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Factors associated with the use of public eHealth services in Poland – a 2022 nationwide cross-sectional survey

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Abstract

Introduction and Objective. Poland is an example of a European country that has made significant progress in digitizing healthcare during the last 5 years. There is limited data on the use of eHealth services by different socio-economic groups in Poland during the COVID-19 pandemic The aim of the study was to characterize public attitudes towards the use of e-Health services in Poland, as well as to identify factors associated with the use of e-Health services among adults in Poland.

Materials and Method. A questionnaire-based survey was carried out during 9–12 September 2022. A computer-assisted web interview methodology was used. A nationwide random quota sample of 1,092 adult Poles was selected. Questions on the use of 6 different public eHealth services in Poland and soci-economic characteristics were addressed.

Results. Two-thirds of participants (67.1%) had received an e-prescription in the last 12 months. More than half of the participants used the Internet Patient Account (58.2%) or the patient.gov.pl website (54.9%). One-third of the participants had teleconsultation with a doctor (34.4%), and approximately one-quarter of participants had received electronic sick leave (26.9%) or used electronic information about treatment dates (26.7%). Of the ten different socio-economic factors analyzed in this study, educational level, and place of residence ($p<0.05$) were the most important factors associated with the use of public eHealth services among adults in Poland.

Conclusions. Living in rural areas or small cities is associated with a lower level of public eHealth services utilization. A relatively high interest in health education through eHealth methods was observed.

Key words

Poland, health services, telemedicine, health services research, mobile health, socio-economic factor

INTRODUCTION

Digital technologies are currently widely implemented in the industry and have led to significant changes in daily life [1]. In 2022, more than 63% of the global population were internet users [2], with the most common reasons for its use being finding information and social media (especially staying in touch with family and friends) [2]. However, information and communications technology (ICT) is also widely implemented in healthcare [3, 4]. The use of ICT for health-related purposes is defined by the World Health Organization (WHO) as 'eHealth' [5]. This definition included a wide range of activities carried out remotely with the use of ICT, wherein the most common are: (1) providing health care services; (2) remote monitoring of health status; (3) health education; (4) developing professional literature and scientific research [6].

eHealth services are developed both by public and private healthcare institutions [7, 8]. Private medical facilities and health companies are mostly working on eHealth services that increase the sales of their products/services, or affect the labour productivity process. The most common type of eHealth services developed by the private medical sector is the e-queue, teleconsultation or IT systems, dedicated to health management and labour organizations [8]. Public institutions are mostly focused on eHealth services accessible to the general population, mostly related to services provided within the national health system or health education [9, 10].

The development of eHealth digital service infrastructure is one of the priorities of the European Union (EU) [11] and the level of its implementation in national health systems differs across the EU Member States [12], with Denmark, Estonia, Finland, Spain, and Sweden considered the countries with the highest eHealth adoption [12]. Central and Eastern Europe is the region with the lowest adoption of e-Health services. However, the COVID-19 pandemic favoured digital transitions [13] and during the first phase of the pandemic, numerous countries implemented a wide scope of eHealth services that are now often treated as a standard of care [14].

Poland is an example of an EU country that has made significant progress in digitizing healthcare during the last five years [9, 10, 15]. In The first eHealth strategy was developed in 2004, but the widespread implementation of the first public eHealth services took place in 2019–2020 [10]. Public eHealth services in Poland are available free of charge for all individuals covered by mandatory health insurance [16]. Between 2020–2022, a significant development of public eHealth services in Poland was observed. Currently, there are eight major public eHealth services: (1) electronic prescription;

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(2) electronic order for medical supplies (e-medical supplies); (3) electronic referral (e-referral); (4) electronic sick leave; (5) teleconsultation; (6) electronic information about treatment dates (e-queue); (7) Internet Patient Account (IKP) and (8) the patient.gov.pl website [10].

An e-prescription is an electronic document authorizing the purchase of a prescription drug, which is issued by a healthcare worker – usually a doctor [17]. E-prescription has been a mandatory form of drug prescription in Poland since January 2020 [10, 17]. After issuing an e-prescription in the IT system, the patient receives a text message (SMS) with a 4-digit pin or an e-mail with an attached file in pdf format, containing the prescription with a barcode and a pin. The holder of the prescription can then fill the prescription at a pharmacy, providing the individual PESEL number and a pin code assigned to the e-prescription [10]. This is a useful solution for patients because the electronic document cannot be lost, can be easily read without handwriting legibility problems and if accidentally deleted from e-mail or SMS, it can be easily accessed via IKP (Internetowe Konto Pacjenta) – Internet Patient Account [10, 17]. The same mechanism of action was used in the case of electronic orders for medical supplies (e-medical supplies).

