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Neighbourhood Socioeconomic Status and Treatment Provided for Primary Care Patients with Musculoskeletal Pain

Sarah Gebauer*, Joanne Salas and Jeffrey Scherrer

Department of Family and Community Medicine, Saint Louis University School of Medicine, USA

Abstract

Background: Guidelines recommend against opioids prior to exhausting non-medical and non-opioid medications. Guidelines are not always followed and Socioeconomic Status (SES) has been associated with non-guideline prescribing for pain in the Emergency Department. It is not known if similar results occur in primary care where the patient-provider relationship is well established.

Methods: Patient data was obtained from 11,553 primary care encounters in St. Louis, MO in the United States between 2008 and 2015. Neighbourhood SES (nSES) was used to assign person to lowest, low-middle, upper-middle and highest nSES. Pain conditions included musculoskeletal conditions, low back pain and arthritis. Separate regression models were used to compute the association between each type of treatment provided, (i.e. Physical Therapy (PT), non-opioid medications and opioids), and nSES before and after adjusting for covariates.

Results: In a full model, highest nSES compared to lowest nSES was significantly associated with referral to PT (OR = 1.21; 95% CI: 1.05-1.38). In full models, nSES was not associated with receiving an opioid prescription and highest nSES was inversely associated with receiving a non-opioid prescription (OR = 0.87 (95% CI: 0.76-0.99). In full models, white race was negatively associated with receipt of PT referral or non-opioid therapy, and was not associated with opioid prescription.

Conclusions: Patients with higher nSES receive more PT referrals and fewer non-opioids for pain treatment than those from low nSES areas. Results may be partly explained by greater access to care via health insurance, transportation and time. Further research is warranted to determine if nSES and pain treatment impacts acute and chronic pain in a similar fashion.

Keywords

Social determinants of health, Opioids, GIS

Introduction

Musculoskeletal complaints are some of the most common reasons for primary care visits [1]. Treatment for these complaints is varied, ranging from physical therapy to oral anti-inflammatories and opioids. For example, in acute low back pain, conservative management with reassurance, Non-Steroidal Anti-Inflammatories (NSAIDs), muscle relaxants, and core stabilization exercises is widely recommended as first line [2]. In chronic low back pain, NSAIDs, mindfulness exercises, and rehabilitation are among the most evidence-based interventions [2]. In contrast, use of opioid analgesics in low back pain when other alternatives have not been considered is not recommended, regardless of chronicity [2]. Despite these recommendations, physicians frequently make clinical decisions in conflict with guidelines [3].

There is very little robust evidence explaining physician deviation from clinical guidelines regarding pain

treatment. Although patient pain score has been associated with receipt of an opioid, many social determinants of health have also been linked to difference in treatment offered to patients [4]. Evidence suggests patient gender plays a role in prevalence of musculoskeletal pain conditions, as well as patient perception of pain and provider offered treatments. Studies have noted that women appear to report musculoskeletal pain more often than men

***Corresponding author:** Sarah Gebauer, MD, Department of Family and Community Medicine, Saint Louis University School of Medicine, 1402 S Grand Blvd, St Louis, MO 63104, USA, Tel: (314)-977-8484, E-mail: speter34@slu.edu

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and also report higher pain scores than men [5]. There is also evidence that patient race plays a role in decision to prescribe opioids in the Emergency Room (ER), as well as in primary care offices [6]. Kao, et al. noted in primary care and specialty visits for pain that African Americans were less likely to receive opioids than white patients [6]. However, race is closely entangled with the influence Socioeconomic Status (SES) [7]. The present study is designed to elucidate if the role of SES on type of prescribed pain treatment exists after controlling for race.

Patient SES has been shown to influence a wide variety of adverse health outcomes, but has also proven difficult to quantify as a predictor. Multiple measures, such as patient level of educational attainment and personal income, have been used to predict health care outcomes [8]. Recently, multifaceted SES variables have been validated as robust means to assess the effects of SES on health [9]. In particular, Neighbourhood Socioeconomic Status (nSES) has emerged as a way to quantify the socioeconomic milieu in which patients reside.

