



Research Paper

Immigrant status and likelihood of opioid treatment. Lessons from Spain's National Health Service

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ABSTRACT

This study investigates opioid prescription patterns among immigrants and native populations in Spain, using novel patient health records from the *Base de Datos Clínicos de Atención Primaria* (BDCAP). We examined two subsets of data from 2017 and 2018, specifically targeting individuals diagnosed with musculoskeletal (MSK) issues and new cancer diagnoses, as these conditions frequently involve pain management. Our empirical analysis involved estimating a series of linear and count data models to explore the relationship between regions of origin, socioeconomic factors, and the probability of opioid use, controlling for a rich set of health conditions, and primary care centers fixed effects. Despite previously documented healthcare inequities, Spain demonstrates no major differences in opioid prescriptions between immigrants and natives, highlighting the effectiveness of its National Health Service (NHS). This contrasts sharply with the opioid crises in the United States and Canada. The absence of significant disparities underscores the importance of comprehensive healthcare systems and stringent regulations on opioid prescribing practices, as observed in European guidelines. Policy implications include the need to maintain and strengthen public healthcare systems to ensure equitable access to essential medications like opioids and to continue monitoring and regulating opioid prescribing practices to safeguard public health.

1. Introduction

Europe has experienced rising immigration in recent decades (King and Okólski, 2019). As of the beginning of 2022, the European Union counted 23.8 million residents who were citizens of non-member countries, constituting 5.3% of the total population. Moreover, in 2019 alone, the EU received 2.7 million immigrants from non-EU countries. Three-quarters of these immigrants have settled in Germany, France, Italy, and Spain.¹ While immigrants tend to arrive healthier than natives, referred to as the “healthy immigrant effect”, persistent disparities exist in healthcare access and outcomes between migrants and non-migrants (Jasso et al., 2004; Lebano et al., 2020). Inequalities in care access are well documented across areas like mental health, dental services, essential medicines, and emergency treatment (Lillie-Blanton et al., 2003; Clarke and Isphording, 2017). These healthcare disparities extend to opioid prescription and therapy, with research showing variations in practices, challenges, and utilization specific to migrants (Bacha et al., 2010; Meyer et al., 2014; Reissner et al., 2012). Factors like cultural biases, language barriers, lower socioeconomic status,

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and experiences of discrimination are thought to contribute to immigrant-native care disparities (Norredam et al., 2006; Hacker et al., 2015).

In particular, investigating opioid prescription patterns in Europe has gained urgency in light of the ongoing crisis in North America, highlighting the potential risks of unchecked opioid use. Compared to USA and Canada, Europe currently maintains a more controlled situation regarding opioid abuse and mortality. This relative stability can be attributed to several factors: stricter pharmaceutical regulations, universal healthcare systems, and cultural attitudes that often favor alternative approaches to pain management. However, challenges start to emerge in settings such as drug prescriptions in primary care (Gimeno-Feliú et al., 2016), dentistry (Sabounchi et al., 2021) and postoperative care (Sitter and Forget, 2020). Given the worrisome situation observed in other industrialized countries like the USA and Canada, the need for continued vigilance and research to prevent the development of a more severe opioid problem in Europe is paramount. Understanding the nuances of Europe's situation is, therefore, crucial for maintaining and improving current safeguards, particularly for vulnerable populations such as immigrants, who may face additional barriers in accessing appropriate pain management and healthcare services.

Importantly, a significant gap exists in the literature regarding opioid prescription patterns in Europe, particularly concerning differences between native-born populations and migrants. While extensive research has been conducted on opioid use and prescriptions in the United States (Pletcher et al., 2008; Groenewald et al., 2018), comparatively little attention has been paid to the unique characteristics and challenges of opioid prescription practices within European healthcare systems. This lack of Europe-specific studies limits our understanding of how factors such as universal healthcare coverage, different regulatory environments, and diverse immigrant populations influence opioid prescription patterns and potential disparities.

In this study we try to fill the gap by answering to the following question: *Are there disparities between immigrants and native populations in Spain regarding their probability of receiving opioid prescriptions?*

By examining this question, we contribute to the scant literature on the topic in the European area. In particular, we explore the unique characteristics of opioid prescription patterns in Europe, potentially revealing different dynamics in healthcare utilization and access for immigrants compared to natives. Our focus on Spain provides a valuable case study within the European context, offering insights that could also benefit the US and Canadian healthcare systems as an example of European healthcare practices. By analyzing opioid prescription patterns in a European universal healthcare setting, we may uncover approaches to addressing opioid-related challenges that could be informative for diverse healthcare systems, including those in North America.

The importance of examining opioid prescriptions in Europe becomes evident when considering the ongoing debates about appropriate pain management and equitable healthcare access. If certain groups face barriers in obtaining adequate pain management, it may lead to suboptimal health outcomes or drive individuals to seek medications through unsafe means. Documenting these disparities is a crucial step toward identifying their causes, which may stem from patient preferences, provider biases, structural barriers, or other factors specific to European healthcare systems.

Moreover, as immigration continues to rise across Europe, monitoring prescriber behavior and prescription outcomes will be vital for ensuring fairness and justice within healthcare systems. This study lays the groundwork for equity-focused analyses of prescription drug utilization among immigrants in a European context, with a particular focus on Spain. By doing so, it identifies potential disparities and informs policy efforts aimed at ensuring equitable prescription practices across diverse patient populations in the country, while highlighting the distinct characteristics of opioid prescription patterns in a European healthcare system compared to the North America context.

In order to address our research question, we employ Spanish data coming from the *Base de Datos Clínicos de Atención Primaria* (BDCAP), which comprises administrative information pertaining to primary healthcare services provided by the Spanish Health Ministry. We focused on a subsample of individuals experiencing specific symptoms (musculoskeletal (MSK) conditions and cancer, respectively), which are more consistently associated with pain management. Our empirical approach involved estimating a series of linear and count data models employing three different opioid usage indicators. Overall, our findings do not indicate significant inequalities in opioid use, although some interesting differences emerged depending on the individual's reported diagnosis. Specifically, we observed ethnic disparities in opioid use among individuals diagnosed with musculoskeletal (MSK) conditions, while no significant differences were observed for patients diagnosed with cancer. This outcome is particularly intriguing, suggesting that the ethnic patterns observed in opioid use are unique to the MSK subsample and may be potentially influenced by specific mechanisms within this patient group. We attempted to explore one of the potential mechanisms at play, which we hypothesized to be related to labor market factors. A strand of literature has shown that foreign-born workers are over-represented in physically demanding and hazardous jobs. This increased exposure to work-related accidents may be associated with a higher likelihood of experiencing trauma and fractures, which can result in intense pain. Furthermore, working in physically demanding jobs may contribute to the development of chronic pain. Consequently, individuals may turn to opioid drugs as a means of coping with this pain (Alacevich and Nicodemo, 2024). By regressing the probability of reporting a subset of MSK conditions potentially associated with work injuries and physically demanding jobs on regions of origin variables, we found a significant association between immigrant status and the likelihood of suffering from MSK problems potentially linked to labor conditions. This finding supports our hypothesis that ethnic disparities may be potentially linked to labor market factors rather than characteristics of the healthcare system.

The paper is structured as follows. In Section 2, we describe the context of the healthcare system and immigration flows in Spain. Section 3 describes the data and methodology employed, Sections 4 and 5 present the findings, and Section 6 discusses the implications of our findings.

