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Demographic variation in pain across 22 countries

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Abstract

Background Recent work has explored the sociocultural aspects of pain. However, global evidence is scarce, and little is known about how levels of pain differ across cultures and across demographic groups within those different cultures.

Methods Using a nationally representative dataset of 202,898 individuals from 22 countries and a random effects meta-analysis, we examine the proportion of people in pain across key demographic groups (age, gender, marital status, employment status, education, immigration status, religious service attendance, race/ethnicity) and across countries.

Results We find substantial variation in pain across countries and demographic groups. Unadjusted proportions tests show that Egypt (0.60), Brazil (0.59), Australia (0.56), and Turkey (0.53) have the greatest proportion of people in pain whereas Israel (0.25), South Africa (0.29), Poland (0.32), and Japan (0.33) have the lowest proportion. The random effects meta-analysis shows that, across countries, the proportion of people in pain is highest in older age groups, among women and other gender groups, the widowed, those who were retired, those who had low level of education, and those who attended a religious service more than once a week. The analysis shows no difference in the proportion of people in pain regarding immigration status.

Conclusions Pain varies substantially across countries and key demographic groups. This work provides valuable foundational insights for future research on the sociocultural factors of pain.

Plain language summary

Understanding how the proportion of people in pain varies across key demographic groups and across countries is of high importance. Here, we used rigorous statistical techniques to uncover how pain varies across demographic groups and across 22 countries from all over the world. We found that the proportion of people in pain is highest in older age groups, among women and other gender groups, the widowed, those who were retired, those who had low level of education, and those who attended a religious service more than once a week. Substantial country-specific variation was also found. These findings may serve as a starting point for future research on other social aspects of pain.

The International Association for the Study of Pain (IASP) defines pain as 'an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage'[1]. Pain is one of the most typical human feelings and it has shown a rising trend all over the world in the last decade[2]. In particular, 27.8% of people experienced some kind of pain in the United States in 2021[3] while 30% of medical consultations in the United Kingdom are related to musculoskeletal pain[4]. Pain prevalence is also high in other regions like Saharan Africa, the Arab countries, and Southern Asia[5]. Pain is a global problem.

Prior work has shown that pain also varies across demographic groups. For instance, using data from the United States, Case and Deaton[6] have shown that white non-Hispanics aged 45–54 reported greater pain than other race and age groups. In a related study that also used US data, the same authors found that people with a bachelor degree reported lower pain than those who had not graduated from college[7]. Using data from older adults in the United States, Janevic and colleagues[8] found that pain intensity was highest among individuals in the lowest wealth quartile while Kennedy et al.[9] showed that pain was greater among women and people between 60 and 69 years of age [10]. These patterns were also found in developed European nations. For instance, Zimmer et al.[11] examined a sample of people over the age of 50 in 15 European countries and found that pain prevalence was highest among women and the elderly. Using data from 19 European countries, Todd et al.[12] showed that pain prevalence was lower in Central and Eastern European countries like Hungary and Lithuania and greater in Western European countries like Germany and Finland. The authors also found general

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socioeconomic disparities in pain: women (vs men) and people with lower education (vs higher) reported greater pain. Religious attendance has also been found to be linked to pain: A longitudinal cohort study of Norwegian individuals has shown that individuals with a headache were more frequent religious attendees than those without a headache[13].

Although pain prevalence across demographic groups has been previously explored, most existing evidence relied on data from the United States and developed European nations. Two exceptions used cross-national data from the Gallup World Poll (GWP) and showed differences in pain across continents and demographic groups. One study used data from 146 countries from the GWP and examined time trends in pain and how these time trends differed across demographic factors[2]. A follow-up study explored pain prevalence across continents and demographic groups during the COVID-19 pandemic[5]. In line with the evidence discussed earlier, these studies concluded that women (vs men), people with lower education and lower income levels (vs higher), the elderly (vs the younger and those in mid-life), the unemployed (vs the employed), and widowed and separated (vs single) individuals reported greater pain the day before. Other investigations on pain using the GWP but exploring different research questions include Case and Deaton[7], Macchia and Oswald[14], Macchia[15], and Tang et al.[16]. Another exception is the study by Zimmer et al.[17] that examined data from 52 countries and documented that pain was greater among women (vs men), older people (vs younger), and those living in rural areas (vs urban areas). The study also found that five country-level factors, namely region, population density, life expectancy, gender inequality, and income inequality, explained the cross-country variations of pain.

