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ORIGINAL PAPER

Health care usage among immigrants and native-born elderly populations in eleven European countries: results from SHARE

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Abstract Differences in health care utilization of immigrants 50 years of age and older relative to the native-born populations in eleven European countries are investigated. Negative binomial and zero-inflated Poisson regression are used to examine differences between immigrants and native-borns in number of doctor visits, visits to general practitioners, and hospital stays using the 2004 Survey of Health, Ageing, and Retirement in Europe database. In the pooled European sample and in some individual countries, older immigrants use from 13 to 20% more health services than native-borns after demographic characteristics are controlled. After controlling for the need for health care, differences between immigrants and native-borns in the use of physicians, but not hospitals, are reduced by about half. These are not changed much with the incorporation of indicators of socioeconomic status and extra insurance coverage. Higher country-level relative expenditures on health, paying physicians a fee-for-service, and physician density are associated with higher usage of physician services among immigrants.

Keywords Count data · Physician services · Elderly · Immigration

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Introduction

The purpose of this study is to examine differences in health care utilization (HCU) among older populations of foreign-born and native-born persons in eleven European countries, exploring how elderly European immigrants and native-borns differ in their use of multiple dimensions of health care and how individual and health system factors affect differential usage in these countries. As Europe has received new waves of immigrants over recent decades, we believe that differences in HCU by nativity could be important in understanding how HCU is likely to be affected in the future.

We will show that there is evidence of higher usage of health care by elderly immigrants in Europe as a whole, even when immigrants have been residing in their countries of destination for decades. Differential HCU among elderly immigrants compared to elderly natives could reflect differences in health, differences in behavioral or socioeconomic characteristics, or characteristics of the health care system.

The analysis is based on a multinational survey, the Survey of Health, Ageing and Retirement in Europe (SHARE) database which provides comparable cross-national individual-level data for eleven countries. The sample is nationally representative of community-dwelling individuals who are 50 years old and over. An immigrant is defined as a person living in a country where he/she was not born. Citizenship is also reported in SHARE but it is not used in our definition of immigrant status because it is residence, not citizenship that entitles a person to healthcare.

Three types of factors are assumed to explain variability in HCU: need for health care, factors that predispose one to use medical care and factors that enable or encourage the

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use of medical care [1–3]. Previous analysis of the SHARE data for the older population has reported generally worse health for older immigrants relative to native populations [4], leading us to hypothesize that this factor could increase usage of health care by immigrants. Predispositions can arise from different cultural backgrounds. If there are cultural differences between immigrants and the provider of health services, this might result in reduced immigrant usage of some types of services. In addition, medical care use can be enabled by strong social networks, understanding of needs for health care, access, and familiarity with the health care system, as well as health insurance and policies which reduce individual costs. Within a country as well as across countries, these factors may vary between the native-born and immigrant populations [5–7].

The effect of immigrant status on relative HCU may not be the same across countries, because differences between immigrants and natives may be greater in some countries than in others—e.g., language, culture (health beliefs and traditions), or living circumstances [8]. Some researchers would expect lower HCU among immigrant populations because of the initial selection of relatively healthy persons as immigrants [9–13]. However, this effect is thought to be strongest among recent immigrants and health is likely to converge toward that of the native-born population with more time and increasing age [14, 15].

Differences in spending on medical services among European countries may be related to the availability of services provided [16]. For instance, within the SHARE countries, health care expenditures per person in 2007 varied from lows of $2,465 in Spain and $2,963 in Greece, to highs of $5,171 in Denmark and $5,662 in Switzerland [17]. It is also possible that variability in use of some services is related to policies controlling payment for services [18]. Despite the availability of universal coverage for health care services in these countries, the type and extent of coverage may differ across countries and for individuals within countries. In principle, national public plans provide appropriate basic health care coverage for all individuals in need of health care; however, citizens often purchase private insurance plans for supplemental coverage. This may mean that people of different socioeconomic statuses have differential barriers to health care access and immigrants may be disadvantaged in those regions where greater socioeconomic differences exist between the two populations [19]. The probability of choosing to visit a GP or a specialist (SP) can be affected by differences in access to care [20]; wealthier individuals tend to use more SP care in some European countries [21]. The increasing use of emergency room services as opposed to other alternatives is, in some cases, a consequence of differing barriers to and satisfaction with primary care services [19, 22].