Low nSES has been associated with several risk factors for disease, such as smoking [10]. Low nSES has also been associated with adverse health outcomes, such as increased cancer mortality [11]. Although many associations have been characterized between nSES and disease status, there is little information on how a patient's nSES may affect which treatments for pain are offered during a primary care physician visit. In the ER, low nSES is associated with decreased likelihood of receiving opioid analgesic [12]. These observations are intimately intertwined with the influence of race, as described above. In addition to the role of nSES in the ER, patient-provider interactions likely differ from those that occur in primary care. Primary care is founded on the principle of a long-term relationship over extended periods of time, as well as intent to follow up frequently as needed. Ideally, primary care providers not only have knowledge of the patients' ongoing care regarding medical issues, but also about the patient as a person. This very different aspect of patient-physician relationship makes the factors influencing management decisions inherently different. Further, the primary care interaction involves a different set of treatments, aimed at long-term goals, such as Physical Therapy (PT).

There is a paucity of data describing how nSES affects primary care interactions. When nSES is included in studies, it is often not the main exposure of interest, but rather included as a covariate [13]. Ndlovu, et al. found that higher neighbourhood deprivation (e.g. lower nSES) was associated with increased odds of "strong analgesic" prescription. "Strong analgesics" were generally opioid medications. To this end, we explored whether patient nSES is associated with treatments offered to patients

with musculoskeletal conditions by their primary care provider. We hypothesized that lower nSES would be associated with greater likelihood of receiving medications, both opioid and non-opioid, and less likelihood of referral for PT.

Methods

Subjects

Clinical data were obtained from the Department of Family and Community Medicine's Primary Care Patient Data Registry (PCPD). The PCPD consists of 33,661 patients who had at least one family medicine or general internal medicine encounter between July 1, 2008 and June 30, 2015 occurring at any one of the three academic primary care practices based in Saint Louis, Missouri. The PCPD contains ICD-9-CM codes, prescription orders, CPT codes, social history, family history, demographics, laboratory orders, referrals, and vital signs. The protocol for creating this data base has been previously described [14]. The study procedures were reviewed and approved by the university IRB.

Inclusion criteria: For this retrospective cohort design, eligible patients were identified as adults aged 18 years or older and free of Human Immunodeficiency Virus (HIV) or cancer ($n = 30,431$). Patients must have had a diagnosis of back pain, musculoskeletal pain or arthritis and have had at least 2 visits between 2008 and 2015 ($n = 11,825$). Patients with missing demographic data ($n = 272$) were excluded leaving a final analytic sample size of 11,553.

Exposure: nSES index was adapted from a verified measure comprised of 7 measures obtained from the 2009-2013 5-year census estimates from the American Community Survey [9]. The value of each variable was assigned based on US 5-digit zip code and included: 1) Percent of households with income below the poverty level; 2) Percent of households receiving public assistance; 3) Percent of households with an annual income below \$35,000; 4) Percent of adult males age 20-64 not in the labour force; 5) Percent of adults 25 and older with less than high school education; 6) Log of median household income and 7) Log of median value of single family homes. Standardized index scores were assigned based on a principle components analysis of all 33,120 US zip codes. Based on the distribution of index scores for 1,326 zip codes for 33,661 patients in the PCPD, patients were assigned into nSES quartiles (lowest SES, low-middle SES, upper-middle SES, highest SES).

Outcomes: Outcomes of interest included management therapies for pain conditions documented during primary care encounters on or after index visit with diagnosis of back pain, musculoskeletal pain or arthritis.

Management options included three separate variables: Physical therapy referral, opioid prescription, and non-opioid drug prescription. Physical therapy referral was defined as the presence of at least one institution specific referral code for physical therapy evaluation and treatment. Opioid prescription included a prescription order for any of the following: Codeine, oxycodone, fentanyl, hydrocodone, hydromorphone, morphine, oxymorphone, pentazocine, levorphanol, and meperidine. Non-opioids included a prescription order for Non-Steroidal Anti-Inflammatories (NSAIDs) or adjunctive medications (muscle relaxants, tricyclic antidepressants, gabapentin and duloxetine).