Although these studies used large and diverse datasets, they did not present cross-country distributions or cross-country meta-analyses and only examined a limited number of demographic factors leaving out other key aspects like religious service attendance, immigration status, and race/ethnicity. This body of work demonstrates that the literature on pain needs evidence on the foundational aspects of pain.

Here, we address this need by using a diverse dataset of 202,898 individuals from 22 countries to explore how levels of pain vary across cultures and several demographic groups within those different cultures. The present study examines three hypotheses. Hypothesis 1 suggests that the distributions and descriptive statistics of key demographic features (age, gender, marital status, employment, religious service attendance, education, immigration status, race/ethnicity) will reveal diverse patterns across our international sample from 22 countries. This hypothesis suggests that the distribution of pain across each demographic feature will vary across the 22 countries. Hypothesis 2 suggests that the proportion of people in pain will vary meaningfully across different countries. Hypothesis 3 proposes that pain will exhibit variations across different demographic categories such as age, gender, marital status, employment, education, and immigration status. These differences across demographic categories will themselves vary by country.

Overall, we find substantial variation in pain across countries and demographic groups. Specifically, across countries, the proportion of people in pain is highest in older age groups, among women and other gender groups, the widowed, those who are retired, those who have low level of education, and those who attend a religious service more than once a week. These findings offer insights into country-specific and demographic variations in pain and lays a valuable foundation for future research on the sociocultural factors that might shape pain.

Methods

The description of the methods below has been adapted from VanderWeele et al.[18]. Further methodological detail is available elsewhere[19–25].

Data

The Global Flourishing Study (GFS) is a study of 202,898 participants from 22 geographically and culturally diverse countries, with nationally representative sampling within each country, concerning the distribution of determinants of wellbeing. Wave 1 of the data included the following countries and territories: Argentina, Australia, Brazil, Egypt, Germany, Hong Kong, India, Indonesia, Israel, Japan, Kenya, Mexico, Nigeria, the Philippines, Poland, South Africa, Spain, Sweden, Tanzania, Turkey, the United Kingdom, and the United States. The countries were selected to (a) maximize coverage of the world's population, (b) ensure geographic, cultural, and religious diversity, and (c) prioritize feasibility and existing data collection infrastructure. Data collection was carried out by Gallup Inc. Data for Wave 1 were collected principally during 2023, with some countries beginning data collection in 2022 and exact dates varying by country[23]. Four additional waves of panel data on the participants will be collected annually from 2024-2027. The precise sampling design to ensure nationally representative samples varied by country and further details are available in Ritter et al.[23].

Survey items included aspects of wellbeing such as happiness, health, meaning, character, relationships, and financial stability[26], along with other demographic, social, economic, political, religious, personality, childhood, community, health, and wellbeing variables. The data are publicly available through the Center for Open Science (COS, https://www.cos.io/gfs). During the translation process, Gallup adhered to the TRAPD model (translation, review, adjudication, pretesting, and documentation) for cross-cultural survey research (ccsg.isr.umich.edu/chapters/translation/overview). Additional details about methodology and survey development can be found in the GFS Questionnaire Development Report[19], and the GFS Methodology[23], GFS Codebook, and GFS Translations documents[20].

This project was ruled EXEMPT for Institutional Review Board (IRB) review by the Baylor University IRB (#1841317-2). Gallup Inc. IRB approved the study on November 16, 2021 (#2021-11-02). All data collection was performed in accordance with the ethical standards of Gallup and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained during the respondent recruitment stage of fieldwork. Consent was also obtained at the start of the survey. The exact wording varies across countries depending on the local laws and regulations governing data protection. All personally identifiable information (PII) was removed from the data used in this study by Gallup Inc.