Variability in use of health care systems can also be influenced by additional system level characteristics. The payment system for physician visits (e.g., co-payments, fee-for-service) and policies surrounding gatekeeping may affect the level of usage. For instance, Jiménez–Martín et al. [23] confirm that in countries in which practitioners are paid through a fee-for-service system the number of visits to general practitioners (GPs) is smaller, while visits to SPs are greater. They also find evidence that where GPs act as gatekeepers in the system, the frequency of visits to GPs increases, while SP visits decrease.

We hypothesize that because of differences in health, economic integration, language, social barriers and other social network factors, immigrants will not use the health system in the same way as the native-born population in most countries. Because countries vary in their acceptance of immigrants, because the cultural differences between natives and immigrants differ across countries, and because health care systems differ across countries, the difference between use of services by immigrants and natives will vary across countries. We also hypothesize that the differences in usage between immigrants and natives will vary by types of HCU [24]. Our hypothesis is that more optional or elective usage will differ more between immigrants and natives. Whether immigrants have higher or lower hospitalization rates than natives has not been consistently reported in the literature and differential use of GPs and SPs may vary by country because of system policies as well as immigrant characteristics [25–28].

For clarifying European patterns of HCU among immigrants and native-born individuals, we will try to explain variations among the two populations using individual-level (demographic, socioeconomic, and extra health insurance variables) and country-level (GDP, type of payment to doctors, doctor density, and whether GPs act as gatekeepers) factors, employing comparable cross-national, individual, and national level data. Overall, differences in HCU might be explained by individual factors including differences in the socioeconomic and demographic composition, and health dimensions of the populations; or by differences in financing and organizational characteristics of each country. Thus, we take into account these differences sequentially to see how they affect differences in HCU by immigrants and natives across countries.

Data

The Survey of Health, Ageing, and Retirement in Europe

The individual data come from release 2.3.1 of the first wave of the SHARE (2004) [29] database which is

coordinated at the Mannheim Research Institute for the Economics of Aging (MEA). SHARE provides probability samples of the noninstitutionalized population of each country's population 50 years of age and over, and their spouses. Each country conducted its own national survey using a common questionnaire translated into the appropriate language (for more details see [30]). Our study includes information from eleven countries, which range from Scandinavia through central Europe to the Mediterranean. We do not include Israel because of the very different patterns of immigration. The list of individual countries used in the analysis is shown in Table 1.

The overall household response rate in the first wave of SHARE was 61.8%; this response rate is slightly lower than that in two official Eurostat surveys but it is substantially higher than the response rate of other scientific surveys in Europe [31]. However, there is variation in the response rates across countries. Five countries exceeded 60%: Denmark (63.2%), France (81.0%), Germany (63.4%), Greece (63.1%), and the Netherlands (61.6%). The remaining countries were lower: Austria (55.6%), Belgium (39.2%), Italy (54.5%), Spain (53%), Sweden (46.9%), and Switzerland (38.8%). SHARE does not provide differences in response rates by immigrant status.

The sample

Table 1 shows the size and composition of the SHARE sample. Data for the present analysis include information on 27,395 individuals; 66 individuals were eliminated from the sample because their immigration status was unknown. In this sample of persons 50 years of age and older, the percentage of immigrants is 8.1% ranging from 18.7% in Germany to 1.5% in Italy. Most of these older immigrants (71.6%) are citizens in the country in which they reside but this ranges from 50% in Spain to 100% in Italy. On average, immigrants arrived in these countries in 1958. The mean year of immigration ranges from 1944 in Netherlands to 1980 in Spain, indicating the country differences in the patterns and timing of immigration (see Table 1).

Individual measures

As indicated above, an immigrant is defined as a person living in a country where he/she was not born based on respondent reports of country of birth. Immigrants also report their year of migration into the country.

We examine three different types of medical care usage in the past 12 months: the number of times the respondent has seen a medical doctor, the number of these visits that are visits to a GP, and the number of times the patient has been in hospital for at least a night. Visits to a medical doctor are determined in response to the following question: "During the last 12 months, about how many times in total have you seen or talked to a medical doctor about your health? Dentist visits and hospital stays are excluded, but emergency room or outpatient clinic visits are included". Contact with a GP is reported in response to the question "How many of these medical doctor contacts were with a GP or with a doctor at your health care center?" Finally, for hospital stays, individuals answer the question "How often have you been a patient in a hospital overnight during the last 12 months?"

