than those in the other two pain severity groups. Participants reported an average of 5.0 (SD 2.8) pain locations using the body map. Participants in the severe pain group reported a higher number of pain locations than the mild pain group. The most frequently shaded locations were the calf (62.5%), feet (56.8%) and lower back (52.3%).

Differences in pain qualities among the pain severity groups

Overall, the qualities with mean ratings above 5.0 were aching, sharp, and throbbing (Table 2). Significant differences in pain quality ratings were found among the three pain severity groups for all qualities, except itchy. In terms of the global domains of the PQAS, only unpleasantness was assessed and was rated as 6.8 (SD=2.8). Significant differences were found among the three pain severity groups on their ratings of unpleasantness ($p < 0.0001$; mild<moderate<severe, all $p \leq 0.0002$). In terms of the spatial domains, for the overall group, mean ratings for intensity of deep pain (6.7, SD 3.0) were significantly higher than mean ratings for intensity of surface pain (4.4, SD 3.3; $p < 0.0001$). In addition, significant differences were found among the three pain severity groups in their ratings of the intensity of deep pain ($p < 0.0001$; mild<moderate<severe, all $p \leq 0.0002$) and surface pain ($p = 0.001$; mild<moderate=severe, all $p \leq 0.002$). In terms of the three PQAS subscale scores, significant differences in mean scores were found among the three pain severity groups for all three subscale scores (i.e., paroxysmal, surface, and deep; all $p < 0.0001$). For all three

subscales, post-hoc contrasts demonstrated the following relationship – mild < moderate < severe; all $p < 0.0024$.

Differences in pain interference among the pain severity groups

Mean interference scores for all of the activities were in the moderate range for the overall sample (Figure 1). As expected, significant differences in all of the interference items, as well as in the total interference score, were found among the three pain severity groups (all $p < 0.0001$; mild < moderate < severe).

Differences in pain medications among the pain severity groups

The majority of participants (78.9%) had a prescription for a pain medication (Table 3). Compared to the mild and moderate pain groups, participants in the severe pain group were more likely to have a prescription analgesic ($p = 0.008$). Over half (57.0%) of the sample had a prescription for an opioid analgesic; 35.1% had a prescription for only a short-acting opioid analgesic, 14.1% for only a long-acting opioid analgesic, and 7.8% for both a short-acting and a long-acting opioid analgesic. Participants in the severe group were more likely to have a prescription for a short-acting opioid compared to the other two pain severity groups.

Approximately 24% of participants were prescribed anticonvulsants. A higher percentage of the participants in the severe pain group (33.1%) were prescribed an anticonvulsant compared to the mild (0.0%) and moderate (17.5%) pain groups ($p \leq 0.008$). While approximately 35% of the sample was prescribed an antidepressant, 17.8% a benzodiazepene, and 8.5% a muscle relaxant, no differences were found among the pain severity groups in the percentage of participants who had a prescription for these medications. Approximately 36% of the sample used marijuana for pain control. Post-hoc contrasts demonstrated that a higher percentage of participants in the severe pain group used marijuana compared to the mild pain severity group ($p = 0.003$). Of those using marijuana for pain control, 78.4% ($n = 58$) obtained marijuana with a cannabis card prescribed by a clinician. No differences in pain relief scores were found among the pain severity groups, with the mean relief score reported at 63.1% (SD 27.4%). Overall 2.2% of the participants were referred to a pain specialist or pain clinic in the prior 90 days.

Differences in substance use characteristics among the pain severity groups

The majority of participants (71.5%) were current smokers and 7.4% reported daily drinking (Table 4). Overall, 22.2% reported current use of crack/cocaine and 55.0% met criteria for a lifetime use disorder. A smaller proportion (15.2%) reported current use of methamphetamines and 39.2% met criteria for a lifetime use disorder. Overall, 5.6% reported current use of heroin and 30.4% met criteria for a lifetime use disorder. Except for smoking status, no differences in any of the substance use characteristics were found among the three pain severity groups. More participants in the severe group reported that they currently smoked (77.9%) compared to those in the mild (54.6%) and moderate (66.0%) groups. Smoking was significantly associated with pain level ($p = 0.023$), but none of the post-hoc comparisons between pain groups were significant.

Differences in depression among the pain severity groups

Almost half (42.8%) of participants were classified as having moderate or severe depression (Table 1). Significant differences in the proportion of participants in the BDI groups were found among the three pain severity groups ($p = 0.003$). A higher percentage of participants in the severe pain group had BDI scores consistent with moderate or severe depression compared to the mild pain severity group ($p < 0.0001$).

Differences in QOL among the pain severity groups

The SF-36 scores for the entire sample and for each of the pain severity groups are illustrated in Figure 2. Significant differences in the physical functioning ($p < 0.0001$; severe < moderate < mild, all $p < 0.038$), role physical ($p = 0.005$; severe < mild, $p = 0.012$), bodily pain ($p < 0.0001$; severe < moderate, < mild, all $p \leq 0.038$), role-emotional ($p = 0.036$; no significant post-hoc contrasts) and mental health ($p = 0.004$; severe = moderate < mild, $p < 0.027$) subscale scores were found among the pain severity groups.

Discussion

In this study of a socioeconomically disadvantaged cohort of HIV-infected adults, over 90% reported chronic pain lasting greater than 6 months. Ninety-two percent of these participants were found to have moderate to severe pain using well established methods for characterizing pain severity cutpoints.^{51, 64} This percentage is higher than the 55% found in a study that excluded patients with current illicit drug use or a diagnosis of schizophrenia or bipolar disorder.⁴

The cutpoints for mild, moderate, and severe pain in this study are identical to a sample of oncology patients with metastatic bone pain.⁵¹ The distribution of patients across pain severity groups and the mean pain intensity and interference scores in each group are comparable across the two studies. Findings from this study suggest that a significant percentage of indigent patients living with HIV disease experience moderate to severe pain that is associated with decrements in their physical, psychological, and social well-being.