Measures

Demographics variables. Continuous age was classified as 18–24, 25–29, 30–39, 40–49, 50–59, 60–69, 70–79, and 80 or older. Gender was assessed as male, female, or other. Marital status was assessed as single/never married, married, separated, divorced, widowed, and domestic partner. Employment was assessed as employed, self-employed, retired, student, homemaker, unemployed and searching, and other. Education was assessed as up to 8 years, 9–15 years, and 16+ years. Religious service attendance was assessed as more than once/week, once/week, one-to-three times/month, a few times/year, or never. Immigration status was dichotomously assessed with: "Were you born in this country, or not?" Religious tradition/affiliation with categories of Christianity, Islam, Hinduism, Buddhism, Judaism, Sikhism, Baha'i, Jainism, Shinto, Taoism, Confucianism, Primal/Animist/Folk religion, Spiritism, African-Derived, some other religion, or no religion/atheist/agnostic; precise response categories varied by country[27]. Racial/ethnic identity was assessed in some, but not all, countries, with response categories varying by country. For additional details on the assessments see the GFS codebook (https://www.cos.io/gfs) or Crabtree et al.[19].

Outcome variable. Our pain measure comes from the following question: 'How much bodily pain have you had during the past 4 weeks?' Respondents could answer a lot, some, not very much, or none at all. To test the hypotheses about the proportion of people in pain, in our main analyses this variable was dichotomized as A lot/some (1) vs. not very much/none at all (0). We also conducted post-hoc sensitivity analysis with alternative dichotomization points including A lot (1) vs some/not very much/none at all (0) and A lot/some/not very much (1) vs none at all (0).

Sampling and data collection

In most countries, a probability-based face-to-face or telephone methodology to recruit participants was implemented. To ensure representativeness of the population, we used different selection methods. For face-to-face interviews, the selection of probability-based samples was performed by selecting sampling units stratified by population size, urbanicity and/or geography, and clustering. For telephone interviews, the selection of participants was performed using random digit dialling or a nationally representative list of phone numbers. These various methods reduced the risk of excluding specific groups of the population, for example, those who did not have access to the internet. As part of the recruitment, participants first completed a survey about basic demographics and information for recontact. Then, participants received invitations to take part in the annual survey via phone or online. Eligibility for participation in the study required the selected participants to have access to a phone or the internet, a practical necessity to help retention. As a small token of appreciation for their time, eligible participants who completed the annual survey received a gift card or mobile top-up worth roughly $5.

To recruit participants, three sampling frames were used: a probability-based sample, a non-probability-based sample, or a combination of both[23]. A probability-based sampling approach was used in Egypt, India, Indonesia, Israel, Kenya, Nigeria, Philippines, South Africa, Tanzania, Turkey, and the United States. To complement probability samples to obtain adequate coverage of population subgroups (i.e. sex, age, region), a non-probability-based sampling design was implemented in some countries. More details of the recruitment process, data collection stages, and sampling can be found in Padgett et al.[25].

Statistics and reproducibility

Descriptive statistics for the full sample, weighted to be nationally representative within each country, were estimated for each of the demographic variables. Nationally representative proportions of people in pain were estimated separately for each country and ordered from highest to lowest along with 95% confidence intervals and standard deviations. Variation in proportions of people in pain across demographic categories were estimated, with all analyses initially conducted by country. Primary results consisted of random effects meta-analyses of country-specific proportions of people in pain in each specific demographic category[28,29] along with 95% confidence intervals, standard errors, upper and lower limits of a 95% prediction interval across countries, heterogeneity (τ), and I2 for evidence concerning variation within a particular demographic variable across countries[30]. Meta-analyses were chosen because they are a rigorous and widely accepted method for synthesizing findings from multiple contexts. Forest plots of estimates are available in the Supplementary Information (SI). All meta-analyses were conducted in R[31] using the metafor package[32]. Within each country, a global test of variation of outcome across levels of each particular demographic variable was conducted, and a pooled p-value[33] (Global p-value) across countries reported concerning evidence for variation within any country. Bonferroni corrected p-value thresholds are provided based on the number of demographic variables[34,35]. Religious affiliation/tradition and race/ethnicity were used, when available, in the country-specific analyses, but were not included in the meta-analyses since the availability of these response categories varied by country. As a supplementary analysis, population-weighted meta-analyses were also conducted. All analyses were preregistered with COS prior to data access (https://osf.io/ewyr5/?view_only=1fceb9e7dac440a88ad1d5764a6ea6bd, see also Supplementary Note 1 in the Supplementary Information); all code to reproduce analyses are openly available in an online repository[22].