Need for health care is measured using three dimensions of health that characterize the dimensions of chronic health problems common among older people. First the number of symptoms (out of eleven) reported by each individual from a list including: pain in back, knees, hips or other joint;

Table 1 Number of respondents by sex and immigration status; characteristics of immigrants

Country	*N*	Males	Females	Immigrants	Mean year of immigration	% of immigrants with citizenship	% of immigrants		
							Total	Males	Females
Austria	1,846	777	1,069	173	1952	73.4	9.4	41.0	59.0
Belgium	3,647	1,717	1,930	253	1945	51.0	6.9	46.6	53.4
Denmark	1,611	753	858	59	1963	67.8	3.7	47.5	52.5
France	2,999	1,343	1,656	454	1960	64.4	15.1	46.0	54.0
Germany	2,942	1,371	1,571	550	1962	87.3	18.7	47.6	52.4
Greece	2,668	1,241	1,427	64	1954	89.1	2.4	39.1	60.9
Italy	2,507	1,126	1,381	37	1962	100	1.5	27.0	73.0
Netherlands	2,866	1,346	1,520	173	1944	82.6	6.0	46.8	53.2
Spain	2,353	991	1,362	52	1980	50.0	2.2	32.7	67.3
Sweden	2,995	1,403	1,592	250	1966	69.2	8.4	41.2	58.8
Switzerland	961	457	504	155	1964	55.5	16.1	45.8	54.2
Total	27,395	12,525	14,870	2,220	1958	71.6	8.1	44.9	55.1

Source SHARE data 2004 (individuals 50+)

heart trouble; breathlessness; persistent cough; swollen legs; sleeping problems; falling down; fear of falling down; dizziness, faints or blackouts; stomach or intestinal problems and incontinence. Second, the number of chronic diseases (out of 5) reported in response to the question "Has the doctor told you that you had any of the following conditions?": heart and cardiovascular diseases (heart attack or other heart problems, high blood pressure, high blood cholesterol, stroke or cerebral vascular disease); diabetes; lung disease (chronic lung disease or asthma); cancer (malignant tumor); and hip or femoral fracture. Finally, we included an indicator of self-perceived health assessed using the question "Would you say your health is very good, good, fair, bad or very bad?" with answers categorized into two categories: good or very good health, and less than good health.

Predisposing factors affecting HCU include age, gender, and years of education. Enabling factors include work status, and the presence of voluntary supplementary health insurance that reduces the need for co-payment or increases access to physicians and services. Voluntary supplementary health insurance is measured by two variables assessed with answers to the question "Do you have any voluntary, supplementary or private health insurance for at least one of the following types of care in order to complement the coverage offered by the National Health System?" People are coded as having extended access to care if they have direct access to SPs, medical care with an extended choice of doctors and an extended choice of hospitals and clinics. The second variable is reported using the same question but refers to coverage of costs for doctor visits and for hospital care. People are coded as having no co-payments for medical care or full coverage of costs for doctor visits and hospital care or not. For immigrants, country of origin and length of residence in the country are also considered as enabling and predisposing factors in supplemental analyses.

Descriptive statistics

The differences between immigrants and native-born persons in the dependent and independent variables for each country and the total sample are shown in Table 2. There is extensive variability in the use of medical care across these countries. The lowest mean number of physician and GP visits is reported in Sweden for both immigrants (3.9) and the native-born (2.9). The highest physician use is in Belgium (9.2) for immigrants and in Spain for the native-born (9.2). The average number of GP visits ranged from 2.4 to 7.4 for immigrants and from 2.0 to 7.6 for native-born populations. The average number of hospital stays in the last 12 months ranged from 0.15 in Italy to 0.44 in Denmark for immigrants and from 0.13 in Greece to 0.37 in Austria for native-born populations. In most countries, immigrants have more physician visits, GP visits, and hospital stays than the native-born populations. Exceptions include Italy, where the native-born population uses more of all three types of medical care, and in Austria and in Spain where the native-born have more physician visits and GP visits when compared to immigrant populations. In Austria and France, the native-born average more hospital stays than immigrants.