Since January 2021, all referrals have been issued in electronic form. The introduction of e-referral makes it possible to monitor the patient's path and manage the process of waiting for medical services. The process of issuing and implementing e-referrals is similar to e-prescriptions. A medical employee issues an e-referral (electronically signed document), that is verified by the IT system (P1 e-Health platform), and a 4-digit pin is assigned (send to the patient via SMS) [10]. The patient can choose a medical facility (preferred place of medical service delivery) where the 4-digit pin along with a PESEL number is used to add a patient to the waiting list. The history of e-referrals is available via IKP [10].

Electronic sick leave (e-sick leave) is an electronic certificate of the patient's incapacity for work, issued by a doctor [10]. Information about incapacity for work, caused by an illness or disease of a minor child, is immediately forwarded to the Social Insurance Institution, and then to the employer. From 1 December 2018, only the electronic form of sick leave is valid.

Teleconsultation is a medical service provided remotely using an information and communications technology (ICT system) or telephone [10]. The doctor providing teleconsultation is obligated to confirm the patient's identity and make an appropriate note in the medical documentation informing about the form of medical consultation and treatment. Teleconsultation significantly facilitates contact between the doctor and patient, and contributed to the reduction of SARS-CoV-2 virus transmission during the COVID-19 pandemic [18].

Electronic information about treatment dates (e-queue) is an eHealth service developed by the National Health Fund – a public payer in Poland [19]. Thanks to this service, the patient can find a medical facility in which he can obtain the fastest medical service and monitor the number of patients waiting for service in the medical facility. The database of addresses and telephones includes nearly 14,000 medical facilities that provide services under a contract with the National Health Fund. The search engine has been operating since September 2018 [19].

The Internet Patient Account (IKP) is an e-Health service that stores individual information about the health of a given patient [10]. IKP is available free of charge to any holder of a PESEL number – the Universal Electronic System for Registration of the Population. Access to the services is possible after logging-in via the website (patient.gov.pl) or the dedicated mobile application 'mojeIKP' ('myIKP'), available in PLAY or App Stores [10]. The patient's account contains data on medical services and interventions in the past (under mandatory health insurance), future visits, prescriptions, and medical certificates (including sick leaves and proof of vaccination). IKP allows the account holder to perform certain activities, such as selecting a primary healthcare provider or granting access to medical records to a doctor or a close person/relative [10].

Patient.gov.pl is a website in Poland devoted to health management and created by government administration bodies [20]. The purpose of the website is to make it easier for the patient to use health services, including e-Health services, available in Poland, and to provide verified content about health. The website is constantly updated, and the published content is adapted to the current health needs of the Polish population [20].

The utilization of eHealth services and mobile health technology differs by soci-economic factors [21, 22, 23]. Bujnowska-Fedak et al. showed that living in urban areas, having higher education, and being professionally active are the factors associated with Internet use as a source of health information and services [22]. Żarnowski et al. showed that younger age and a healthy lifestyle are associated with the use of mobile health applications and wearables among adults in Poland (without economic barriers) [23].

In Poland, the percentage of households with internet access is higher in urban areas compared to rural areas [24]. Moreover, access to health services differs by place of residence (limited access to specialized care in rural areas) [25]. During the COVID-19 pandemic both citizens of rural and urban areas were encouraged to use public eHealth services (e.g., teleconsultations or IKP when booking COVID-19 vaccination appointments). However, there is no data on the use of eHealth services by different socio-economic groups in Poland during the pandemic. Identification of the factors associated with the use of public eHealth services in Poland may inform policymakers, healthcare providers, and public health specialists on further needs in the development of eHealth in Poland and educational needs.

OBJECTIVE

The aim of the study was to characterize public attitudes towards the use of e-Health services in Poland, as well as to identify factors associated with the use of e-Health services among adults in Poland.

