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Investigating the relationship between unmet need and utilisation of health care in European countries

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ABSTRACT

Access to health care is a multidimensional concept, influenced by individual and health system factors and the relationship between different access dimensions is not well understood. We used individual-level data from the 2019 wave of the European Health Interview Survey, covering 27 European Union member states, Iceland, and Norway (n = 269,799 individuals) and country-level data from the Eurostat, OECD and World Bank databases to explore this important research gap.

We investigated six outcome measures: unmet need due to long wait, distance, affordability of medical care, and affordability of prescribed medicines, and the utilisation of general practitioner, or specialist care. We investigated the relationship between these outcomes and individual characteristics using a multilevel multivariate logit random effects model, which allowed us to model outcomes simultaneously. After controlling for individual socio-economic position, health status and health behaviour, we assessed the correlation between outcomes at individual and country levels to gain insight into the relationship between different dimensions of access. We investigated the association between each outcome measure and health system characteristics including health expenditure, physician density and primary care gatekeeping as well as macroeconomic characteristics (income and income inequality) using multilevel logit random effects models.

We found that people with lower self-reported health status, multimorbidity and limitations due to health problems were more likely to report unmet need and utilisation. Higher household income was negatively associated with unmet need and positively associated with utilisation. After controlling for individual characteristics, correlations between unmet need and utilisation were very low (under 10%) at individual level. At country level, there was a negative correlation between unmet need due to the affordability of prescribed medicines and GP (−49%), and specialist (−42%) care. Individuals in countries that incentivised or required a referral from primary to specialist care were less likely to report use of specialist care. Our findings emphasise that unmet need and utilisation measure different dimensions of access, thus underscoring the importance of employing complementary measures of access to health care.

1. Introduction

Health care access is a key feature of high performing health systems (Carinci et al., 2015; Levesque et al., 2013), but definitions of 'access' have varied. Noting the lack of clarity of, and consensus on the concept of access to health care, Levesque et al. (2013) proposed a definition of access as a series of steps along a pathway or process whereby individuals have the opportunity to recognise their health care needs, to seek, reach, and use health care services, and to be offered care appropriate to their needs. Building on this definition of access, Levesque et al. (2013) developed a conceptual framework that considers both supply- and demand-side factors. The former includes approachability, acceptability, availability and accommodation, affordability, and appropriateness, while the latter includes the abilities of individuals to perceive a need for care, seek care, reach care, pay for care, and engage with care. These factors are interrelated and are shaped by individual as well as

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health system characteristics. The Levesque et al. (2013) framework helps us understand the reasons for variation in access to health care within and across countries. These include differences in the characteristics of individuals who demand health care, along with differences in the characteristics of providers and health systems that provide the institutional context for the supply of health care. Individual differences in the demand for health care arise from different characteristics that influence the ability of individuals to recognise that they have a health problem, to identify, find and pay for the type of health care necessary to address this health problem, and to participate in the health care process. These individual characteristics include health knowledge and literacy, gender, mobility, income, social capital and social (including caregiver) support, among others. Similarly, differences in the supply of health care at the provider or health system levels relate to differences in the extent to which health care services are: made known and acceptable to various population groups, available with sufficient capacity of physical and human resources and modes of service provision, affordable in terms of direct and indirect costs and resource mobilization, and of adequate quantity and quality. These provider or health system characteristics include information and outreach, professional values and norms, the geographic location and opening hours of facilities, and the cost and quality of care. Exploring variations in access to health care across countries helps us understand the magnitude of differences across countries and the individual and country characteristics associated with these differences. Cross-country analysis can provide important insights into whether specific features of health systems and the wider country context in which they operate are related to access to health care. This in turn can help inform policies to improve access to health care.

Several studies have used the Levesque framework to study access to care, but few of these have explored access from both the supply- and demand-side (Cu et al., 2021) and of those that did, only one was a cross-country study. Russell et al. (2019) aimed to evaluate the implementation of different interventions to improve access to primary health care for vulnerable people in Australia and Canada. Another cross-country study (Corscadden et al., 2018) examined multiple dimensions of access but only on the supply-side, and like Russell et al. (2019), stopped short of examining the relationship between different dimensions of access.

Another body of literature has investigated access to health care, using measures of unmet need and utilisation available in survey data. A limited number of studies considered both unmet need and health care utilisation, focusing on equity and disparities (Allin et al., 2010; Gibson et al., 2019; Han et al., 2016; Manuel, 2018), or the causal relationship between utilisation and unmet need (Bataineh et al., 2019). These studies investigated access primarily from the demand-side perspective and used data for a single country only. To date, no study has investigated access to health care across countries using both unmet need and utilisation. Rather, cross-country studies have focused primarily on unmet need (Arnault et al., 2022; Carnazza et al., 2023; Chaupain-Guillot and Guillot, 2015; Cylus and Papanicolas, 2015; Detollenaere et al., 2017; Elstad, 2016; Fiorillo, 2020; Fjær et al., 2017; González-Touya et al., 2021; Hübner et al., 2023; Israel, 2016; Quintal et al., 2019; Smolić et al., 2022; Tavares, 2022) and, to a much lesser extent, on utilisation of care (Devaux, 2015; Jusot et al., 2011; Majo and van Soest, 2012). These studies have identified wide variations in access to health care across countries. Returning to the Levesque et al. (2013) framework, in explaining these variations in access to health care, most of these studies focused on the demand-side using individual characteristics. A small number of cross-country studies also investigated the relationship between access to health care and country characteristics with some consistent findings across studies regarding out-of-pocket payments, availability of physicians, and income inequality (Carnazza et al., 2023; Elstad, 2016; Smolić et al., 2022; Tavares, 2022). Chaupain-Guillot and Guillot (2015) found a positive association between the individual probability of reporting unmet need and households' out-of-pocket payments as a share of total health expenditure. Fjær et al. (2017) and Tavares (2022) also found that high out-of-pocket payments were associated with unmet need. Jusot et al. (2011) reported positive associations between physician utilisation and health system variables including availability of doctors (density), and GP referral to specialist care (gatekeeping). Similarly, Fjær et al. (2017) reported that low physician density was associated with unmet need due to availability. Studies have also highlighted the relationship between unmet need and income inequalities. Carnazza et al. (2023) showed that unmet need was concentrated among lower income people in most European countries and that income-related inequalities in unmet needs due to affordability and long waiting lists were associated with out-of-pocket payments (as a percentage of health expenditure). Elstad (2016) found evidence of higher unmet need for medical care in countries with larger income inequalities.

This study builds on the various approaches to study access to health care with an explicit focus on bringing the individual and country perspectives together and quantifying the interdependence of different access dimensions as posited by Levesque et al. (2013). We contribute to the existing literature in several ways. First, we explored the 'steps' in the Levesque et al. (2013) access pathway related to 'reaching' and 'using' health care using measures of unmet need (due to long wait, distance, and affordability of medical care and prescribed medicines) and utilisation of health care (consultations with a general practitioner (GP), or a specialist doctor) across European countries. This moves us beyond existing cross-country studies that have focused on only one measure of access (unmet need or utilisation of health care). Second, we investigated variations in access to health care using a wide range of individual and country characteristics, providing insight into whether the relationship between characteristics and access differs by the measure of access. Third, we assessed the correlation between the unexplained variation in the different access measures at individual and country levels. This enabled us to provide a comprehensive analysis of the relationship between different dimensions of access at individual and health system levels, by exploiting both observed and unobserved components.

2. Materials and methods

2.1. Data

We used individual-level data from the third wave of the European Health Interview Survey (EHIS), a dedicated comprehensive cross-country health survey covering health status, use of health care, health determinants and socio-economic status of people aged 15 years and over living in private households in the 27 EU Member States, Iceland and Norway. The value of EHIS for this study lies in its comprehensive exploration of unmet need due to long waits, distance/transportation, and financial affordability. Other datasets, such as EU-SILC allow respondents to only choose one reason for unmet need. The data was collected in 2019, except for Austria (2018–2019), Belgium (2018), and Germany and Malta (2019–2020) (Eurostat, n.d.). Countries used one or a combination of data collection modes including face-to-face interviews, telephone interviews, and self-administered (postal or web) questionnaires. The surveys are nationally representative and countries used various sampling frames including population census, population registers, dwelling registers or other frames. In general, countries used either multi-stage stratified or systematic (cluster) sampling, or single stage sampling (random, stratified, systematic or cluster). The unit non-response rate varied between countries from 12% to around 78% and did not exceed 40% in 15 countries (Eurostat, 2022). For more information on the survey design and non-response rate, please see Eurostat (2022). We sourced data on health expenditure, physician density, and countries' level of income and income inequality for 2019 (or latest available year) from the Eurostat (Eurostat, 2023, 2024), OECD (OECD, 2023) and World Bank (World Bank Group, 2024) databases and data on primary care

gatekeeping for 2016 from the OECD Health Systems Characteristics survey (OECD, 2016) and Health at a Glance: Europe 2016 (OECD & European Union, 2016).

