



Over-indebtedness and its association with pain and pain medication use

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ABSTRACT

In developed countries, millions of households are over-indebted, and the number continues to rise. Studies have found an increased risk of adverse health effects among individuals that cannot cover payment obligations with available assets persistently. However, little is known about the role of over-indebtedness in pain. This study examined the association between over-indebtedness and pain and pain medication use.

A cross-sectional study conducted among over-indebted individuals in 70 debt advisory centres in Germany (OID-survey; $n = 699$) was linked to the nationally representative German Health Interview and Examination Survey for Adults (DEGS1; $n = 7987$). Descriptive statistics and logistic regression analyses were used to examine the association between over-indebtedness and pain and pain medication use among participants with valid data on both outcome variables ($n = 7560$).

Pain was experienced by over-indebted individuals more frequently (71.3%) compared to the general population (59.6%) whereas the prevalence of pain medication use was similar in both samples (DEGS1 12.6% vs. OID-survey 13.1%). Over-indebtedness significantly increased the odds of pain (aOR 1.30; 95%-CI 1.07–1.59) after adjusting for socioeconomic, demographic and health factors. The over-indebted were significantly less likely to use pain medication compared to the general population after adjustment (aOR 0.76; 95%-CI 0.58–0.99).

Taking over-indebtedness into account as risk factor for pain and restricted pain medication use in research and clinical practice will help to advance the understanding of pain disparities, develop suitable interventions for preventive action and promote accessible pain management among those at risk.

1. Introduction

The number of over-indebted households has been increasing across high-income countries (Betti et al., 2007; Barba and Pivetti, 2008; Angel and Heitzmann, 2015; European Commission, 2010). 6.9 million individuals are estimated to be over-indebted in Germany alone, in terms of a continuous inability to cover payment obligations with available assets (Creditreform Wirtschaftsforschung, 2018).

Adverse health effects of low socioeconomic status (SES) – most commonly measured by income, education and occupation – have been well established (Adler and Ostrove, 1999; Mackenbach et al., 2008) whereas the role of over-indebtedness is still understudied (Drentea and Lavrakas, 2000; Richardson et al., 2013; Turunen and Hiilamo, 2014). However, individuals across all socioeconomic positions may be over-

indebted (Betti et al., 2007). As a source of severe economic hardship, psychological distress, social exclusion and stigmatization (Clayton et al., 2015; Sweet, 2018), over-indebtedness has been associated with an increased risk of poor health outcomes, including depression (Bridges and Disney, 2010; Alley et al., 2011; Drentea and Reynolds, 2012; Gathergood, 2012; Meltzer et al., 2013), diabetes (Blomgren et al., 2016) and obesity (Münster et al., 2009), independent of conventional SES measures. However, the only study (Ochsmann et al., 2009) that has examined the association between over-indebtedness and pain found increased odds of back pain in over-indebted individuals compared to the German general population after adjustment for socioeconomic and health-related characteristics (aOR: 10.92; 95% CI: 8.96–13.46).

Pain reflects a major global health problem, and exacts a substantial

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societal burden (Goldberg and McGee, 2011; Breivik et al., 2006). Chronic pain accounts for a large proportion of primary care consultations (Deyo et al., 2006; Friessem et al., 2009; Jank et al., 2017), and analgesics are widely used for the treatment of pain (Turunen et al., 2005; Berterame et al., 2016). There is strong evidence showing that pain is distributed unequally across population groups: Those in low socioeconomic positions were shown to have a significantly increased risk of pain (Johannes et al., 2010; Azevedo et al., 2012; Grol-Prokopczyk, 2017), and pain medication use in a few studies (Turunen et al., 2005; Chou et al., 2016). Beyond conventional SES measures, few studies have detected a significant association between ongoing financial strain (Marshall et al., 2018; Jablonska et al., 2006), economic hardship (Rios and Zautra, 2011), deprivation (Morgan et al., 2011) and economic insecurity (Chou et al., 2016) and pain outcomes after adjustment.

In line with evidence on the biopsychosocial model, neurophysiological as well as psychosocial factors influence the experience of pain (Owen et al., 2018; Miller and Kaiser, 2018). These might contribute to increased pain vulnerability, disability and poorer treatment outcomes among over-indebted individuals. Therefore, the objective of this study was to examine the association between over-indebtedness, pain and pain medication use.

