

# Associations Between Opioid Prescriptions and Use of Hospital-Based Services Among US Adults with Longstanding Physical Disability or Inflammatory Conditions Compared to Other Adults in the Medical Expenditure Panel Survey, 2010–2015

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**Purpose:** To investigate the association of filling opioid prescriptions with healthcare service utilization among a nationally representative sample of adults with disability.

**Materials and Methods:** The Medical Expenditure Panel Survey (MEPS) for 2010–2015, Panels 15–19, was used to identify adults who were prescribed opioids during each two-year period. We examined the data for associations between opioid prescription filling and the number of emergency department (ED) visits and hospitalizations. The participants were grouped as those with inflammatory conditions or with longstanding physical disability, and a comparison group of those without these conditions.

**Results and conclusions:** Opioid prescription filling differed among adults with inflammatory conditions and longstanding physical disability compared to the comparison group (44.93% and 40.70% vs 18.10%, respectively). For both groups of people with disability, the relative rates for an ED visit or hospitalization were significantly higher for those who filled an opioid prescription, compared to adults with the same conditions who did not fill an opioid prescription. People with a longstanding physical disability who filled an opioid prescription had the highest rate ratio of ED use and hospitalization. Results from this investigation demonstrate that opioid prescription filling among persons with inflammatory conditions and longstanding physical disabilities is associated with higher rates of ED visits and hospitalizations.

**Keywords:** opioids, rheumatoid arthritis, disabled person, chronic pain, health care utilization

## Plain Language Summary

A US national survey “The Medical Expenditure Panel Survey (MEPS)” for 2010–2015 was used to identify adults who were prescribed opioids during two-year periods in order to look for associations between filling opioid prescriptions and use of health care, specifically use of the emergency department (ED) and hospitalizations. We compared people with an inflammatory condition (eg, rheumatoid or psoriatic arthritis, lupus), longstanding physical disability (eg, spinal cord injury, cerebral palsy, stroke), and a comparison group of people without these conditions. We found opioid prescription filling differed among adults with inflammatory conditions and longstanding physical disabilities compared to the comparison group (44.93% and 40.70% vs 18.10%, respectively). For both groups of people with disabling conditions, rates for an ED visit or hospitalization were significantly higher for those who

filled an opioid prescription, compared to adults with the same conditions who did not fill an opioid prescription. People with a longstanding physical disability who filled an opioid prescription had the highest rate of ED use and hospitalization.

## Introduction

Pain is a common medical complaint of the general United States (US) adult population; an estimated 56% of adults report having some pain in the last 3 months, while 11% report having chronic pain, which is defined as pain every day for the past 3 months.<sup>1</sup> People with a variety of disability conditions, representing one in four American adults,<sup>2</sup> report higher levels of chronic pain and pain interference for daily tasks than people without disability.<sup>3–7</sup> Pain is a common secondary health condition for people with longstanding physical disabilities (eg, spinal cord injury, cerebral palsy),<sup>6</sup> with reports of pain interference not decreasing with aging, unlike reports of those without disability.<sup>7</sup> People with adult onset inflammatory conditions (eg, ankylosing spondylitis, inflammatory bowel disease) report acute and chronic pain<sup>8</sup> that might result in early withdrawal from the workforce.<sup>9</sup>

Pain management can be complex, especially for chronic pain or pain confounded by the disability and multiple health conditions. Treatment for progressive symptoms of many inflammatory conditions focuses on treating the underlying condition, and that approach is not always successful for alleviating pain.<sup>8</sup> There is no clear consensus for managing pain complaints in adults with longstanding physical disabilities.<sup>10–12</sup> Opioids are commonly prescribed for pain among people with disability, despite risks for harm. A 2013–2015 Swedish study reported that about one in four people with knee or hip osteoarthritis were dispensed opioids.<sup>13</sup> People with longstanding physical disabilities and inflammatory conditions are reported to have higher dosing of opioids compared to people without those conditions.<sup>14</sup>

Health-care utilization is known to be increased in people using prescription opioids, along with higher health-care costs for those demonstrating nonadherence to opioid prescriptions.<sup>15,16</sup> Prescription opioid use has been associated with misuse and addiction, especially in the face of certain mental health conditions.<sup>17</sup> People with disability are known to have high use of health-care services,<sup>18</sup> however, it is unknown how prescription opioid use contributes to health service use among people with disability.