2.2. Variables

The EHIS (Wave 3) methodological manual (Eurostat, 2020) includes a detailed description of the variables included in the EHIS. In the following sections, we explain how we constructed the outcome measures and individual- and country-level explanatory variables used in this study.

2.2.1. Outcome measures

EHIS includes separate questions on unmet need and utilisation of healthcare. Drawing on four separate unmet need questions, we created four binary variables to measure unmet need for health care in the past 12 months due to (i) long waiting list(s) ('long wait': yes/no), (ii) distance or transportation problems ('distance': yes/no), (iii) could not afford medical examination or treatment ('affordability of medical care': yes/no), and (iv) could not afford prescribed medicines ('affordability of prescribed medicines': yes/no). We coded these variables as missing if respondents reported no need for health care. Therefore, these variables measured unmet need for health care among those who reported a need for care. We created two variables to measure utilisation in the previous 12 months using two separate questions on the last time of a consultation with: (i) a general practitioner or family doctor (GP), and (ii) a medical or surgical specialist. We coded these variables as one if respondents replied that they had a consultation "less than 12 months ago", and zero if they reported a consultation "12 months ago or longer" or "Never".

2.2.2. Individual-level explanatory variables

We considered the following individual-level variables that may contribute to variations in unmet need, and utilisation of GP and specialist care based on previous literature (Bataineh et al., 2019; Chaupain-Guillot and Guillot, 2015; Elstad, 2016; Fiorillo, 2020; Jusot et al., 2011). We included the following socio-demographic characteristics: age, sex, marital status, degree of urbanisation, education, labour force status, household income, and social support. We also included measures of health behaviour (tobacco smoking), and health status (self-rated health, multimorbidity, and limitation in activity due to health problems) (see Table S1 for further details). We did not consider migration status, which Hübner et al. (2023) have shown to be associated with unmet need for medical care. While the EHIS contains variables measuring the country of birth of the respondent and the respondents' parents, this data was not available for Norway. However, we included migration status as an individual-level variable in a sensitivity analysis.

2.2.3. Country characteristics

We considered six health system characteristics covering health expenditure, physician density and primary care gatekeeping and two macroeconomic characteristics, which we expected to be associated with different measures of access to care. We measured health expenditure using (i) government/compulsory schemes, (ii) voluntary health care payment schemes, and (iii) household out-of-pocket payments, as a share of current expenditure on health (Eurostat, 2024; OECD, 2023). As a sensitivity analysis, we included these expenditure variables as per capita measures. We also included a variable that measured health expenditure as a percentage of GDP. We measured physician density using (i) generalist medical practitioners (per 100,000 population) and (ii) specialist medical practitioners (per 100,000 population) (Eurostat, 2023; OECD, 2023). We constructed a variable measuring primary care gatekeeping as: zero if patients were not required or had no incentive to obtain a referral from primary to specialist care; one if patients were not required but had a financial incentive to obtain a referral; and two if patients were required to have a referral from primary to specialist care (OECD, 2016; OECD & European Union, 2016). We included two macroeconomic indicators: GDP per capita and the Gini index. The Gini index measures the extent to which the distribution of income deviates from a perfectly equal distribution with an index of 0 representing perfect equality and an index of 100 perfect inequality (World Bank Group, 2024). Table S2 in the supplementary data provides the data for the country characteristics (including sources and available years). We expected that a higher share of government/compulsory schemes of current expenditure on health would be negatively associated with unmet need and positively associated with utilisation. Similarly, a higher share of voluntary health care payment schemes could be negatively associated with unmet need due to long wait and affordability if private health insurance gains faster access to care and covers costs that are not covered by government or compulsory schemes. In general, we would expect a positive association between out-of-pocket payments and unmet need but there may be a negative association for long wait, if people pay out-of-pocket to gain faster access to care. We expected that a higher share of health expenditure as a percentage of GDP would be negatively associated with unmet need and positively associated with utilisation. We expected that higher rates of GPs and specialists would be associated with better access to care. We hypothesised that gatekeeping would be associated with a higher probability of reporting a GP consultation and unmet need due to long wait, and a lower probability of reporting a specialist consultation. We expected that a higher GDP per capita would be negatively associated with unmet need and positively associated with utilisation while higher income inequality as measured by Gini index would be associated with higher unmet need.

2.3. Analytical approach

We analysed variation in the six outcome measures using multilevel multivariate random effects logit models. Multilevel models allow for the correlation of individuals (level one) within countries (level two). In contrast to fixed effects models, which control for this correlation, multilevel models allow us to explicitly model variation at each level. We estimated the following model for outcome i of individual j in country k:

$$Logit\left(p_{ijk}\right) = a_0 + X'jk\,\beta + V'k\,\gamma + uk + \varepsilon_{ijk} \quad (1)$$

where $p_{ijk} = \Pr(y_{ijk} = 1)$ and y_{ijk} is the observed outcome i ($i = 1,2,3,4,5,6$ where 1 = unmet need long wait, 2 = unmet need distance, 3 = unmet need affordability of medical care, 4 = unmet need affordability of prescribed medicines, 5 = GP consultation, 6 = specialist consultation) of individual j in country k, X'_{jk} is a vector of individual-level variables, V'_k is a vector of country-level variables, u_k is the country-level random intercept and ε_{ijk} is the error term for outcome i of individual j in country k. The country-level random effects, u_k are assumed to follow a multivariate normal distribution with zero mean and covariance matrix Ω_u. We calculated the residual variation in each outcome attributable to the country-level as $\frac{\sigma^2 u}{\sigma^2 u + \sigma^2 e}$ where we substitute $\pi^2/3 \approx 3.29$ for $\sigma^2 e$ i.e. we adopt the latent variable approach to calculating the variance partition coefficient where we assume that the observed binary responses reflect latent continuous variables that are greater or less than a given threshold and that these latent continuous variables come from a standard logistic distribution, which has a variance of $\pi^2 = 3.29$ (with a scale factor of 1), which we substitute for the level 1 variance (Browne et al., 2005; Goldstein et al., 2002; Hox et al., 2018; Leyland and Groenewegen, 2020). The multilevel multivariate model allowed us to model the six outcomes simultaneously and to calculate the correlation between the residual variation in the outcomes y_{ijk} at the country-level as $r_{(x,\ y)} = \frac{\sigma_{u1u2}}{\sqrt{\sigma^2_{u1}\sigma^2_{u2}}}$ where σ_{u1u2} is the covariance between the country random effects for outcome 1 and outcome 2, σ^2_{u1} is the variance of the country random effect for outcome 1, and σ^2_{u2} is the variance of the country random effect for outcome 2.

In order to assess the association between the outcome measures and country characteristics, we ran separate multilevel random effects logit models for each outcome with the characteristic of interest included as a country-level variable, together with the individual-level variables. We modelled each country characteristic variable separately due to the small number of countries (n = 29).

The multilevel estimates were statistically efficient even if some observations had missing data for any outcome (Goldstein, 1995). This meant that the estimation model included observations with missing data for one or more outcomes if there were complete data for the other outcome(s). Analyses were conducted using MLwiN 3.05 (Rabash et al., 2009) via the *runmlwin* command (Leckie and Charlton, 2012) in Stata version 17 (StataCorp, 2021).

3. Results

Our sample included 269,799 individuals with complete data on at least one outcome and all explanatory variables (Tables S3-S6 in the supplementary data). Table S7 in the supplementary data shows the estimation sample for each country.

Fig. 1 (and Table S8 in the supplementary data) shows the variation across countries in the percentage of individuals reporting unmet need due to long wait, distance, affordability of medical care, and affordability of prescribed medicines.

The percentage of respondents who reported at least one unmet need was highest in Luxembourg (33.6%), Croatia (32.7%), and Portugal (32.5%). In the majority of countries, the most common reason for unmet need was long waits, followed by the affordability of medical care. The ranking of countries changed according to the different measures. Luxembourg (35.3%), Iceland (32.8%), and Portugal (28.9%) had the highest percentage of respondents reporting unmet need due to long waits, while Latvia (16.7%), Portugal (12.2%), and Croatia (12%), had the highest percentage of respondents who reported unmet need due to financial affordability.

The percentage of people reporting at least one GP consultation in the previous 12 months ranged from 50% in Romania to 87% in Belgium (Fig. 2) (see also Table S8).

In general, a higher percentage of people reported a GP consultation compared to a specialist consultation, although the percentages were similar in Austria (79.4% reported a GP consultation and 74.6% reported a specialist consultation). As expected, a lower percentage of people reported a specialist consultation in countries that required (e.g. Bulgaria (27.7%), Ireland (32.1%)) or incentivised (e.g. Denmark (34.6%), Romania (21.7%)) a referral from primary to specialist care.

Table 1 shows the characteristics of individuals in the estimation sample who did and did not report unmet need and utilisation of health care in the previous 12 months, weighted using survey sampling weights. The majority who reported unmet need and utilisation of health care were women, had bad or very bad self-assessed health, had four or more chronic conditions, and were limited or severely limited in activities because of health problems.