2. Methods

A cross-sectional study among over-indebted individuals (OID-survey; German: ArSemü) (Münster et al., 2019) was merged with the first wave of the nationally representative German Health Interview and Examination Survey for Adults (DEGS1) (Robert Koch Institute, 2015).

Between July and October 2017, an anonymous survey was conducted among clients of 70 approved debt advisory centres in North Rhine-Westphalia in western Germany using a standardized self-administered written health questionnaire developed for this study. Eligible participants were required to have completed at least an initial consultation considered necessary to build trust. One respondent within each household, individuals aged 16 years and above, and all nationalities were considered eligible. Sufficient language, reading and writing skills were required to complete the questionnaire. Each debt advisory centre received a specific number of questionnaires and stamped addressed envelopes according to self-reported available resources for recruitment. A comprehensive information letter introduced study objectives and procedures to debt advisors that identified eligible clients and handed out the study material to clients. Of 1393 clients, 699 returned the questionnaire with complete data on sex and age (response rate: 50.2%). The ethical committee of the University Medical Faculty in Bonn, Germany, approved the survey (No. 167/17).

Data on the over-indebted population group were merged with the nationally representative data on adults aged 18 to 79 years (Supplementary file 1). Between 2008 and 2011, the national public health agency, Robert Koch Institute (RKI), conducted DEGS1 as part of the health-monitoring programme. Further details of the methodology of DEGS1 have been published elsewhere (Scheidt-Nave et al., 2012; Kamtsiuris et al., 2013). Data on 7987 individuals randomly selected from local population registries were available for public use.

So far there is a lack of a broadly accepted definition of over-indebtedness (European Commission, 2008). In Germany, approved debt advisory centres offer counselling for over-indebted private households and have a mandated role in national legal provisions on consumer insolvency proceedings. Thus, we considered eligible clients of debt advisory centres as over-indebted and DEGS1 respondents as non-over-indebted. All debt advisory centres in this study were associated with the local German Consumer Organisation or one of the member organisations of the 'Expert Committee Debt Counselling of Non-statutory Welfare NRW' (German: Fachausschuss Schuldnerberatung der Freien Wohlfahrtspflege NRW). Due to missing data on outcome variables,

1126 individuals were excluded from analyses (OID-survey: $n = 71$; DEGS1: $n = 1055$). On this basis, the merged dataset comprised 7560 individuals (OID-survey: $n = 628$; DEGS1: $n = 6932$). Exclusion of participants with missing outcome data could yield biased estimates but complete case analysis showed stable results.

Both surveys captured self-reported experiences of pain for the last four weeks: In the OID-survey, respondents rated the frequency of pain on a 4-point scale (not at all; less than once a week; once or twice a week; three or more times per week). In DEGS1, severity of pain (no pain; very mild; mild; moderate; strong; very strong) and the interference with daily activities due to pain (not at all; little; somewhat; strong; very strong) were assessed. However, data on pain among DEGS1 respondents was available for public use only in the form of a transformed variable that combined these two measures into a continuous variable ranging from 100 (absence of pain) to 0 (very strong pain and/or interference with daily activities). Available data were dichotomized into presence versus absence of any pain for subsequent analyses. In the OID-survey, those individuals reporting to have experienced pain 'not at all', and DEGS1 respondents with a transformed value of 100, i.e. no pain and interference with daily activities due to pain, were classified as reference group.

Pain medication in the last seven days was identified by the 'Anatomical Therapeutic Chemical' (ATC) code 'N02'. OID-survey respondents self-reported any medication use and underlying complaints whereas DEGS1 respondents were asked to bring all packages of pharmaceuticals they had used to the medical examination (Knopf and Grams, 2013). In the OID-survey, the ATC code was derived from the self-reported name of the medical product based on the national database of medicinal drugs, substances and drug-related information (ABDA database) offered by the German Institute of Medical Documentation and Information (DIMDI). In DEGS1, the 'Central Pharmaceutical Number' (PZN) that identifies medical products in Germany or the brand name was recorded at the study centre to identify ATC classification. Missing information was acquired by further inquiry via phone or mail (Knopf and Grams, 2013).