The proportion of immigrants reporting bad or very bad health varied from 31.5% in Switzerland to 55.7% in Germany. Among the native-born populations, it ranged from 17.5% in Switzerland to 52.1% in Italy. Only in three countries, Austria, Italy, and Spain, was the percentage of immigrants reporting bad health lower among immigrants than among the native-born population. Switzerland and Spain, respectively, had the lowest and the highest mean number of chronic conditions for native-born populations; for immigrants Austria and Italy, respectively, had the lowest and the highest mean number of chronic conditions. The countries with the lowest number of symptoms are the same as those for the mean number of chronic conditions, whereas the highest number of symptoms occurs in Spain, among the native-born, and Denmark for immigrants.

While the sample ranges in age from 50 to 104, the average age is 65.3 years old. However, immigrants are a year younger on average (64.7) than the native-born (65.3); only in Austria, Belgium, and Greece are immigrants older than the native-borns. More than half of both immigrants and the native-born populations are married with the exceptions of Denmark and Greece. Differences in educational level between immigrants and native-borns vary markedly across Europe. The mean number of years of education for the Spanish native-born population was 6.6 (vs. 10.6 for the immigrants), whereas for Germany it was 13.1 (vs. 12.4 for the immigrants). On the contrary, for immigrants, the mean years of education was 6.9 in France and 13.8 in Denmark. Participation in the labor force ranged from 19.7% for the native-born population in Italy to 41.6% in Switzerland. While the corresponding figure for immigrants is 18.4% in Germany to 44.0% in Spain.

As can be seen in Table 2 in five countries (Belgium, Denmark, Greece, Italy, and Spain), immigrants have a higher proportion with extended access to the health care system compared to native-born populations. In five other countries, the native-born have greater access (Austria, France, Germany, Sweden, and Switzerland). Though, all of these countries have universal health coverage, most people do not have full coverage of all expenses. It is above 50% among native-borns in Belgium and France but not in other countries. The percentage of individuals with full coverage of costs for doctor visits and for hospital care is higher for immigrants than native-born populations in Austria, Denmark, Greece, Spain, and Switzerland. On the