In a previous study, we reported higher opioid prescription dosing in people with inflammatory conditions and longstanding physical disabilities compared to people without those disabilities.<sup>14</sup> These two conditions were chosen for comparison in that study since management strategies for underlying pathologies, pain, and other comorbid conditions differ between the two types of disabling conditions. Using the previously defined disability condition groupings defined by International Classification of Disease Version 9 (ICD-9) codes and a comparison group, the study being presented examined the association between opioid prescriptions filled and hospital services utilization. Our study objectives were to examine: (1) the proportion of adults with inflammatory conditions and longstanding physical disability conditions who filled opioid prescriptions during a two-year period and (2) the rate ratio of emergency department (ED) visits and hospitalizations for people with inflammatory conditions and longstanding physical disabilities with and without filled opioid prescriptions. The comparison group was adults without inflammatory conditions or longstanding physical disability diagnoses. People with cancer were excluded from the case and comparison groups to capture opioid prescription filling practices likely related to the underlying conditions of interest. We hypothesized that (1) people with inflammatory conditions and longstanding physical disabilities were more likely to utilize the ED and be hospitalized, compared to the comparison group, and, (2) people with inflammatory conditions and longstanding physical disabilities who were prescribed opioids would be more likely to frequent the ED and hospital, compared to people with the same conditions who did not have opioid prescriptions filled during the two-year study period.

## Materials and Methods

### Data Source

Data for this study were obtained from 2010 to 2015 (Panels 15–19) of the Medical Expenditure Panel Survey (MEPS) which are weighted to be nationally representative of the US civilian noninstitutionalized population. The survey was conducted by the Agency for Healthcare Research and Quality. Data for MEPS was obtained from a subset of the National Health Interview Study (NHIS) households (also referred to as Dwelling Units: DU) and people or group of people in the DU who are related (referred to as Reporting Units.) The RU is interviewed as a single unit for MEPS and

each MEPS panel was selected from the prior year's NHIS. Each MEPS panel included data for two sequential years. During the interviews, respondents were asked information about demographic characteristics, insurance coverage, income, employment, health conditions, access to care, and charges and source of payments for all household members. After interview completion, a sample of medical providers participated in the Medical Provider Component. Providers were contacted by telephone to obtain, verify, and/or replace the health-care information that was not fully provided by participants. Recorded information was collected from hospitals, physician offices, home health-care providers, and pharmacies. More information can be found at: [https://meps.ahrq.gov/mepsweb/about\\_meps/survey\\_back.jsp](https://meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp).

## IRB Approval

This study was not subject to approval by an Institutional Review Board, because the deidentified data used here was obtained from a free and publicly available dataset (URL is shown above). The authors of this manuscript did not enroll any subjects nor collect any data.

## Study Sample

The study sample is based on previous MEPS analysis related to disability conditions associated with pain complaints and opioid use.<sup>14</sup> Five panels of MEPS data for 48,681 US adults aged 18 through 64 years were included: those with inflammatory conditions (n = 1055), those with longstanding physical disabilities (n = 543), and the comparison group (n = 47,083). Three-digit ICD-9 codes were used to identify the three groups (Table 1). Adults with inflammatory conditions were those with rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, systemic lupus erythematosus, or inflammatory bowel disease. Adults with longstanding physical disabilities reported stroke, spina bifida, spinal cord injury, multiple sclerosis, or cerebral palsy. Clinical reports have documented that both of these groups report a high prevalence of pain and require different complex medical management, making it problematic to combine them into one group.<sup>3-9</sup> The comparison group of people was all other MEPS participants in the sample who did not meet the case definitions for inflammatory conditions or longstanding physical disabilities (n = 47,083). Adults with reported cancer were eliminated from the entire sample since opioid use for palliative care would complicate our interpretation of the results.