Table 2 shows the association between the six outcome and the individual characteristics, after controlling for all covariates in the model. Fig. 3 displays the results using coefficient plots (Jann, 2014). Socio-economic characteristics, health status and health behaviour were associated with access to care, but the relationship varied according to the different access measures.

3.1. Socio-economic characteristics

Compared to those aged 15–29 years, those aged 70 years and over had a lower odds of reporting all measures of unmet need, and a higher odds of consulting a GP. Females had a higher odds of reporting unmet need and service utilisation. Compared to unmarried people, married people had a higher odds of reporting unmet need due to long wait, and a lower odds of reporting unmet need due to distance or affordability of medical care. Married people also had a higher odds of consulting a GP or specialist. Perhaps unsurprisingly, people living in rural areas had a higher odds of reporting unmet need due to distance compared to people living in cities, and a lower odds of reporting unmet need due to long wait or affordability of medical care, and utilisation of GP or specialist care.

There was no clear pattern of educational differences in reaching and using health care. In contrast, there were clear income disparities,

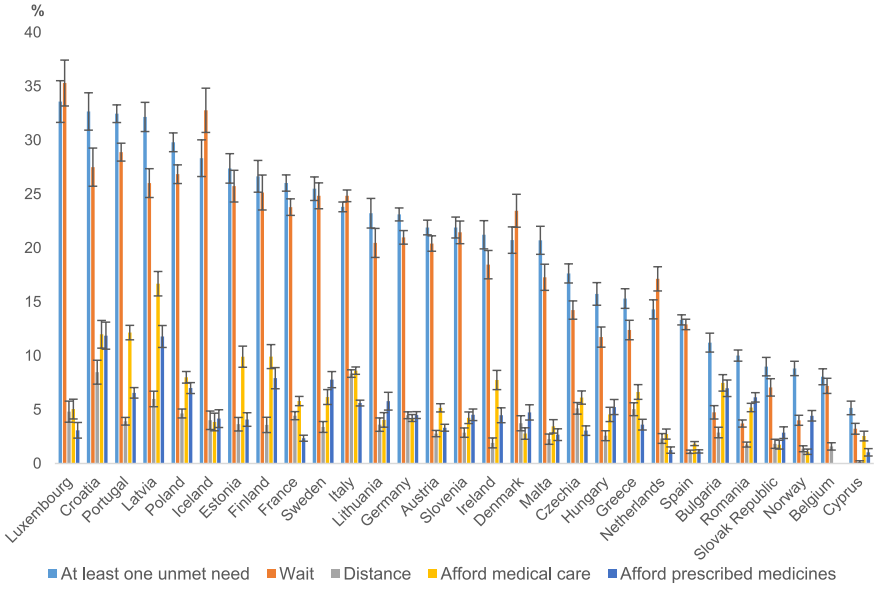

Fig. 1. Percentage of individuals with a need for health care, who reported unmet need for health care due to long wait, distance, affordability of medical care, and affordability of prescribed medicines in the previous twelve months, by country.
Note: Weighted using survey sampling weights. Data sorted according to the percentage of respondents who reported at least one unmet need due to long wait, distance, affordability of medical care, and affordability of prescribed medicines. Respondents in Belgium did not report data on unmet need due to the affordability of medical care and the affordability of prescribed medicines. Source: European Health Interview Survey data, 2019.

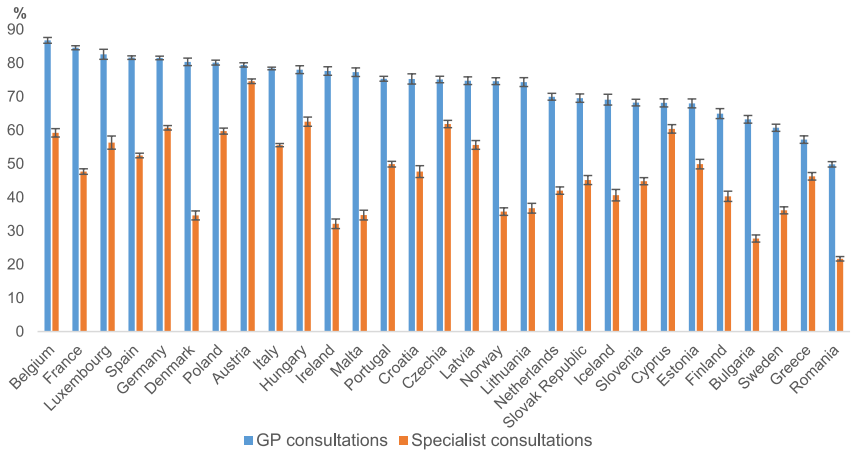

Fig. 2. Percentage of respondents who reported at least one GP or specialist consultation in the previous twelve months, by country.
Note: Weighted using survey sampling weights. Data sorted according to highest total percentage of respondents who reported at least one GP consultation in the previous twelve months. Source: European Health Interview Survey data, 2019.

particularly in relation to the affordability of medical care, and the use of specialist care. while there were also contrasting patterns related to labour force status. Moderate or high social support was associated with better access to health care for all measures, compared to low social support.

3.2. Health status

Higher need for health care as reflected in health status was associated with a higher probability of reporting unmet need and health care utilisation with the largest effects observed for respondents with four or more chronic conditions.

3.3. Health behaviour

Compared to non-smokers, daily smokers had higher odds of reporting unmet need due to distance or the affordability of medical care and lower odds of reporting a consultation with a GP or specialist.

3.4. Residual variation

The residual variation in the access measures at the country-level varied from 5.5% for GP consultation to 8.6% for unmet need due to long wait, and the affordability of medical care (see Tables S9–10 in the supplementary data for the calculation of the country-level residual variation). This means that, after controlling for individual characteristics, 8.6% of the unexplained variation in unmet need due to long wait or the affordability of medical care was due to differences between countries.

Table 3 shows the correlation between the residual variation in the six outcome variables at individual- and country-level. There were positive correlations in the residual variation between the two utilisation measures, and between the four unmet need measures at individual and country-levels. The positive correlations between the residual variation for unmet needs imply that there were unobservable individual- and country-level characteristics that meant that an individual who reported unmet need due to long wait, was more likely to also report unmet need due to distance, or affordability of medical care, or affordability of prescribed medicines. Similarly, an individual who reported a GP consultation was more likely to report a specialist consultation. At the country-level, the strongest correlations were between: i) unmet need due to the affordability of medical care and prescribed medicines (0.71) ii) unmet need due to long wait and distance (0.56), iii) unmet need due to distance and affordability of medical care (0.61), and iv) GP and specialist consultation (0.54). There were negative correlations between unmet need due to the affordability of prescribed medicines, and (i) GP consultation (−0.49), and (ii) specialist consultation (−0.42), meaning there were unobservable country-level factors that meant that people who reported unmet need due to affordability of prescribed medicines, were less likely to report a consultation with a GP or a specialist.

3.5. Country characteristics

Table 4 shows the relationship between the different outcome measures and country characteristics. Our findings suggest that country characteristics do not influence access in general, with some exceptions. People who resided in countries with a higher share of government/compulsory schemes of current expenditure on health had lower odds of reporting unmet need due to affordability of medical care. People in countries that either incentivised or required a referral from primary to specialist care had lower odds of reporting a specialist consultation, while people in countries that required a referral from primary to specialist care had higher odds of reporting unmet need due to the affordability of prescribed medicines. People living in countries with higher income inequality as measured by the Gini index had higher odds of reporting unmet need due to the affordability of medical care.

The country-level residual variation in unmet need due to the affordability of medical care was 7.4% after controlling for individual characteristics and the share of government/compulsory schemes of current expenditure on health. It was 7.6% after controlling for individual characteristics and the Gini index. After controlling for individual characteristics and gatekeeping, the residual variation at the country-level was 5.8% for unmet need due to the affordability of prescribed medicines, and 5.7% for specialist consultations (see supplementary data Tables S11–12).

3.6. Sensitivity analyses

Results of the sensitivity analysis that included migration status as an additional individual level variable (Norway excluded) (see supplementary data Tables S13–S17) showed that people born in a different country than their residence at the time of the survey had higher odds of unmet need due to distance, the affordability of medical care, and the affordability of prescribed medicines and had lower odds of GP and specialist consultations compared to people born in their country of residence (Table S13). The country-level correlation between unmet need due to long waits and the affordability of medical care was not

Table 1
Characteristics of individuals who reported unmet need and utilisation of health care in previous twelve months.