Consistent with previous reports, participants attributed their pain to multiple causes.^{6, 28} Across all three pain severity groups, the most common cause of pain was HIV disease or side effects of HIV medication. As expected, the severe pain group reported a higher number of pain causes. Additional research is warranted to determine the exact etiologies of HIV-related pain to facilitate development and testing of the most effective pain management interventions.

The characteristics of pain in patients with HIV disease was reported in two studies done over a decade ago, prior to the initiation of highly effective antiretroviral therapy.^{6, 8} This study found almost identical pain intensity, interference, and relief scores to these prior studies. This finding suggests that HIV-related pain continues to be undertreated and is associated with decrements in patients' ability to function.^{4, 8, 35, 36, 55}

This study is the first to provide a detailed evaluation of the pain qualities across pain severity groups using a valid and reliable measure (i.e., PQAS) and significant differences were found for almost all of the pain qualities. For nine of the pain qualities, participants in the severe pain group reported higher scores compared to those with moderate pain, who reported higher scores than the mild pain group. Comparing results of this study with a previous report analyzing PQAS scores in patients with carpal tunnel syndrome, low back pain, and osteoarthritis,⁷⁵ participants in the moderate and severe pain groups in this study reported similar ratings for the majority of the pain qualities and for all three PQAS subscale scores as patients with low back pain and osteoarthritis pain. Additional research is warranted to determine whether the factor structure of the PQAS is similar in individuals with HIV-related pain.

To our knowledge, this study is the first to describe differences in prescription analgesics among HIV patients categorized into three pain severity groups. Most participants reported a prescription for an analgesic, but, despite the severity and chronic nature of the pain among those in the moderate and severe pain groups, a small percentage of participants had a

prescription for a long-acting opioid analgesic. This finding provides evidence that the treatment of pain continues to be problematic in patients with HIV disease,^{7, 8, 36, 74} which is not unexpected given the high rate of illicit drug use in the sample. In recent guidelines on the use of opioids for chronic noncancer pain developed by the American Pain Society (APS),¹¹ clinicians are advised to use caution and institute appropriate monitoring procedures for this high risk group. The coexistence of moderate-to-severe pain and substance use disorders creates challenges for clinicians trying to balance the competing risks of undertreated pain and prescription analgesic misuse.

While the APS guidelines recommend that PCPs seek consultation with pain and/or addiction medicine specialists, only 2.2% of participants saw a pain specialist in the past 90 days. While no data are available on disparities in access to pain specialists specifically, studies have shown that patients receiving care in safety-net systems, which primarily serve uninsured, Medicaid-insured, and other vulnerable populations,³⁹ have less access to specialty care.^{15, 16, 23} The lack of access to pain specialists for underinsured and publicly insured patients creates an additional challenge for appropriate management in the primary care setting. This finding warrants investigation in future studies.

A relatively small percentage of study participants reported a prescription for an anticonvulsant or an antidepressant. This finding warrants additional investigation to determine if these medications were prescribed and found to be ineffective, not taken by the patient due to side effects or other issues, or not prescribed due to lack of knowledge on the part of PCPs. Several clinical trials have demonstrated that marijuana is an effective treatment for neuropathic pain, including HIV-related neuropathy.^{1, 20} Marijuana use among patients with HIV neuropathy is common. In fact, a 2007 study of patients from four countries found that marijuana use was reported by 14.9% of those with HIV neuropathy.⁴⁹ The higher rate of marijuana use for pain in this study may reflect the legal status of medical marijuana use in California, the fact that many of the participants had co-existing substance use disorders, or local acceptance of marijuana for pain control. Similar to a previous work showing that patients with moderate to severe pain were somewhat more likely to use marijuana,⁵² a higher percentage of participants in the moderate and severe pain groups reported using marijuana to treat their pain.

Our findings on sociodemographic and clinical correlates of pain intensity are consistent with previous work characterizing pain in HIV-infected adults, despite the fact that many existing reports derive from data collected prior to the availability of highly active antiretroviral therapies.^{6, 8, 55, 72, 73} In the present study, female participants and those with less than high school education were more likely to report severe pain, consistent with research among HIV-infected adults showing increased pain among women^{6, 72, 74} and those of lower socioeconomic status,⁷² and disproportionate undertreatment of pain among women and individuals with less education.⁸ Similar to previous reports,^{6, 55} no ethnic differences were found among the three pain severity groups, although this finding may reflect the uniformly low SES and social marginalization of the study participants.

In this study, CD4 count was not associated with pain severity group. A prior study showed a modest association between low CD4 count and headache and polyneuropathy. However, individuals with CD4 counts above 200 composed only 5% of that study cohort.²⁸ Other studies in cohorts with similar disease severity distribution demonstrated mixed results. A 1998 study found no correlation between CD4 count and pain intensity,²¹ while a more recent study found greater pain among those with CD4 counts under 200.⁷³

Consistent with previous reports,^{21, 61, 66} a higher percentage of participants in the moderate and severe pain groups reported clinically significant levels of depression. In addition,

increased levels of pain severity appear to be associated with decreases in patients' psychological well-being. Overall, participants in this study reported significantly lower physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health than the general US population.⁵⁶ Notably, participants in the mild pain severity group had SF-36 scores similar to the general US population. While direct comparisons are difficult due to different age distributions than other published reports, this finding speaks to the overall low level of functioning of the majority of members of this cohort who had moderate or severe pain.

No differences were found among the three pain severity groups in their reports of current or lifetime history of illicit substance use or of an illicit substance use disorders. While this finding is consistent with a previous report,⁷³ it contrasts with findings from two studies showing positive associations between illicit drug use and pain severity.^{55, 72} The high overall rates of illicit substance use and use disorders in this study sample make it difficult to find statistical differences. Consistent with a previous study,⁵⁵ a higher percentage of participants in the severe pain group compared to the mild and moderate pain groups endorsed current smoking.