Based on previous research, sociodemographic variables, including sex, age, educational attainment, employment and marital status were considered as covariates in logistic regression analyses to control for potential confounding and to examine systematic differences between the two study populations. Age was classified into four age groups (18–29; 30–49; 50–64; 65–79 years) to differentiate phases of life. Educational level was classified into three categories (low, medium, high) according to the International Standard Classification of Education (ISCED) (UNESCO, 2011). The current employment status was dichotomized a priori: "Unemployment" (student; volunteer; intern; vocational training; retired; homemaker; unemployed; unable to work) and "employment" (full-time; part-time; minor employment; temporary leave). Marital status was classified into three groups: married, divorced or widowed, and single.

Individuals' health status was considered based on the assessment of ongoing chronic health conditions. In DEGS1, participants reported the presence or absence of chronic diseases only (yes; no; I don't know) whereas over-indebted individuals in the OID-survey were asked to specify chronic illnesses if applicable (no; yes, namely: ...; I don't know). Chronic illnesses reported by over-indebted individuals were verified and classified according to ICD-10-GM (German adaptation of the International Statistical Classification of Diseases and Related Health Problems). We also assumed a chronic disease when participants' self-reported medication regimen could be attributed to a chronic health condition by medical experts.

Individuals' mental health status was taken into account to control for the potential disease-specific impact of depression and anxiety disorders on pain (Tsang et al., 2008). In DEGS1, available data on psychological disorders comprised the self-reported prevalence of diagnosed depression and anxiety disorders in the previous 12-month. In the OID-survey, information on the 12-month prevalence of psychological

Table 1
Study population characteristics (n = 7560).

Variable	Full sample (n = 7560)		DEGS1 [†] (n = 6932)		OID-survey [‡] (n = 628)	
Sex (n, %)						
Male	3600	47.6	3309	47.7	291	46.3
Female	3960	52.4	3623	52.3	337	53.7
Age (n, %)						
18–29 years	1167	15.4	1059	15.3	108	17.2
30–49 years	2415	31.9	2096	30.2	319	50.8
50–64 years	2177	28.8	2015	29.1	162	25.8
65–79 years	1801	23.8	1762	25.4	39	6.2
Marital status (n, %)						
Married	4687	62.0	4503	65.0	184	29.3
Single	1800	23.8	1562	22.5	238	37.9
Divorced or widowed	1017	13.5	822	11.9	195	31.1
Missing	56	0.7	45	0.6	11	1.8
Education level (n, %)						
Low	1211	16.0	948	13.7	263	41.9
Medium	4044	53.5	3719	53.6	325	51.8
High	2276	30.1	2245	32.4	31	4.9
Missing	29	0.4	20	0.3	9	1.4
Employment status (n, %)						
Employment	4461	59.0	4133	59.6	328	52.2
Unemployment	2974	39.3	2740	39.5	234	37.3
Missing	125	1.7	59	0.9	66	10.5
Chronic illness (n, %)						
Yes	2584	34.1	2200	31.7	384	61.1
No	4594	61.2	4377	63.1	217	34.6
Missing	382	5.1	355	5.1	27	4.3
Depression/anxiety (n, %)						
Yes	533	7.1	434	6.3	99	15.8
No	6915	91.5	6433	92.8	482	76.8
Missing	112	1.5	65	0.9	47	7.5

[†] DEGS1, Germany (2008–2011).

[‡] OID-survey, Germany (2017).

disorders was categorized accordingly, i.e. presence or absence of a depression or anxiety disorder.

First, descriptive statistics were used to illustrate population characteristics and the prevalence of pain and pain medication use. Second, multiple logistic regression analyses were used to identify factors that predict pain and pain medication use. All independent variables were entered into the model simultaneously. The reference group for covariates was defined as the most frequent category, except for the reference categories of sex (male) and age (youngest age group) to simplify interpretation. Within covariates, missing values that were below a threshold of 5% were assigned to the most frequent category in the full sample. Missings above this threshold were assigned to a separate category. The level of statistical significance was set at 0.05. Analyses were carried out using IBM SPSS (version 25).