Covariates

Other variables accounted for in models included patient race, age, gender, marital status, high clinic utilization, smoking status, any substance abuse/dependence, depression, any anxiety, obesity, comorbidity index, presence of multiple pain conditions, patient reported history of either opioid or non-opioid prescription as a proxy for treatments received outside the primary care office, as well as the other outcomes. Covariates were selected based on previous literature identifying them as having some influence on treatment recommendations for pain [15,16]. Clinic utilization was determined by average number of clinic visits per month, where those patients in the top quartile were classified as high utilization. Smoking status was ascertained through social history and ICD-9-CM code for nicotine dependence and classified as never, former, and current smoker for 2008-2015. Depression and any anxiety (anxiety disorder unspecified, generalized anxiety disorder, panic disorder, obsessive compulsive disorder, social phobia or post-traumatic stress disorder) were determined through ICD-9-CM codes where for each, a patient must have had at least two diagnoses for the same condition within any 12 month period. Obesity was determined through vital signs documentation of calculated Body Mass Index (BMI) ≥ 30.00 or ICD-9-CM code. Any substance abuse/dependence was defined as the presence of an ICD-9-CM code for alcohol or any drug abuse or dependence.

The comorbidity index was created using the Romano adapted Charlson Comorbidity Index, which is derived from the presence of 17 health conditions associated with morbidity and mortality where higher index means worse health [17]. The presence of multiple pain conditions was noted as “yes” or “no” based on presence of 2 or more conditions (back pain, musculoskeletal pain or arthritis) based on ICD-9-CM codes. Patient report of either opioid prescription or non-opioid prescription was collected from historical medications listed in the EMR. This list reflects patients’ recollection of past medications, not active prescriptions. Evidence suggests a

high level of concordance between patient reports and fills for pain treatments [18]. Lastly, the other two outcomes were adjusted for in final models. This was done because the treatment outcomes were not mutually exclusive and could occur at the same time as the primary outcome being assessed.

Analysis: Data were analyzed using SAS v9.4 (SAS Institute Inc., Cary, NC). Outcomes were treated as occurring on or after initial pain diagnosis. All other variables could have occurred at any time in the observation period of 2008 to 2015, regardless of when pain diagnosis occurred. Assumptions regarding normality were verified for continuous variables using skewness statistic. Acceptable skewness was determined to be -2 to 2, given the large sample size. Patient characteristics were compared between nSES groups using chi-squared tests for categorical variables and one-way ANOVA for continuous variables. Separate unadjusted logistic regression models were used to measure the association between nSES and the three separate outcomes (i.e. opioid prescription, non-opioid prescription, physical therapy referral). Unadjusted models were expanded by adding subsequent blocks of variables: 1) Race; 2) Number of pain conditions, and 3) All other covariates. For logistic regression models, odds ratios and 95% confidence intervals are shown. All statistical tests were assessed at the $\alpha < 0.05$ level.

Results

Overall, the average age of the cohort was 52.5 years. The cohort was 64.2% female and 57.0% non-Hispanic white. As shown in Table 1, the bivariate association between PT referral and nSES was not significant. The prevalence of opioid and non-opioid prescriptions decreased from lowest nSES to highest nSES in univariate analysis. The prevalence of white race was significantly associated with nSES and increased with each higher level of nSES with 83.5% of the highest nSES group and 23.3% of the lowest nSES group being white ($P < 0.0001$). Older patients were disproportionately in the lowest nSES group and female patients were under represented among the highest nSES ($p < 0.0001$). The prevalence of married patients increased with each higher level of nSES ($p < 0.0001$).

Higher health care utilization was associated with lower nSES ($p < 0.0001$). Patients who were current smokers, diagnosed with substance abuse/dependence, and obese were more prevalent among the lowest nSES group ($p < 0.0001$). Depression was most common among the middle two nSES groups ($p = 0.018$) and anxiety disorders most common among the two highest nSES groups ($p < 0.0001$). Patients with two or more pain conditions were more common among the lower

Table 1: Characteristics of primary care patients with a pain condition, age 18 years and over without a history of cancer or HIV, overall and by neighborhood SES (n = 11,553).