Several study limitations need to be acknowledged. While extensive information was obtained on participants' pain, future studies need to determine the exact causes of pain using findings from physical examinations and diagnostic tests. We relied on participant self-report for most data, including reports of stigmatized behaviors and detailed medical information. We attempted to increase validity of self-report by conducting interviews at a research facility embedded in the community and unassociated with health care delivery sites, and using tools such as photos and lists of analgesic medications to enhance recall. However, underreporting and misclassification are possible. Underreporting of illicit substance use may have limited our ability to find differences between those who did and did not use illicit substances. In addition, the non-medical use of prescription opioid analgesics was not accounted for and data were not verified with urine toxicology testing. Multiple statistical comparisons could have led to spurious associations. Finally, because adults living with HIV in San Francisco may have better access to healthcare, housing, and social services compared to those in many other urban environments, these findings may not be generalizable to other areas of the U.S..

Findings from this study suggest that unrelieved pain is a significant problem in this high risk, indigent group of individuals with HIV disease and previous or concurrent use of illicit drugs. This unrelieved pain is associated with decrements in these individuals' mood and functional status. Additional research is warranted to determine the optimal interventions to effectively treat pain in this highly vulnerable population.

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References

1. Abrams DI, Jay CA, Shade SB, Vizoso H, Reda H, Press S, Kelly ME, Rowbotham MC, Petersen KL. Cannabis in painful HIV-associated sensory neuropathy: a randomized placebo-controlled trial. *Neurology*. 2007; 68:515–21. [PubMed: 17296917]

2. Al-Delaimy, W.; Messer, K.; Pierce, J.; Trinidad, D.; White, M. Technical Report on Analytic Methods and Approaches Used in the 2005 California Tobacco Survey Analysis. La Jolla, CA: University of California, San Diego; 2007.
3. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4. Washington, DC: American Psychiatric Association; 2000. revised
4. Aouizerat BE, Miaskowski CA, Gay C, Portillo CJ, Coggins T, Davis H, Pullinger CR, Lee KA. Risk factors and symptoms associated with pain in HIV-infected adults. *J Assoc Nurses AIDS Care*. 2010; 21:125–33. [PubMed: 20116299]
5. Beck, AT.; Steer, RA.; Brown, GK. BDI-II Beck Depression Inventory Manual. San Antonio, TX: The Psychological Corp, Harcourt Brace & Company; 1996.
6. Breitbart W, McDonald MV, Rosenfeld B, Passik SD, Hewitt D, Thaler H, Portenoy RK. Pain in ambulatory AIDS patients. I: Pain characteristics and medical correlates. *Pain*. 1996; 68:315–21. [PubMed: 9121820]
7. Breitbart W, Rosenfeld B, Passik S, Kaim M, Funesti-Esch J, Stein K. A comparison of pain report and adequacy of analgesic therapy in ambulatory AIDS patients with and without a history of substance abuse. *Pain*. 1997; 72:235–43. [PubMed: 9272808]
8. Breitbart W, Rosenfeld BD, Passik SD, McDonald MV, Thaler H, Portenoy RK. The undertreatment of pain in ambulatory AIDS patients. *Pain*. 1996; 65:243–9. [PubMed: 8826513]
9. California Health and Safety Code: § 11362.5. 1996.
10. Chen I, Kurz J, Pasanen M, Faselis C, Panda M, Staton LJ, O'Rourke J, Menon M, Genao I, Wood J, Mechaber AJ, Rosenberg E, Carey T, Calleson D, Cykert S. Racial differences in opioid use for chronic nonmalignant pain. *J Gen Intern Med*. 2005; 20:593–8. [PubMed: 16050852]
11. Chou R, Fanciullo GJ, Fine PG, Adler JA, Ballantyne JC, Davies P, Donovan MI, Fishbain DA, Foley KM, Fudin J, Gilson AM, Kelter A, Mauskop A, O'Connor PG, Passik SD, Pasternak GW, Portenoy RK, Rich BA, Roberts RG, Todd KH, Miaskowski C. Clinical guidelines for the use of chronic opioid therapy in chronic noncancer pain. *J Pain*. 2009; 10:113–30. [PubMed: 19187889]
12. Cicero TJ, Inciardi JA, Munoz A. Trends in abuse of Oxycontin and other opioid analgesics in the United States: 2002–2004. *J Pain*. 2005; 6:662–72. [PubMed: 16202959]
13. Cleeland CS, Gonin R, Baez L, Loehrer P, Pandya KJ. Pain and treatment of pain in minority patients with cancer. The Eastern Cooperative Oncology Group Minority Outpatient Pain Study. *Ann Intern Med*. 1997; 127:813–6. [PubMed: 9382402]
14. Cleeland CS, Ryan KM. Pain assessment: global use of the Brief Pain Inventory. *Ann Acad Med Singapore*. 1994; 23:129–38. [PubMed: 8080219]
15. Cook NL, Hicks LS, O'Malley AJ, Keegan T, Guadagnoli E, Landon BE. Access to specialty care and medical services in community health centers. *Health Aff (Millwood)*. 2007; 26:1459–68. [PubMed: 17848458]
16. Cunningham PJ, Bazzoli GJ, Katz A. Caught in the competitive crossfire: safety-net providers balance margin and mission in a profit-driven health care market. *Health Aff (Millwood)*. 2008; 27:w374–82. [PubMed: 18697764]
17. Daut RL, Cleeland CS, Flanery RC. Development of the Wisconsin Brief Pain Questionnaire to assess pain in cancer and other diseases. *Pain*. 1983; 17:197–210. [PubMed: 6646795]
18. Del Borgo C, Izzi I, Chiarotti F, Del Forno A, Moscati AM, Cornacchione E, Fantoni M. Multidimensional aspects of pain in HIV-infected individuals. *AIDS Patient Care STDs*. 2001; 15:95–102. [PubMed: 11224935]
19. Dobalian A, Tsao JC, Duncan RP. Pain and the use of outpatient services among persons with HIV: results from a nationally representative survey. *Med Care*. 2004; 42:129–38. [PubMed: 14734950]
20. Ellis RJ, Toperoff W, Vaida F, van den Brande G, Gonzales J, Gouaux B, Bentley H, Atkinson JH. Smoked medicinal cannabis for neuropathic pain in HIV: a randomized, crossover clinical trial. *Neuropsychopharmacology*. 2009; 34:672–80. [PubMed: 18688212]
21. Evans S, Ferrando S, Sewell M, Goggin K, Fishman B, Rabkin J. Pain and depression in HIV illness. *Psychosomatics*. 1998; 39:528–35. [PubMed: 9819953]