3. Results

The full sample of 7560 individuals aged 18 to 79 years, comprised females (52.4%) and males (47.6%) in nearly equal shares (Table 1). The majority of over-indebted respondents (OID-survey: 68.0%) was under 50 years of age (DEGS1: 45.5%). A smaller share of over-indebted individuals than the general population was married (OID-survey: 29.3%; DEGS1: 65.0%). Educational attainment in the over-indebted was lower than in the general population. The majority of both OID-survey (52.2%) and DEGS1 (59.6%) respondents was employed. The prevalence of chronic illness and depression and anxiety disorders was higher in the OID-survey than in DEGS1.

The prevalence of pain during the last four weeks was higher in the over-indebted sample (71.3%) than in the general population (59.6%)

Table 2
Prevalence of pain and pain medication use (n = 7560).

Variable	Full sample (n = 7560)		DEGS1 [†] (n = 6932)		OID-survey [‡] (n = 628)	
Pain ^a (n, %)						
Yes	4582	60.6	4134	59.6	448	71.3
No	2978	39.4	2798	40.4	180	28.7
Pain medication use ^b (n, %)						
Yes	956	12.6	874	12.6	82	13.1
No	6604	87.4	6058	87.4	546	86.9

[†] DEGS1, Germany (2008–2011).

[‡] OID-survey, Germany (2017).

^a Pain in the last four weeks.

^b Pain medication use in the last 7 days.

Table 3
Unadjusted and adjusted odds ratios (OR/aOR) and 95% confidence intervals (CI) of pain and pain medication use (n = 7560).^{*}

	Pain ^a		Pain medication use ^b	
	OR	95%-CI	OR	95%-CI
Over-indebtedness ^c	1.69	1.41–2.02	1.04	0.82–1.33
	Pain ^a		Pain medication use ^b	
	aOR	95%-CI	aOR	95%-CI
Over-indebtedness ^c	1.30	1.07–1.59	0.76	0.58–0.99
Pain ^a	–	–	2.46	2.08–2.92
Female ^d	1.35	1.22–1.49	1.39	1.21–1.61
Age				
18–29 years	Reference (Ref.)	Ref.	Ref.	Ref.
30–49 years	1.51	1.28–1.80	0.90	0.69–1.15
50–64 years	1.99	1.64–2.40	0.71	0.54–0.94
65–79 years	2.03	1.64–2.51	0.69	0.50–0.93
Marital status				
Married	Ref.	Ref.	Ref.	Ref.
Single	0.90	0.78–1.04	0.96	0.78–1.19
Divorced/widowed	1.09	0.93–1.28	1.03	0.84–1.27
Education level				
Low	1.12	0.97–1.30	0.99	0.81–1.20
Medium	Ref.	Ref.	Ref.	Ref.
High	0.90	0.81–1.01	0.91	0.77–1.08
Unemployment ^e	1.16	1.02–1.32	1.02	0.85–1.21
Chronic illness				
No	Ref.	Ref.	Ref.	Ref.
Yes	2.36	2.10–2.65	1.44	1.23–1.68
Missing	2.24	1.78–2.82	1.26	0.93–1.71
Depression/anxiety ^f	2.38	1.87–3.02	1.28	1.01–1.62

^{*} Full sample: DEGS1, Germany (2008–2011), OID-survey, Germany (2017).

^a Pain in the last four weeks.

^b Pain medication use in the last 7 days.

^c Not over-indebted (Ref.).

^d Male (Ref.).

^e Employment (Ref.).

^f Absence of depression/anxiety (Ref.).

(Table 2). The prevalence of pain medication use during the last four weeks was 13.1% in the OID-survey and 12.6% in DEGS1.

As shown in Table 3, crude logistic regression analysis demonstrated significantly higher odds of pain among the over-indebted (OR 1.69; 95%-CI 1.41–2.02) compared to the general population. After adjustment for sociodemographic and health factors, over-indebtedness remained significantly associated with pain. The over-indebted had 1.30 greater odds of experiences of pain (95%-CI 1.07–1.59) compared to the general population. Sociodemographic characteristics had a significant effect on the experience of pain. Women (aOR 1.35; 95%-CI 1.22–1.49) and individuals aged 30 years and above (aOR 1.51–2.03; 95%-CI

1.28–2.51 across age groups) had higher odds of experiencing pain. In the adjusted model, unemployed individuals had significantly higher odds of experiencing pain (aOR 1.16; 95%-CI 1.02–1.32). The associations between the chronic illness (aOR 2.36; 95%-CI 2.10–2.65) and psychological disorder (aOR 2.38; 95%-CI 1.87–3.02) and the presence of pain were statistically significant.