MATERIALS AND METHOD

The study was carried out using the methods of a cross-sectional design and computer-assisted web interview. A questionnaire-based survey was carried out between 9–12 September 2022. A nationwide random-quota sample of 1,092 adult Poles was selected from a dataset of 100,000 users of

the National Research Panel 'Ariadna' (a specialized public opinion poll company) [26]. The sample size was calculated based on the demographic data of the Polish population [27]. The following demographic variables: gender, age, and place of residence were included in the stratification model to meet the criteria of representativeness of the study population.

The study tool was a self-prepared questionnaire. The questionnaire included six questions on the use of public e-Health services in Poland, as well as ten questions on socio-economic characteristics.

The use of public e-Health services was defined based on the following questions: 'In the last 12 months, have you used the following digital (eHealth) services available from public healthcare: (1) teleconsultation with a doctor; (2) electronic prescription (e-prescription); (3) electronic sick leave; (4) electronic information about treatment dates (e-queue); (5) Internet Patient Account (IKP); (6) patient.gov.pl website.

Socio-economic characteristics included gender, age, educational level, marital status, having children, place of residence, number of household members, children in the home, occupational status: active (currently employed/self-employed) or passive (unemployed, retired, or student) and economic status ('How do you assess the economic status of your household: good/moderate/bad'?).

The study questionnaire and the study protocol were approved by the Ethics Board at the Central Clinical Hospital of the Ministry of the Interior and Administration in Warsaw, Poland (Decision No. 41/2022).

Statistical analysis was carried out using IBM SPSS Statistics 28 (Armonk, USA). Statistical testing to compare categorical variables was completed using the independent samples chi-square test. Associations between socio-demographic factors (independent variables) and the use of public e-Health services in the last 12 months were assessed using multivariable logistic regression analyses (each e-Health service was defined as dependent variable in separated models). Odds ratio (OR) and 95% confidence intervals (95%CI) were used to measure the strength of associations. The statistical significance level was set as $p<0.05$.

Table 1. Characteristics of the study population (n=1092)

Variable	n	%
Gender		
female	574	52.6
male	518	47.4
Age (years)		
18–29	242	22.2
30–44	301	27.6
45–59	297	27.2
60+	252	23.1
Educational level		
primary	29	2.7
vocational	104	9.5
secondary	488	44.7
higher	471	43.1
Marital status		
ever married	570	52.2
never married	522	47.8
Having children		
yes	675	61.8
no	417	38.2
Place of residence		
rural	411	37.6
city < 20,000 residents	141	12.9
city 20,000–99,999 residents	210	19.2
city 100,000–499,999 residents	194	17.8
city ≥ 500,000 residents	136	12.5
Number of household members		
living alone	155	14.2
living with at least one person	937	85.8
Children in home		
yes	362	33.2
no	730	66.8
Occupational status		
active (currently employed/self-employed)	674	61.7
passive (unemployed, retired, or student)	418	38.3
Self-declared economic status		
good	449	41.1
moderate	419	38.4
bad	224	20.5

RESULTS

Completed questionnaires were received from 1,092 adults of whom 52.6% were females and over one-third of participants (37.7%) lived in rural areas (Tab. 1).

Two-thirds of participants (67.1%) had received an e-prescription in the last 12 months. More than half of the participants used the Internet Patient Account (58.2%) or the patient.gov.pl website (54.9%). One-third of the participant had a teleconsultation with a doctor (34.4%) in the last 12 months. Approximately one-quarter of participants had received electronic sick leave (26.9%) or used electronic information about treatment dates (26.7%).

There were significant differences in the prevalence of the use of public e-Health services by socio-economic factors (Tab. 2, Tab. 3). Females compared to males, more often used teleconsultation with a doctor (38.9% vs. 39.5%; p=0.001) and e-prescription (70.9% vs. 62.9%; p=0.005). The prevalence of the use of e-prescriptions increased with age, contrary to the prevalence of electronic sick leave which decreased with the age. The prevalence of use of Internet Patient Accounts (IKP) was the lowest among the youngest participants aged 18–29 years. Respondents with higher education more often used governmental websites (IKP and patient.gov.pl website), compared to other educational groups. Participants who had children more often used teleconsultation (37.2% vs. 30%; p=0.02), e-prescription (75.7% vs. 53.2%; p<0.001), Internet Patient Account (61.3% vs. 53.2%; p=0.008) and patient.gov.pl website (58.5% vs. 49.2%; p=0.003), compared to those who did not have children. The prevalence of the use of teleconsultation or e-prescription was the highest among those who lived in the largest cities (Tab. 2). Moreover, the prevalence of use of Internet Patient Account (IKP) and the patient.gov.pl website increased with the size of place of residence (p<0.05). Participants who had children more often