2. The Spanish context

Spain boasts a comprehensive and universal healthcare system, the Spanish National Health Service (NHS also known as Sistema Nacional de Salud or SNS), which provides healthcare coverage to all citizens and legal residents. Established under the principles of universality, equity, and access, the NHS ensures that essential healthcare services, including pharmaceuticals, are available to all individuals, regardless of socioeconomic status or country of origin (López-Casasnovas and Pifarré i Arolas, 2021). The NHS operates on a decentralized model, with healthcare management devolved to the 17 autonomous communities (Bernal-Delgado et al., 2018). A key feature of this system is the assignment of patients, including migrants, to General Practitioners (GPs) based primarily on geographical criteria. This process is designed to ensure equitable access to primary care services across the population. Patients are typically assigned to a primary care center (centro de salud) closest to their registered address, and within this center, they are usually allocated to a specific GP. This system effectively limits patient choice of GP, resulting in a quasi-random assignment of patients to doctors. For migrants, while the initial registration process may vary slightly depending on their legal status and specific region, once integrated into the system, they generally follow the same assignment process as other residents.

Within the framework of the NHS, access to opioids is governed by strict regulatory protocols and guidelines established at both national and European levels. Opioids are considered essential medications for the management of acute and chronic pain, and their prescription is subject to stringent regulations to prevent misuse and diversion (Webster and Grabois, 2015; Vranken et al., 2016). Healthcare providers in Spain adhere to evidence-based practices and clinical guidelines when prescribing opioids, ensuring that these medications are utilized judiciously and responsibly. Moreover, patients receiving opioid therapy are closely monitored to minimize the risk of adverse effects and addiction while optimizing pain management outcomes (Falcón and miguel Torres Morera, 2017).

Spain, as a member state of the European Union (EU), aligns its healthcare policies and regulations with EU directives and guidelines, including those pertaining to opioid prescribing practices. European regulations emphasize the importance of ensuring safe and appropriate use of opioids while safeguarding patient access to these medications for legitimate medical purposes (Public Centers for Disease Control and Prevention, 2016). The Spanish healthcare system's adherence to European regulations underscores its commitment to promoting patient safety, public health, and equitable access to healthcare services, including controlled substances such as opioids. By aligning with European standards, Spain enhances its ability to address opioid-related challenges while upholding the principles of quality care and patient-centeredness (López-Casasnovas and Pifarré i Arolas, 2021).

While there is not a single set of European guidelines for opioid prescriptions, most EU countries, including Spain, have implemented similar stringent measures to control opioid prescriptions. These regulations typically cover all opioids, with distinctions often made between strong opioids (e.g., morphine, fentanyl) and weak opioids (e.g., codeine, tramadol). Common regulatory elements across EU countries include strict prescription requirements, controlled dispensing, prescription monitoring systems, and restrictions on prescriber qualifications. However, specific details can vary between countries (Bosetti et al., 2019). Regulations are generally less restrictive for cancer patients due to the recognized need for pain management in palliative care. For MSK conditions, prescriptions are usually more tightly controlled, with a focus on short-term use and exploration of alternative pain management strategies (O'Brien et al., 2017; Caraceni et al., 2012). This distinction underscores the importance of tailored pain management approaches that consider the specific needs and conditions of different patient groups.

Based on the evidence provided, Spain can serve as an important case study for several reasons. First, its NHS provides a unique opportunity to study healthcare delivery and access within a universal coverage system, offering insights into how equitable access to opioids can be achieved within such a framework. Second, as an EU member state, Spain's healthcare system operates within the broader regulatory framework of the EU, making it pertinent to examine its compliance with European regulations regarding opioid prescribing practices. Third, by comparing Spain's healthcare system with those of other countries, particularly those outside the EU, such as the United States and Canada, where opioid crises have emerged, valuable lessons can be learned regarding the role of healthcare system structures and regulatory policies in addressing opioid-related challenges (Donroe et al., 2018; Ayoo et al., 2020; Humphreys et al., 2022; Sivolap, 2024). Finally, findings from studying Spain's healthcare context and access to opioids can inform policy discussions and interventions aimed at improving opioid prescribing practices, enhancing patient safety, and mitigating the risks associated with opioid misuse and addiction (Montero and Curado, 2018). Spain's healthcare system provides a fertile ground for studying access to opioids within the context of universal healthcare and European regulations. By examining Spain's experiences and practices, policymakers and healthcare stakeholders can glean valuable insights to inform evidence-based strategies for addressing opioid-related challenges both within Spain and on a broader European scale.

3. Data and methods

The Spanish National Health Service was established under the *National Health Service Act* in 1946. Funded through general taxation, its expenditures are integrated into the overall budgets of the Autonomous Communities who are responsible for the healthcare provision within their territories. Communities are divided into "health areas" (*Areas de Salud*), and these are further divided into "basic health zones" (*Zonas Básicas de Salud*) which serve as the smallest administrative units for healthcare provision. Typically, there are multiple primary care centers (PCC) within a basic health zone, with residents registered at a center within their respective area. Once registered, patients are assigned a General Practitioner (GP) within their center.

3.1. Data and variables

To perform the analysis, we utilize patient health records at the primary care level. The dataset, known as the *Base de Datos Clínicos de Atención Primaria* (BDCAP), comprises administrative data pertaining to primary healthcare services provided by the Spanish Health Ministry. This dataset offers extensive insights into demographics, socioeconomic conditions, diagnoses of health issues, prescriptions of medications, and geographical identifiers for primary care facilities.

The administrative dataset, BDCAP, includes fundamental information such as gender, age, country of birth, municipality size, and individual income brackets. Income categories are utilized in determining individual co-payments for drug usage. The dataset also encompasses clinical history details such as tests, diagnoses, referrals, and prescriptions. An inherent advantage of this dataset lies in its detailed geographical identifiers for patients' areas of residence, including region, province, health area (*area de salud*, AS), and basic health zone (*zona básica de salud*, ZBS). Immigrants are categorized based on their country of birth.² Due to data sensitivity, countries of origin are aggregated into regions, resulting in the following origin regions: Eastern Europeans, other Europeans (from Northern, Southern, and Western Europe), Africans, Latin Americans, and Asians.

The BDCAP records drug prescriptions according to the WHO Anatomical Therapeutic Chemical (ATC) Classification System.³ Drugs are classified into groups across five different levels.

The individual income variable is derived from drug co-payment schemes. Co-payments within the NHS are generally moderate and are determined based on income, age, and illness severity. Contribution percentages vary based on income (ranging from 0% to 60%), with pensioners subject to maximum monthly contribution limits based on income. Patients with serious and/or chronic illnesses benefit from reduced contribution rates of 10% for prescribed medicines and medical devices, with maximum contribution limits adjusted according to the consumer price index (see Table A.1 in the Appendix for a detailed description).

Within the analgesic medications group (N02) of the Anatomical Therapeutic Chemical (ATC) Classification System of the WHO, opioid drugs are classified with the N02 A code (ATC-3 level). Subtypes of opioids include: natural opium alkaloids (N02AA), phenylpiperidine derivatives (N02AB), diphenylpropylamine derivatives (N02AC), benzomorphan derivatives (N02AD), oripavine derivatives (N02AE), morphinan derivatives (N02AF), opioids in combination with antispasmodics (N02AG), opioids in combination with non-opioid analgesics (N02AJ), and other opioids (N02AX). For our analysis, we aggregate all opioid prescriptions at the ATC 3 level.