Participants were further defined by filling patterns of opioid prescriptions. Participants who filled a prescription for opioids are referred to as adults with filled an opioid prescription; those who did not fill any opioid prescriptions are referred to as adults without filled opioid prescription.

**Table 1** ICD-9CM Codes for Inflammatory Conditions and Longstanding Physical Disability

Condition Group	Diagnosis	ICD-9 Code
Inflammatory Conditions	Systemic Lupus erythematosus	710
	Rheumatoid Arthritis	714
	Psoriatic arthritis	696
	Inflammatory bowel disorder	555, 556
	Ankylosing spondylitis	720
Longstanding physical disability	Stroke	433, 434, 436
	Spina bifida	756
	Spinal Cord Injury	952
	Multiple sclerosis	340
	Cerebral palsy	343

## Outcomes

The outcomes of interest in this investigation were the numbers of ED visits and hospitalizations. Some participants had no ED visits or hospitalizations, while others had multiple ED visits and/or hospitalizations.

## Variables

The primary independent variable was prescription opioid use. Those with an opioid prescription during the two-year panel period were self-reported and confirmed by pharmacy records. Opioid prescriptions were identified using a list of opioid analgesics compiled by the Centers for Disease Control and Prevention in 2017 ([Appendix 1](#)). Opioid prescriptions filled within the panel period were dichotomized as  $\geq 1$  opioid prescription filled (adults with opioid prescription filled) or no opioid prescription filled (adults without opioid prescription filled).

Demographic and medical variables were used as covariates in the modeling. The demographic variables included age (continuous), sex (male, female), race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic other, Hispanic), marital status (married, widowed, divorced/separated, never married), health insurance coverage (private, public, uninsured), census region (northeast, Midwest, south, west), poverty level (poor, near poor, low income, middle income, high income), and education level (less than high school, high school, college or above). Other medical variables were an outpatient visit in the previous year (continuous), self-reported depression symptoms (ie, feeling down), smoking status (yes, no), body mass index (underweight, normal, overweight, obese), and physical activity status (active, inactive).

## Statistical Methods

Baseline characteristics for the start of the two-year study period were summarized for the two case disability groups of people and the comparison group of people. Means (standard errors) were calculated for continuous variables and frequency (percent) was used for categorical variables.

Zero-inflated Poisson (ZIP)<sup>19</sup> regression models were used for the analyses to identify the variables associated with higher numbers of ED visits and hospitalizations. ZIP regression considers the excessive zero number of visits for both ED visits and hospitalizations. ZIP models have two parts, a logit model to predict the group of people with zero ED visits and hospitalizations, and a Poisson count model for the group of people with one or more encounters. Over-dispersion of the Poisson model was tested using Pearson Chi-square dispersion statistic and Vuong test<sup>20</sup> was used to test the Zero-inflation part of the model. Age and sex were used to calculate the probability of excessive zeros in the logistic model. Other covariates were included in the Poisson model initially and removed via step-wise elimination if the p-value was greater than 0.05; however, age and sex remained in the model since they are central to understanding of prescription opioid use. Parameter estimates were reported as coefficients and rate ratios (RR) with 95% confidence intervals (CI).

We comparatively analyzed the three groups of people identified for this study in three ways. First, the interactive effect between disability and comparison groups of people and prescription opioid use was examined to compare between those with inflammatory conditions or with longstanding physical disabilities with and without an opioid prescription filled. Second, we compared the two categories of people with disabling conditions with an opioid prescription filled with the comparison group (ie, those without those two disabling conditions) with opioid prescriptions filled. Lastly, because the longstanding physical disability group had the highest rates of emergency department and hospital utilization, we combined the inflammatory condition group with the comparison group and compared them to the longstanding physical disability group.

To account for having five MEPS panels for the analysis, we adjusted the analytic weights by dividing it by the five years being pooled. Data management and univariate tests were performed using SAS 9.4 (SAS Institute Inc., Cary, NC, USA). ZIP modeling was performed using STATA 12 (StataCorp, 2011). The statistical significance level was set at  $p = 0.05$ .