Table 2. Use of selected public eHealth services (related to a contact with a doctor) among adults in Poland (n=1,092)

Use of selected public eHealth services related to a contact with a doctor						
Variable	Teleconsultation with a doctor		Electronic prescription (e-prescription)		Electronic sick leave	
	n (%)	p	n (%)	p	n (%)	p
Overall	376 (34.4)		733 (67.1)		294 (26.9)	
Gender						
female	223 (38.9)	**0.001**	407 (70.9)	**0.005**	152 (26.5)	0.7
male	153 (29.5)		326 (62.9)		142 (27.4)	
Age (years)						
18–29	84 (34.7)	0.09	135 (55.8)	**<0.001**	85 (35.1)	**<0.001**
30–44	115 (38.2)		188 (62.5)		103 (34.2)	
45–59	106 (35.7)		216 (72.7)		90 (30.3)	
60+	71 (28.2)		194 (77.0)		16 (6.3)	
Educational level						
primary	9 (31.0)	0.1	19 (65.5)	**<0.001**	9 (31.0)	0.4
vocational	25 (24.0)		55 (52.9)		23 (22.1)	
secondary	172 (35.2)		316 (64.8)		125 (25.6)	
higher	170 (36.1)		343 (72.8)		137 (29.1)	
Marital status						
ever married	209 (36.7)	0.1	433 (76.0)	**<0.001**	159 (27.9)	0.4
never married	167 (32.0)		300 (57.5)		135 (25.9)	
Having children						
yes	251 (37.2)	**0.02**	511 (75.7)	**<0.001**	176 (26.1)	0.4
no	125 (30.0)		222 (53.2)		118 (28.3)	
Place of residence						
rural	116 (28.2)	**<0.001**	255 (62.0)	**0.01**	94 (22.9)	0.1
city < 20,000 residents	35 (24.8)		91 (64.5)		36 (25.5)	
city 20,000–99,999 residents	74 (35.2)		149 (71.0)		60 (28.6)	
city 100,000–499,999 residents	83 (42.8)		133 (68.6)		61 (31.4)	
city 500,000 residents	68 (50.0)		105 (77.2)		43 (31.6)	
Number of household members						
living alone	45 (29.0)	0.1	96 (61.9)	0.1	35 (22.6)	0.2
living with at least one person	331 (35.3)		637 (68.0)		259 (27.6)	
Children in home						
yes	159 (43.9)	**<0.001**	257 (71.0)	0.06	145 (40.1)	**<0.001**
no	217 (29.7)		476 (65.2)		149 (20.4)	
Occupational status						
active	266 (39.5)	**<0.001**	452 (67.1)	0.9	-	-
passive	110 (26.3)		281 (67.2)		-	
Self-declared economic status						
good	163 (36.3)	0.2	308 (68.6)	0.6	122 (27.2)	0.9
moderate	131 (31.3)		275 (65.6)		112 (26.7)	
bad	82 (36.6)		150 (67.0)		60 (26.8)	

Table 3. Use of selected public eHealth services (related to information seeking) among adults in Poland (n=1092)