	Unmet need long wait, n = 203,832					Unmet need distance, n = 202,397					Unmet need affordability of medical care, = 197,208				
	Yes		No			Yes		No			Yes		No		
	N	%	N	%	P-value	N	%	N	%	P-value	N	%	N	%	P-value
Socio-economic characteristics															
Age															
29 and under	4387	18.22	20,538	81.78	<0.001	761	3.46	24,020	96.54	<0.001	1206	4.57	23,400	95.43	<0.001
30–39	4646	20.80	19,761	79.20		788	4.03	23,463	95.97		1299	5.46	22,239	94.54	
40–49	5942	20.99	25,009	79.01		951	3.33	29,794	96.67		1860	6.08	28,304	93.92	
50–59	7111	20.13	29,212	79.87		1363	4.01	34,614	95.99		2376	6.10	32,871	93.90	
60–69	7096	17.58	32,493	82.42		1480	3.57	37,786	96.43		2196	4.89	35,964	95.11	
70 and over	8411	16.59	39,226	83.41		2671	5.16	44,706	94.84		2804	5.02	42,689	94.98	
Sex															
Male	14,453	16.66	74,660	83.34	<0.001	2940	3.37	85,557	96.63	<0.001	4175	4.17	82,372	95.83	<0.001
Female	23,140	20.91	91,579	79.09		5074	4.45	108,826	95.55		7566	6.37	103,095	93.63	
Marital status															
No	17,399	19.15	75,288	80.85	<0.001	4250	4.69	87,936	95.31	<0.001	6221	6.07	83,731	93.93	<0.001
Yes	20,194	18.81	90,951	81.19		3764	3.29	106,447	96.71		5520	4.69	101,736	95.31	
Urbanisation															
Cities	14,145	19.82	59,701	80.18	<0.001	2208	3.35	71,290	96.65	<0.001	4210	5.56	66,631	94.44	0.085
Towns	12,241	18.48	53,989	81.52		2647	4.15	63,003	95.85		3716	5.22	60,201	94.78	
Rural areas	11,207	18.35	52,549	81.65		3159	4.60	60,090	95.40		3815	5.22	58,635	94.78	
Education															
Primary	6263	18.65	23,599	81.35	<0.001	1941	6.00	27,727	94.00	<0.001	2518	7.15	26,022	92.85	<0.001
Secondary	20,389	18.38	95,952	81.62		4634	4.03	110,903	95.97		7091	5.73	106,493	94.27	
Tertiary	10,941	20.51	46,688	79.49		1439	2.78	55,753	97.22		2132	3.56	52,952	96.44	
Job status															
Employed	17,199	19.75	77,128	80.25	<0.001	2422	2.93	91,204	97.07	<0.001	4310	4.51	87,147	95.49	<0.001
Unemployed	2044	21.88	6948	78.12		552	6.16	8369	93.84		1122	10.77	7904	89.23	
Retired	11,843	16.79	56,026	83.21		3221	4.31	64,188	95.69		3767	4.76	60,885	95.24	
Outside Labour Force	6507	19.25	26,137	80.75		1819	5.73	30,622	94.27		2542	7.00	29,531	93.00	
Household Income (quintile)															
Below first	7461	20.26	29,638	79.74	<0.001	2398	6.57	34,450	93.43	<0.001	3946	9.85	32,090	90.15	<0.001
First to second	8069	19.70	33,172	80.30		1996	4.47	38,982	95.53		3000	6.63	37,137	93.37	
Second to third	7750	18.74	34,051	81.26		1535	3.72	39,963	96.28		2203	4.85	38,191	95.15	
Third to fourth	7373	18.46	34,799	81.54		1127	2.69	40,717	97.31		1572	3.41	38,927	96.59	
Fourth to fifth	6940	17.80	34,579	82.20		958	2.55	40,271	97.45		1020	2.33	39,122	97.67	
Social support															
Low	1242	27.68	3166	72.32		507	11.17	3867	88.83	<0.001	759	14.50	3521	85.50	<0.001
Moderate	10,829	22.21	39,462	77.79		2681	5.33	47,189	94.67		4015	7.71	43,937	92.29	
High	25,522	17.59	23,611	82.41		4826	3.27	143,327	96.73		6967	4.29	138,009	95.71	
Health status															
Self-assessed health															
Good/very good	18,500	15.77	107,243	84.23	<0.001	2886	2.57	121,962	97.43	<0.001	4233	3.30	118,359	96.70	<0.001
Fair	12,694	23.48	43,749	76.52		2756	5.19	53,235	94.81		4499	7.83	49,380	92.17	
Bad/very bad	6399	29.71	15,247	70.29		2372	10.60	19,186	89.40		3009	13.73	17,728	86.27	
Multimorbidity															
None	8710	12.29	63,940	87.71	<0.001	1490	2.03	70,661	97.97	<0.001	2304	2.68	68,938	97.32	<0.001
One	8014	17.84	39,944	82.16		1399	3.07	46,285	96.93		2335	4.81	44,352	95.19	
Two	6672	21.73	26,195	78.27		1315	4.20	31,316	95.80		1968	5.71	29,545	94.29	
Three	5180	25.30	15,982	74.70		1175	5.82	19,773	94.18		1661	7.55	18,392	92.45	
Four or more	9017	30.94	20,178	69.06		2635	8.99	26,348	91.01		3473	11.71	24,240	88.29	
Limitations in activities															
Not limited	20,553	15.94	116,354	84.06	<0.001	3351	2.60	132,597	97.40	<0.001	5353	3.68	127,862	96.32	<0.001
Limited/ severely limited	17,040	25.79	49,885	74.21		4663	7.01	61,786	92.99		6388	9.21	57,605	90.79	
Health behaviours															
Smoker															
No	29,460	18.33	131,559	81.67	0.001	6203	3.63	153,669	96.37	0.001	8597	4.82	146,649	95.18	<0.001
Occasionally	1744	21.42	7170	78.58		364	4.46	8509	95.54		534	6.13	8252	93.87	
Daily	6389	20.97	27,510	79.03		1447	5.14	32,205	94.86		2610	7.28	30,566	92.72	

(*continued on next page*)

Table 1 (*continued*)

	Unmet need affordability of prescribed medicines, = 198,208					GP Consultation, n = 269,431					Specialist consultation, n = 268,401				
	Yes		No			Yes		No			Yes		No		
	N	%	N	%	P-value	N	%	N	%	P-value	N	%	N	%	P-value
Socio-economic characteristics															
Age															
29 and under	842	3.01	22,048	96.99	<0.001	25,007	68.87	13,478	31.13	<0.001	15,323	40.81	22,999	59.19	<0.001
30–39	894	3.79	21,318	96.21		23,398	69.53	11,585	30.47		15,415	45.02	19,464	54.98	
40–49	1207	3.74	28,110	96.26		30,237	72.72	13,114	27.28		20,269	48.31	22,930	51.69	
50–59	1744	4.42	33,718	95.58		36,504	78.29	11,464	21.71		25,239	54.23	22,537	45.77	
60–69	1948	4.47	37,795	95.53		40,123	84.47	8532	15.53		27,899	58.81	20,570	41.19	
70 and over	2644	4.60	45,940	95.40		49,590	90.25	6399	9.75		34,508	63.02	21,248	36.98	
Sex															
Male	3489	3.54	83,146	96.46	<0.001	89,028	72.99	35,237	27.01	<0.001	56,085	44.68	67,688	55.32	<0.001
Female	5790	4.47	105,783	95.53		115,831	81.09	29,335	18.91		82,568	57.80	62,060	42.20	
Marital status															
No	4939	4.70	84,714	95.30	<0.001	93,125	75.21	32,532	24.79	<0.001	61,362	48.85	63,828	51.15	<0.001
Yes	4340	3.45	104,215	96.55		111,734	79.08	32,040	20.92		77,291	54.00	65,920	46.00	
Urbanisation															
Cities	3015	3.87	67,749	96.13	<0.001	73,001	77.25	22,757	22.75	<0.001	51,320	53.66	44,088	46.34	<0.001
Towns	3020	4.16	61,768	95.84		68,510	77.73	20,911	22.27		46,253	51.67	42,819	48.33	
Rural areas	3244	4.15	59,412	95.85		63,348	76.40	20,904	23.60		41,080	48.19	42,841	51.81	
Education															
Primary	1965	5.39	28,028	94.61	<0.001	30,497	85.91	5682	14.09	<0.001	18,794	52.61	17,217	47.39	<0.001
Secondary	5729	4.45	108,084	95.55		117,508	76.24	39,278	23.76		77,915	50.10	78,144	49.90	
Tertiary	1585	2.34	52,817	97.66		56,854	75.48	19,612	24.52		41,944	54.28	34,387	45.72	
Job status															
Employed	2816	2.85	86,399	97.15	<0.001	93,200	73.37	38,340	26.63	<0.001	61,504	47.50	69,613	52.50	<0.001
Unemployed	810	7.51	8048	92.49		9160	70.94	4198	29.06		5828	44.27	7463	55.73	
Retired	3622	4.70	64,522	95.30		69,260	88.48	10,715	11.52		48,676	62.14	31,001	37.86	
Outside labour force	2031	5.32	29,960	94.68		33,239	75.11	11,319	24.89		22,645	51.03	21,671	48.97	
Household Income (quintile)															
Below first	3269	7.79	33,225	92.21	<0.001	37,009	76.32	11,705	23.68	<0.001	23,647	48.10	24,839	51.90	<0.001
First to second	2307	4.59	38,417	95.41		41,758	78.53	11,721	21.47		27,327	50.33	25,925	49.67	
Second to third	1710	3.34	38,996	96.66		42,309	78.19	13,055	21.81		28,308	51.03	26,830	48.97	
Third to fourth	1170	2.71	39,304	97.29		42,599	77.21	13,840	22.79		29,277	52.54	26,973	47.46	
Fourth to fifth	823	1.99	38,987	98.01		41,184	75.66	14,251	24.34		30,094	55.10	25,181	44.90	
Social support															
Low	613	12.40	3767	87.60	<0.001	4320	76.24	1459	23.76	<0.001	2925	51.02	2815	48.98	<0.001
Moderate	3009	5.25	46,159	94.75		51,005	75.49	17,809	24.51		34,157	50.80	34,346	49.20	
High	5657	3.36	139,003	96.64		149,534	77.81	45,304	22.19		101,571	51.73	92,587	48.27	
Health status															
Self-assessed health															
Good/very good	3131	2.24	117,305	97.76	<0.001	125,704	71.64	55,211	28.36	<0.001	80,021	44.54	100,173	55.46	<0.001
Fair	3539	6.02	52,824	93.98		57,509	89.60	7851	10.40		41,202	65.21	23,925	34.79	
Bad/very bad	2609	11.28	18,800	88.72		21,646	93.99	1510	6.01		17,430	77.61	5650	22.39	
Multimorbidity															
None	1639	2.10	64,701	97.90	<0.001	68,571	64.15	42,291	35.85	<0.001	41,127	37.85	69,070	62.15	<0.001
One	1776	3.03	46,452	96.97		49,976	80.78	12,657	19.22		33,236	53.06	29,235	46.94	
Two	1609	4.43	31,539	95.57		34,298	86.71	5380	13.29		24,239	60.85	15,343	39.15	
Three	1323	5.38	19,913	94.62		21,994	90.96	2357	9.04		16,353	66.28	7946	33.72	
Four or more	2932	9.13	26,324	90.87		30,020	94.95	1887	5.05		23,698	74.70	8154	25.30	
Limitations in activities															
Not limited	3929	2.52	127,531	97.48	<0.001	136,565	72.18	57,510	27.82	<0.001	85,558	44.27	107,713	55.73	<0.001
Limited/ severely limited	8.02	7.36	61,398	92.64		68,294	91.21	7062	8.79		53,095	71.67	22,035	28.33	
Health behaviours															
Smoker															
No	6825	3.67	149,940	96.33	<0.001	162,823	78.37	47,517	21.63	<0.001	111,427	53.04	98,084	46.96	<0.001
Occasionally	484	4.82	8256	95.18		8766	71.62	3759	28.38		5761	47.31	6717	52.69	
Daily	1970	5.34	30,733	94.66		33,270	73.95	13,296	26.05		21,465	46.45	24,947	53.55	