## Results

In general, those who were prescribed opioids within each of the three cohorts were female, non-Hispanic white, married, with less than a high school education, and lived in the Southern US. Those with inflammatory conditions and those with longstanding

physical disabilities differed from people without those two disabling conditions and who were prescribed opioids (now called the comparison group) in the proportion who had an opioid prescription filled during the two-year study window. Among the people in the comparison group, 81.9% had no opioid prescription filled, and 18.1% had one or more prescriptions filled. Those with inflammatory conditions and those with longstanding physical disabilities had 55.1% and 59.3%, respectively, no opioid prescription filled, and 44.9% and 40.7% having one or more opioid prescriptions filled (Table 2).

**Table 2** Characteristics of Adults Who Filled an Opioid Prescription in the 2010–2015 US Medical Expenditure Panel Study Data (Unadjusted for the Complex Survey Design) for Inflammatory Conditions, Longstanding Physical Disability, and a Comparison Group

Characteristics	Total Sample Size (N=47,083)		
	Inflammatory Conditions n=1055 (%)	Longstanding Physical Disability n=543 (%)	Comparison Group n=45,485 (%)
<b>Demographic</b>			
<b>Sex</b>			
Male	300 (28.44)	242 (44.57)	21,752 (47.82)
Female	755 (71.56)	301 (55.43)	23,733 (52.18)
<b>Age (y)*</b>	47 (18–64)	50 (18–64)	39 (18–64)
<b>Race/ethnicity</b>			
Non-Hispanic white	499 (47.3)	250 (46.04)	17,019 (37.42)
Non-Hispanic black	247 (23.41)	163 (30.02)	9393 (20.65)
Non-Hispanic other	86 (8.15)	37 (6.81)	4805 (10.56)
Hispanic	223 (21.14)	93 (17.13)	14,268 (31.37)
<b>Marital status</b>			
Married	530 (50.24)	236 (43.46)	21,577 (47.44)
Widowed	37 (3.51)	29 (5.34)	741 (1.63)
Divorced/separated	265 (25.12)	144 (26.52)	6165 (13.55)
Never married	223 (21.14)	134 (24.68)	17,002 (37.38)
<b>Education</b>	Missing=11 (1.04)	Missing=5 (0.92)	Missing=511 (1.12)
Less than high school	607 (57.54)	363 (66.85)	31,070 (68.31)
High school	183 (17.35)	66 (12.15)	5462 (12.01)
College and Above	254 (24.08)	109 (20.07)	8442 (18.56)
<b>Census region</b>			
Northeast	190 (18.01)	93 (17.13)	7345 (16.15)
Midwest	221 (20.95)	136 (25.05)	8230 (18.09)
South	409 (38.77)	215 (39.59)	16,960 (37.29)
West	235 (22.27)	99 (18.23)	12,950 (28.47)
<b>Poverty level</b>			
Negative or poor (<100%)	232 (21.99)	185 (34.07)	9122 (20.05)
Near poor (100–125%)	74 (7.01)	34 (6.26)	2735 (6.01)

(Continued)

Table 2 (Continued).