Use of selected public eHealth services related to information seeking						
Variable	electronic information about treatment dates (e-queue)		Internet Patient Account (IKP)		patient.gov.pl website	
	n (%)	p	n (%)	p	n (%)	p
Overall	292 (26.7)		636 (58.2)		600 (54.9)	
Gender						
female	162 (28.2)	0.2	335 (58.4)	0.9	323 (56.3)	0.4
male	130 (25.1)		301 (58.1)		277 (53.5)	
Age (years)						
18–29	72 (29.8)	0.5	121 (50.0)	**0.01**	122 (50.4)	0.4
30–44	83 (27.6)		192 (63.8)		172 (57.1)	
45–59	71 (23.9)		173 (58.2)		166 (55.9)	
60+	66 (26.2)		150 (59.5)		140 (55.6)	
Educational level						
primary	10 (34.5)	0.1	14 (48.3)	**<0.001**	11 (37.9)	**<0.001**
vocational	20 (19.2)		44 (42.3)		41 (39.4)	
secondary	125 (25.6)		265 (54.3)		246 (50.4)	
higher	137 (29.1)		313 (66.5)		302 (64.1)	
Marital status						
ever married	163 (28.6)	0.1	353 (61.9)	**0.01**	336 (58.9)	**0.005**
never married	129 (24.7)		283 (54.2)		264 (50.6)	
Having children						
yes	187 (27.7)	0.4	414 (61.3)	**0.008**	395 (58.5)	**0.003**
no	105 (25.2)		222 (53.2)		205 (49.2)	
Place of residence						
rural	101 (24.6)	0.4	221 (53.8)	**0.02**	196 (47.7)	**<0.001**
city < 20,000 residents	35 (24.8)		74 (52.5)		73 (51.8)	
city 20,000–99,999 residents	54 (25.7)		126 (60.0)		121 (57.6)	
city 100,000–499,999 residents	60 (30.9)		124 (63.9)		116 (59.8)	
city ≥ 500,000 residents	42 (30.9)		91 (66.9)		94 (69.1)	
Number of household members						
living alone	34 (21.9)	0.1	88 (56.8)	0.7	80 (51.6)	0.4
living with at least one person	258 (27.5)		548 (58.5)		520 (55.5)	
Children in home						
yes	114 (31.5)	**0.01**	226 (62.4)	**0.048**	220 (60.8)	**0.006**
no	178 (24.4)		410 (56.2)		380 (52.1)	
Occupational status						
active	191 (28.3)	0.1	419 (62.2)	**<0.001**	397 (58.9)	**<0.001**
passive	101 (24.2)		217 (51.9)		203 (48.6)	
Self-declared economic status						
good	120 (26.7)	0.5	278 (61.9)	**0.04**	260 (57.9)	0.2
moderate	106 (25.3)		242 (57.8)		226 (53.9)	
bad	66 (29.5)		116 (51.8)		114 (50.9)	

used all public e-Heath services (Tab. 2, Tab. 3). Currently employed or self-employed respondents more often used teleconsultation or governmental health-related websites (p<0.05). There were no differences in the prevalence of the use of teleconsultation, e-prescription, electronic sick leave, and e-queue by self-reported economic status (Tab. 2, Tab. 3).

In multivariable logistic regression analyses adjusted to ten different socio-economic variables (Tab. 4, Tab. 5), female gender (OR:1.55, 95%CI:1.18–2.03; p=0.001), living in cities above 100,000 residents (p<0.05), having children in the home (OR: 1.57, 95%CI: 1.08–2.28; p=0.02) and active occupational status (OR: 1.79, 95%CI: 1.29–2.46; p= <0.001) were associated with higher odds of use teleconsultation with a doctor in the last 12 months (Tab. 4). Higher educational level (OR: 1.49, 95%CI:1.12–1.98; p=0.006), being ever married (OR: 1.54, 95%CI:1.12–1.98; p=0.02), having children (OR: 1.97, 95%CI:1.25–3.11; p=0.003), as well as living in the city from 20,000 – 99,999 residents (OR: 1.48, 95%CI: 1.02–2.16; p= =0.04) or in city ≥ 500,000 residents (OR: 2.21, 95%CI: 1.37–3.55; p=0.001) were associated with higher odds of use e-prescription (Tab. 4). Younger age, being ever married, living in cities with over 100,000 residents, and having children at home were significantly associated with higher odds of using electronic sick leave (p<0.05). Having higher education (OR: 1.58, 95%CI: 1.22–2.05; p<0.001), living in cities with over 100,000 residents (p<0.05), and good economic status (OR: 1.43, 95%CI: 1.02–2.01; p=0.04) were significantly associated with higher odds of using the Internet

Table 4. Factors associated with the use of selected public eHealth services (related to a contact with a doctor) among adults in Poland (n=1092)