Variable, n (%)	Overall (n = 11,553)	Lowest SES (n = 3,243)	Low-Middle SES (n = 2,748)	Upper-Middle SES (n = 2,867)	Highest SES (n = 2,695)	p-value
Pain treatment						
PT referral	3620 (31.3)	1060 (32.7)	856 (31.2)	881 (30.7)	823 (30.5)	0.253
Opioid rx	2136 (18.5)	715 (22.1)	514 (18.7)	512 (17.9)	395 (14.7)	< 0.0001
Non-opioid rx	5617 (48.6)	1745 (53.8)	1367 (49.7)	1343 (46.8)	1162 (43.1)	< 0.0001
Covariates						
Race: White	6587 (57.0)	756 (23.3)	1543 (56.2)	2037 (71.1)	2251 (83.5)	< 0.0001
Age, mean(sd)	52.5 (16.3)	55.1 (16.0)	51.8 (16.3)	51.6 (16.1)	51.1 (16.6)	< 0.0001
Gender: Female	7418 (64.2)	2157 (66.5)	1748 (63.6)	1876 (65.4)	1637 (60.7)	< 0.0001
Marital Status: Married	5112 (44.3)	940 (29.0)	1043 (37.9)	1434 (50.0)	1695 (62.9)	< 0.0001
High clinic utilization	4697 (40.7)	1523 (47.0)	1127 (41.0)	1159 (40.4)	888 (32.9)	
Smoking Status						< 0.0001
Never	6461 (55.9)	1595 (49.2)	1439 (52.4)	1664 (58.0)	1763 (65.4)	
Former	2350 (20.3)	679 (20.9)	558 (20.3)	616 (21.5)	497 (18.4)	
Current	2742 (23.7)	969 (29.9)	751 (27.3)	587 (20.5)	435 (16.1)	
Substance abuse/dependence	471 (4.1)	169 (5.2)	125 (4.6)	97 (3.4)	80 (3.0)	< 0.0001
Depression	1630 (14.1)	437 (13.5)	409 (14.9)	440 (15.4)	344 (12.8)	0.018
Any anxiety	1164 (10.1)	227 (7.0)	254 (9.2)	353 (12.3)	330 (12.2)	< 0.0001
Obese	6106 (52.8)	1989 (61.3)	1458 (53.1)	1481 (51.7)	1178 (43.7)	< 0.0001
≥ 2 pain conditions	5258 (45.5)	1538 (47.4)	1261 (45.9)	1280 (44.7)	1179 (43.7)	0.027
Comorbidity Index, mean(sd)	1.0 (1.7)	1.4 (2.0)	1.0 (1.7)	0.9 (1.6)	0.7 (1.4)	< 0.0001
Opioid history (self-report)	1745 (15.1)	584 (18.0)	428 (15.6)	418 (14.6)	315 (11.7)	< 0.0001
Non-opioid history (self-report)	4667 (40.4)	1363 (42.0)	1116 (40.6)	1196 (41.7)	992 (36.8)	< 0.0001

Table 2: Association of neighborhood SES and PT referral, crude and adjusted logistic regression models (n = 11,553).

Outcome Variable, OR (95% CI)	PT referral			
	Crude	Add race	Add pain	Add all covariates
Neighborhood SES				
Lowest SES	1.00	1.00	1.00	1.00
Lower Middle SES	0.93 (0.82-1.02)	1.03 (0.92-1.15)	1.03 (0.91-1.15)	1.05 (0.93-1.18)
Upper Middle SES	0.91 (0.82-1.02)	1.05 (0.94-1.18)	1.06 (0.94-1.20)	1.09 (0.97-1.24)
Highest SES	0.91 (0.81-1.01)	1.08 (0.96-1.23)	1.10 (0.97-1.25)	1.21 (1.05-1.38)
Race: White		0.74 (0.68-0.81)	0.78 (0.71-0.85)	0.81 (0.74-0.90)
≥ 2 pain conditions			3.28 (3.02-3.56)	2.55 (2.33-2.79)
Age				0.99 (0.98-1.00)
Gender: Female				1.11 (1.01-1.21)
Marital Status: Married				0.96 (0.88-1.05)
High clinic utilization				1.38 (1.26-1.51)
Smoking Status				
Never				1.00
Former				1.01 (0.90-1.13)
Current				0.98 (0.88-1.09)
Substance abuse/dependence				0.91 (0.73-1.12)
Depression				1.06 (0.93-1.20)
Any anxiety				0.99 (0.86-1.14)
Obese				1.03 (0.94-1.12)
Comorbidity Index				1.01 (0.99-1.04)
Opioid RX				1.24 (1.11-1.39)
Non-opioid RX				1.70 (1.56-1.86)
Opioid history (self-report)				0.99 (0.87-1.12)
Non-opioid history (self-report)				1.10 (1.01-1.39)

nSES groups (0.027) and the highest comorbidity index scores were also observed among the lowest nSES group (p < 0.0001). Patient report of both opioid and non-o-

pioid varied by nSES, with lowest nSES having highest prevalence of patient report of these medications (p < 0.0001) (Table 1).