In the crude analysis, there was no statistically significant association between over-indebtedness and pain medication use (Table 3). After adjustment the over-indebted had reduced odds of pain medication use compared to the general population (aOR 0.76; 95%-CI 0.58–0.99) whereas other socioeconomic measures, i.e. educational level and unemployment were not significantly related to pain medication use.

Female sex (aOR 1.39; 95%-CI 1.21–1.61) was associated with significantly increased odds of using pain medication. Individuals aged 50 years and above had significantly lower odds of using pain medication compared to the youngest age group (aOR 0.69–0.71; 95%-CI 0.50–0.94 across age groups). Health factors that comprised pain (aOR 2.46; 95%-CI 2.08–2.92), chronic illness (aOR 1.44; 95%-CI 1.23–1.68) and depression and anxiety (aOR 1.28; 95%-CI 1.01–1.62) were positively associated with pain medication use.

4. Discussion

The present study revealed significantly increased odds of pain (aOR 1.30; 95%-CI 1.07–1.59) for over-indebted individuals compared to the general population. Nevertheless, the over-indebted were less likely to use pain medication for symptom relief (aOR 0.76; 95%-CI 0.58–0.99). A key finding was that the association between over-indebtedness, pain and pain medication was significant after adjustment for conventional socioeconomic measures, i.e. educational attainment and unemployment, physical and mental health status and sociodemographic characteristics.

In view of the millions of individuals that are continuously unable to repay their debts with available assets, the findings of this study suggest that pain among the over-indebted is an important public health issue (Betti et al., 2007; Angel and Heitzmann, 2015; European Commission, 2008). Until today, insights into determinants of pain disparities, best practices for pain treatment and effective interventions to address disparities in pain management are limited (Goldberg and McGee, 2011; Campbell et al., 2012). This study adds to the small but growing literature that indicates a significant association between measures of financial stress and pain, and in part, frequent use of analgesics independent of the well-established association with SES (Johannes et al., 2010; Azevedo et al., 2012; Grol-Prokopczyk, 2017; Chou et al., 2016). Recently, a significant association between ongoing financial strain and difficulty paying bills, and severe pain was shown in a representative US sample of older men (Marshall et al., 2018). Based on daily assessments for 30 days a study among women with chronic pain found a significant association between both day-to-day financial worry and economic hardship and daily pain severity even after adjustment for sociodemographic factors and personality (Rios and Zautra, 2011). A single cross-sectional study (Ochsmann et al., 2009) found that over-indebted individuals were eleven times more likely to suffer from back pain compared to the general population (aOR 10.92; 95%-CI 8.96–13.46) independent of other socioeconomic and health factors.

The available literature suggests that even minor or short-term financial strain can adversely affect pain in different ways. The experience of pain depends on both nociception which reflects stimulation of nerves due to potential tissue damage and the subjective perception of pain that relates to affective and behavioural responses to pain (Gatchel et al., 2007). Thus, biopsychosocial mechanisms may explain the association between over-indebtedness and pain outcomes. These can be linked to the increased risk of diseases found in this population group (Richardson et al., 2013; Turunen and Hiilamo, 2014) as well as the subjective experience of pain, beliefs about pain, suffering and coping

(Gatchel et al., 2007). More specifically, over-indebted individuals might be more vulnerable to experience pain due to comorbid disorders. Moreover, the over-indebted possibly perceive pain sensations as more intense and less controllable than those who are not over-indebted when facing ongoing debt-related stress and negative feelings such as lack of control, shame or hopelessness (Turunen and Hiilamo, 2014; Wang, 2010; Meltzer et al., 2011). Beliefs about self-efficacy or effectiveness of pain management might prevent pain rehabilitation and reflect perpetuating factors (Gatchel et al., 2007).

A larger share of the over-indebted than the general population in this study had a low SES which may reflect increased physical demands at the workplace that have been associated with pain outcomes (Courvoisier et al., 2011). Educational attainment, however, was not associated with experiences of pain whereas a significant association between unemployment and pain was shown. In this context, the independent association between over-indebtedness and pain suggests that this concept goes beyond previously considered socioeconomic indicators (Braveman et al., 2005; Fliesser et al., 2017).