Factors associated with the use of selected public eHealth services related to a contact with a doctor						
Variable	teleconsultation with a doctor		electronic prescription (e-prescription)		electronic sick leave	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
Gender						
female	1.55 (1.18–2.03)	**0.001**	1.27 (0.97–1.67)	0.09	0.89 (0.67–1.19)	0.4
male	Reference		Reference		Reference	
Age (years)						
18–29	1.25 (0.71–2.20)	0.4	0.77 (0.44–1.37)	0.4	8.27 (4.07–16.80)	**<0.001**
30–44	1.08 (0.65–1.78)	0.8	0.64 (0.38–1.07)	0.09	5.80 (3.04–11.05)	**<0.001**
45–59	0.91 (0.58–1.43)	0.7	0.85 (0.53–1.36)	0.5	5.43 (2.99–9.83)	**<0.001**
60+	Reference		Reference		Reference	
Educational level						
higher	0.92 (0.70–1.21)	0.5	1.49 (1.12–1.98)	**0.006**	1.14 (0.85–1.53)	0.4
less than higher	Reference		Reference		Reference	
Marital status						
ever married	1.14 (0.80–1.61)	0.5	1.54 (1.07–2.20)	**0.02**	1.53 (1.03–2.26)	**0.03**
never married	Reference		Reference		Reference	
Having children						
yes	1.28 (0.81–2.02)	0.3	1.97 (1.25–3.11)	**0.003**	0.89 (0.54–1.48)	0.7
no	Reference		Reference		Reference	
Place of residence						
rural	Reference		Reference		Reference	
city < 20,000 residents	0.84 (0.53–1.31)	0.4	1.09 (0.71–1.65)	0.7	1.19 (0.75–1.90)	0.5
city 20,000 – 99,999 residents	1.30 (0.90–1.88)	0.2	1.48 (1.02–2.16)	**0.04**	1.34 (0.90–2.01)	0.2
city 100,000 – 499,999 residents	2.06 (1.42–3.00)	**<0.001**	1.41 (0.96–2.08)	0.08	1.84 (1.22–2.78)	**0.004**
city ≥ 500,000 residents	2.88 (1.88–4.41)	**<0.001**	2.21 (1.37–3.55)	**0.001**	1.89 (1.18–3.01)	**0.008**
Number of household members						
living alone	0.88 (0.57–1.35)	0.5	0.92 (0.61–1.40)	0.7	1.30 (0.81–2.10)	0.3
living with at least one person	Reference		Reference		Reference	
Children in home						
yes	1.57 (1.08–2.28)	**0.02**	0.97 (0.66–1.44)	0.9	2.06 (1.37–3.08)	**<0.001**
no	Reference		Reference		Reference	
Occupational status						
active	1.79 (1.29–2.46)	**<0.001**	1.12 (0.82–1.54)	0.5	–	**–**
passive	Reference		Reference		–	
Self-declared economic status						
good	0.93 (0.65–1.32)	0.7	1.06 (0.73–1.52)	0.8	0.95 (0.64–1.40)	0.8
moderate	0.74 (0.52–1.06)	0.1	0.95 (0.66–1.36)	0.8	0.97 (0.66–1.44)	0.9
bad	Reference		Reference		Reference	

Table 5. Factors associated with the use of selected public eHealth services (related to information seeking) among adults in Poland (n=1092).