Note: Percentage of respondents is weighted using survey sampling weights. P-value from chi-square test of the difference between respondents who (i) report and (ii) do not report unmet need and utilisation of health care.

statistically significant (Table S15). The variables measuring government/compulsory schemes as a share of current expenditure on health, and the Gini index were no longer statistically significant in the model for unmet need due to the affordability of medical care, while the requirement to obtain a referral from primary to secondary care was not statistically significant in the model for unmet need due to the affordability of prescribed medicines (Table S16). The sensitivity analysis including expenditure variables as per capita measures no longer

showed that higher expenditure was associated with lower unmet need due to the affordability of medical care (supplementary data Table S18).

4. Discussion

Variations in access to health care can arise due to differences in the characteristics of individuals and health systems. This study found that females and individuals with higher need for care (as reflected in health status) were more likely to report unmet need and to consult a doctor. Our results are in line with other work investigating utilisation (Jusot et al., 2011), and unmet need due to long wait (Moran et al., 2021), distance (Cavalieri, 2013), and affordability of medical care (Fiorillo, 2020). One would of course expect that people with poorer health status use more health care. The reasons why this group experiences higher unmet need may differ according to the measure of unmet need. For example, individuals' health may deteriorate because of a longer wait. As people with poorer health use more health care, it may become more unaffordable if there are user charges, and no exemptions or income caps. We found that people with higher income were less likely to report unmet need due to distance or affordability of medical care, which is supported by previous studies (Cavalieri, 2013; Moran et al., 2021; Popovic et al., 2017). People with higher income have more financial

Table 2
Multivariate multinomial model results, n = 269,799.

Variable	Unmet need wait		Unmet need distance		Unmet need, affordability of medical care	
	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Socio-economic characteristics						
Age category						
15–29	1.000		1.000		1.000	
30–39	0.928	(0.883 0.976)**	1.151	(1.031 1.285)*	1.115	(1.023 1.214)*
40–49	0.853	(0.812 0.896)***	0.898	(0.805 1.001)	1.049	(0.966 1.139)
50–59	0.715	(0.681 0.750)***	0.828	(0.746 0.920)***	0.871	(0.803 0.945)**
60–69	0.606	(0.574 0.640)***	0.684	(0.610 0.767)***	0.666	(0.608 0.730)***
70 and over	0.491	(0.462 0.522)***	0.708	(0.625 0.801)***	0.518	(0.468 0.574)***
Sex						
Male	1.000		1.000		1.000	
Female	1.229	(1.199 1.259)***	1.160	(1.103 1.220)***	1.251	(1.200 1.304)***
Marital Status						
No	1.000		1.000		1.000	
Yes	1.064	(1.037 1.092)***	0.867	(0.824 0.914)***	0.914	(0.876 0.953)***
Urbanisation						
Cities	1.000		1.000		1.000	
Towns	0.908	(0.882 0.934)***	1.213	(1.139 1.291)***	0.870	(0.829 0.913)***
Rural areas	0.836	(0.812 0.862)***	1.503	(1.413 1.599)***	0.821	(0.781 0.862)***
Education						
Primary	1.000		1.000		1.000	
Secondary	1.046	(1.005 1.089)*	0.906	(0.842 0.975)**	0.934	(0.877 0.994)*
Tertiary	1.251	(1.194 1.311)***	0.921	(0.839 1.010)	0.910	(0.842 0.983)*
Labour force status						
Employed	1.000		1.000		1.000	
Unemployed	1.018	(0.961 1.078)	1.340	(1.203 1.492)***	1.367	(1.264 1.478)***
Retired	0.891	(0.852 0.933)***	1.099	(1.000 1.207)	0.853	(0.790 0.921)***
Outside labour force	0.895	(0.862 0.930)***	1.229	(1.138 1.327)***	0.976	(0.919 1.037)
Household income (quintile)						
Below first	1.000		1.000		1.000	
Between first and second	1.022	(0.985 1.061)	0.812	(0.760 0.868)***	0.747	(0.708 0.788)***
Between second and third	1.002	(0.965 1.041)	0.712	(0.662 0.766)***	0.595	(0.561 0.631)***
Between third and fourth	0.966	(0.929 1.005)	0.580	(0.534 0.629)***	0.453	(0.424 0.483)***
Between fourth and fifth	0.934	(0.897 0.974)**	0.592	(0.542 0.647)***	0.331	(0.307 0.358)***
Social support						
Low	1.000		1.000		1.000	
Moderate	0.776	(0.722 0.833)***	0.584	(0.524 0.652)***	0.593	(0.541 0.650)***
High	0.634	(0.591 0.680)***	0.416	(0.374 0.463)***	0.416	(0.380 0.456)***
Health status						
Self-assessed health						
Good/very good	1.000		1.000		1.000	
Fair	1.312	(1.270 1.355)***	1.291	(1.204 1.385)***	1.548	(1.465 1.636)***
Bad/very bad	1.631	(1.558 1.707)***	2.116	(1.941 2.306)***	2.191	(2.040 2.354)***
Multimorbidity						
None	1.000		1.000		1.000	
One	1.427	(1.378 1.477)***	1.245	(1.148 1.349)***	1.474	(1.386 1.569)***
Two	1.736	(1.670 1.806)***	1.481	(1.357 1.616)***	1.633	(1.523 1.750)***
Three	2.066	(1.975 2.161)***	1.798	(1.634 1.977)***	1.946	(1.801 2.102)***
Four or more	2.511	(2.400 2.627)***	2.160	(1.968 2.370)***	2.412	(2.237 2.601)***
Limitations in activities due to health						
No limitations	1.000		1.000		1.000	
Limited/severely limited	1.328	(1.287 1.370)***	1.472	(1.378 1.572)***	1.333	(1.265 1.405)***
Health behaviours						
Smoker						
No	1.000		1.000		1.000	
Occasionally	1.179	(1.116 1.246)***	1.228	(1.093 1.379)**	1.185	(1.079 1.301)***
Daily	1.028	(0.995 1.062)	1.126	(1.055 1.202)***	1.288	(1.225 1.354)***
Constant	0.209	(0.167 0.262)***	0.047	(0.036 0.06)***	0.119	(0.093 0.153)***