Table 2 Descriptive statistics: means or percentages by country

Variables	Native-born											
	Countries Number of respondents	All 25,175	Austria 1,673	Belgium 3,394	Denmark 1,552	France 2,545	Germany 2,392	Greece 2,604	Italy 2,470	Netherlands 2,693	Spain 2,301	Sweden 2,745	Switzerland 806
Dependent	Times physician	6.5	6.4	8.3	4.2	7.0	7.9	5.6	8.9	4.5	9.2	2.9	4.4
	Times GP	5.0	5.0	6.4	3.3	5.5	5.5	4.2	7.4	2.9	7.6	2.0	3.2
	Times hospital	0.20	0.37	0.22	0.23	0.22	0.25	0.13	0.19	0.13	0.19	0.20	0.15
Explanatory													
Health status	Less than good heath	38.4%	39.6%	32.6%	30.6%	37.2%	44.7%	38.2%	52.1%	31.1%	50.0%	36.0%	17.5%
	Chronic diseases	1.5	1.3	1.7	1.6	1.6	1.5	1.5	1.7	1.3	1.8	1.6	1.0
	Number of symptoms	1.5	1.3	1.6	1.5	1.6	1.5	1.3	1.7	1.2	1.9	1.7	1.0
Marital status	Married	63.7%	59.2%	68.9%	61.4%	64.8%	62.1%	67.1%	63.6%	65.9%	63.0%	56.1%	66.1%
Socioeconomic characteristics	Age	65.3	65.0	64.9	64.6	65.7	65.1	65.2	65.9	64.4	66.4	66.2	64.7
Gender	Female	54.1%	55.6%	54.0%	53.5%	55.4%	55.2%	53.4%	55.0%	53.3%	54.2%	52.6%	53.4%
Education	Years of education	9.7	10.6	9.9	12.1	8.1	13.1	8.4	7.1	11.2	6.6	10.2	11.4
Employment status	Employed	27.9%	21.5%	22.5%	38.0%	26.9%	30.9%	25.0%	19.7%	30.8%	22.5%	39.1%	41.6%
Supplementary insurance coverage	Extended access	14.4%	18.7%	6.6%	13.2%	82.0%	7.5%	2.6%	3.8%	0%	6.9%	1.6%	49.1%
	Full coverage	15.5%	7.3%	59.5%	2.7%	52.1%	5.8%	2.3%	1.2%	0%	4.8%	1.8%	5.1%
Variables	Immigrants												
	Countries Number of respondents	All 2,220	Austria 173	Belgium 253	Denmark 59	France 454	Germany 550	Greece 64	Italy 37	Netherlands 173	Spain 52	Sweden 250	Switzerland 155
Dependent	Times physician	7.3	6.8	9.2	5.7	7.6	8.9	7.5	8.8	5.3	6.7	3.9	7.0
	Times GP	5.5	4.8	7.4	5.3	5.7	6.5	5.3	7.3	3.9	5.5	2.4	5.2
	Times hospital	0.25	0.25	0.26	0.44	0.21	0.28	0.23	0.15	0.20	0.25	0.20	0.31
Explanatory													
Health status	Less than good health	46.7%	37.9%	35.7%	38.4%	49.7%	55.7%	54.4%	41.9%	49.6%	30.9%	50.5%	31.5%
	Chronic diseases	1.6	1.0	1.9	1.8	1.5	1.7	2.0	2.0	1.3	1.6	1.8	1.2
	Number of symptoms	1.8	1.3	2.0	2.3	1.6	2.0	2.2	1.9	1.5	1.6	2.0	1.3
Marital status	Married	60.8%	51.7%	67.6%	48.6%	64.8%	61.3%	45.8%	70.0%	59.4%	64.4%	54.6%	66.2%
Socioeconomic characteristics	Age	64.7	66.6	65.1	63.4	63.5	66.6	68.5	64.7	62.7	60.9	63.9	63.5
Gender	Female	55.1%	56.4%	54.4%	51.0%	53.2%	54.3%	63.7%	66.8%	52.9%	59.6%	57.3%	55.6%
Education	Years of education	10.3	10.6	9.3	13.8	6.9	12.4	9.2	9.1	11.0	10.6	11.0	11.0
Occupation	Employed	27.2%	20.5%	19.6%	37.0%	31.5%	18.4%	22.0%	24.7%	31.8%	44.0%	37.5%	36.3%
Supplementary insurance coverage	Extended access	20.2%	17.3%	10.8%	15.6%	69.4%	3.6%	8.0%	4.6%	0%	14.5%	0.9%	40.6%
	Full coverage	15.5%	8.0%	51.2%	4.7%	35.1%	3.7%	4.9%	0%	0%	4.9%	1.2%	8.9%
Length of stay	>20 years	84.1%	79.0%	90.0%	84.5%	93.0%	77.8%	93.3%	85.3%	82.4%	47.5%	83.5%	89.7%
	$10 < x < 20$ years	10.1%	12.2%	7.3%	12.2%	2.9%	15.7%	6.7%	8.2%	10.4%	16.8%	12.6%	8.4%

Table 2 continued

Variables	Immigrants												
	Countries	All	Austria	Belgium	Denmark	France	Germany	Greece	Italy	Netherlands	Spain	Sweden	Switzerland
	Number of respondents	2,220	173	253	59	454	550	64	37	173	52	250	155
	<10 years	5.7%	8.8%	2.8%	3.3%	4.1%	6.5%	0.0%	6.5%	7.3%	35.7%	4.9%	1.9%
Place of origin	America	6.3%	2.6%	3.9%	18.4%	2.9%	0.2%	3.9%	15.4%	22.5%	46.6%	8.5%	1.6%
	Africa	12.3%	0.0%	7.4%	3.5%	44.3%	0.8%	12.7%	22.9%	10.6%	5.8%	3.0%	2.9%
	Asia	6.0%	1.3%	2.0%	13.6%	8.5%	2.7%	9.6%	0.0%	22.1%	4.0%	5.1%	2.2%
	Europe	75.4%	96.1%	86.7%	64.6%	44.3%	96.3%	73.8%	61.7%	44.8%	43.6%	93.4%	93.3%

Source SHARE data, 2004. Weights are used in this table

other hand, it is higher for the native-born in Belgium, France, Germany, Italy, and Sweden.