22. Fantoni M, Ricci F, Del Borgo C, Izzi I, Damiano F, Moscati AM, Marasca G, Bevilacqua N, Del Forno A. Multicentre study on the prevalence of symptoms and symptomatic treatment in HIV infection. Central Italy PRESINT Group. *J Palliat Care*. 1997; 13:9–13. [PubMed: 9231582]
23. Felt-Lisk S, McHugh M, Howell E. Monitoring local safety-net providers: do they have adequate capacity? *Health Aff (Millwood)*. 2002; 21:277–83. [PubMed: 12224892]
24. Frich LM, Borgbjerg FM. Pain and pain treatment in AIDS patients: a longitudinal study. *J Pain Symptom Manage*. 2000; 19:339–47. [PubMed: 10869874]
25. Galvan FH, Burnam MA, Bing EG. Co-occurring psychiatric symptoms and drug dependence or heavy drinking among HIV-positive people. *J Psychoactive Drugs*. 2003; 35 (Suppl 1):153–60. [PubMed: 12825758]
26. Gjeilo KH, Stenseth R, Wahba A, Lydersen S, Klepstad P. Validation of the brief pain inventory in patients six months after cardiac surgery. *J Pain Symptom Manage*. 2007; 34:648–56. [PubMed: 17629665]
27. Gould EM, Jensen MP, Victor TW, Gammaitoni AR, White RE, Galer BS. The pain quality response profile of oxymorphone extended release in the treatment of low back pain. *Clin J Pain*. 2009; 25:116–22. [PubMed: 19333156]
28. Hewitt DJ, McDonald M, Portenoy RK, Rosenfeld B, Passik S, Breitbart W. Pain syndromes and etiologies in ambulatory AIDS patients. *Pain*. 1997; 70:117–23. [PubMed: 9150284]
29. Horton, J.; Compton, W.; Cottler, L. Assessing Psychiatric Disorders Among Drug Users: Reliability of The Revised DIS-IV. In: Harris, L., editor. *NIDA Research Monograph-Problems of Drug Dependence*. Washington, D.C: NIH; 1998. p. 205
30. Jamison RN, Kauffman J, Katz NP. Characteristics of methadone maintenance patients with chronic pain. *J Pain Symptom Manage*. 2000; 19:53–62. [PubMed: 10687327]
31. Jensen MP, Dworkin RH, Gammaitoni AR, Olaleye DO, Oleka N, Galer BS. Do pain qualities and spatial characteristics make independent contributions to interference with physical and emotional functioning? *J Pain*. 2006; 7:644–53. [PubMed: 16942950]
32. Jensen MP, Gammaitoni AR, Olaleye DO, Oleka N, Nalamachu SR, Galer BS. The pain quality assessment scale: assessment of pain quality in carpal tunnel syndrome. *J Pain*. 2006; 7:823–32. [PubMed: 17074624]
33. Karon JM, Fleming PL, Steketee RW, De Cock KM. HIV in the United States at the turn of the century: an epidemic in transition. *American journal of public health*. 2001; 91:1060–8. [PubMed: 11441732]
34. Keller S, Bann CM, Dodd SL, Schein J, Mendoza TR, Cleeland CS. Validity of the brief pain inventory for use in documenting the outcomes of patients with noncancer pain. *Clin J Pain*. 2004; 20:309–18. [PubMed: 15322437]
35. Koeppe J, Armon C, Lyda K, Nielsen C, Johnson S. Ongoing pain despite aggressive opioid pain management among persons with HIV. *Clin J Pain*. 2010; 26:190–8. [PubMed: 20173432]
36. Larue F, Fontaine A, Colleau SM. Underestimation and undertreatment of pain in HIV disease: multicentre study. *Bmj*. 1997; 314:23–8. [PubMed: 9001475]
37. Lebovits AH, Smith G, Maignan M, Lefkowitz M. Pain in hospitalized patients with AIDS: analgesic and psychotropic medications. *Clin J Pain*. 1994; 10:156–61. [PubMed: 8075469]
38. Lee KA, Gay C, Portillo CJ, Coggins T, Davis H, Pullinger CR, Aouizerat BE. Symptom experience in HIV-infected adults: a function of demographic and clinical characteristics. *J Pain Symptom Manage*. 2009; 38:882–93. [PubMed: 19811886]
39. Lewin, ME.; Altman, SH. *America's health care safety net: intact but endangered*. Washington, DC: Institute of Medicine; 2000.
40. Lorenz KA, Shapiro MF, Asch SM, Bozzette SA, Hays RD. Associations of symptoms and health-related quality of life: findings from a national study of persons with HIV infection. *Ann Intern Med*. 2001; 134:854–60. [PubMed: 11346321]
41. Loyland B, Miaskowski C, Paul SM, Dahl E, Rustoen T. The relationship between chronic pain and health-related quality of life in long-term social assistance recipients in Norway. *Qual Life Res*. 2010; 19:1457–65. [PubMed: 20652418]