The BDCAP dataset is constructed in the following way. The Spanish regional healthcare systems collect the health records either directly from primary care centers or from hospitals and secondary care centers through the PCC. The health records from the PCC encompass active health problems diagnosed by physicians (along with the date of initial diagnosis), information on the type and frequency of the interactions with the medical staff, and medication prescriptions given by GPs. Data from hospitals and secondary care centers include the number of specialist consultations by type and therapeutic and laboratory procedures. Individual-level health and healthcare records are subsequently shared with the central NHS system by the autonomous communities. From the universe of the data, the statistical team of the Health Ministry selects a subsample of representative PCCs from randomly selected basic health zones. This sampling strategy aims at gathering data for approximately one-tenth of the resident population in Spain each year.⁴

We focus on a sample of individuals with diagnosis that may involve the use of opioid drugs, for which we have data collected in 2017 and 2018. Specific disorders such as musculoskeletal (MSK) conditions and cancer are systematically more associated with pain management. Research indicates that individuals with MSK problems, such as chronic pain conditions like arthritis or back pain, are more likely to receive opioid prescriptions compared to those with other types of pain (Sites et al. 2018; Delaney et al. 2020). Additionally, cancer-related pain poses a significant concern for many patients undergoing cancer treatment or in palliative care. Opioids are frequently utilized to manage cancer pain, particularly when other pain relief measures prove ineffective. Our initial sample consists of individuals aged 18 to 60,⁵ who did not report an MSK or cancer diagnosis in 2017 (Table A.2 in the Appendix reports descriptive statistics on this sample). Using this sample, we estimate the likelihood of receiving a new diagnosis of musculoskeletal (MSK) issues or cancer in 2018. We then focus on two distinct subgroups to analyze opioid prescriptions and dosages. The first group comprises patients who received a new musculoskeletal (MSK) diagnosis in 2018 but had no MSK issues in 2017. The second group consists of individuals with a new cancer diagnosis in 2018 but no cancer diagnoses in 2017. The MSK subgroup includes 134,131 individuals diagnosed for the first time in 2018, while the cancer subgroup includes 15,415 individuals diagnosed for the first time in 2018.⁶

We consider three distinct variables related to opioid use. The first variable is a binary indicator, with a value of 1 if individuals report having used an opioid drug, and 0 otherwise. The second variable represents the total number of opioid prescriptions, while the third variable reflects the total dosage units (DDD) consumed. Table 1 presents the descriptive statistics for each specific

² The BDCAP lacks information on citizenship and duration of stay.

³ The ATC Classification System categorizes active substances based on the organ or system they target and their therapeutic, pharmacological, and chemical properties.

⁴ For more information on the BDCAP: <https://www.sanidad.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/SIAP/home.htm>.

⁵ This age restriction is due to the predominant representation of immigrants within younger cohorts in Spain (INE, 2022).

⁶ We lack information regarding the provision of opioids in hospital settings. However, according to Regueras Escudero and López Guzmán (2021), 73% of opioid prescriptions in Spain from June 2019 to June 2020 were issued by primary care physicians. In the context of cancer-related pain, oncologists or pain specialists often take the lead, particularly when prescribing strong opioids like fentanyl. Nonetheless, general practitioners (GPs) may continue managing these treatment plans, especially for chronic pain or palliative care.

Table 1
Descriptive statistics: Sub-samples of MSK or cancer diagnosed individuals.

	MSK sample		Cancer sample	
	Natives	Immigrant	Natives	Immigrant
Women	53.10	56.32	58.11	63.88
Employed	66.07	62.49	64.22	62.01
% of ind. treated with opioid medication in 2018	15.01%	15.28%	17.00%	18.50%
Age groups				
18–24 years	10.98	10.48	6.08	7.12
25–34 years	19.04	22.22	12.59	14.12
35–44 years	26.97	34.00	23.53	28.74
45–54 years	28.44	24.90	33.75	33.28
55–60 years	14.57	8.40	24.05	16.75
Income groups				
High Income	0.4	0.14	0.52	0.33
Medium Income	27.19	7.42	30.32	11.88
Low Income	66.57	83.5	62.94	80.35
Very low income	5.59	7.51	6.11	6.95
Unknown income	0.24	1.43	0.11	0.49
Average number of health problems				
General and Unspecific Problems	0.85	0.70	0.99	0.89
Blood, Hematopoietic Organs, and Immune System	0.08	0.09	0.15	0.16
Digestive System	0.57	0.65	1.02	1.00
Eye and Adnexa	0.25	0.30	0.37	0.42
Auditory System	0.15	0.13	0.22	0.18
Circulatory System	0.31	0.29	0.51	0.46
Locomotor System	1.32	1.28	1.35	1.29
Nervous System	0.25	0.30	0.38	0.44
Psychological Problems	0.47	0.36	0.68	0.55
Respiratory System	0.67	0.61	0.89	0.79
Skin and Appendages	0.71	0.73	1.48	1.48
Endocrine System, Metabolism, and Nutrition	0.47	0.43	0.75	0.75
Urinary System	0.13	0.14	0.23	0.23
Family Planning, Pregnancy etc.	0.14	0.26	0.15	0.27
Genital System	0.35	0.52	0.62	0.85
Social Problems	0.03	0.08	0.05	0.10
N	109,786	24,345	13,588	1,827

subsample of individuals newly diagnosed with either MSK problem or cancer, distinguishing between natives and immigrants. Within the MSK subsample, 15% of both natives and immigrants report having used an opioid drug. On average, natives have 0.37 opioid prescriptions, while immigrants have 0.31. In terms of the prescribed DDDs, natives consume an average of 3.7 dosage units compared to 3.08 among immigrants. As for the cancer subsample, 17% of natives report having used an opioid drug, while for immigrants the percentage is 18.5%. Moreover, natives report an average of 0.66 prescriptions compared to about 0.7 for immigrants. Regarding DDDs, the average dosage units are about 7 for natives and 8.5 for immigrants.

In both MSK and cancer subsample, women represent the majority, as do employed individuals. Women are evenly distributed between natives and immigrants subgroups: among natives, approximately 53.10% were represented in the MSK sample compared to about 56% among immigrants, while roughly 58% of natives and 63% of immigrants were represented in the cancer sample. A similar distribution was observed for employed individuals. In terms of age, differences are observed between natives and immigrants. As expected, the largest proportion of older individuals (aged between 55–60) is among natives, comprising approximately 15% and 24% in the MSK and cancer subgroups, respectively, compared to 8.4% and 16.7% among immigrants. Statistics regarding income depict a unsurprising scenario: natives, in both subsamples, report higher income levels compared to immigrant subgroups. Additionally, when considering the average number of health problems categorized by body system, we notice a lower prevalence of these conditions among the immigrant sample, underscoring the phenomenon known as the “healthy immigrant effect”. This effect suggests that immigrants, on average, exhibit lower rates of chronic diseases, better mental health, and lower mortality rates than the general population of the host country (Ichou and Wallace, 2019).

Table 2 shows the distribution of immigrants according to their regions of origin. The largest group of immigrants comes from Latin American countries, making up 47% of the MSK subsample and 49% of the cancer subsample. They are followed by immigrants from various European countries, who constitute about 29% of the MSK subsample and 36% of the cancer subsample. The Middle East is the fourth largest region of origin, with approximately 15% in the MSK subsample and 8% in the cancer subsample, followed by immigrants from Africa and Asia. Figs. 1 and 2 display the distribution of the opioids variables by patients' region of origin. For the sake of space, here we focus on individuals diagnosed with either MSK conditions or cancer. Fig. 1 shows the distribution of opioid use (dummy variable) by patients' regions of origin. Approximately 18% of immigrants from the Middle East report using opioid drugs, the highest percentage among the groups. In contrast, about 12% of patients born in the Pacific region report having received

Table 2
Region of origins of immigrants (%)

	MSK sample		Cancer sample	
	N	% of immigr.	N	% of immigr.
Africa	1,286	5.28%	54	2.96%
Latin America	11,440	46.99%	902	49.37%
Asia	149	0.61%	4	0.22%
Europe	7,108	29.20%	655	35.85%
Middle East	3,629	14.91%	160	8.76%
Pacific Ocean	733	3.01%	52	2.85%
Total	24,345	100.00%	1,827	100.00%

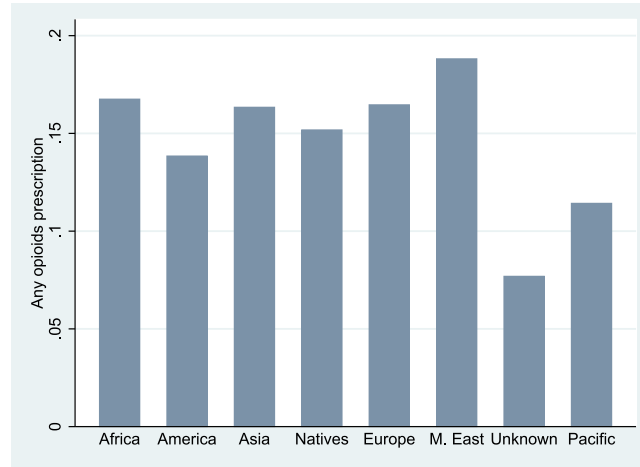


Fig. 1. Opioids use (dummy) by region of origin.
Source: Base de Datos Clínicos de Atención Primaria, years: 2017–2018.

at least one opioid prescription. Fig. 2 displays the average number of opioid prescriptions and Defined Daily Doses (DDDs) based on the region of origin. We observe that the highest number of opioid prescriptions and dosages is recorded among immigrants from Asian and Middle Eastern countries, followed closely by natives (Spanish) and patients from other European countries. Immigrants from the Pacific region report a lower average number of prescriptions and dosages.