Characteristics	Total Sample Size (N=47,083)		
	Inflammatory Conditions n=1055 (%)	Longstanding Physical Disability n=543 (%)	Comparison Group n=45,485 (%)
Low income (125–200%)	179 (16.97)	88 (16.21)	7728 (16.99)
Middle income (200–400%)	270 (25.59)	132 (24.31)	13,654 (30.02)
High income (≥400%)	300 (28.44)	104 (19.15)	12,246 (26.92)
<b>Health insurance coverage</b>			
Any, private	617 (58.48)	251 (46.22)	26,120 (57.43)
Public only	285 (27.01)	217 (39.96)	7653 (16.83)
Uninsured	153 (14.5)	75 (13.81)	11,712 (25.75)
<b>Medical/health</b>			
<b>Physical activity</b>	Missing=16 (1.52)	Missing=26 (4.79)	Missing=1184 (2.6)
Active	583 (55.26)	245 (45.12)	29,532 (64.93)
Inactive	456 (43.22)	272 (50.09)	14,769 (32.47)
<b>Current smoking status</b>	Missing=66 (6.26)	Missing=42 (7.73)	Missing=4296 (9.44)
Yes	249 (23.6)	145 (26.7)	7578 (16.66)
No	740 (70.14)	356 (65.56)	33,611 (73.89)
<b>Body mass index category</b>	Missing=31 (2.94)	Missing=18 (3.31)	Missing=1239 (2.72)
Underweight (< 18.5 kg/cm <sup>2</sup> )	15 (1.42)	19 (3.5)	798 (1.75)
Normal (18.5 to < 25 kg/cm <sup>2</sup> )	254 (24.08)	129 (23.76)	14,824 (32.59)
Overweight (25 to < 30 kg/cm <sup>2</sup> )	320 (30.33)	178 (32.78)	15,143 (33.29)
Obese (≥ 30 kg/cm <sup>2</sup> )	435 (41.23)	199 (36.65)	13,481 (29.64)
<b>Body mass index (kg/cm2)*</b>	30.3 (16.0–77.3)	29.3 (13.6–63.2)	28.1 (8.9–110.9)
<b>Feeling down</b>	Missing=97 (9.19)	Missing=76 (14)	Missing=6291 (13.83)
All or most of the time	220 (20.85)	123 (22.65)	3831 (8.42)
Some of the time	280 (26.54)	150 (27.62)	9113 (20.04)
Little or none of the time	458 (43.41)	194 (35.73)	26,250 (57.71)
<b>Number of opioid prescriptions filled</b>			
=0 prescription	581 (55.07)	322 (59.3)	37,254 (81.9)
≥1 prescription	474 (44.93)	221 (40.7)	8231 (18.1)
<b>ED Visits (number of visit)<sup>†</sup></b>	0, 1, 2	1, 2, 4	0, 0, 1
<b>Hospital visits (number of visit)<sup>†</sup></b>	0, 0, 1	0, 1, 2	0, 0, 0
<b>Outpatient (number of visit)<sup>†</sup></b>	0, 0, 1	0, 2, 6	0, 2, 5

Notes: Numbers are presented as number (percentage) or as otherwise indicated. \*Median (min, max). <sup>†</sup>50th, 75th, and 90th percentiles.

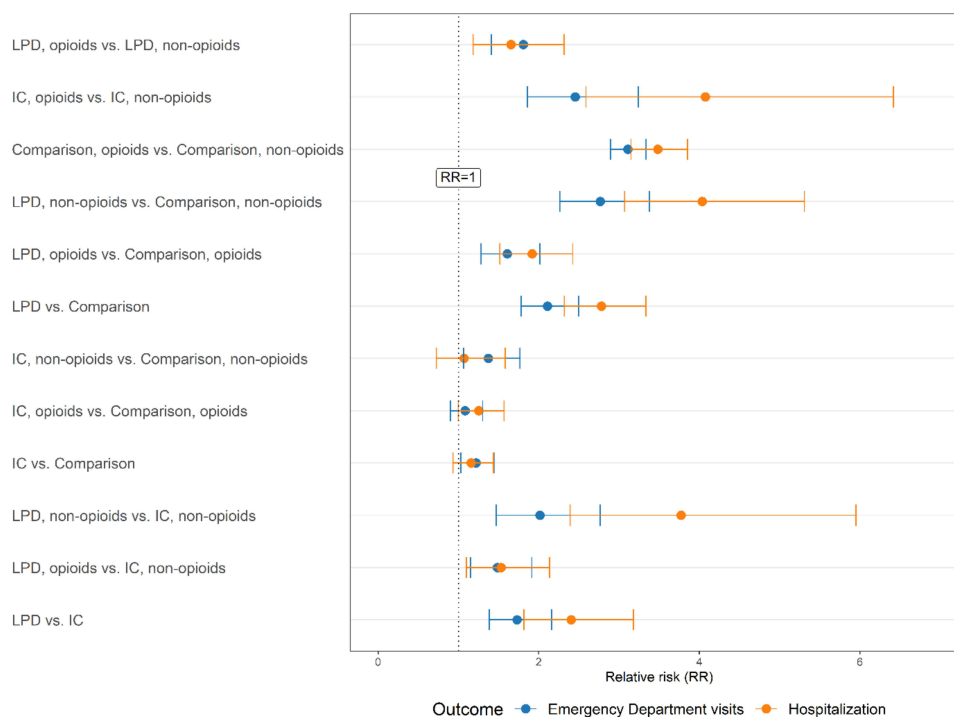
There was a higher rate of opioid prescription filling in those with inflammatory conditions among those who were female, obese (defined by body mass index  $\geq 30$  kg/cm<sup>2</sup>), and who had a higher education level compared to people with longstanding physical disabilities and the comparison group of people. There was a higher prevalence of non-Hispanic Black and poor adults with longstanding physical disabilities compared to the other cohorts. The number of ED visits were higher for those with inflammatory conditions or longstanding physical disabilities compared to the comparison group. There were relatively few hospitalizations for all three cohorts, although adults with longstanding physical disabilities had the highest number. For outpatient visits, those with longstanding physical disabilities have similar patterns to the comparison group, while those with inflammatory conditions had the lowest values. Further details can be found in [Appendices 2](#) and [3](#), where we modeled the association between each patient characteristic with emergency department visits and hospitalizations. The only characteristics that were statistically significant risks were being physically inactive and having public insurance.