42. Loyland B, Miaskowski C, Wahl AK, Rustoen T. Prevalence and characteristics of chronic pain among long-term social assistance recipients compared to the general population in Norway. *Clin J Pain*. 2010; 26:624–30. [PubMed: 20639732]
43. Lydick E, Epstein RS, Himmelberger D, White CJ. Area under the curve: a metric for patient subjective responses in episodic diseases. *Qual Life Res*. 1995; 4:41–5. [PubMed: 7711690]
44. Mahungu TW, Rodger AJ, Johnson MA. HIV as a chronic disease. *Clin Med*. 2009; 9:125–8. [PubMed: 19435115]
45. McCormack JP, Li R, Zarowny D, Singer J. Inadequate treatment of pain in ambulatory HIV patients. *Clin J Pain*. 1993; 9:279–83. [PubMed: 8118093]
46. Mphahlele N, Mitchell D, Kamerman P. Validation of the Wisconsin Brief Pain Questionnaire in a multilingual South African population. *J Pain Symptom Manage*. 2008; 36:396–412. [PubMed: 18448308]
47. Ng B, Dimsdale JE, Rollnik JD, Shapiro H. The effect of ethnicity on prescriptions for patient-controlled analgesia for post-operative pain. *Pain*. 1996; 66:9–12. [PubMed: 8857626]
48. Nguyen M, Ugarte C, Fuller I, Haas G, Portenoy RK. Access to care for chronic pain: racial and ethnic differences. *J Pain*. 2005; 6:301–14. [PubMed: 15890632]
49. Nicholas PK, Voss JG, Corless IB, Lindgren TG, Wantland DJ, Kemppainen JK, Canaval GE, Sefcik EF, Nokes KM, Bain CA, Kirksey KM, Eller LS, Dole PJ, Hamilton MJ, Coleman CL, Holzemer WL, Reynolds NR, Portillo CJ, Bunch EH, Tsai YF, Mendez MR, Davis SM, Gallagher DM. Unhealthy behaviours for self-management of HIV-related peripheral neuropathy. *AIDS Care*. 2007; 19:1266–73. [PubMed: 18071970]
50. Passik SD, Kirsh KL, Donaghy KB, Portenoy RK. Pain and Aberrant Drug-Related Behaviors in Medically Ill Patients With and Without Histories of Substance Abuse. *Clin J Pain*. 2006; 22:173–81. [PubMed: 16428952]
51. Paul SM, Zelman DC, Smith M, Miaskowski C. Categorizing the severity of cancer pain: further exploration of the establishment of cutpoints. *Pain*. 2005; 113:37–44. [PubMed: 15621362]
52. Prentiss D, Power R, Balmas G, Tzuang G, Israelski DM. Patterns of marijuana use among patients with HIV/AIDS followed in a public health care setting. *J Acquir Immune Defic Syndr*. 2004; 35:38–45. [PubMed: 14707790]
53. Puntillo, K.; Wilhelm, FH. Assessment of pain in the critically ill. In: Puntillo, K., editor. *Pain in the Critically Ill: Assessment and Management*. Gaithersburg MD: Aspen; 1991.
54. Quinn TC. HIV epidemiology and the effects of antiviral therapy on long-term consequences. *Aids*. 2008; 22 (Suppl 3):S7–12. [PubMed: 18845925]
55. Richardson JL, Heikes B, Karim R, Weber K, Anastos K, Young M. Experience of pain among women with advanced HIV disease. *AIDS Patient Care STDS*. 2009; 23:503–11. [PubMed: 19534600]
56. Riley ED, Bangsberg DR, Perry S, Clark RA, Moss AR, Wu AW. Reliability and validity of the SF-36 in HIV-infected homeless and marginally housed individuals. *Qual Life Res*. 2003; 12:1051–8. [PubMed: 14651422]
57. Robertson MJ, Clark RA, Charlebois ED, Tulskey J, Long HL, Bangsberg DR, Moss AR. HIV seroprevalence among homeless and marginally housed adults in San Francisco. *American journal of public health*. 2004; 94:1207–17. [PubMed: 15226145]
58. Robins, L.; Cottler, L.; Bucholz, K.; Compton, W.; North, C.; Rourke, K. *Diagnostic Interview Schedule for the DSM-IV (DIS-IV)*. 2000.
59. Robins LN, Helzer JE, Croughan J, Ratcliff KS. National Institute of Mental Health Diagnostic Interview Schedule. Its history, characteristics, and validity. *Arch Gen Psychiatry*. 1981; 38:381–9. [PubMed: 6260053]
60. Rosenblum A, Joseph H, Fong C, Kipnis S, Cleland C, Portenoy RK. Prevalence and characteristics of chronic pain among chemically dependent patients in methadone maintenance and residential treatment facilities. *Jama*. 2003; 289:2370–8. [PubMed: 12746360]
61. Rosenfeld B, Breitbart W, McDonald MV, Passik SD, Thaler H, Portenoy RK. Pain in ambulatory AIDS patients. II: Impact of pain on psychological functioning and quality of life. *Pain*. 1996; 68:323–8. [PubMed: 9121821]