3.2. Empirical strategy

In order to explore the association between ethnicity and opioids use, we proceed into two steps. First, we consider the likelihood of reporting a specific diagnosis (MSK or cancer) as the dependent variable, regressing it on a list of control variables. This first step aims to explore whether ethnicity and other socio-economic and demographic factors of patients are associated with the likelihood of reporting a specific diagnosis. We employ Linear Probability Models (LPM)⁷ and estimate the following equation:

$$Y_i = \omega_0 + \omega_1 origin_i + \omega_2 X_i + \psi_i + \alpha_i + \epsilon_i, \quad (1)$$

where Y_i represents a MSK or cancer diagnosis; $origin_i$ is (i) a dummy indicator for immigrant status and (ii) a set of dummy variables that describe the specific region of birth for immigrants, respectively. X_i includes individual-level demographic and socio-economics characteristics (age, gender, income categories), ψ_i includes a set of dummy variables reporting the health conditions an individual experiences⁸; α_i is a primary care center (PCC) fixed effect, while ϵ_i is the error term.

⁷ We estimate Linear Probability Models using the “areg” command in STATA with the “absorb” option since it is more efficient in handling large datasets with numerous fixed effects levels compared to probit/logit models with fixed effects, which might require more complex estimation techniques and longer computation times (Kunz et al., 2021).

⁸ Health conditions include: general and unspecific problems; blood, hematopoietic organs and immune system; digestive system; eye and adnexa; auditory system; circulatory system; locomotor system; nervous system; psychological problems; respiratory system; skin and appendages; endocrine system, metabolism, and nutrition; urinary system; family planning, pregnancy etc.; genital system; social problems.

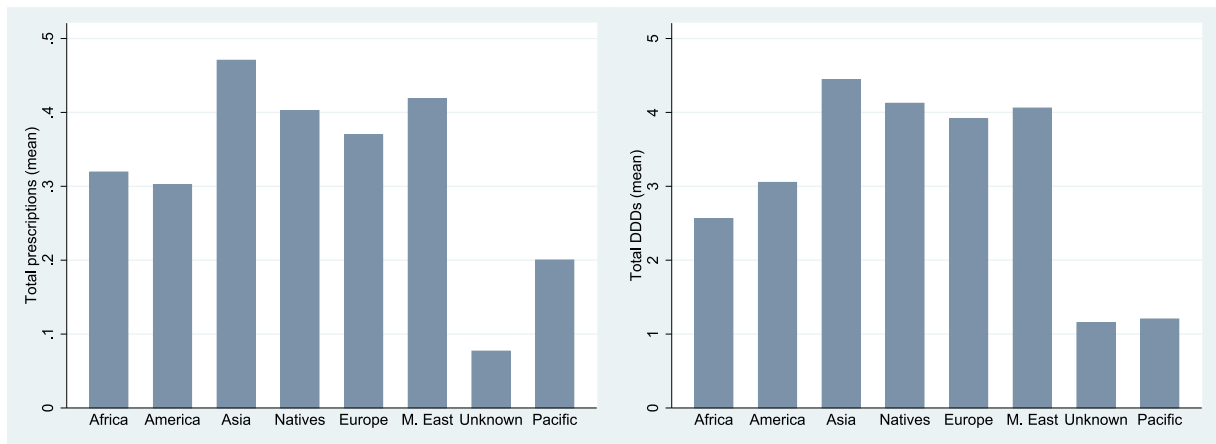


Fig. 2. Total prescriptions and Defined Daily Doses (DDDs) by region of origin.
Source: Base de Datos Clínicos de Atención Primaria, years: 2017–2018.

Second, conditional on receiving a formal diagnosis (MSK or cancer), we estimate a series of additional models to examine in detail the effects of immigrants' regions of origin and other characteristics on various outcomes. We first regress the probability of using any opioid drugs (dummy) on the set of controls from Eq. (1). Then, we regress the total number of opioid prescriptions, and the total defined daily doses (DDDs) on the set of control variables as in the first equation. Given the count nature of these two outcomes, we employ count model regressions, specifically negative binomial regressions, to account for data overdispersion. In all models we include a primary care center fixed effect. Robust standard errors are clustered at the primary care center.

4. Results

This section shows our main results. Table 3 presents findings concerning the subset of individuals who reported newly diagnosed musculoskeletal conditions in 2018. In column 1, we examine which individual-level characteristics are associated with an increased or decreased likelihood of reporting a new diagnosis of an MSK condition. In column 2, we estimate whether migration status and other socio-economic factors are related to the probability of using opioids, conditional on having received an MSK diagnosis. Finally, columns 3 and 4 focus on the number of prescriptions and the number of DDDs (Defined Daily Doses), conditional on having received an MSK diagnosis. For these last two outcomes, we use count model regressions, specifically negative binomial models that account for data overdispersion.

The results reveal a positive and statistically significant correlation between migration status and the likelihood of reporting a musculoskeletal (MSK) diagnosis. Individuals born outside the country who are diagnosed with musculoskeletal conditions are more likely to report at least one opioid prescription compared to native-born individuals. However, no significant differences are detected in terms of the number of prescriptions and defined daily doses (columns 3–4). Interestingly, other socio-economic factors, such as reporting a low income level (compared to the reference category of high income) and being employed, also significantly correlate with the probability of reporting an MSK condition. Workers are more likely to receive an MSK diagnosis but are less likely to use opioids. They also receive fewer prescriptions and lower doses compared to other categories. Being a woman is negatively associated with the likelihood of receiving an MSK diagnosis. However, women are more likely to use opioids and receive more prescriptions compared to males. On one hand, this may be because women experience pain more intensely and report higher levels of pain than men, potentially leading to increased opioid use for pain management, even though they are less likely to report a MSK condition (Bartley et al. 2013). On the other hand, women generally visit healthcare providers more frequently than men, which might result in more opportunities for them to be prescribed opioids (Green et al. 2003). Interestingly, some studies indicate that although women report pain more frequently and are prescribed opioids more often, the dosage they receive is generally lower compared to men. This disparity could be due to several factors, including differences in pain perception and response to opioids between genders. Women may metabolize opioids differently, leading to a slower onset of pain relief, which can affect the amount of medication prescribed and consumed (Goetz et al., 2021).

Looking at the coefficients for each region of birth (Table 4), we observe that immigrants from all the regions considered exhibit a significantly higher probability of reporting a musculoskeletal (MSK) issue. This is an interesting finding that we explore in more depth in Section 5 as a potential mechanism driving our results. Interestingly, individuals born in some regions (Africa, Latin America, Europe, and the Middle East) show a significantly higher likelihood of using these drugs. However, except for Latin America and Pacific countries, there were no significant effects regarding the total number of prescriptions and the cumulative defined daily doses (DDDs) (columns 3–4). For the last two mentioned regions, it is noteworthy that even though immigrants from these

Table 3
Probability of MSK diagnoses and opioids use: Immigrant status.