(continued on next page)

Table 2 (*continued*)

Variable	Unmet need, affordability of prescribed medicines		GP consultation		Specialist consultation	
	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Socio-economic characteristics						
Age category						
15–29	1.000		1.000		1.000	
30–39	1.195	(1.082 1.319)***	0.899	(0.868 0.930)***	0.979	(0.947 1.012)
40–49	1.051	(0.955 1.156)	0.897	(0.868 0.930)***	0.991	(0.959 1.024)
50–59	0.948	(0.864 1.039)	0.977	(0.943 1.012)	1.018	(0.985 1.051)
60–69	0.756	(0.684 0.836)***	1.116	(1.070 1.164)***	1.024	(0.987 1.062)
70 and over	0.612	(0.548 0.683)***	1.284	(1.220 1.351)***	0.965	(0.925 1.006)
Sex						
Male	1.000		1.000		1.000	
Female	1.134	(1.084 1.186)***	1.424	(1.398 1.451)***	1.522	(1.497 1.547)***
Marital Status						
No	1.000		1.000		1.000	
Yes	0.900	(0.86 0.942)***	1.134	(1.111 1.158)***	1.168	(1.148 1.189)***
Urbanisation						
Cities	1.000		1.000		1.000	
Towns	0.937	(0.889 0.988)*	0.976	(0.954 0.998)*	0.884	(0.867 0.902)***
Rural areas	0.918	(0.870 0.969)**	0.894	(0.873 0.916)***	0.794	(0.778 0.811)***
Education						
Primary	1.000		1.000		1.000	
Secondary	0.902	(0.845 0.962)**	1.047	(1.011 1.085)*	1.389	(1.349 1.429)***
Tertiary	0.843	(0.776 0.916)***	1.031	(0.991 1.073)	1.776	(1.718 1.836)***
Labour force status						
Employed	1.000		1.000		1.000	
Unemployed	1.626	(1.493 1.772)***	0.815	(0.782 0.850)***	0.906	(0.870 0.943)***
Retired	1.125	(1.037 1.221)**	1.097	(1.054 1.142)***	1.140	(1.104 1.178)***
Outside Labour Force	1.203	(1.124 1.286)***	0.918	(0.891 0.946)***	1.087	(1.058 1.116)***
Household income (quintile)						
Below first	1.000		1.000		1.000	
Between first and second	0.691	(0.653 0.732)***	1.110	(1.076 1.145)***	1.117	(1.088 1.148)***
Between second and third	0.570	(0.536 0.608)***	1.163	(1.128 1.199)***	1.224	(1.191 1.257)***
Between third and fourth	0.433	(0.403 0.465)***	1.210	(1.173 1.248)***	1.336	(1.300 1.373)***
Between fourth and fifth	0.349	(0.321 0.380)***	1.188	(1.150 1.226)***	1.510	(1.467 1.553)***
Social support						
Low	1.000		1.000		1.000	
Moderate	0.570	(0.517 0.629)***	1.227	(1.147 1.313)***	1.124	(1.061 1.192)***
High	0.452	(0.411 0.498)***	1.355	(1.267 1.448)***	1.184	(1.118 1.253)***
Health status						
Self-assessed health						
Good/very good	1.000		1.000		1.000	
Fair	1.464	(1.378 1.554)***	1.679	(1.629 1.730)***	1.486	(1.452 1.521)***
Bad/very bad	2.125	(1.969 2.294)***	2.092	(1.970 2.223)***	2.067	(1.988 2.149)***
Multimorbidity						
None	1.000		1.000		1.000	
One	1.397	(1.302 1.498)***	1.876	(1.832 1.921)***	1.532	(1.500 1.565)***
Two	1.599	(1.481 1.727)***	2.469	(2.390 2.551)***	1.820	(1.773 1.869)***
Three	1.848	(1.697 2.011)***	2.927	(2.797 3.063)***	2.002	(1.937 2.069)***
Four or more	2.412	(2.222 2.618)***	3.626	(3.442 3.819)***	2.226	(2.151 2.304)***
Limitations in activities due to health						
No limitations	1.000		1.000		1.000	
Limited/severely limited	1.341	(1.267 1.419)***	1.593	(1.543 1.644)***	1.724	(1.684 1.764)***
Health behaviours						
Smoker						
No	1.000		1.000		1.000	
Occasionally	1.376	(1.246 1.519)***	0.962	(0.923 1.003)	1.000	(0.963 1.040)
Daily	1.325	(1.254 1.399)***	0.858	(0.838 0.879)***	0.856	(0.837 0.876)***
Constant	0.081	(0.064 0.103)***	0.799	(0.667 0.956)*	0.194	(0.158 0.238)***

Note: Results are displayed as an Odds Ratio adjusted for the other explanatory variables, ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

resources to pay for transportation costs to health facilities, and user charges (e.g. co-payments) for health care. Our results revealed that higher education and income levels were associated with higher use of specialist care. Previous studies (Devaux, 2015; Jusot et al., 2011) have also found evidence of income disparities for specialist care and in some countries, this may be driven by specialist visits in the private sector (Devaux, 2015).

After controlling for individual characteristics, correlations between unmet need and utilisation were very low (less than 10%) at an individual-level. Unmet need due to long wait had a correlation of 0.05 with GP consultations, and 0.07 with specialist consultations. In a study using survey data from Canada, Allin et al. (2010) found a positive association between unmet need due to wait and utilisation, after adjusting for need and socioeconomic variables. The authors surmise that this may be due to unobserved needs or that individuals' health status deteriorates due to waits, which in turn necessitates additional care. At the country level, there were negative correlations between unmet need due to affordability and consultations but these were only statistically significant for unmet need due to the affordability of prescribed medicines and GP (−49%), and specialist (−42%) care. This suggests that there were financial barriers - potentially related to co-payments - that were preventing people from accessing care. Countries can utilize various policies to increase access and protect people from financial hardship, including exemptions for specific population groups

(people with chronic illness, low income), individual annual caps on all co-payments, and low fixed co-payments instead of percentage co-payments, which depend on the price of the service (World Health Organization European Region, 2023).

The individual- and country-level correlations suggest that on the whole, unmet need and utilisation are measuring different dimensions of access, and these are reflected in different individual abilities and health system dimensions, as argued by Levesque et al. (2013). This further underlines that access is a multifaceted concept that cannot be captured by a single measure.

Some health system characteristics played a role in explaining differences in access across countries in our study. There was a small negative association between government/compulsory schemes as a share of current expenditure on health and unmet need due to the affordability of medical care, which disappeared in the sensitivity analysis that included migration status. The negative relationship between government health expenditure and unmet need due to the affordability of medical care may have been driven by certain countries including Norway and Denmark, which had high levels of government expenditure on health and low levels of unmet need. Other countries with comparable levels of government health expenditure to Denmark and Norway, including France and Luxembourg, had higher levels of unmet need due to the affordability of medical care. This suggests that increasing government spending may not be sufficient to ensure need is met and that coverage policies are important in improving access to health care (World Health Organization European Region, 2023). For example, France and Luxembourg, have systems of retrospective reimbursement whereby patients pay the full cost upfront and then request