62. Rustoen T, Wahl AK, Hanestad BR, Lerdal A, Paul S, Miaskowski C. Prevalence and characteristics of chronic pain in the general Norwegian population. *Eur J Pain*. 2004; 8:555–65. [PubMed: 15531224]
63. Ryan CF, White JM. Health status at entry to methadone maintenance treatment using the SF-36 health survey questionnaire. *Addiction*. 1996; 91:39–45. [PubMed: 8822013]
64. Serlin RC, Mendoza TR, Nakamura Y, Edwards KR, Cleeland CS. When is cancer pain mild, moderate or severe? Grading pain severity by its interference with function. *Pain*. 1995; 61:277–84. [PubMed: 7659438]
65. Sharp LK, Lipsky MS. Screening for depression across the lifespan: a review of measures for use in primary care settings. *Am Fam Physician*. 2002; 66:1001–8. [PubMed: 12358212]
66. Singer EJ, Zorilla C, Fahy-Chandon B, Chi S, Syndulko K, Tourtellotte WW. Painful symptoms reported by ambulatory HIV-infected men in a longitudinal study. *Pain*. 1993; 54:15–9. [PubMed: 8378098]
67. Storch EA, Roberti JW, Roth DA. Factor Structure, Concurrent Validity, and Internal Consistency of the Beck Depression Inventory-Second Edition in a Sample of College Students. *Depression and Anxiety*. 2004; 19:187–9. [PubMed: 15129421]
68. Sullivan LW, Egel BA. Leveling the playing field: recognizing and rectifying disparities in management of pain. *Pain Med*. 2005; 6:5–10. [PubMed: 15669945]
69. Tan G, Jensen MP, Thornby JI, Shanti BF. Validation of the Brief Pain Inventory for chronic nonmalignant pain. *J Pain*. 2004; 5:133–7. [PubMed: 15042521]
70. Todd KH, Deaton C, D'Adamo AP, Goe L. Ethnicity and analgesic practice. *Ann Emerg Med*. 2000; 35:11–6. [PubMed: 10613935]
71. Todd KH, Samaroo N, Hoffman JR. Ethnicity as a risk factor for inadequate emergency department analgesia. *Jama*. 1993; 269:1537–9. [PubMed: 8445817]
72. Tsao JC, Dobalian A, Stein JA. Illness burden mediates the relationship between pain and illicit drug use in persons living with HIV. *Pain*. 2005; 119:124–32. [PubMed: 16297562]
73. Tsao JC, Soto T. Pain in persons living with HIV and comorbid psychologic and substance use disorders. *Clin J Pain*. 2009; 25:307–12. [PubMed: 19590479]
74. Tsao JC, Stein JA, Dobalian A. Sex differences in pain and misuse of prescription analgesics among persons with HIV. *Pain Med*. 2010; 11:815–24. [PubMed: 20456074]
75. Victor TW, Jensen MP, Gammaitoni AR, Gould EM, White RE, Galer BS. The dimensions of pain quality: factor analysis of the Pain Quality Assessment Scale. *Clin J Pain*. 2008; 24:550–5. [PubMed: 18574365]
76. Vogl D, Rosenfeld B, Breitbart W, Thaler H, Passik S, McDonald M, Portenoy RK. Symptom prevalence, characteristics, and distress in AIDS outpatients. *J Pain Symptom Manage*. 1999; 18:253–62. [PubMed: 10534965]
77. Ware, JE.; Kosinski, M.; Keller, SD. SF-36 Physical & Mental Health Summary Scales: A User's Manual. Boston: Health Assessment Lab; 1994.
78. Waterman C, Victor TW, Jensen MP, Gould EM, Gammaitoni AR, Galer BS. The assessment of pain quality: an item response theory analysis. *J Pain*. 2010; 11:273–9. [PubMed: 20211439]
79. Whetten K, Reif SS, Napravnik S, Swartz MS, Thielman NM, Eron JJ Jr, Lowe K, Soto T. Substance abuse and symptoms of mental illness among HIV-positive persons in the Southeast. *South Med J*. 2005; 98:9–14. [PubMed: 15678633]
80. Zelman DC, Gore M, Dukes E, Tai KS, Brandenburg N. Validation of a modified version of the brief pain inventory for painful diabetic peripheral neuropathy. *J Pain Symptom Manage*. 2005; 29:401–10. [PubMed: 15857744]
81. Zelman DC, Hoffman DL, Seifeldin R, Dukes EM. Development of a metric for a day of manageable pain control: derivation of pain severity cut-points for low back pain and osteoarthritis. *Pain*. 2003; 106:35–42. [PubMed: 14581108]
82. Zolopa AR, Hahn JA, Gorter R, Miranda J, Wlodarczyk D, Peterson J, Pilote L, Moss AR. HIV and tuberculosis infection in San Francisco's homeless adults. Prevalence and risk factors in a representative sample. *Jama*. 1994; 272:455–61. [PubMed: 8040981]

Figure 1.

Pain interference item scores for the total sample and differences in pain interference item scores among the three pain severity groups are reported as means ($\pm$ standard deviations). Significant differences in all of the interference items, as well as in the total interference score, were found among the three pain severity groups (all $p < 0.0001$; mild < moderate < severe).

Figure 2.

Figure 2A – SF-36 subscale scores for the total sample and differences in SF-36 subscale scores among the three pain severity groups are reported as means ($\pm$ standard deviations). Significant differences in the physical functioning (PF, $p < 0.0001$; severe < moderate < mild, all $p < 0.038$), role physical (RP, $p = 0.005$; severe < mild, $p = 0.012$), bodily pain (BP, $p < 0.0001$; severe < moderate, < mild, all $p \leq 0.038$), role-emotional (RE, $p = 0.036$; no significant post-hoc contrasts) and mental health (MH, $p = 0.004$; severe = moderate < mild, $p < 0.027$) subscale scores were found among the pain severity groups. No differences were found among the pain severity groups in general health (GH) or vitality (V) subscale scores. Figure 2B – Mental health component summary (MCS) and physical health component summary (PCS) scores for the United States (U.S.) general population, total sample, and pain severity groups are reported as means ($\pm$ standard deviations). Significant differences in PCS scores were found among the pain severity groups ($p = 0.005$, severe < moderate < mild, $p \leq 0.0381$).

Table 1

Demographic and clinical characteristics

<i>Characteristics</i>	<i>Overall (n=270)</i>	<i>Mild Pain (n=22)</i>	<i>Moderate Pain (n=103)</i>	<i>Severe Pain (n=145)</i>	<i>P Value[†]</i>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	
Age in years	48.2 (7.3)	50.8 (8.6)	48.8 (8.3)	47.5 (6.2)	0.09
Monthly income in dollars	943.1 (429.1)	947.5 (437.1)	1012.9 (544.5)	892.9 (316.2)	0.09
	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	
Sex at birth ^a					
Male	191 (70.7%)	20 (90.9%)	83 (80.6%)	88 (60.7%)	<.0001
Female	79 (29.3%)	2 (9.1%)	20 (19.4%)	57 (39.3%)	
Race / Ethnicity					
White	103 (38.2%)	10 (45.5%)	47 (45.6%)	46 (31.7%)	0.11
African-American	113 (41.9%)	6 (27.3%)	37 (35.9%)	70 (48.3%)	
Mixed / Other	54 (20.0%)	6 (27.3%)	19 (18.5%)	29 (20.0%)	
Education (n=266) ^b					
Less than high school	78 (29.3%)	3 (14.3%)	21 (20.8%)	54 (37.5%)	0.005
High school or more	188 (70.7%)	18 (85.7%)	80 (79.2%)	90 (62.5%)	
HIV blood data					
CD4 count (n=269)					
<200	77 (28.6%)	6 (27.3%)	25 (24.5%)	46 (31.7%)	0.46
200+	192 (71.4%)	16 (72.7%)	77 (75.5%)	99 (68.3%)	
Nadir CD4 count (n=270)					
<200	148 (54.8%)	14 (63.3%)	56 (54.4%)	76 (53.8%)	0.68
200+	122 (45.2%)	8 (36.4%)	47 (45.6%)	66 (46.2%)	
HIV viral load (n=255)					
50+	181 (71.0%)	10 (52.6%)	68 (71.6%)	103 (73.1%)	0.18
<50	74 (29.0%)	9 (47.4%)	27 (28.4%)	38 (27.0%)	
Prescribed antiretrovirals	201 (74.4%)	19 (86.4%)	73 (70.9%)	109 (75.2%)	0.31
Depression (BDI) (n=269) ^c					
None or Mild	154 (57.2%)	20 (90.9%)	59 (57.3%)	75 (52.1%)	0.003
Moderate or Severe	115 (42.8%)	2 (9.1%)	44 (42.7%)	69 (47.9%)	