	MSK cond.	Any Opioid	Tot. Prescr.	Tot. DDDs
Immigrant	0.006*** (0.001)	0.019*** (0.003)	−0.018 (0.043)	−0.150 (0.055)
Employed	0.010*** (0.001)	−0.013*** (0.003)	−0.159*** (0.041)	−1.916*** (0.053)
Woman	−0.006*** (0.000)	0.006** (0.003)	0.022** (0.028)	−0.016 (0.036)
Medium Income	0.007*** (0.001)	0.011 (0.012)	0.044 (0.272)	0.707 (0.333)
Low Income	0.008*** (0.001)	0.028** (0.012)	0.172** (0.268)	2.220** (0.328)
Very low income	0.009*** (0.002)	0.057*** (0.013)	0.276*** (0.272)	3.343*** (0.327)
ND income	−0.001 (0.002)	−0.046** (0.020)	−0.116** (0.353)	−1.075 (0.476)
25–34 years	−0.003*** (0.001)	0.023*** (0.003)	0.083*** (0.053)	1.068*** (0.075)
35–44 years	−0.004*** (0.001)	0.051*** (0.003)	0.186*** (0.044)	2.314*** (0.059)
45–54 years	−0.005*** (0.001)	0.080*** (0.005)	0.332*** (0.044)	4.282*** (0.060)
55–60 years	−0.009*** (0.001)	0.100*** (0.006)	0.485*** (0.059)	5.892*** (0.073)
Health conditions	Yes	Yes	Yes	Yes
PCC FE	Yes	Yes	Yes	Yes
N. obs	1,042,246	134,131	134,131	134,131

Notes: The table shows the effects of the Immigrant Status on different outcomes related to the MSK subsample. Income categories: High: >100.000 (reference category); medium: (99.999 - 18.000); low: < 18.000. The method of estimation is Linear Probability Model or Negative Binomial, depending on the outcome variable. Columns 3–4 present marginal coefficients from negative binomial regressions. Robust standard errors clustered at the PCC level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

areas are more likely to use some opioid drugs, they receive fewer prescriptions and lower DDDs compared to natives. Interpreting these findings with our data is challenging. Several factors may play a role, ranging from different cultural attitudes toward pain management and medication, as well as barriers to accessing the healthcare system, which might limit the number of prescriptions and dosages of such drugs.

Similarly to the results in Table 3, employment status, along with reporting lower income, appear to significantly influence not only the likelihood of opioid usage but also indicators for total prescriptions and total defined daily doses (DDD). Socioeconomic conditions have been demonstrated to be critical determinants of an individual's health status, with a significant impact on the prevalence of illnesses and pain (Garcia-Altes et al. 2018). The increased risk of experiencing such health conditions is greater in unfavorable economic circumstances, which may contribute to increased opioid usage (Serra-Pujadas et al., 2021). Moreover, individuals reporting a lower income may experience a higher prevalence of conditions associated with chronic pain due to physically demanding jobs, higher rates of injury, and inadequate preventive care. This can increase their likelihood of being prescribed opioids, as well as the number of prescriptions and dosages.

A different scenario arises when examining individuals newly diagnosed with cancer in 2018. Tables 5 and 6 present the results. First, we observed a negative and statistically significant correlation between migration variables and the probability of reporting a new diagnosis of cancer. This evidence is not surprising. Existing studies have shown that the overall cancer incidence among first-generation migrants is lower compared to natives (e.g., see Norredam et al. (2007)). Specifically, Western studies on cancer incidence indicate that migrants from developing countries tend to have lower overall cancer incidence rates compared to natives, a trend that is also reflected in our findings.

While advancing age and being employed remain significant predictors for the probability of using opioids, as well as the number of prescriptions and DDDs, we do not observe any significant differences between foreign-born individuals and natives, nor do we find notable distinctions when focusing on specific regions of birth (Table 6). Additionally, the effect of income appears to be less pronounced compared to the MSK subsample, and we do not find any significant effects related to patients' gender.

While we observe some inequalities regarding regions of origin, gender, and income when referring to the sample with musculoskeletal disorders, these inequalities diminish further when looking at the sample of cancer patients. These results are not totally surprising. In Spain (as in other European countries) opioid prescriptions are regulated to ensure their proper use and minimize the risk of misuse, addiction, and other adverse effects. Typically, opioids are classified as controlled substances, and their prescription and distribution are subject to strict regulations. Healthcare professionals, such as doctors, are required to follow specific guidelines when prescribing opioids. This includes assessing the patient's medical condition, history of opioid use, and

Table 4
Probability of MSK diagnoses and opioids use: Region of origin.

	MSK cond.	Any Opioid	Tot. Prescr.	Tot. DDDs
Africa	0.007*** (0.002)	0.030*** (0.012)	-0.028 (0.130)	-0.845 (0.162)
Latin America	0.008*** (0.001)	0.007** (0.003)	-0.053*** (0.050)	-0.502** (0.064)
Asia	0.007* (0.004)	0.030 (0.030)	0.151 (0.486)	3.030 (0.548)
Europe	0.003*** (0.001)	0.027*** (0.005)	0.002 (0.054)	0.226 (0.073)
Middle East	0.009*** (0.002)	0.040*** (0.007)	0.048* (0.074)	0.412 (0.096)
Pacific Ocean	0.003** (0.001)	-0.013 (0.011)	-0.153*** (0.152)	-2.748*** (0.188)
Employed	0.010*** (0.001)	-0.012*** (0.003)	-0.157*** (0.041)	-1.897*** (0.053)
Woman	-0.006*** (0.000)	0.007*** (0.003)	0.024** (0.028)	-0.007 (0.037)
Medium Income	0.007*** (0.001)	0.011 (0.012)	0.044 (0.271)	0.708 (0.333)
Low Income	0.008*** (0.001)	0.028** (0.012)	0.172** (0.267)	2.235** (0.328)
Very low income	0.009*** (0.002)	0.057*** (0.013)	0.276*** (0.272)	3.347*** (0.327)
ND income	-0.001 (0.002)	-0.045** (0.020)	-0.114** (0.353)	-0.993 (0.489)
25–34 years	-0.003*** (0.001)	0.023*** (0.003)	0.082*** (0.053)	1.052*** (0.075)
35–44 years	-0.004*** (0.001)	0.051*** (0.003)	0.185*** (0.044)	2.302*** (0.059)
45–54 years	-0.005*** (0.001)	0.080*** (0.005)	0.332*** (0.045)	4.286*** (0.060)
55–60 years	-0.009*** (0.001)	0.100*** (0.006)	0.485*** (0.059)	5.891*** (0.073)
Health conditions	Yes	Yes	Yes	Yes
PCC FE	Yes	Yes	Yes	Yes
N. obs	1,042,246	134,131	134,131	134,131

Notes: The table shows the effects of the patients' regions of origin on different outcomes related to the MSK subsample. Income categories: High: >100.000 (reference category); medium: (99.999 - 18.000); low: < 18.000. The method of estimation is Linear Probability Model or Negative Binomial, depending on the outcome variable. Columns 3-4 present marginal coefficients from negative binomial regressions. Robust standard errors clustered at the PCC level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

potential risk factors for abuse or addiction before prescribing these medications. Additionally, there are limitations on the quantity and duration of opioid prescriptions to prevent overuse or dependence. This scenario contrasts with the situation in the United States, where opioid prescribing has historically been more liberal compared to many European countries. The more regulated and restricted access to opioid medications in EU countries may lead to fewer inequalities in the prescription and use of these drugs. However, the contrasting picture that emerges when examining the results for the two distinct subsamples is worth exploring in more detail.

5. Potential mechanisms at play

One of the potential mechanisms underlying the significant correlation between regions of origin and opioid use among patients diagnosed with musculoskeletal conditions may be linked to labor market factors.