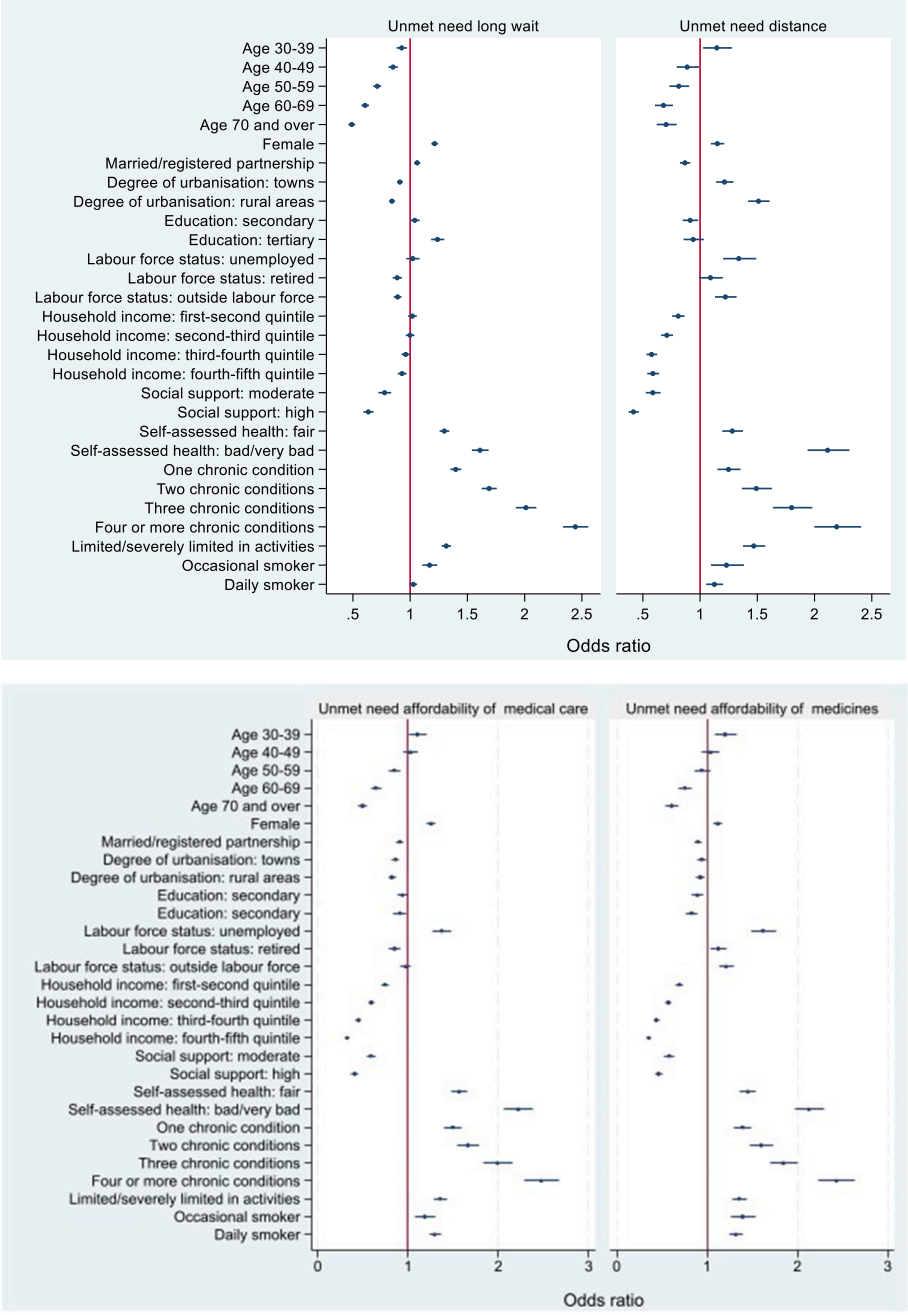

Fig. 3. a. Coefficient plots of the results of the multivariate multinomial model for unmet need due to long wait or distance
b. Coefficient plots of the results of the multivariate multinomial model for unmet need due to the affordability of medical care, or prescribed medicines
c. Coefficient plots of the results of the multivariate multinomial model for GP or specialist consultations.

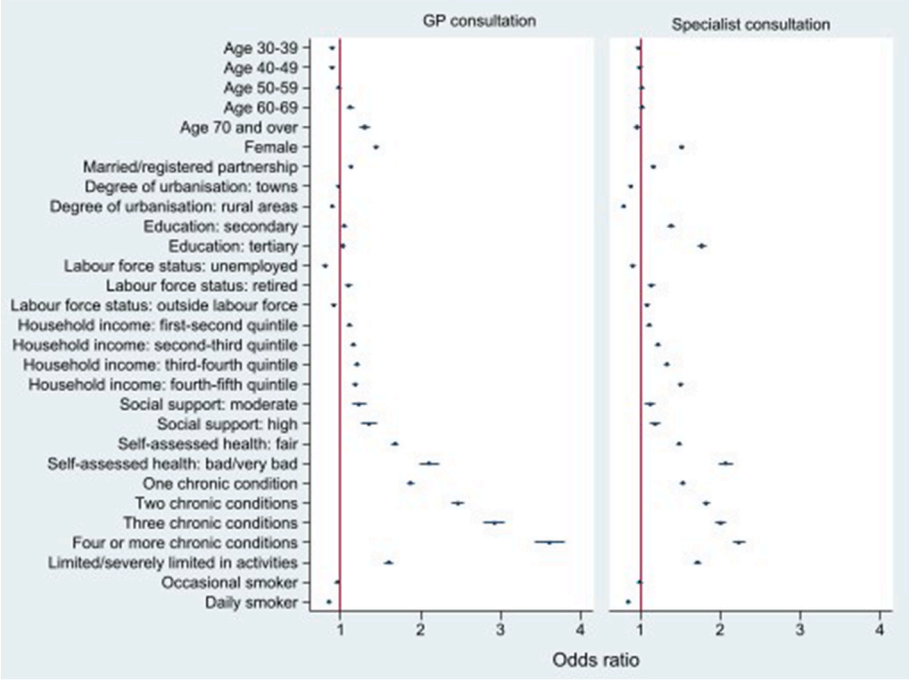

Fig. 3. (*continued*).

Table 3
Correlations between the residual variation in the six outcome variables.

	Unmet need long wait	Unmet need distance	Unmet need affordability of medical care	Unmet need affordability of prescribed medicines	GP consultation	Specialist consultation
Unmet need long wait	1.00	***0.56*****	***0.40****	***0.18***	***0.12***	***0.07***
Unmet need distance	0.27***	1.00	***0.61*****	***0.40****	***0.00***	***0.14***
Unmet need affordability of medical care	0.16***	0.16***	1.00	***0.71*****	***−0.29***	***−0.06***
Unmet need affordability of prescribed medicines	0.09***	0.11***	0.47***	*1.00*	***−0.49*****	***−0.42*****
GP consultation	0.05***	0.00	0.00	0.00*	1.00	***0.54*****
Specialist consultation	0.07***	0.01***	0.01***	0.00	0.22***	1.00

Note: ***p < 0.001, **p < 0.01, *p < 0.05.Country-level correlations are distinguished from individual-level correlations by bold and italic fonts.

reimbursement from the health insurance fund, which may pose a financial barrier to accessing care. The positive association between unmet need due to the affordability of prescribed medicines and gatekeeping, may have been driven by several countries, including Croatia, Finland, Sweden, Poland and Bulgaria, which had high levels of unmet need due to the affordability of prescribed medicines, and where patients require a referral from primary to specialist care. Gatekeeping (incentivised and required) was also negatively associated with specialist consultations, to an extent that was similar to that reported by Jusot et al. (2011). Bulgaria and Sweden also had relatively low rates of specialist consultations as did other countries, such as Ireland and Norway, where patients require a referral from primary to specialist care. In contrast to Jusot et al. (2011) we found no significant association between gatekeeping or GP density and GP consultations. Sripa et al. (2019) in their systematic review of the impact of primary care gatekeeping, found that, in general, gatekeeping was associated with lower use of specialist care. However, at the same time they cautioned against drawing firm policy conclusions due to a lack of evidence on the long-term consequences of reduced specialist care use, which could potentially lead to delayed diagnosis and care, resulting in worse patient outcomes in the longer run. We also did not detect any relationship between specialist consultations and specialist density. Country-level indicators can mask regional and local variations in physician availability, which may be more closely related to access (Chaupain-Guillot and Guillot, 2015). Data on physician density disaggregated by region is available across countries from the OECD Data Explorer database (OECD, 2024). EHIS includes a variable on 'region of residence' but this is only available for 19 of the 29 countries in our study (Eurostat, n.d.), preventing the inclusion of a regional level or variables. Out-of-pocket payments were not associated with any of our access measures, a finding also reported by Jusot et al. (2011) in relation to GP or specialist visits. This lack of association may be due to the variability of co-payment policies across countries and that cost-sharing may be low for these services (Jusot et al., 2011). Similarly, Carnazza et al. (2023) did not find a significant association between out-of-pocket expenditure (as a percentage of health expenditure) and the percentage of the population experiencing unmet need in a study using EHIS 2 data. However, when accounting for the concentration of unmet needs among low income groups, their study did show a negative relationship with unmet need due to long waits, the affordability of medical care, and the affordability of prescribed medicines. Conversely, Chaupain-Guillot and Guillot (2015) reported a positive association between out-of-pocket expenditure (as a percentage of total health expenditures) and unmet need for medical care but this may be because their study used an overall measure of unmet need and did not distinguish different barriers to access.

There are additional factors that could explain cross-country variation in access that are not available in the EHIS dataset. Levesque et al.

Table 4
Associations between outcome measures and country characteristics.