From the above information on the mean date of immigration, we can see that the timing of immigration varies across countries. For the total sample, 84.1% of immigrants arrived in the country of destination 20 years or more before the survey; 10.1% arrived 10–20 years ago; and only 5.7% arrived less than 10 years before the interview. Spain differs the most from the other countries with only 47.5% of the immigrants residing there for at least 20 years. The place of origin for immigrants also varies across countries. In Austria, Belgium, Germany, Greece, Sweden, and Switzerland, the majority of immigrants came from Europe. There is less homogeneity across the rest of the countries; France, Italy, the Netherlands, and Spain received a significant proportion of immigrants from Africa and America.

Country-level data

Table 3 shows the variability in characteristics of national health care systems in the eleven countries. France and Switzerland spend the highest percentage of GDP on health and Spain the lowest among these countries. In most of the countries studied here, public coverage is close to universal; however, there are some differences. For instance, Spain and Germany have special systems for civil servants which tend to provide more extensive coverage. There can also be regional disparities within countries as a consequence of the degree of autonomy in the organization of the health care system.

The number of physicians per person also varies across countries. Denmark has the lowest physician density and Greece the highest. In Austria, Denmark, France, Italy, the Netherlands, Spain, and Sweden, a GP acts as a gatekeeper and must be seen before a visit to a SP can be arranged; whereas, in other countries the patient can visit a SP directly. Where the GP acts as a gatekeeper one might expect it to be harder to use SPs, and this might reduce usage.

The method of payment to physicians also differs across countries. In Austria, Belgium, Denmark, France, Germany, and Switzerland, physicians are paid a fee-for-service; in Italy, the Netherlands, and Sweden physicians are paid a set amount per patient; and in Greece and Spain, physicians are salaried with no extra payment for seeing more patients.

Almost half of the countries require some co-pay for physician's services as a part of their national health system, and this should be a larger barrier to those who have less income. The substantial differences in the health care systems across Europe are likely to cause differences in the link between utilization and immigration across countries.

Table 3 Characteristics of national health systems and the distribution of health spending by countries

Country	Total health expenditure as a percent of GDP (%), 2006	Types of coverage[a,b]	Physicians/ 1000, 2006	GP gatekeepers[c]	Doctor type of payment[a,b]
Austria	10.1	SHI. PHI covers 30% of population	3.6	YES	Fee-for-service
Belgium	10.3	Universal public coverage, except for self-employed. PHI covers most self-employed. Complementary PHI offered by many employers	4.0	NO	Fee-for-service
Denmark	9.5	98% of population universal coverage and copayments. Complementary PHI covers 30% of pop	3.3[2]	YES	Fee-for-service
France	11.0	NHS covers about 75% of the total health expenditures. Half of the other 25% is covered by out of pocked payments and the other half is paid by PHI companies offering supplementary health insurance policies to individuals	3.4	YES	Fee-for-service
Germany	10.6	Almost universal health care coverage. Civil servants different insurance. Small percentage private insurance	3.5	NO	Fee-for-service
Greece	9.1	SHI. Supplementary PHI covers about 8% of pop	5.0[2]	NO	Salary
Italy	9.0	Universal NHS coverage. Supplementary PHI covers 5–10% of pop	3.7	YES	Capitation
Netherlands	9.5[a]	SHI. Substitutive PHI for high incomes and self-employed	3.8	YES	Capitation
Spain	8.4	Universal NHS coverage. PHI covers about 10% of pop. Special regime with choice of public or private health care provider for civil servants	3.6	YES	Salary
Sweden	9.2	Universal coverage. PHI exists but has relatively little significance (about 1%)	3.5[b]	YES	Capitation
Switzerland	11.3	Mandatory private HI is the most common form of coverage and provides free choice of senior physicians in public hospitals, access to private hospitals and more comfortable accommodation	3.8	NO	Fee-for-service

Sources OECD Health Data (2009)—Frequently Requested Data; [a] Bago and Jones [20]; [b] Van Doorslaer et al. [36]; [c] WHO (2004)

Remuneration for doctors: (a) Capitation means doctors are paid as a function of the number of registered patients; (b) Salary is when doctors are employed by the state or the insurer; (c) Fee-for-service indicates doctors are paid (at least partially) on the basis of the services provided

NHS National Health System, *SHI* Social Health Insurance, *PHI* Private Health Insurance

[a] 2004; [b]2005

Methodology

Statistical approach

We assume that the dependent variables indicating HCU in this analysis follow a Poisson basic model, with each individual having a separate gamma distribution mean, giving rise to a negative binomial specification. Poisson or negative binomial models are nonlinear models developed for variables whose form is counts with nonnegative integer values. When the assumption of equi-dispersion in the Poisson basic model is not met, the negative binomial model provides a more general model by including a random term reflecting the unexplained part between subject differences [32].