Research on socioeconomic disparities in pain management, specifically in the presence of persistent financial stress is relatively sparse. Some studies have identified a positive association between unemployment (Chou et al., 2016), low educational level (Turunen et al., 2005), and analgesics use. These findings have been related to potentially greater exposure to pain, and consequently higher familiarity with pain medication use among those in lower socioeconomic positions (Chou et al., 2016; Hong et al., 2016). However, other studies have suggested that analgesics are more affordable and accessible for those with higher SES: In a representative sample of the German population low SES has been associated with significantly more prescribed analgesics use but not over-the-counter (OTC) analgesics use (Sarganas et al., 2015). Based on the 2009 European Health Interview Survey for Spain, higher educational attainment and monthly income was associated with increased odds of analgesic self-medication (Carrasco-Garrido et al., 2014). There are a few studies that have found general medication non-adherence related to different types of debt (Alley et al., 2011; Kalousova and Burgard, 2014).

In contrast to these findings, none of the conventional socioeconomic measures considered in the present study, i.e. educational attainment and unemployment, showed a consistent significant association with pain medication use. However, over-indebtedness was significantly associated with reduced odds of pain medication use (aOR 0.76; 95%-CI 0.58–0.99). Persistent unmanageable debt may adversely affect affordability of both prescription and OTC medication that require (co-)payments in Germany (Turunen and Hiilamo, 2014; Israel, 2016). In Germany, copayments range from EUR5 to EUR10 for each prescribed medication for adults covered by statutory health insurance, and any cost related to OTC medications according to the Social Security Code (SGB, Book V). Thus, over-indebted individuals may be less likely to use analgesics than the general population when experiencing pain due to costs of medications. National legal regulations on debt and co-payments for medications differ which may contribute to inconsistent findings across countries. However, when recognizing access to pain management as a fundamental human right as proposed by the United Nations and other international organisations (Cousins and Lynch, 2011; Brennan et al., 2016), the latter finding highlights the urgent need for intervention among those at risk.

4.1. Limitations

Although assumptions are strong that over-indebtedness precedes pain and medication use rather than vice versa, the direction of the observed associations cannot be established due to the cross-sectional study design. Due to the lack of information on debts in DEGS1, possible misclassification of respondents as 'non-over-indebted' could have attenuated the observed effect sizes. We statistically controlled for key sociodemographic characteristics to account for potential differences

between the OID and DEGS1 samples. However, due to a lack of data, we did not consider additional covariates such as participants' ethnic origin which might induce unmeasured confounding.

The prevalence of pain during the last four weeks in the general population was higher in the present study than previous estimates across populations in developed countries because these have mainly quantified chronic pain persisting for at least three to six months (Tsang et al., 2008; Andrews et al., 2018). Due to the subjective experience of pain, the more detailed pain assessment in DEGS1 may lead to bias toward the null for over-indebtedness. However, the assessment period was equivalent, and comparability of the indicators of pain enhanced by dichotomizing the experience of pain a priori. Therefore, differences in pain indicators between the OID-survey and DEGS1 might introduce a minor bias.

Information on medication intake in the OID-survey exclusively relied on self-reported data whereas records of medicines in DEGS1 were based on a more comprehensive documentation of pharmaceutical products at study centres (Knopf and Grams, 2013). When assuming that underreporting of analgesics use possibly played a more important role in the over-indebted sample, the negative association between over-indebtedness and pain medication use might be attenuated. However, due to the major impact of chronic pain on patients' life (Dueñas et al., 2016), it is likely that over-indebted respondents have reported recent analgesics use when applicable.

5. Conclusions

The present study is the first to demonstrate that the over-indebted population group is at increased risk of suffering from pain but less likely to use pain medication compared to the general population. The results contribute to the mounting evidence on pain disparities in disadvantaged groups. These disparities need to be tackled in order to avert escalating societal costs of pain, to minimize unrelieved pain and pain-related disability among risk groups. It might help to increase awareness of over-indebtedness as a potential risk factor for pain and undertreatment of pain to overcome barriers to recognition, effective treatment and management of pain among stakeholders in the field of clinical practice, social policy and research. The findings suggest that interdisciplinary interventions, which comprise physical, psychosocial and pharmacological approaches, may be useful to address pain disparities and to promote access to pain management for all.

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Declaration of competing interest

None.

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