Factors associated with the use of selected public eHealth services related to information seeking						
Variable	electronic information about treatment dates (e-queue)		Internet Patient Account (IKP)		patient.gov.pl website	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
Gender						
female	1.18 (0.89-1.56)	0.2	0.99 (0.77-1.28)	0.9	1.07 (0.83-1.38)	0.6
male	Reference		Reference		Reference	
Age (years)						
18–29	1.08 (0.60-1.94)	0.8	0.69 (0.40-1.17)	0.2	0.87 (0.51-1.49)	0.6
30–44	0.78 (0.46-1.32)	0.4	0.92 (0.57-1.50)	0.7	0.80 (0.50-1.30)	0.4
45–59	0.66 (0.41-1.06)	0.09	0.75 (0.50-1.15)	0.2	0.78 (0.51-1.19)	0.2
60+	Reference		Reference		Reference	
Educational level						
higher	1.18 (0.88-1.56)	0.3	1.58 (1.22-2.05)	<0.001	1.71 (1.32-2.22)	<0.001
less than higher	Reference		Reference		Reference	
Marital status						
ever married	1.28 (0.89-1.86)	0.2	1.12 (0.80-1.57)	0.5	1.16 (0.83-1.63)	0.4
never married	Reference		Reference		Reference	
Having children						
Yes	0.93 (0.58-1.51)	0.8	1.22 (0.79-1.87)	0.4	1.28 (0.83-1.98)	0.3
No	Reference		Reference		Reference	
Place of residence						
Rural	Reference		Reference		Reference	
city < 20,000 residents	1.01 (0.64-1.59)	0.9	0.93 (0.62-1.37)	0.7	1.15 (0.77-1.70)	0.5
city 20,000–99,999 residents	1.04 (0.71-1.54)	0.8	1.20 (0.85-1.70)	0.3	1.39 (0.99-1.97)	0.6
city 100,000–499,999 residents	1.43 (0.97-2.12)	0.07	1.50 (1.04-2.16)	0.03	1.62 (1.13-2.32)	0.009
city ≥ 500,000 residents	1.42 (0.91-2.22)	0.1	1.58 (1.04-2.42)	0.03	2.35 (1.52-3.61)	<0.001
Number of household members						
living alone	0.81 (0.51-1.29)	0.4	0.98 (0.66-1.46)	0.9	0.91 (0.61-1.35)	0.6
living with at least one person	Reference		Reference		Reference	
Children in home						
yes	1.42 (0.96-2.11)	0.08	1.19 (0.83-1.70)	0.3	1.33 (0.93-1.90)	0.1
no	Reference		Reference		Reference	
Occupational status						
active	1.30 (0.93-1.81)	0.1	1.19 (0.83-1.70)	0.3	1.47 (1.09-1.97)	0.01
passive	Reference		Reference		Reference	
Self-declared economic status						
good	0.79 (0.55-1.14)	0.2	1.43 (1.02-2.01)	0.04	1.21 (0.86-1.71)	0.3
moderate	0.77 (0.53-1.11)	0.2	1.27 (0.91-1.78)	0.2	1.12 (0.80-1.57)	0.5
bad	Reference		Reference		Reference	

Patient Account (IKP). Having higher education (OR: 1.71, 95%CI: 1.32–2.22; p<0.001), living in cities with over 100,000 residents (p<0.05), and active occupational status (OR:1.47, 95%CI: 1.09–1.97; p=0.01) were significantly associated with higher odds of using the patient.gov.pl website (Tab. 5). There was no impact of socio-economic variables on the odds of use of electronic information about treatment dates (Tab. 5).

DISCUSSION

This study presents comprehensive characteristics of the use of six different public eHealth services in Poland were. A high level of use of public eHealth services related to information seeking, such as Internet Patient Account (IKP) and patient.gov.pl website, was observed. Of the ten different socio-economic factors analyzed in the study, educational level and place of residence were the most important factors associated with the use of public eHealth services among adults in Poland.

The development of public eHealth services in Poland was a long-term action that faced numerous barriers [9, 10, 28], among which legal barriers were the most important [28, 29]. However, the lack of stable financing also led to the limited development of public eHealth services before the pandemic. Between 1995–2015, the most developed eHealth

services in Poland were observed in the private medical sector, e.g., cardiology, family medicine, and pathology [9]. Nevertheless, in the last five years, significant progress in the development and implementation of public eHealth services has been observed [10].

The law on the provision of medical services at a distance (e.g., via ICT) was the most important barrier limiting the development of telemedicine systems in Poland [28]. However, since December 2015, teleconsultations are a legally-defined form of providing medical services. Before the COVID-19 pandemic onset, teleconsultations were mostly provided by private medical companies or health insurance companies [9]. Moreover, because of the pandemic lockdown, general practitioners as well as medical specialists were encouraged to provide teleconsultations [29]. Kludacz-Alessandri et al. showed that the quality of teleconsultations is not inferior to the quality of consultation during a face-to-face visit and the patients indicated a high level of satisfaction regarding communication with their general practitioner during teleconsultation [30]. Karwowski and Gasiorowska also reported that telemedicine consultations are well-perceived by patients in obstetrics and gynaecology clinics [31]. Grata-Borkowska et al. showed that during the COVID-19 pandemic, teleconsultations were well-perceived by doctors and nurses, wherein the least positive view of teleconsultations was declared by paramedics and physiotherapists [32]. Moreover, in the opinion of healthcare professionals in Poland, 20% of visits may be offered via teleconsultation, and most healthcare workers declare willingness to continue remote communication with the patient when necessary or desirable [32]. In the current study, over one-third of participants had used teleconsultation in the last 12 months. By 2022, most of the anti-epidemic measures in Poland had been abolished, including the return to stationary activities of medical facilities [18]. The findings of this study suggest that teleconsultations will be used as a well-tolerated alternative to face-to-face visits, even after the end of the pandemic. Females and those who had a child were more likely to use teleconsultations that may result from their health needs and higher healthcare utilization [18, 33]. In the current study, occupationally active participants and those who lived in cities with at least 100,000 residents were more likely to use teleconsultation. It can be hypothesize that teleconsultation is preferred by those who lived in medium-sized and large cities due to time-saving (e.g., related to transport, etc.). However, teleconsultations pose a chance to visit specialists from large academic medical facilities without the need to travel. Ambulatory specialist services usage among citizens of rural areas may have a high potential for development.