Missing data. Missing data on all variables was imputed using multivariate imputation by chained equations, and five imputed datasets were used[36–39]. To account for variation in the assessment of certain variables across countries (e.g., religious affiliation/tradition and race/ethnicity), the imputation process was conducted separately in each country. This within-country imputation approach ensured that the imputation models accurately reflected country-specific contexts and assessment methods. Sampling weights were included in the imputation model to account for missingness to be related to probability of inclusion. We performed all analyses described above using each of the five imputed datasets and combined the results across the imputations via Rubin's rule[40].

Accounting for complex sampling design. The GFS used different sampling schemes across countries based on availability of existing panels and recruitment needs[23]. All analyses accounted for the complex survey design components by including weights, primary sampling units, and strata. Additional methodological detail, including accounting for the complex sampling design is provided elsewhere[41].

Reporting summary

Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Results

Descriptive statistics

Table 1 shows the number and percentage of people across each demographic group in the observed sample: Most individuals were middle age (30–39 years old (20%), 40–49 years old (17%), 50–59 (16%)), most of the sample was composed of men and women (women (51%), men (49%)), most people were married (53%), employed for an employer (39%), and with 9 to 15 years of education (57%). Religious attendance was varied (never (37%), a few times a year (20%), once a week (19%)), and most people were born in the country in which the survey was conducted (94%). Table 1 also shows the number and percentage of people within each country: The countries with the greatest number of individuals were the United States (19%) and Japan (10%) whereas the countries with the lowest number of individuals were Turkey (0.7%) and South Africa (1.3%). Tables S1–S22 in the Supplementary Information show variation of the number and percentage of people in each demographic group in each of the 22 countries. These results confirm Hypothesis 1: The distributions of key demographic groups reveal diverse patterns across our international sample from 22 countries. This finding is itself relevant for interpreting country proportions.

Proportion of people in pain in each country. Getting into the outcome of interest of this study, Table 2 orders the countries based on the proportion of people in pain. As a reminder, our pain measure was dichotomized as A lot/some (1) vs. not very much/none at all (0). The countries with the greatest proportion of people in pain were Egypt (0.60), Brazil (0.59), Australia (0.56), and Turkey (0.53) whereas the countries with the lowest proportion of people in pain were Israel (0.25), South Africa (0.29), Poland (0.32), and Japan (0.33). In this case, standard deviations show the level of dispersion or inequality in pain across individuals in each specific country. The overall mean of the proportion of people in pain across the 22 countries is 0.44 (95%CI 0.40–0.48). We conducted post-hoc sensitivity analysis using different dichotomization points: a) A lot/some/not very much (1) vs none at all (0) and b) A lot (1) vs some/not very much/none at all (0). In both cases, the results are, in general, in line with the ones presented in the main analyses. One notable difference is that when combining the three categories that denote some pain into the same category ('none at all' coded as 0 and all the other categories coded as 1), Philippines moves to the top of the ranking together with Australia. The other notable difference is that when focusing on severe pain ('a lot' coded as 1 and all the other categories coded as 0), India moves to the top of the ranking together with Egypt, Turkey, and Brazil. All the other countries remain in the same quantile as in the original analyses. These results confirm Hypothesis 2: The proportion of people in pain vary meaningfully across different countries.