Extensive literature suggests that foreign-born workers are over-represented in physically demanding and hazardous occupations, which have relatively higher rates of injury hazards (e.g., Alacevich and Nicodemo, 2024). The concentration of most migrant workers in hazardous occupations can be attributed to their lower educational attainment, which often leads to employment opportunities in low-skill sectors (Bratti and Conti, 2018). Lower risk aversion or perception, a comparative advantage in health endowments, reduced bargaining power, and limited alternative employment options may contribute to the increased vulnerability of foreign-born workers to work-related accidents compared to native workers (Orrenius and Zavodny, 2007). A higher exposure to work-related accidents may be associated with an increased likelihood of experiencing trauma and fractures, which can result in intense pain. To cope with this pain, individuals may resort to using opioid drugs. Additionally, workers employed in physically demanding jobs are at a significantly higher risk of experiencing chronic pain and more rapid aging compared to those in less physically demanding jobs, which may further promote the consumption of these drugs (Giuntella et al., 2019).

In Tables 3 and 4 (Section 4) we found a positive and statistically significant correlation between migration status and the likelihood of reporting a musculoskeletal diagnosis. Looking at the coefficients for each region of birth, we note that immigrants

Table 5
Probability of cancer diagnoses and opioids use: Immigrant status.

	Cancer	Any Opioid	Tot. Prescr.	Tot. DDDs
Immigrant	−0.002*** (0.000)	0.019 (0.010)	0.208* (0.102)	3.582* (0.126)
Employed	0.000** (0.000)	−0.025*** (0.007)	−0.637*** (0.089)	−10.797*** (0.117)
Woman	0.000 (0.000)	−0.005 (0.007)	−0.081 (0.086)	−1.497 (0.114)
Medium Income	0.001 (0.001)	−0.001 (0.035)	−0.085 (0.501)	−3.283 (0.665)
Low Income	−0.001 (0.001)	0.033 (0.034)	0.367 (0.493)	5.510 (0.660)
Very low income	−0.001 (0.001)	0.078** (0.036)	0.409 (0.493)	6.512 (0.682)
ND income	−0.002** (0.001)	0.101 (0.100)	0.235 (0.811)	−2.690 (0.893)
25–34 years	0.002*** (0.000)	0.044*** (0.011)	0.162*** (0.148)	2.193*** (0.181)
35–44 years	0.004*** (0.000)	0.054*** (0.011)	0.381*** (0.171)	5.992*** (0.211)
45–54 years	0.006*** (0.000)	0.087*** (0.011)	0.844*** (0.157)	12.957*** (0.190)
55–60 years	0.009*** (0.000)	0.107*** (0.013)	1.070*** (0.155)	18.403*** (0.205)
Health conditions	Yes	Yes	Yes	Yes
PCC FE	Yes	Yes	Yes	Yes
N. obs	1,627,476	15,415	15,415	15,415

Notes: The table shows the effects of the immigrant status on different outcomes related to the cancer subsample. Income categories: High: >100.000 (reference category); medium: (99.999 - 18.000); low: < 18.000. The method of estimation is Linear Probability Model or Negative Binomial, depending on the outcome variable. Columns 3–4 present marginal coefficients from negative binomial regressions. Columns 3–4 present marginal coefficients from negative binomial regressions. Robust standard errors clustered at the PCC level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

born in all the regions considered exhibit a significant higher probability of reporting a MSK issue. However, it is important to note that the MSK diagnoses considered so far encompass a broad spectrum of MSK conditions, which also include those associated with genetic factors. To overcome this issue, we narrow down the entire set of musculoskeletal diagnoses to two subsets specifically related to (i) trauma, fractures, and musculoskeletal symptoms potentially linked to work-related accidents, and (ii) a set of specific musculoskeletal disorders causing chronic pain and associated with physically demanding jobs. Tables 7 and 8 report the results. Panel “A” refers to the model with the inclusion of the immigrant dummy while panel “B” refers to the model with the specific region of origin of the immigrants. For the sake of space, we do not report all the other coefficients. The findings in these Tables corroborate our hypothesis that immigrants seem to face a higher risk of certain musculoskeletal (MSK) conditions related to trauma and work-injuries compared to native populations. This reinforces the conjecture that disparities in opioid utilization among immigrant subgroups may be influenced more by factors within the labor market rather than by characteristics of the healthcare system.

6. Conclusion and discussion

In this study, we aimed to investigate disparities in opioid prescriptions between immigrant and native populations in Spain. We found that despite previously documented healthcare inequities across various domains, including mental health, dental services, and emergency treatment, there were no major disparities in opioid prescriptions between immigrants and natives. Our results revealed some ethnic differences in opioid use among patients diagnosed with musculoskeletal (MSK) conditions. Specifically, foreign-born individuals, particularly those from Africa, Latin America, Europe, and the Middle East, exhibited a significantly higher likelihood of using opioids compared to native-born patients. However, these disparities were generally not observed when examining the total number of opioid prescriptions or the cumulative defined daily doses (DDD), except in the case of Latin American and Pacific immigrants, who reported lower prescription rates and dosages.

In contrast, for patients diagnosed with cancer, no significant differences were found between foreign-born individuals and natives in terms of opioid usage indicators. This finding suggests that the observed ethnic patterns in opioid use are specific to the MSK subsample and may be driven by underlying mechanisms unique to this patient group. Different factors may contribute, including cultural attitudes toward pain management and medication, barriers to accessing the healthcare system, and language differences, which might influence the utilization, number of prescriptions, and dosages of these drugs. However, our data makes it challenging to test all these potential channels. One potential mechanism that we have explored is the higher opioid use among

Table 6
Probability of cancer diagnoses and opioids use: Region of origin.

	Cancer	Any Opioid	Tot. Prescr.	Tot. DDDs
Africa	−0.005*** (0.000)	0.047 (0.056)	0.017 (0.411)	−7.116 (0.453)
Latin America	−0.002*** (0.000)	0.015 (0.013)	0.084 (0.137)	2.199 (0.172)
Asia	−0.005*** (0.002)	0.331 (0.204)	0.446 (0.570)	−6.556 (0.674)
Europe	−0.000 (0.000)	0.021 (0.015)	0.307* (0.176)	4.754* (0.191)
Middle East	−0.005*** (0.000)	0.021 (0.027)	0.434* (0.273)	9.278 (0.404)
Pacific Ocean	−0.001 (0.001)	−0.017 (0.049)	0.151 (0.575)	−3.418 (0.588)
Employed	0.000** (0.000)	−0.024*** (0.007)	−0.630*** (0.089)	−10.683*** (0.117)
Woman	0.000 (0.000)	−0.005 (0.007)	−0.082 (0.087)	−1.564 (0.115)
Medium Income	0.001 (0.001)	−0.001 (0.035)	−0.085 (0.500)	−3.230 (0.664)
Low Income	−0.001 (0.001)	0.033 (0.034)	0.366 (0.493)	5.529 (0.659)
Very low income	−0.001 (0.001)	0.078** (0.036)	0.410 (0.492)	6.526 (0.681)
ND income	−0.002** (0.001)	0.102 (0.100)	0.246 (0.807)	−2.641 (0.892)
25–34 years	0.002*** (0.000)	0.043*** (0.011)	0.158*** (0.147)	2.162*** (0.182)
35–44 years	0.004*** (0.000)	0.054*** (0.011)	0.375*** (0.170)	5.863*** (0.210)
45–54 years	0.006*** (0.000)	0.086*** (0.011)	0.844*** (0.158)	12.941*** (0.190)
55–60 years	0.009*** (0.000)	0.107*** (0.013)	1.066*** (0.156)	18.268*** (0.204)
Health Conditions	Yes	Yes	Yes	Yes
PCC FE	Yes	Yes	Yes	Yes
N. obs	1,627,476	15,415	15,415	15,415