Physical therapy order: Results of logistic regression models estimating odds of PT referral are shown in **Table 2**. In unadjusted models, the odds of PT referral were similar for lower, middle, and highest nSES compared to lowest nSES. After adding race, odds of PT referral remained similar in magnitude across nSES group. Adding race to the model revealed that whites were significantly less likely to receive a PT referral (OR = 0.74; 95% CI: 0.68-0.81). In the full model, patients in the highest nSES group were significantly more likely to have a PT referral (OR = 1.21; 95% CI: 1.05-1.38) compared to patients in the lowest nSES. White race remained inversely associated with PT referral. Female patients, high clinic utilizers, those with 2 or more pain conditions, self-report of non-opioid, presence of non-opioid prescription and opioid prescription were all positively associated with PT referral (**Table 2**).

Opioid prescription: Results of logistic regression models estimating odds of opioid prescription are shown in **Table 3**. In the unadjusted model, the odds of opioid prescription are significantly lower among all nSES group compared the lowest nSES group. Odds of opioid prescription became increasingly less likely with each higher level of nSES. After adjusting for race, the effect appeared to change little and remained significant at all levels of nSES. Adjustment for number of pain conditions with race resulted in very little change in OR and

significance remained for all nSES levels compared to lowest nSES. In the full model, nSES was no longer associated with opioid prescription, while many other covariates were positively associated with the outcome. These included patients having ≥ 2 pain conditions, high clinic utilization, former and current smokers compared to never smokers, patients diagnosed with substance abuse/dependence, depression, anxiety, obesity, self-report of history of opioid prescription, presence of physical therapy referral and presence of non-opioid prescription. Higher comorbidity index was also positively associated with receipt of opioid prescription (**Table 3**).

Non-opioid prescription: Results of logistic regression models estimating odds of non-opioid prescription are shown in **Table 4**. In unadjusted models, odds of non-opioid prescription were significantly lower in all nSES groups compared to the lowest nSES group. Non-opioid prescription became increasingly less likely as nSES increased. When adjusting for race, the Lower Middle nSES group was no longer significantly different, while the other two groups remained significantly lower than the lowest nSES group. Very little change in ORs was noted upon adjustment for number of pain diagnoses. However, in the full model, only the highest nSES group remained significantly less likely to receive a non-opioid prescription compared to the lowest nSES group (OR = 0.87; 95% CI: 0.76-0.99). White race was also in-

Table 3: Association of neighborhood SES and Opioid RX, crude and adjusted logistic regression models (n = 11,553).

Outcome	Opioid RX			
	Crude	Add race	Add Pain	Add all covariates
Neighborhood SES				
Lowest SES	1.00	1.00	1.00	1.00
Lower Middle SES	0.81 (0.72-0.92)	0.84 (0.73-0.95)	0.82 (0.72-0.94)	0.92 (0.80-1.06)
Upper Middle SES	0.77 (0.68-0.87)	0.80 (0.70-0.92)	0.79 (0.69-0.91)	0.97 (0.83-1.13)
Highest SES	0.61 (0.53-0.69)	0.64 (0.55-0.74)	0.63 (0.54-0.73)	0.90 (0.76-1.07)
Race: White		0.92 (0.83-1.03)	0.98 (0.88-1.10)	1.10 (0.97-1.24)
≥ 2 pain conditions			3.26 (2.94-3.60)	1.85 (1.65-2.08)
Age				1.01 (1.00-1.02)
Gender: Female				0.90 (0.80-1.01)
Marital Status: Married				0.91 (0.82-1.02)
High clinic utilization				1.66 (1.49-1.86)
Smoking Status				
Never				1.00
Former				1.29 (1.12-1.47)
Current				1.88 (1.66-2.13)
Substance abuse/dependence				1.54 (1.24-1.93)
Depression				1.55 (1.35-1.77)
Any anxiety				1.33 (1.13-1.56)
Obese				1.31 (1.18-1.46)
Comorbidity Index				1.16 (1.13-1.19)
PT referral				1.24 (1.11-1.39)
Non-opioid RX				2.51 (2.23-2.81)
Opioid history (self-report)				
Non-opioid history (self-report)				