Table 1 | Nationally representative descriptive statistics of the observed sample

Characteristic	N = 202,898[1]	Characteristic	N = 202,898[1]
Age group		Education	
18–24	27,007 (13%)	up to 8 years	45,078 (22%)
25–29	20,700 (10%)	9–15 years	115,097 (57%)
30–39	40,256 (20%)	16+years	42,578 (21%)
40–49	34,464 (17%)	Missing	146 (<0.1%)
50–59	31,793 (16%)	Immigration	
60–69	27,763 (14%)	Born in this country	190,998 (94%)
70–79	16,776 (8.3%)	Born in another country	9791 (4.8%)
80 or older	4119 (2.0%)	Missing	2110 (1.0%)
Missing	20 (<0.1%)	Country	
Gender		Argentina	6724 (3.3%)
Male	98,411 (49%)	Australia	3844 (1.9%)
Female	103,488 (51%)	Brazil	13,204 (6.5%)
Other	602 (0.3%)	Egypt	4729 (2.3%)
Missing	397 (0.2%)	Germany	9506 (4.7%)
Marital status		India	12,765 (6.3%)
Married	107,354 (53%)	Indonesia	6992 (3.4%)
Separated	5195 (2.6%)	Israel	3669 (1.8%)
Divorced	11,654 (5.7%)	Japan	20,543 (10%)
Widowed	9823 (4.8%)	Kenya	11,389 (5.6%)
Never	52,115 (26%)	Mexico	5776 (2.8%)
Domestic Partner	14,931 (7.4%)	Nigeria	6827 (3.4%)
Missing	1,826 (0.9%)	Philippines	5292 (2.6%)
Employment		Poland	10,389 (5.1%)
Employed for an employer	78,815 (39%)	South Africa	2651 (1.3%)
Self-employed	36,362 (18%)	Spain	6290 (3.1%)
Retired	29,303 (14%)	Tanzania	9075 (4.5%)
Student	10,726 (5.3%)	Turkey	1473 (0.7%)
Homemaker	21,677 (11%)	United Kingdom	5368 (2.6%)
Unemployed and looking for a job	16,790 (8.3%)	United States	38,312 (19%)
None of these/other	8431 (4.2%)	Sweden	15,068 (7.4%)
Missing	793 (0.4%)	Hong Kong	3012 (1.5%)
Religious service attendance			
>1/week	26,537 (13%)		
1/week	39,157 (19%)		
1-3/month	19,749 (9.7%)		
A few times a year	41,436 (20%)		
Never	75,297 (37%)		
Missing	722 (0.4%)		
Education			
up to 8 years	45,078 (22%)		
9–15 years	115,097 (57%)		
16+years	42,578 (21%)		
Missing	146 (<0.1%)		

[1]n (%).

Table 2 | Ordered proportions of people in pain with standard deviations

Country	Proportion	95% CI	Standard deviation
Egypt	0.60	(0.58, 0.62)	0.49
Brazil	0.59	(0.58, 0.60)	0.49
Australia	0.56	(0.54, 0.58)	0.50
Turkey	0.53	(0.49, 0.56)	0.50
United Kingdom	0.53	(0.51, 0.55)	0.50
Tanzania	0.52	(0.50, 0.54)	0.50
United States	0.51	(0.50, 0.52)	0.50
India	0.50	(0.49, 0.52)	0.50
Spain	0.47	(0.45, 0.49)	0.50
Hong Kong	0.45	(0.43, 0.48)	0.50
Kenya	0.45	(0.43, 0.46)	0.50
Argentina	0.44	(0.42, 0.46)	0.50
Philippines	0.43	(0.41, 0.45)	0.50
Germany	0.41	(0.40, 0.42)	0.49
Sweden	0.40	(0.39, 0.41)	0.49
Nigeria	0.39	(0.37, 0.41)	0.49
Mexico	0.38	(0.36, 0.39)	0.48
Indonesia	0.34	(0.33, 0.36)	0.48
Japan	0.33	(0.32, 0.34)	0.47
Poland	0.32	(0.30, 0.35)	0.47
South Africa	0.29	(0.26, 0.31)	0.45
Israel	0.25	(0.22, 0.27)	0.43

Meta-analytic proportions across countries. Table 3 shows the meta-analytic proportions for each demographic group across the 22 countries. This analysis shows that, across countries, the proportion of people in pain is highest in older age groups, among women and other gender groups, the widowed, those who were retired, who had low level of education, and those who attended a religious service more than once a week. This analysis also shows that the proportion of people in pain is the same among people who were born in the country in which the survey was conducted and those who were born in another country.