As shown in [Table 3](#), those with inflammatory conditions who had an opioid prescription filled had 2.46 times the rate of ED use and 4.08 times the rate of hospitalization compared to those within that category without an opioid prescription

**Table 3** The Interactive Effects Between Opioid Prescription Fills and Inflammatory Condition, Longstanding Physical Disability, and a Comparison Group, on Emergency Department Visits and Hospitalizations, from the US Medical Expenditure Panel Survey, 2010–2015

Variable	ED Visits	Hospitalizations
	Rate Ratio (RR) and 95% CI	Rate Ratio (RR) and 95% CI
IC x opioids (ref=IC - no opioids filled)		
IC - opioids filled	2.46 (1.86,3.24)	4.08 (2.59,6.42)
LPD x opioids (ref= LPD - no opioids filled)		
LPD - opioids filled	1.81 (1.41,2.31)	1.65 (1.18,2.31)
Comparison group x opioids (ref=comparison - no opioids filled)		
Comparison group - opioids filled	3.11 (2.90,3.34)	3.48 (3.15,3.85)
No opioids use (ref= comparison group - no opioids filled)		
LPD - no opioids filled	2.77 (2.26,3.38)	4.04 (3.07,5.31)
IC - no opioids filled	1.37 (1.07,1.77)	1.07 (0.72,1.58)
Yes opioids use (ref= comparison group - yes opioids filled)		
LPD - yes opioids filled	1.61 (1.28,2.01)	1.92 (1.52,2.43)
IC - yes opioids filled	1.08 (0.90,1.30)	1.25 (1.00,1.57)
Overall comparison no matter about opioids fills or not (ref= comparison group)		
LPD	2.11 (1.78,2.49)	2.78 (2.32,3.34)
IC	1.22 (1.03,1.44)	1.16 (0.93,1.44)
No opioids use (ref= IC - no opioids filled)		
LPD - no opioids filled	2.02 (1.47,2.77)	3.77 (2.39,5.95)
Yes opioids use (ref= IC - no opioids filled)		
LPD - yes opioids filled	1.48 (1.15,1.91)	1.53 (1.10,2.14)
Overall comparison no matter about opioids fills or not (ref= IC)		
LPD	1.73 (1.39,2.16)	2.40 (1.82,3.18)

**Abbreviations:** ED, Emergency Department; IC, Inflammatory conditions; LPD, Longstanding physical disability.



**Figure 1** Interactive Effects Between Opioid Prescription Fills Among People with Inflammatory Conditions, Longstanding Physical Disabilities, and a Comparison Group, on Emergency Department Visits and Hospitalizations.

filled. For people with longstanding physical disabilities, those with an opioid prescription filled had 1.81 higher utilization of the ED and 1.65 times the rate of hospitalization compared to those within that category who did not have an opioid prescription filled. The comparison group had the highest rate ratio of ED use (RR = 3.11) and 3.48 times the rate ratio for hospitalizations, for within group comparison.