Notes: The table shows the effects of patients' regions of origin on different outcomes related to the cancer subsample. Income categories: High: >100.000 (reference category); medium: (99.999 - 18.000); low: < 18.000. The method of estimation is Linear Probability Model and Negative Binomial, depending on the outcome variable. Columns 3–4 present marginal coefficients from negative binomial regressions. Robust standard errors clustered at the PCC level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

foreign-born patients with MSK conditions, which could be due to their overrepresentation in physically demanding and hazardous occupations (Giuntella et al., 2019; Alacevich and Nicodemo, 2024). Immigrants often find employment opportunities in low-skill sectors, exposing them to a higher risk of work-related injuries and trauma. Consequently, these individuals may experience intense pain, leading to an increased likelihood of being prescribed opioids for pain management, and thus the system is trying to help those in worse pain conditions. In fact, additional analysis shows a significant correlation between migration status and the likelihood of reporting a musculoskeletal diagnosis, which suggests these differences in prescription patterns could be driven by the overrepresentation of foreign-born workers in physically demanding jobs, which carry a higher risk of work-related injuries and associated pain, rather than discriminatory practices within the healthcare system itself. On the other side, it is worth noting that the fact that we do not find disparities in prescriptions for cancer patients shows that the system is quite fair for the most vulnerable individuals independently of their ethnicity.

These findings present an interesting contrast to previously documented healthcare inequities and the patterns observed in North American contexts. While disparities have been noted in various healthcare domains, our study reveals a more equitable landscape in opioid prescriptions within the Spanish healthcare system. This discrepancy may be attributed to several factors unique to the European, and specifically Spanish, context. The strict regulation and guidelines for opioid prescriptions in Spain, characteristic of many European countries, may standardize prescribing practices across patient populations. Furthermore, the nature of pain management as a more objectively assessed need compared to other healthcare services could contribute to reduced disparities. The universal healthcare system in Spain likely plays a crucial role in mitigating access barriers that might contribute to disparities in other healthcare domains or in countries with different healthcare models. In sum, our findings suggest that the National Health Service (NHS) in Spain has been successful in ensuring equitable access to opioid prescriptions for immigrants, without increasing the risk of overprescription to specific groups, thereby indicating the effectiveness of the public healthcare system in addressing potential

Table 7

Probability of MSK diagnoses - MSK conditions potentially associated with work-injuries and physically demanding jobs: Immigrant status & region of origin.

	MSK cond. (work-injuries)	Any Opioid	Tot. Prescr.	Tot. DDDs
Panel A: Immigrant				
Immigrant	0.007*** (0.001)	0.020*** (0.003)	-0.014 (0.050)	-0.093 (0.065)
Panel B: Region				
Africa	0.008*** (0.002)	0.036*** (0.012)	0.016 (0.153)	-0.112 (0.192)
Latin America	0.009*** (0.001)	0.007* (0.004)	-0.053*** (0.057)	-0.467 (0.077)
Asia	0.008* (0.004)	0.026 (0.033)	0.134 (0.579)	2.710 (0.709)
Europe	0.003*** (0.001)	0.029*** (0.005)	0.015 (0.064)	0.443 (0.085)
Middle East	0.011*** (0.002)	0.040*** (0.008)	0.032 (0.086)	0.091 (0.120)
Pacific Ocean	0.007*** (0.001)	-0.006 (0.012)	-0.108* (0.152)	-2.543*** (0.157)
Individual Controls	Yes	Yes	Yes	Yes
Health Conditions	Yes	Yes	Yes	Yes
PCC FE	Yes	Yes	Yes	Yes
N. obs	1,042,246	101,847	101,847	101,847

Notes: The table shows the effects of Immigrant Status (Panel A) and the patients' regions of origin (Panel B) on different outcomes related to the MSK subsample. Income categories: High: >100.000 (reference category); medium: (99.999 - 18.000); low: < 18.000. The method of estimation is Linear Probability Model or Negative Binomial, depending on the outcome variable. Columns 3-4 present marginal coefficients from negative binomial regressions. Robust standard errors clustered at the PCC level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8

Probability of MSK diagnoses - MSK conditions potentially associated with chronic pain -physically demanding jobs: Immigrant status & region of origin.

	MSK cond. (chronic pain)	Any Opioid	Tot. Prescr.	Tot. DDDs
Panel A: Immigrant				
Immigrant	0.010*** (0.001)	0.018*** (0.003)	-0.022 (0.047)	-0.236 (0.059)
Panel B: Region				
Africa	0.012*** (0.002)	0.030** (0.013)	-0.029 (0.144)	-0.718 (0.179)
Latin America	0.011*** (0.001)	0.004 (0.003)	-0.063*** (0.053)	-0.608** (0.070)
Asia	0.017*** (0.004)	0.035 (0.033)	0.148 (0.500)	2.971 (0.580)
Europe	0.006*** (0.001)	0.030*** (0.005)	0.011 (0.059)	0.264 (0.076)
Middle East	0.014*** (0.002)	0.038*** (0.007)	0.031 (0.081)	0.094 (0.107)
Pacific Ocean	0.007*** (0.001)	-0.011 (0.013)	-0.146** (0.164)	-2.758*** (0.204)
Individual Controls	Yes	Yes	Yes	Yes
Health Conditions	Yes	Yes	Yes	Yes
PCC FE	Yes	Yes	Yes	Yes
N. obs	1,042,246	108,016	108,016	108,016

Notes: The table shows the effects of Immigrant Status (Panel A) and the patients' regions of origin (Panel B) on different outcomes related to the MSK subsample. Income categories: High: >100.000 (reference category); medium: (99.999 - 18.000); low: < 18.000. The method of estimation is Linear Probability Model or Negative Binomial, depending on the outcome variable. Columns 3-4 present marginal coefficients from negative binomial regressions. Robust standard errors clustered at the PCC level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.1
Co-payment scheme in the Spanish NHS.

Groups	Active	Retired	
<€18,000	40%	10%	Monthly cap €8.23
€18,000 ≤ income < €100,000	50%	10%	Monthly cap €18.52
income ≥ €100,000	60%	60%	Monthly cap €61.75
Reduced contribution ATC medications	10%		Monthly cap €4.24
"Mutualistas" (public employees)	30%		

Notes: The contribution levels for the payment of medicines in the NHS are established according to three criteria: income, age and degree of illness. There are three income-based contribution brackets (from 0% to 60%) and, in the case of pensioners, maximum contribution limits per month are established according to income. Patients with serious illnesses and chronic patients have a reduced contribution of 10% on these medicines and medical products, with a maximum contribution limit updated to the consumer price index. More information on the co-payments scheme is available [here](#).

disparities. This is particularly noteworthy when compared to countries like the United States and Canada, where the opioid crisis has reached alarming proportions, often attributed to the predominance of private healthcare schemes and the liberalization of commercial opioid drugs (Ayoo et al., 2020; Sivolap, 2024).

Policy implications of our findings extend beyond opioid prescriptions and speak to broader issues of healthcare equity in the context of increasing immigration in Europe. Maintaining and strengthening the public healthcare system remains crucial for promoting equitable access to essential medications. Given the higher prevalence of MSK conditions among immigrants, policymakers should focus on improving workplace safety standards and ergonomics, particularly in sectors with high immigrant employment. This aligns with the need to address the "healthy immigrant effect" and the declining health over time in migrant populations due to demanding work and poor living conditions, as mentioned in our introduction. Developing culturally sensitive health education programs could raise awareness about MSK conditions, pain management, and the appropriate use of opioids among immigrant communities. This is particularly important given the potential age and gender differences in healthcare utilization and risk factors for opioid misuse among immigrant populations. While our findings show relatively equitable access, maintaining vigilant monitoring and regulation of opioid prescribing practices remains crucial to prevent misuse and dependence, particularly in light of the ongoing debates about appropriate pain management in Europe.