The 'tau' estimate measures how much the proportion of people in pain within a demographic category varies across countries. For instance, the gender category 'Other' (0.76) and the age category '80 or older' (0.35) have higher 'tau' estimates than other categories. This indicates that the proportion of individuals in these categories varies more substantially across countries compared to the categories with smaller 'tau' estimates. The global *p*-value is highly significant in each demographic group indicating that the proportion of people in pain in a given demographic group differs statistically across countries. More details about the technical aspects of the global *p*-value can be found in Padgett et al.[41].

Building on the heterogeneity estimate 'tau' shown in Table 3, Tables S23–S44 in the Supplementary Information allow us to examine the actual variation in the proportion of people in pain for each demographic group in each country *separately*. For instance, we found that the proportion of women (vs men) in pain is greater in all countries except for Hong Kong and Nigeria. These analyses also show that the proportion of people in pain is greater among the elderly in most countries except for Australia, Brazil, Egypt, and the United States which show high proportions of people in pain in middle-age groups and Indonesia, Japan, Mexico, and Philippines where this proportion was fairly homogenous across all age groups. The variation across countries for each demographic group is also illustrated in Figures S1–S34 in the Supplementary Information (SI).

Table 3 | Random effects meta-analysis of proportions of people in pain by demographic category

Variable	Category	Proportion	95% CI of Proportion	SE Analogue (CI Width/4)	Prediction Interval		(tau)	I^2	Global *p*-value
					LL	UL			
Age group									1.46e-06
	18–24	0.38	(0.33,0.43)	0.02	0.16	0.56	0.11	90.7	
	25–29	0.39	(0.34,0.44)	0.02	0.19	0.58	0.11	90.4	
	30–39	0.41	(0.36,0.46)	0.03	0.19	0.60	0.12	91.3	
	40–49	0.43	(0.38,0.48)	0.03	0.21	0.60	0.11	90.2	
	50–59	0.48	(0.43,0.52)	0.02	0.27	0.66	0.10	87.3	
	60–69	0.49	(0.44,0.53)	0.02	0.29	0.66	0.11	88.7	
	70–79	0.53	(0.48,0.59)	0.03	0.34	0.72	0.12	90.8	
	80 or older	0.61	(0.46,0.75)	0.07	0.33	1.00	0.35	98.9	
Gender									1.20e-06
	Male	0.40	(0.36,0.44)	0.02	0.23	0.54	0.09	85.1	
	Female	0.47	(0.43,0.52)	0.02	0.30	0.65	0.10	87.8	
	Other	0.52	(0.20,0.83)	0.16	0.00	1.00	0.76	99.7	
Marital status									1.46e-06
	Married	0.44	(0.40,0.48)	0.02	0.24	0.61	0.10	86.9	
	Separated	0.49	(0.44,0.55)	0.03	0.15	0.68	0.13	91.7	
	Divorced	0.48	(0.42,0.54)	0.03	0.26	0.74	0.13	92.3	
	Widowed	0.56	(0.51,0.62)	0.03	0.36	0.74	0.12	91.3	
	Domestic partner	0.43	(0.38,0.48)	0.03	0.24	0.61	0.11	90.6	
	Single, never married	0.40	(0.35,0.44)	0.02	0.22	0.57	0.09	86.9	
Employment status									1.37e-06
	Employed for an employer	0.41	(0.36,0.45)	0.02	0.22	0.56	0.09	86.8	
	Self-employed	0.42	(0.37,0.47)	0.02	0.20	0.56	0.11	90.2	
	Retired	0.51	(0.47,0.55)	0.02	0.34	0.69	0.10	87.1	
	Student	0.35	(0.30,0.39)	0.02	0.14	0.52	0.11	90.0	
	Homemaker	0.49	(0.43,0.54)	0.03	0.26	0.68	0.12	90.3	
	Unemployed and looking for a job	0.47	(0.42,0.51)	0.02	0.25	0.61	0.09	86.4	
	None of these/other	0.53	(0.46,0.60)	0.04	0.24	0.80	0.17	94.9	
Education									1.10e-06
	Up to 8 years	0.51	(0.47,0.55)	0.02	0.36	0.65	0.09	85.7	
	9–15 years	0.43	(0.39,0.47)	0.02	0.25	0.59	0.10	87.0	
	16+ years	0.36	(0.32,0.39)	0.02	0.23	0.53	0.08	82.0	
Religious service attendance									2.65e-06
	>1/week	0.48	(0.43,0.53)	0.02	0.18	0.63	0.11	89.9	
	1/week	0.46	(0.42,0.50)	0.02	0.28	0.59	0.09	84.4	
	1–3/month	0.45	(0.41,0.49)	0.02	0.30	0.60	0.08	82.7	
	A few times a year	0.43	(0.39,0.48)	0.02	0.28	0.59	0.10	86.8	
	Never	0.42	(0.38,0.47)	0.02	0.26	0.61	0.11	89.4	
Immigration status									5.22e-06
	Born in this country	0.44	(0.39,0.48)	0.02	0.24	0.59	0.10	87.3	
	Born in another country	0.44	(0.40,0.49)	0.02	0.26	0.62	0.10	86.9	