[†] Note: p-value from Analysis of Variance for continuous variables and χ^2 test for categorical variables

^a Mild<Severe, Moderate<Severe, Mild = Moderate

^b Moderate < Severe, Mild=Moderate, Mild = Severe

^c Mild < Moderate, Mild < Severe, Moderate = Severe

Table 2

Differences in pain characteristics among the pain severity groups

<i>Pain Characteristics</i>	<i>Overall (n=270)</i>	<i>Mild Pain (n=22)</i>	<i>Moderate Pain (n=103)</i>	<i>Severe Pain (n=145)</i>	<i>P Value[†]</i>
Pain attributed to...	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	
HIV/AIDS	163 (60.4%)	11 (50.0%)	56 (54.4%)	96 (66.2%)	0.10
Medicine (a side effect)	74 (27.4%)	6 (27.3%)	24 (23.3%)	44 (30.3%)	0.47
Physical assault	58 (21.5%)	1 (4.6%)	19 (18.5%)	38 (26.2%)	0.04
Living conditions	92 (34.1%)	5 (22.7%)	32 (31.1%)	55 (37.9%)	0.27
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	
Number of pain attributions ^b	1.4 (1.1)	1.1 (1.1)	1.3 (1.0)	1.6 (1.2)	0.01
Frequency and Duration	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	
Chronic pain ^c	243 (90.0%)	16 (72.7%)	93 (90.3%)	134 (92.4%)	0.02
Daily pain over last 90 days ^b	175 (64.8%)	10 (45.5%)	58 (56.3%)	107 (73.8%)	0.003
Intensity Questions (BPI)	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	<i>Mean (SD)</i>	
Pain right now ^a	4.2 (2.8)	1.2 (1.4)	3.1 (1.9)	5.4 (2.8)	<.0001
Average past-week pain ^a	5.6 (2.2)	1.9 (1.5)	4.7 (1.6)	6.7 (1.8)	<.0001
Worst past-week pain ^a	7.5 (2.1)	2.9 (1.2)	6.2 (0.8)	9.0 (0.9)	<.0001
Days/wk pain interferes with mood /activities ^{*, b}	5.2 (2.2)	3.6 (2.9)	4.7 (2.3)	5.8 (1.8)	<.0001
Total # of body regions ^c	5.0 (2.8)	3.6 (2.9)	4.9 (2.7)	5.3 (2.8)	0.021
Pain Qualities Assessment Scale (PQAS)					
Unpleasant ^a	6.8 (2.8)	3.6 (2.5)	6.0 (2.5)	7.8 (2.4)	<.0001
Aching ^a	5.8 (3.2)	2.4 (2.5)	5.1 (2.7)	6.8 (3.2)	<.0001
Sharp ^a	5.8 (3.3)	1.5 (1.9)	4.6 (3.0)	7.3 (2.7)	<.0001
Throbbing ^a	5.2 (3.5)	2.1 (2.8)	4.0 (3.0)	6.6 (3.3)	<.0001
Shooting ^a	4.8 (3.5)	1.9 (2.4)	3.9 (3.0)	5.8 (3.6)	<.0001
Cramping ^a	4.7 (3.6)	1.2 (2.0)	4.0 (3.3)	5.8 (3.6)	<.0001
Dull ^d	4.7 (3.1)	2.6 (2.5)	4.4 (2.9)	5.3 (3.2)	0.0002
Numb ^b	4.6 (3.6)	2.0 (2.3)	3.9 (3.1)	5.5 (3.7)	<.0001

<i>Pain Characteristics</i>	<i>Overall (n=270)</i>	<i>Mild Pain (n=22)</i>	<i>Moderate Pain (n=103)</i>	<i>Severe Pain (n=145)</i>	<i>P Value[†]</i>
Tingling ^a	4.4 (3.6)	1.3 (1.7)	3.6 (3.1)	5.4 (3.8)	<.0001
Tender ^a	4.1 (3.5)	1.1 (2.1)	3.3 (3.1)	5.1 (3.6)	<.0001
Heavy ^b	4.0 (3.8)	0.9 (1.9)	2.9 (3.4)	5.2 (3.8)	<.0001
Hot ^a	3.7 (3.6)	0.7 (1.7)	2.7 (2.8)	4.9 (3.9)	<.0001
Sensitive skin ^b	3.7(3.6)	0.9 (1.8)	2.9 (3.2)	4.7 (3.8)	<.0001
Electrical ^a	3.5 (3.7)	0.7 (1.6)	2.9 (3.3)	4.3 (3.9)	<.0001
Radiating ^b	3.3 (3.6)	0.8 (2.3)	2.4 (2.8)	4.4 (3.9)	<.0001
Itchy	2.9(3.5)	1.2 (2.4)	2.8 (3.3)	3.2 (3.7)	0.13
Cold ^c	1.8 (3.1)	0.2 (0.7)	1.5 (2.6)	2.3 (3.5)	0.009
Intensity of deep pain ^a	6.7(3.0)	2.2 (2.6)	5.9 (2.6)	7.9 (2.5)	<.0001
Intensity of surface pain ^d	4.4 (3.3)	2.2 (2.6)	4.2 (3.1)	4.9 (3.4)	0.001
Paroxysmal sub-scale ^a	4.2 (2.5)	1.1 (1.3)	3.3 (2.0)	5.4 (2.3)	<.0001
Surface sub-scale ^a	3.5 (2.4)	1.1 (1.0)	2.9 (1.9)	4.2 (2.5)	<.0001
Deep sub-scale ^a	4.9 (2.6)	1.8 (1.5)	4.1 (2.2)	5.9 (2.4)	<.0001