Table 4: Association of neighborhood SES and Non-Opioid RX, crude and adjusted logistic regression models (n = 11,553).

Outcome Variable, OR (95% CI)	Non-Opioid RX			
	Crude	Add race	Add Pain	Add all covariates
Neighborhood SES				
Lowest SES	1.00	1.00	1.00	1.00
Lower Middle SES	0.85 (0.77-0.94)	0.95 (0.85-1.05)	0.94 (0.84-1.05)	0.96 (0.85-1.07)
Upper Middle SES	0.76 (0.68-0.84)	0.89 (0.79-0.99)	0.88 (0.78-0.98)	0.89 (0.79-1.01)
Highest SES	0.65 (0.59-0.72)	0.79 (0.71-0.89)	0.78 (0.69-0.88)	0.87 (0.76-0.99)
Race: White		0.72 (0.66-0.78)	0.75 (0.68-0.81)	0.72 (0.66-0.79)
≥ 2 pain conditions			3.57 (3.30-3.85)	2.61 (2.39-2.84)
Age				0.99 (0.98-1.00)
Gender: Female				1.04 (0.95-1.13)
Marital Status: Married				0.96 (0.88-1.04)
High clinic utilization				1.30 (1.18-1.42)
Smoking Status				
Never				1.00
Former				0.94 (0.84-1.05)
Current				1.25 (1.12-1.38)
Substance abuse/dependence				1.21 (0.97-1.49)
Depression				1.22 (1.08-1.38)
Any anxiety				1.04 (0.90-1.20)
Obese				1.12 (1.03-1.22)
Comorbidity Index				0.94 (0.92-0.97)
PT Referral				1.71 (1.56-1.87)
Opioid RX				2.32 (2.06-2.62)
Opioid history (self-report)				1.01 (0.89-1.14)
Non-opioid history (self-report)				1.90 (1.75-2.07)

versely associated with non-opioid prescription receipt. Other covariates significantly associated with odds of non-opioid prescription were high clinic utilizers, current smokers compared to never smokers, those patients diagnosed with depression, obesity, comorbidity index, self-report of non-opioid history, presence of PT referral and presence of non-opioid prescription (Table 4).

Discussion

These data characterize a possible association between highest nSES quartile and increased odds of physical therapy referral, as well as decreased odds of receiving a non-opioid prescription for diagnosis of back pain, musculoskeletal pain or arthritis. White race was inversely associated with PT referral. nSES was not associated with differences in odds of opioid prescription in the fully adjusted model. Race also did not appear to play a role in odds of opioid prescription.

Results from fully adjusted models indicated few comorbidities were associated with PT referral. In contrast, current smoking, substance use disorder, depression, obesity and higher comorbidity score were significantly associated with both receipt of opioids and non-opioid medications. This may reflect the pain patient typology described as chemical coping [19]. Chemical copers tend to prefer drugs to other treatments for pain have difficulty managing emotional stress and suffer alexithymia,

which is difficulty expressing and communicating about emotions which increases risk of psychiatric disorders [19]. Further research is needed to determine if lower nSES might lead to this patient characteristic.

Our findings regarding opioid prescription are in conflict with findings from those based on patient visits to the ED or primary care visits in a European setting. Joynt, et al. noted that patients living in lowest nSES regions were 24% less likely to receive opioid analgesic in a study of ER visits for pain conditions [12]. Ndlovu found lower nSES was associated with increased odds of opioid prescription. Ultimately, the evidence thus far examining nSES and treatment are mixed and warrant further investigation.