Proportion estimated overall proportion in the category, *95% CI of Proportion* the 95% CI for the estimated overall proportion of people in pain for each demographic category, *SE Analogue (CI Width/4)* standard error for the estimated overall proportion for each demographic group, *Prediction interval* reflects how the country-specific proportion vary, *LL* lower limit of the 95% prediction interval, *UP* Upper limit of the 95% prediction interval, *'tau'* measures the standard deviation of the distribution of means across countries. It is an estimate of how much the mean in that demographic category varies across countries, *I^2* estimates how much of the variability in means is due to heterogeneity across countries vs. sampling variability. Given that the sample sizes of this study are large, the I^2 is high, *Global p-value* tests the null hypothesis that the demographic category does not matter in any of the 22 countries.

It is worth noting that Table 3 does not include proportions across religious affiliation categories and race or ethnicity as these vary by country. As Table 3 shows results pooling all countries together, we only included the demographic categories that used the same categories across countries. For the countries in which these variables were available, proportions of people in pain across religious affiliation categories and race or ethnicity can be found in Tables S23–S44 in the Supplementary Information.

Table S45 in the Supplementary Information provides analyses that complement the analyses presented in Table 3. While Table 3 shows a random effects meta-analysis that treats each person in the 22 countries equally by assuming that the proportion in each country was drawn from the underlying distribution of the 22 countries included in the study, Table S45 shows a population-weighted meta-analysis in which each country's results were weighted by the *actual* 2023 population size. Results across both analyses are mostly aligned.

Overall, the analyses presented in Table 3, Tables S23–S44, and Table S45 confirm hypothesis 3 of this study: Pain exhibits variations across different demographic categories which at the same time vary by country.

To shed light on the different proportion of people in pain across demographic categories, we conducted additional analyses that compare the demographic categories in each country. These results can be found in Figs. S35–S115 in the SI. As one example, Fig. S35 shows the difference in the proportion of people in pain for the 25–29 age group in comparison to the 18–24 age group. In this case, all differences are statistically insignificant suggesting that there is no difference in the proportion of people in pain across these two categories in any of the countries. However, Fig. S49 shows that the proportion of people in pain is smaller in the age group 50–59 than in the age group 30–39 in South Africa, Poland, Sweden, and Germany whereas in all the other countries the difference in the proportion of people in pain across these two age groups is statistically insignificant.

Discussion

In this study, we used a nationally representative dataset with 202,898 individuals from 22 countries to explore the proportion of people in pain across key demographic groups and across countries.

Our results show substantial country-specific variation. For instance, using a mid-point dichotomization of our pain variable, Egypt (0.60), Brazil (0.59), Australia (0.56), and Turkey (0.53) were among the countries with the greatest proportion of people in pain whereas Israel (0.25), South Africa (0.29), Poland (0.32), and Japan (0.33) showed the smallest proportions. However, these findings should be interpreted with caution. These differences might be due to a number of factors such as differing demographic distributions across countries including age and life expectancy, access to healthcare, macroeconomic conditions, and possible seasonal effects. These differences might also be explained by the interpretation of our dependent variable. For example, the question asks about "bodily pain" which might have different meaning to different people. In line with this idea, our dependent variable does not allow us to explore the type of pain, for example, whether bodily pain is chronic or acute.