Since January 2020, e-prescription has been a mandatory form of drug prescription [10]. The implementation of this public eHealth service was preceded by consultations with the medical community, digital competence training, and a pilot program [9, 10]. Wrzosek et al. showed that e-prescription is well-evaluated by patients in Poland and makes it easier to purchase medication [17]. In the current study, having higher education, children, being ever married, and living in small or the largest cities were associated with higher odds of using e-prescription. This observation is in line with healthcare utilization in different soci-economic groups in Poland [18, 34]. The experiences of patients related to the use of e-prescription may have an impact on further attitudes towards the use of other public eHealth services.

According to the social security system in Poland, occupationally-active individuals (employed or self-employed) may receive sick leave due to illness or to care for a family member (following the applicable law). Since December 2018, medical doctors are obligated to issue sick leave only in an electronic form (electronic sick leave) [10]. According to the current study, over one-quarter of adults in Poland reported that they received electronic sick leave in the last 12 months. This finding is in line with the national data on sickness absence published by the social security institution [35]. Younger age, living in cities with at least 100,000 residents, and having children were the most important factors associated with the use of electronic sick leave. It can be hypothesized that participants from rural areas and small cities mostly work in private businesses and are less likely to use sick leave. However, electronic sick leave is well-accepted by employees and employers as this service facilitates the circulation of documentation related to sick leave and introduces automation of this process.

In the presented study, three different public eHealth services related to health information seeking were analyzed, in which the use of these services is voluntary and independent of healthcare utilization. Having higher education and living in medium-sized or the largest cities were the most important factors associated with the use of official governmental health-related websites, e.g. Internet Patient Account (IKP) and the patient.gov.pl website [20]. This finding revealed gaps in health education using eHealth services. Further activities are needed to promote IKP and patient.gov.pl website among less educated individuals, as well as those from rural areas and small cities.

There was no impact of socio-economic factors on the use of electronic information about treatment dates, which may result from the fact that this public eHealth service is relatively low promoted in Poland, resulting in limited public awareness of this service. Moreover, the decision-making process related to the selection of medical facilities may be driven by trust in doctors, or opinions on selected facilities rather than waiting time and queues.

Due to differences in the organization of healthcare in different European countries as well as different funding sources, a direct comparison between countries is difficult. Nevertheless, ensuring consistency between individual public eHealth services, implementing electronic medical records, and creating medical registries based on data collected as part of public eHealth services (using appropriate legal standards and patient privacy) should be an example of foreign eHealth solutions that are worth implementing in Poland.

There are several practical implications of this study. First, this is the most up-to-date socio-economic characteristics of public attitudes towards the use of public eHealth services in Poland. Second, differences in the utilization of eHealth services have been presented. Third, this study confirmed that place of residence is an important factor associated with the use of public eHealth services in Poland. Data from this study may be used in international comparisons on the use of eHealth services in different health systems.

CONCLUSIONS

In this study, socio-economic differences were observed in the utilization of public eHealth services; thus, living in

rural areas or small cities was associated with a lower level of public eHealth services utilization. A relatively high interest in health education through eHealth methods was observed. The findings of this study indicate a high potential for further implementation of public eHealth services in Poland, and may be used by policymakers and healthcare professionals to increase the percentage of Poles who use eHealth services. Moreover, further follow-up studies are needed to monitor the changes in public eHealth services utilization.

Limitations

The following limitations of this study should be mentioned. The study was limited to the six most common eHealth services. Although the scope of public eHealth services in Poland is much wider, only the most common services were included in the study,. Moreover, the use of public eHealth services was based on self-reported answers; therefore, recall bias cannot exclude. As a computer-assisted web interview was used, the study population was limited to internet users in Poland.

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