[†] Note: p-value from Analysis of Variance for continuous variables and χ^2 test for categorical variables

* Note: n=267 due to missing data

^a Mild < Moderate < Severe

^b Mild<Severe, Moderate<Severe, Mild = Moderate

^c Mild < Severe, Mild = Moderate, Moderate = Severe

^d Mild < Moderate, Mild < Severe, Moderate = Severe

Table 3

Past 90-Day use of prescribed medication

<i>Prescribed Medications</i>	<i>Overall (n=270)</i> <i>N (%)</i>	<i>Mild Pain (n=22)</i> <i>N (%)</i>	<i>Moderate Pain (n=103)</i> <i>N (%)</i>	<i>Severe Pain (n=145)</i> <i>N (%)</i>	<i>$\chi^2 P$ Value</i>
Any prescribed pain medicine ^a	213 (78.9%)	12 (54.6%)	74 (71.8%)	127 (87.6%)	0.0002
Opioid Prescriptions					
No Opioid Prescription	116 (43.0%)	16 (72.7%)	52 (50.5%)	48 (33.1%)	0.0078
Only Short-Acting Opioid	95 (35.2%)	5 (22.7%)	30 (29.1%)	60 (41.4%)	
Only Long-Acting Opioid	38 (14.1%)	0	13 (12.6%)	25 (17.2%)	
Both Short-Acting and Long-Acting Opioids	21 (7.8%)	1 (4.6%)	8 (7.8%)	12 (8.3%)	
Nonsteroidal anti-inflammatory drugs ^a	73 (27.0%)	2 (9.1%)	27 (26.2%)	44 (30.3%)	0.11
Anticonvulsants	66 (24.4%)	0	18 (17.5%)	48 (33.1%)	0.0004
Anti-depressants					
Tricyclic Antidepressant	18 (6.7%)	1 (4.6%)	8 (7.8%)	9 (6.2%)	0.82
Non-TCA Antidepressant	78 (28.9%)	5 (22.7%)	24 (23.3%)	49 (33.8%)	0.16
Benzodiazepines	48 (17.8%)	2 (9.1%)	18 (17.5%)	28 (19.3%)	0.50
Muscle Relaxants	23 (8.5%)	0	6 (5.8%)	17 (11.7%)	0.086
Marijuana for pain ^{b,c}	98 (36.3%)	2 (9.1%)	35 (34.0%)	61 (42.1%)	0.0092
Relief from pain medicine (mean (SD))	63.1 (27.4)	69.2 (39.2)	63.2 (24.8)	62.4 (27.7)	0.72
Pain specialist or pain clinic visit (past 90 days)	6 (2.2%)	2 (9.1%)	2 (1.9%)	2 (1.4%)	–

^a Mild<Severe, Moderate<Severe, Mild = Moderate^b Mild < Severe, Mild = Moderate, Moderate = Severe^c includes participants endorsing any marijuana use for pain control, whether or not marijuana was obtained with a cannabis card

Table 4

Substance use

<i>Substances</i>	<i>Overall (n=270)</i> N (%)	<i>Mild Pain (n=22)</i> N (%)	<i>Moderate Pain (n=103)</i> N (%)	<i>Severe Pain (n=145)</i> N (%)	χ^2 P Value
<i>Tobacco</i>					
Ever smoker (100 cigarettes in life) *	226 (84.0%)	16 (72.7%)	85 (82.5%)	125 (86.8%)	0.21
Current Smoker ^a	193 (71.5%)	12 (54.6%)	68 (66.0%)	113 (77.9%)	0.023
<i>Alcohol</i>					
Current daily drinking	20 (7.4%)	1 (4.6%)	11 (10.7%)	8 (5.5%)	0.27
Lifetime history of use disorder [†]	169 (65.0%)	15 (75.0%)	63 (62.4%)	91 (65.5%)	0.55
<i>Crack / cocaine</i>					
Current use	60 (22.2%)	2 (9.1%)	23 (22.3%)	35 (24.1%)	0.29
<i>Lifetime history[†]</i>					
use disorder	143 (55.0%)	5 (25.0%)	57 (56.4%)	81 (58.3%)	0.052
use without disorder	59 (22.7%)	8 (40.0%)	25 (24.8%)	26 (18.7%)	
never used	58 (22.3%)	7 (35.0%)	19 (18.8%)	32 (23.0%)	
<i>Amphetamines</i>					
Current use (methamphetamine only)	41 (15.2%)	5 (22.7%)	18 (17.5%)	18 (12.4%)	0.32
<i>Lifetime history[†]</i>					
use disorder	102 (39.2%)	6 (30.0%)	46 (45.5%)	50 (36.0%)	0.10
use without disorder	52 (20.0%)	8 (40.0%)	17 (16.8%)	27 (19.4%)	
never used	106 (40.8%)	6 (30.0%)	38 (37.6%)	62 (44.6%)	
<i>Heroin / Opiates</i>					
Current use (heroin only)	15 (5.6%)	1 (4.6%)	3 (2.9%)	11 (7.6%)	0.28
<i>Lifetime history[†]</i>					
use disorder	79 (30.4%)	4 (20.0%)	31 (30.7%)	44 (31.7%)	0.79
use without disorder	34 (13.1%)	2 (10.0%)	13 (12.9%)	19 (13.7%)	
never used illicitly	147 (56.5%)	14 (70.0%)	57 (56.4%)	76 (54.7%)	

* Note: n=269 due to missing data

^a Post hoc contrasts showed no significant differences between groups

† Note: n=260 due to missing data

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