Also shown in Table 3, and Figure 1, the longstanding physical disability group had the highest relative risk for emergency department visits and hospitalizations when there was no opioid use (RR = 2.77, 95% CI: 2.26–3.38) and when there was opioid use (RR = 1.61, 95% CI: 1.28–2.01). And overall, people with longstanding physical disabilities, with and without opioid use, had highest ED utilization (RR = 2.11, 95% CI: 1.78–2.49) when compared to the comparison group.

Finally, because the longstanding physical disabilities group had substantially higher and statistically significant results for both ED and hospitalization, we compared them to a combined group of those with inflammatory conditions and the original comparison group of those without either disabling condition, shown in Table 4A and B. Those who had opioid prescriptions filled who were identified with longstanding physical disabilities were 5 times more likely to have an ED encounter compared to the combined group (ie, people with inflammatory conditions and people without either longstanding physical disabilities or inflammatory conditions) who did not have an opioid prescription filled, and 2.56 times more likely to have an ED visit compared to the combined group regardless of opioid prescription status. Those who used opioids and who had longstanding physical disabilities were 6.68 times more likely to have a hospitalization than those in the combined group who did not have an opioid prescription filled and 3.32 times more likely to be hospitalized compared to the combined group regardless of opioid prescription status.

## Discussion

This study offers new insights about hospital-based utilization in the US for select groups of people with disabilities, with and without filled opioid prescriptions. Overall, adults with longstanding physical disabilities had the highest utilization for hospitalization and ED use (bottom row of Table 3). However, when we compared each group of people (with inflammatory condition, longstanding physical disabilities, and the comparison group without either) with and without



**Table 4** Emergency Department and Hospital Inpatient Utilization for People with Longstanding Physical Disability, from the US Medical Expenditure Panel Survey, 2010–2015

<b>A: Emergency department utilization comparison</b>	
Emergency Department Visit	
Ref=Combined group (inflammatory conditions + comparison) without opioids	
Longstanding Physical Disability with opioids filled	5.00 (3.97,6.28)
Ref=Combined group (inflammatory conditions + comparison) with opioids	
Longstanding Physical Disability with no opioids filled	0.89 (0.74,1.07)
Ref=Combined group (inflammatory conditions + comparison) with/without opioids	
Longstanding Physical Disability with opioids filled	2.56 (2.035,3.22)
<b>B: Hospitalization utilization comparison</b>	
Inpatient Hospitalization	
Ref=Combined group (inflammatory conditions + comparison) without opioids	
Longstanding physical disability with opioids filled	6.68 (5.20,8.58)
Ref=Combined group (inflammatory conditions + comparison) with opioids	
Longstanding physical disability with no opioids filled	1.16 (0.91,1.49)
Ref= Combined group (inflammatory conditions + comparison) with/without opioids	
Longstanding physical disability with opioids filled	3.32 (2.57,4.29)

opioid fills, the rate ratio was larger for the comparison group regarding ED visits, and the rate ratio was larger for the longstanding physical disability group for hospital stays. People with inflammatory conditions and longstanding physical disability are clinically and functionally different, and our results show they differ in the utilization of the ED and hospitalization; thus, we did not combine them in the analyses. Instead, we combined the inflammatory condition group with the comparison group and showed substantially higher utilization (RR from 2.56 to 6.68 depending on the comparison) for the longstanding physical disability group, with and without opioids, for emergency department use and hospitalizations.