Country characteristic	Access measure					
	Unmet need long wait, n = 203,832		Unmet need distance, n = 202,397		Unmet need affordability medical care, n = 197,208	
	Odds ratio	95% Confidence Interval	Odds ratio	95% Confidence Interval	Odds ratio	95% Confidence Interval
Health system characteristics						
Government/compulsory schemes, % of current expenditure on health	1.012	(0.991 1.034)	1.000	(0.979 1.021)	0.978	(0.959 0.999)*
Voluntary health care payment schemes, % of current expenditure on health	1.029	(0.977 1.083)	0.972	(0.925 1.021)	1.024	(0.973 1.078)
Household out-of-pocket payments, % of current expenditure on health	0.982	(0.960 1.004)	1.004	(0.982 1.026)	1.018	(0.996 1.041)
Health expenditure, % of GDP	1.005	(0.898 1.125)	0.966	(0.868 1.076)	0.896	(0.800 1.003)
Generalist medical practitioners, per 100,000 population	1.002	(0.998 1.006)	0.998	(0.995 1.002)	1.002	(0.998 1.006)
Specialist medical practitioners, per 100,000 population	0.998	(0.995 1.001)	1.002	(1.000 1.005)*	1.001	(0.998 1.004)
GPs control access to specialist care (gatekeeping): incentive	0.736	(0.418 1.295)	0.751	(0.439 1.284)	1.104	(0.612 1.991)
GPs control access to specialist care (gatekeeping): required	0.943	(0.581 1.530)	0.848	(0.536 1.342)	1.242	(0.764 2.018)
Macroeconomic characteristics						
GDP per capita	1.000	(1.000 1.000)	1.000	(1.000 1.000)	1.000	(1.000 1.000)
GINI index	0.997	(0.945 1.053)	1.031	(0.981 1.085)	1.058	(1.004 1.115)*

Country characteristic	Access measure					
	Unmet need affordability of prescribed medicines, n = 198,208		GP consultation, n = 269,431		Specialist consultation, n = 268,401	
	Odds ratio	95% Confidence Interval	Odds ratio	95% Confidence Interval	Odds ratio	95% Confidence Interval
Health system characteristics						
Government/compulsory schemes, % of current expenditure on health	0.997	(0.977 1.017)	1.001	(0.984 1.019)	0.992	(0.971 1.012)
Voluntary health care payment schemes, % of current expenditure on health	0.978	(0.933 1.026)	1.023	(0.983 1.065)	1.033	(0.984 1.084)
Household out-of-pocket payments, % of current expenditure on health	1.008	(0.987 1.029)	0.994	(0.976 1.012)	1.002	(0.981 1.025)
Health expenditure, % of GDP	0.935	(0.843 1.036)	1.036	(0.947 1.134)	1.019	(0.915 1.135)
Generalist medical practitioners, per 100,000 population	0.999	(0.995 1.002)	1.001	(0.998 1.005)	1.001	(0.996 1.005)
Specialist medical practitioners, per 100,000 population	1.000	(0.998 1.003)	0.998	(0.996 1.001)	1.002	(0.999 1.005)
GPs control access to specialist care (gatekeeping): incentive	1.421	(0.862 2.343)	1.113	(0.711 1.742)	0.516	(0.322 0.825)**
GPs control access to specialist care (gatekeeping): required	1.535	(1.017 2.317)*	0.867	(0.591 1.272)	0.506	(0.339 0.757)**
Macroeconomic characteristics						
GDP per capita	1.000	(1.000 1.000)	1.000	(1.000 1.000)*	1.000	(1.000 1.000)
GINI index	1.027	(0.978 1.079)	1.003	(0.961 1.048)	0.983	(0.934 1.036)

Notes: **p < 0.01, *p < 0.05. All multilevel logit models are adjusted for the individual socio-economic, health status, and health behaviour characteristics shown in Table 2. Number of countries = 28 for unmet need affordability of medical care and prescribed medicines as data is unavailable for Belgium. Data on the number of generalist medical practitioners and specialist medical practitioners (per 100,000 population) is unavailable for Slovak Republic resulting in a sample size of: 199,938 for unmet need long wait, 198,538 for unmet need distance, 193,260 for unmet need affordability of medical care, 194,547 for unmet need affordability of prescribed medicines, 264,188 for GP consultation and 263,158 for specialist consultation.

(2013) highlight that the ability to reach care is shaped by living environments, transport and mobility. Using EU-SILC data, Chaupain-Guillot and Guillot (2015) found that living in a household without a car increased the risk of unmet needs for medical care, as did living in rental accommodation and being a member of a household with debts. As well as income, the ability to pay for health care may be influenced by assets, social capital and health insurance (Levesque et al., 2013). Previous studies have used alternative measures to income, using data from the European Social Survey and SHARE, including 'financial strain' (Fjær et al., 2017) and 'difficulty making ends meet' (Tavares, 2022) and found that these were positively associated with unmet need. Also using EU-SILC data (Fiorillo, 2020), examined the relationship between unmet need for medical care and social capital, which was defined as contact with family and friends, volunteering and participation in group (political, professional, religious or recreational) activities. This study found that frequency of contact with friends was associated with a lower probability of unmet need for medical care due to economic costs, while frequency of contact with relatives was associated with a lower probability of unmet need due to distance and time constraints. Martin et al. (2020) analysed Commonwealth Fund data for ten OECD countries and found that having private health insurance was negatively associated with primary care waiting times in France and Germany.

The formulation of questions on unmet need varies across surveys, which is reflected in the percentage of the population reporting unmet need. A detailed discussion on the unmet need questions in EHIS and EU-SILC, is in the supplementary data Text S1. The identification of unmet needs among those with a need for care in the EHIS questions likely explains why unmet need country scores from EHIS are generally higher than those from EU-SILC. As noted in Section 2.1, EHIS respondents can report unmet need due to long waits, distance/transportation, and financial affordability, while EU-SILC respondents can only choose one reason for unmet need.

The main limitations of this work relate to the use of survey data. Data on unmet need and utilisation was self-reported. Moreover, the unmet need questions did not distinguish (i) the different types of services for which people experienced long waits, and (ii) the affordability of GP or specialist care (which would complement the utilisation measures). Nevertheless, a strength of EHIS is that it contains questions on

both unmet need and utilisation of care, unlike the EU-SILC, which does not routinely include questions on utilisation. As previously noted, EHIS also allows respondents to report more than one type of (reason for) unmet need. While the Survey of Health, Ageing and Retirement in Europe (SHARE) (Börsch-Supan, 2022) collects data on the utilisation of GP, and specialist care as well as GP and specialist care foregone due to cost or because this care was unavailable or inaccessible, this survey is restricted to individuals aged 50 years and over. Therefore, another strength of EHIS is that the data is not restricted by age. A limitation of EHIS is the comparatively low frequency of data collection. EHIS was collected every five years up to 2019 and the next data collection will be undertaken in 2025. In contrast, EU-SILC is collected annually and SHARE every two years. Moreover, EHIS is a cross-sectional study and does not follow people over time, unlike EU-SILC and SHARE, although only cross-sectional data is available from EU-SILC for unmet need. While the formulation of questions on access to care in SHARE has changed over time, data from waves with consistent questions could be used to undertake longitudinal analysis. As noted in Section 2.1, EHIS response rates vary across countries. It is difficult to compare response rates between different surveys because of differences in aims and scope as well as sampling methodology. For example, the SHARE survey involves a screening procedure to identify people aged 50 years and over, and this approach can negatively affect the response rate (Bergmann et al., 2019). Therefore, SHARE response rates across countries cannot be directly compared with EHIS response rates. Multilevel modelling is advantageous to analyse EHIS data as individuals are nested in countries, but it is important to note that this method does not establish causality and the results can only be interpreted as associations between access measures and individual and country characteristics.

There are several avenues for future research. Studies could investigate access across countries in terms of the other steps in the access pathway outlined by Levesque et al., relating to: "perception of need and desire for care", "health care seeking" and "health care consequences". It would also be useful to further interrogate the reasons for variations in access to health care across countries by undertaking an in-depth study of health system characteristics and policies using qualitative methods including focus groups and expert interviews, which facilitates the collection of rich contextual data. Two waves of data (EHIS 2 and EHIS 3) are currently available for all EU countries, Iceland and Norway and the next wave will be collected in 2025. This will provide a rich dataset to analyse changes in access to health care over time, a research question that is beyond the scope of this current study. EHIS also contains information on access (unmet need and utilisation) to dental care, and mental health care, and future work could undertake detailed studies on each of these important sectors.

5. Conclusion

This study contributes to the literature on access to health care by providing evidence of the relationship between different dimensions of access and observable and unobservable factors, at individual and country levels. The study demonstrates that access is a multifaceted concept, underscoring the importance of employing complementary measures of access to health care. Our findings can usefully inform policy by highlighting that vulnerable populations including those with higher health needs, and lower income face multiple barriers to accessing health care and that a diversity of policy responses are necessary to improve access to health care.

CRediT authorship contribution statement

Valerie Moran: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Ellen Nolte:** Writing – review & editing, Funding acquisition, Conceptualization. **Marc Suhrcke:** Writing – review & editing, Visualization, Supervision, Funding acquisition. **Maria Ruiz-Castell:** Writing – review & editing, Visualization, Supervision.

Financial disclosure statement

The authors have no financial interests to declare.

Ethical approval

Ethical approval was not required for the statistical analysis as the data received for the analysis was de-identified and we present only aggregated data, which the GDPR considers as non-personal data.

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Conflict of interest statement

The authors have no conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2025.117715.

Data availability

The European Health Interview Survey microdata is available upon request from Eurostat https://ec.europa.eu/eurostat/web/microdata/european-health-interview-survey.

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