However, in a study examining rates of opioid prescription among PCPs and ER physicians through the National Ambulatory Medical Center Survey, non-white race was associated with decreased rates of opioid prescription [6]. Our findings are contrary to this, where race did not appear to influence rates of opioid prescription. The reason for this difference is difficult to determine because sources of error in survey data mostly differ from those inherent to analysis of medical records.

Our data suggest nSES may affect PT referral. The difference in PT referral offering may reflect insurance status. Insurance plans for low income patients in this ser-

vice area do not offer benefits to cover PT services. There are data to support the notion that higher out-of-pocket costs to patients may be associated with decreased odds of attending PT [20]. With this in mind, physicians may find that it is unnecessary to place orders for PT if their lower income patients will likely not attend. Clouding the picture is the contribution of the patient to the conversation. PT reflects outcomes that are achieved in the long term. A study in low-income cardiac rehab patients and ability to cope and adopt healthful behaviours highlighted a theory known as Short-Termism [21]. This hypothesis holds that individuals living in poverty are subject to short-termism, a tendency to adopt health behaviours that may have benefits in the immediate future, but may be detrimental in the long term [21]. One could potentially assert that perhaps patients with low nSES are less likely to accept a PT order because they fail to see the potential for long term benefit, preferring an intervention that results in immediate benefit, such as medications.

Finally, some relatively pragmatic influences may be present for those with lower nSES, such as decreased availability of transportation to attend PT, as well as decreased ability to commit the time necessary to attend multiple PT sessions. Patients may have trouble getting off work regularly to go to PT. These data also suggest that gender may play a role in receipt of PT referral. The majority of this sample was female, consistent with the literature demonstrating that women have a higher prevalence of musculoskeletal pain diagnoses [5]. The literature suggests that women may perceive pain more intensely than men, but also that women also seem to receive different treatments from health care providers for their pain [5]. Gender differences have been specifically noted related to rehabilitation, as summarized by Cote and Coutu [22]. This review highlighted 3 theories regarding distrust, self-identity, and domestic strain as being particularly impactful among females with musculoskeletal pain. All of these influences may play a role in our findings and further research is warranted to explore these possible explanations.

There are several strengths to this study. Data were obtained from real world clinic encounters and not subject to limitations of self-report. Patterns of treatment provided represent over 100 physicians and residents, therefore findings are unlikely explained by a unique treatment culture of a single clinical practice. A further strength is our ability to standardize nSES index, allowing for comparison to the US population, and not just the demographics of the Saint Louis Metropolitan area.

There are several limitations to this research. As an exploratory study, we did not differentiate between incident and prevalent musculoskeletal conditions. Ma-

agement of these variations is slightly different, especially with regard to emphasis on physical therapy and usage of some maintenance and adjunctive medications. Unlike data from closed healthcare systems, such as the Veterans Administration where patients often receive all their care from the same source, data from private sector health systems do not allow valid distinctions between acute back pain and a visit for a recurrence of chronic back pain. Additional analysis in other large patient populations is warranted. We did not have access to pain scores which could influence the type of treatment prescribed. However, other studies of opioid prescribing have found additional adjustment for pain scores vs. adjusting for only pain conditions, did not change conclusions regarding the relationship between opioid use and new onset depression [23]. Although the outcome is different in the present study, this suggests controlling for pain scores may add little additional information when also adjusting for the number of pain conditions. This study is also cross-sectional in design, capturing only a few moments in time. There is a possibility that the nSES indicator used does not match up with the time period of the painful condition being assessed. However, a recent study using a similar measure of nSES demonstrated that when individuals move, the correlation between nSES of their previous and new residence is roughly 90%, making this potential incongruence unlikely to be influential [24]. Additionally, these data reflect what the physician orders for the patient and does not, for instance, reflect whether a prescription was filled or whether a PT order resulted in the patient obtaining therapy.

In conclusion, this study provides novel results about the influence that nSES may have on the primary care relationship. We demonstrate here possible associations between low nSES, and decreased odds of PT referral and increased odds of non-opioid prescription treatment for musculoskeletal pain conditions. These findings may reflect a disparity in access to guideline-based therapy for patients living in lower nSES areas. Further studies are warranted to explore the mechanisms of this disparity and whether initiatives to grant access to PT resources, whether through insurance coverage or in-home services with broadened hours may be considered to alleviate this possible disparity.

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Conflict of Interest

None.

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