It is worth noting that some differences emerge when using different dichotomization points of our pain variable. For example, when using all types of pain vs no pain, Philippines appears at the top of the ranking together with Australia. When focusing on severe pain, India moves to the top of the ranking. Besides these differences, countries mostly appear in the same quantile as in the original analyses. These differences might be explained by the fact that some people might underrate or overrate their pain. Future research should explore cross-cultural reporting styles of pain.

Using a random effects meta-analysis, we examined the proportion of people in pain across each demographic group across the 22 countries together. We found the highest proportion of people in pain among women and other gender groups, individuals who were widowed, those who were retired, those who had low level of education, and those who attended a religious service more than once a week. These findings are in line with prior work that showed greater levels of pain among women[2], the widowed[5], people who were retired[14], individuals with low level of education[7], and people who attended religious services more frequently[13]. These are all descriptive analyses and should not necessarily be interpreted causally. For instance, while it is possible that religious service attendance makes one more sensitive to pain, it is also possible that those in pain seek relief by attending religious services more often. The potential link among demographic factors should also be considered. For instance, it might be the case that people who are retired reported greater pain because they tend to be older than those who are not retired. The same can happen with religious service attendance: people who attend religious services more frequently might be older than those who attend religious services less frequently and their pain might be due to their age. The demographic descriptive statistics simply inform us of the proportion of people in pain in each demographic category. Additional data will be collected every year within the Global Flourishing Study[20]. This longitudinal data will provide a more comprehensive overview of the role of demographic variables in pain as well as the direction of relationships.

The age groups results deserve special attention. In the aggregated analysis shown in Table 3, we found the highest proportion of people in pain among older age groups. Although prior work has found that the level of pain was higher among the elderly than among the younger[42], related research has found a rapid increase in the percentage of people in pain in middle-age groups[2,7]. In our analysis, countries like Australia, Brazil, Egypt, and the United States show high proportions of people in pain in middle-age groups. Our detailed comparison of categories within each demographic factor in each country (Figs. S35–S115 in the SI) also supports the idea that the age-pain link might be country-specific. We believe that the data collected in the next few years as part of the Global Flourishing Study[20] will help to shed further light on the role of age in pain. These findings should not, however, be generalised to other countries not included in our sample.

By documenting the proportion of people in pain across key demographic groups and across countries worldwide, this study provides foundational insights on the new literature on the social determinants of pain. We hope that these findings are helpful for scientists across the medical, social, economic, and behavioural sciences.

Data availability

The data that support the findings of this article are openly available on the Open Science Framework. The specific dataset used was Wave 1 non-sensitive Global data https://osf.io/sm4cd/ available February 2024 - March 2026 via preregistration and publicly from then onwards. Researchers interested in working with these data before March 2026, need to preregister their analysis. No specific additional registration is needed to access the data.

All analyses were preregistered with COS prior to data access (https://osf.io/ewyr5/?view_only=1fceb9e7dac440a88ad1d5764a6ea6bd, see also Supplementary Note 1 in the Supplementary Information).

Code availability

All code to reproduce analyses are openly available in an online repository[22].

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Author contributions

L.M. Conducted the data analysis, and wrote the paper. C.N.O. Provided helpful comments to the written drafts. T.B. Provided helpful comments to the written drafts. K.S. Provided code for data analysis. A.P. Provided helpful comments to the written drafts. B.R.J. Coordinated data collection, participated in survey design, coordinated creation of code for analysis, and provided helpful comments to the written drafts. T.J.V. Coordinated data collection, participated in survey design, coordinated creation of code for analysis, and provided helpful comments to the written drafts.

Competing interests

The authors declare the following competing interests: Tyler VanderWeele reports consulting fees from Gloo Inc., along with shared revenue

received by Harvard University in its license agreement with Gloo according to the University IP policy. All other authors declare no competing interests.

Additional information

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