Along with its strengths, this study has some intrinsic limitations. In particular, our data does not permit us to control for specific characteristics of general practitioners (GPs), which could potentially influence opioid prescription behaviors. This lack of information may be challenging, as potential variations in GPs' opioid prescribing practices, influenced by their unique characteristics, might also contribute to opioid usage patterns. However, it is plausible to hypothesize that the influence of these factors could be mitigated by the implementation of strict guidelines. We recommend further research to explore the underlying factors contributing to the observed patterns in opioid prescription rates and to assess the long-term impact of healthcare policies on immigrant health outcomes in Spain and beyond.

Future research should explore whether the equitable access to opioid prescriptions observed in this study extends to other types of pain management therapies and whether it translates to equally effective pain control outcomes across different ethnic groups. Additionally, comparative studies across different European healthcare systems could provide valuable insights into the specific aspects of Spain's approach that contribute to its success in maintaining equity in this domain. Such research could further our understanding of how to effectively address healthcare disparities in the European context, where the nature and scale of opioid-related concerns differ significantly from the US experience. This work would contribute to developing appropriately sensitive opioid management and treatment strategies, taking into account the unique challenges faced by migrant populations in European healthcare systems.

Declaration of competing interest

The authors declare no competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data availability

The data that has been used is confidential.

Appendix

See [Tables A.1–A.3](#).

Table A.2
Descriptive statistics- Samples of undiagnosed individuals in 2017.

	No MSK diagn.		No Cancer diagn.	
	Natives	Immigrant	Natives	Immigrant
Women	47.47%	49.61%	49.86%	52.06%
Employed	63.30%	47.12%	63.75%	50.87%
% of ind. treated with opioid medication in 2018	6.87%	5.41%	9.81%	8.48%
Age groups				
18–24 years	13.68	12.30	12.28	10.76
25–34 years	21.86	24.80	19.42	21.69
35–44 years	27.54	33.20	26.27	32.70
45–54 years	25.23	22.43	27.50	25.59
55–60 years	11.69	7.27	14.53	9.26
Income groups				
High Income	1.08	0.53	0.86	0.41
Medium Income	30.08	7.79	29.50	8.03
Low Income	63.22	81.11	63.92	81.81
Very low income	4.56	7.07	5.00	7.21
Unknown income	1.05	3.49	0.72	2.54
Average number of health problems				
General and Unspecific Problems	0.132	0.097	0.292	0.232
Blood, Hematopoietic Organs, and Immune System	0.016	0.013	0.042	0.038
Digestive System	0.108	0.098	0.316	0.304
Eye and Adnexa	0.047	0.046	0.147	0.162
Auditory System	0.027	0.019	0.089	0.067
Circulatory System	0.056	0.044	0.179	0.156
Locomotor System	0.174	0.159	0.755	0.665
Nervous System	0.044	0.044	0.143	0.153
Psychological Problems	0.084	0.054	0.281	0.197
Respiratory System	0.118	0.089	0.324	0.266
Skin and Appendages	0.165	0.126	0.391	0.350
Endocrine System, Metabolism, and Nutrition	0.085	0.066	0.252	0.217
Urinary System	0.023	0.021	0.063	0.061
Family Planning, Pregnancy etc.	0.026	0.038	0.063	0.099
Genital System	0.069	0.081	0.205	0.262
Social Problems	0.006	0.012	0.021	0.036
N	844,716	197,530	1,328,655	298,821

Table A.3
Description of the diagnoses included in the analyses.

ICPC-2 Code	Description of musculoskeletal diagnoses
L01	Signs/symptoms of the neck
L02	Signs/symptoms of the back
L03	Signs/symptoms of the lumbar region
L04	Signs/symptoms of the thorax
L05	Signs/symptoms of the flanks and axillae
L07	Signs/symptoms of the jaw
L08	Signs/symptoms of the shoulder
L09	Signs/symptoms of the arm
L10	Signs/symptoms of the elbow
L11	Signs/symptoms of the wrist
L12	Signs/symptoms of the hand and fingers
L13	Signs/symptoms of the hip
L14	Signs/symptoms of the thigh and leg
L15	Signs/symptoms of the knee
L16	Signs/symptoms of the ankle
L17	Signs/symptoms of the foot and toes
L17/16	Signs/symptoms of the foot and toes not included in L16 or L17
L18	Muscular pain
L18.01	Fibromyalgia

(continued on next page)

Table A.3 (continued).

L19	Other unspecified muscular signs/symptoms
L20	Other unspecified joint signs/symptoms
L26	Fear of cancer of the musculoskeletal system
L27	Fear of other diseases of the musculoskeletal system
L28	Impairment/disability of the musculoskeletal system
L29	Other signs/symptoms of the musculoskeletal system
L70	Infections of the musculoskeletal system
L71	Malignant neoplasms of the musculoskeletal system
L72	Fracture of ulna/radius
L73	Fracture of tibia/fibula
L74	Fracture of carpus/tarsus and bones of the hand/foot
L74.01	Fracture of carpus and bones of the hand
L74.02	Fracture of tarsus and bones of the foot
L75	Fracture of femur
L76	Other fractures
L77	Sprains and strains of the ankle
L78	Sprains and strains of the knee
L79	Unspecified sprains and strains
L80	Dislocation and subluxation
L80/79	Dislocation/subluxation/sprain/strain not included in L79 or L80
L81	Other unspecified musculoskeletal injuries
L82	Congenital anomalies of the musculoskeletal system
L82.01	Congenital dislocation of the hip
L83	Neck syndromes
L84	Lumbar/thoracic syndromes without pain radiation
L85	Acquired deformities of the spine
L86	Lumbar/thoracic syndromes with pain radiation
L86/84/83	Spinal syndromes not included in L83, L84, L86, or L86/84
L87	Unspecified bursitis/tendinitis/synovitis
L88	Rheumatoid arthritis
L88.01	Ankylosing spondylitis
L89	Hip arthrosis
L90	Knee arthrosis
L91	Other arthrosis
L92	Shoulder syndromes
L93	Tennis elbow
L94	Osteochondrosis
L95	Osteoporosis
L96	Acute internal knee injury
L97	Benign/unspecified neoplasms of the musculoskeletal system
L98	Acquired deformities of limbs
L99	Other musculoskeletal disorders
ICPC-2 Code	Description of cancer diagnoses
A79	Malignant cancer/neoplasm unspecified
B74	Other malignant hematological neoplasms
B75	Benign/unspecified hematological neoplasms
D74	Malignant neoplasms of the stomach
D75	Malignant neoplasms of the colon/rectum
D76	Malignant neoplasms of the pancreas
D77	Other unspecified malignant neoplasms of the digestive system
D78	Benign/unspecified neoplasms of the digestive system
F74	Neoplasms of eyes/adnexa
H75	Neoplasms of the auditory system
K72	Cardiovascular neoplasms
L71	Malignant neoplasms of the musculoskeletal system
L97	Benign/unspecified neoplasms of the musculoskeletal system
N74	Malignant neoplasms of the nervous system
N75	Benign neoplasms of the nervous system
N76	Unspecified neoplasms of the nervous system
R84	Malignant neoplasms of the trachea/bronchi/lung
R85	Other malignant neoplasms of the respiratory system
R86	Benign neoplasms of the respiratory system
R92	Unspecified neoplasms of the respiratory system
S77	Malignant neoplasms of the skin
S79	Benign/unspecified neoplasms of the skin
T71	Malignant neoplasms of the thyroid
T72	Benign neoplasms of the thyroid

(continued on next page)

Table A.3 (continued).

T73	Other endocrine/unspecified neoplasms
U75	Malignant neoplasms of the kidney
U76	Malignant neoplasms of the urinary bladder
U77	Other malignant neoplasms of the urinary system
U78	Benign neoplasms of the urinary system
U79	Unspecified neoplasms of the urinary system
YX79	Benign neoplasms of the breast (includes X79)

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