Previous research notes that people with a variety of longstanding physical disabilities have higher use of health-care services,<sup>21–23</sup> but prescription opioid filling within these conditions has not been previously investigated. We demonstrate the higher use of hospital-based health care by people with longstanding physical disabilities who fill an opioid prescription, but we are unable to explain the underlying reason for this finding with our data. It is likely that those with longstanding physical disabilities, all of whom had neurologic conditions, have more comorbidities and secondary health conditions which complicate their care and account for hospital utilization.<sup>24–27</sup> To further support this possibility, there is ample evidence that clinicians, especially primary care clinicians or hospitalists, are not specifically trained in the care of people with disability<sup>8,28–30</sup> or chronic pain management.<sup>31–33</sup> People with longstanding physical disabilities who experience pain have reported their symptom was being treated with opioids without investigation for etiologies or consideration of other pain management strategies.<sup>34,35</sup> During the time of this study, opioid use disorder was not yet described within clinical guidelines.<sup>36,37</sup> There is a clear message that clinicians caring for people with longstanding physical disabilities require an understanding of their patients' complexities of care and vulnerabilities, especially with the addition of opioid prescriptions. Further studies could be designed to identify how the underlying pathology and level of severity play into the choice of management and the effectiveness of non-opioid interventions. Additionally, assessing the utility of guidance about pain assessment and management<sup>38</sup> and opioid prescribing within disability populations<sup>39</sup> could be helpful.

We showed that people with inflammatory conditions filling an opioid prescription had increased health-care usage, although not at the higher levels seen in people with longstanding physical disabilities. Approximately 45% of those with inflammatory conditions filled prescriptions during the study period. Disease-modifying anti-rheumatic drugs and/or biologics, which focus on disease control or remission, are available and have been shown to decrease pain complaints.<sup>40</sup> While we did not analyze the use of these medications, the increased health-care usage may reflect that the newer class of medications are not being used routinely because of insurance coverage restrictions, special drug handling requirements, limited drug distribution networks, or lack of clinician knowledge.<sup>41–43</sup> Further analyses assessing utility of disease managing medications could help to better understand prescribing patterns.

Although the comparison group was not the focus of the study, the results do support previous studies that report people who fill an opioid prescription, regardless of their disability status, used hospital services more than those who do not fill opioid prescriptions.<sup>15,16</sup>

## Limitations

There are some important limitations to note. Prescription filling of opioids was measured, not actual usage, and there are no objective measures for pain etiologies or severity, or determinations of dosing. Another limitation is that reasons for ED visits and hospitalizations were not analyzed. The information collected from respondents indicated they went to the hospital because of their disabling condition, and not the symptom that precipitated the ED or hospital visit (available from the authors on request). Additionally, the MEPS survey questions about pain varied in the panel years; so, a measure of pain frequency and severity during the study period was not possible. Therefore, future research that uses the clinical notes from electronic medical records could determine proximal reasons for hospital utilization. Nonetheless, the high rate of filling opioid prescriptions suggests that pain complaints are common among people with inflammatory conditions and longstanding physical disabilities and investigation to better understand pain and pain management among people with disability is important.

## Conclusion

Our findings suggest that people with disabilities from inflammatory conditions and longstanding physical disabilities more frequently fill opioid prescriptions than the general population. Since this study used a nationally representative sample of the US population and complex analytic procedures, the results can be generalized. Overall, people with longstanding physical disabilities who filled an opioid prescription had the highest rate of ED visits and hospitalizations compared to those with inflammatory conditions or the comparison group, separately or combined. We suggest clinicians carefully consider prescribing opioids for management of pain for people with disabling conditions, especially in people with longstanding physical disabilities.

## Data Sharing Statement

Data for this study were obtained from 2010 to 2015 (Panels 15–19) of the Medical Expenditure Panel Survey (MEPS). The survey was conducted by the Agency for Healthcare Research and Quality. [https://meps.ahrq.gov/data\\_stats/download\\_data\\_files\\_results.jsp?cboDataYear=All&cboDataTypeY=1%2CHousehold+Full+Year+File&buttonYearandDataType=Search&cboPufNumber=All&SearchTitle=Longitudinal](https://meps.ahrq.gov/data_stats/download_data_files_results.jsp?cboDataYear=All&cboDataTypeY=1%2CHousehold+Full+Year+File&buttonYearandDataType=Search&cboPufNumber=All&SearchTitle=Longitudinal).

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## Disclosure

The authors report that there are no competing interests to declare in this work.

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