Let y_{ij} represent the count of the response variable for the ith person residing in country j and x_{ij} be the vector for the covariates with μ_{ij} the expected number of occurrences:

$$\mu_{ij} = \exp\left(\beta_0 + \beta_1 x_{1ij} + \beta_2 x_{2ij} + \cdots + \beta_k x_{kij}\right) = \exp\left(x'_{ij}\beta\right) > 0 \quad (1)$$

where x_{ij} is the vector of independent variables and β the vector of parameters to be estimated.

The observed count of a Poisson model often exhibits more variability than the prediction from a Poisson regression model, for overdispersed data which are unbiased [33]. A simple overdispersion statistical test, the likelihood ratio test, can be used to test the null hypothesis of no overdispersion. If the null hypothesis is rejected, the negative binomial regression model is preferred to the Poisson regression [32]. Inappropriate assumption of mean–variance equality restriction may produce a smaller estimated standard error of β.

In order to accommodate the count nature of two of our dependent variables, a negative binomial model was used

to model physicians and GP visits. Because of the relatively high number of people reporting zero hospital visits in the pooled sample (85%), we used a zero-inflated Poisson model (ZIP) for this variable [34]. The ZIP model has two equations, one is a logit specification that separates the excess of zeros from the rest, i.e., those individuals that have no hospital stay from the others; and the other equation is a Poisson specification that counts the number of hospital visits.

We estimate models within individual countries and for the entire pooled sample for all countries. To produce accurate national country estimates, we used the sampling weights to account for the survey sample design of SHARE data. Data analysis was conducted using SAS statistical analysis software.

We begin by examining regression models for each country as well as the pooled sample. These models incorporate the following sets of individual characteristics in progressive models:

Model 1 (M1) The regressions control for age and gender and include a binary variable indicating immigrant status.

Model 2 (M2) Controls for health status or need for health care are added to the variables in M1 to determine the effect of being an immigrant on the use of health services net of differences in health.

Model 3 (M3) Adds controls for socioeconomic variables (years of education and employment status) and the presence of voluntary supplementary health insurance are added (extended access and full coverage) to M2, showing the association of immigrant status with health services when all individual-level variables are controlled.

In models 4 and 5, we introduce the country-level variables indicating national levels of health expenditures and the supply and payment mechanisms of physicians. These models are run on the pooled sample across countries as the macro-level variables are constant within each country. We include these national contextual variables in two different models because the high colinearity prevents us from including them together.

Model 4 (M4) The effect of being an immigrant is estimated controlling for age, gender, health, socioeconomic status, supplementary health insurance, and the contextual variable indicating the percent of GDP spent on health in each country; we also run this model with an interaction term for immigrant status and health expenditures to see if the effect of relative GDP expenditure on HCU differs for immigrants and the native-born (data not shown).

Model 5 (M5) Adds contextual variables indicating doctor density, doctor type of payment (capitation, fee-for-service and salary), and whether GP acts as a gatekeeper to M4; we also include interaction terms with the health system indicators (data not shown).

Finally, we supplement the analysis by running models 4 and 5 substituting continent of origin and length of time since immigration for immigrant status to determine how these characteristics of immigrants affect our general results. We also perform these analyses including interactions (data not shown).

Results

Regression results

Negative binomial regression results and ZIP estimations (Poisson and logit) are presented in Tables 4, 5 and 6. The negative binomial results indicate the effect of being an immigrant on the use of each of the medical services (total physician visits and GP visits) in each country and in the data pooled across countries. Poisson regression results indicate the effect of being an immigrant on hospital stays in each country and in the data pooled across countries. The logit coefficients indicate the probability of not having a hospital stay.

Impact of individual factors on health care utilization: immigrants versus native-born population

In Table 4, we present only the coefficients related to immigrant status; a positive and significant coefficient means that immigrants have a significantly higher use of medical services than native-born individuals with the same age and gender. The results for the pooled sample indicate that all types of health care visits are significantly larger among immigrants than for the native-born. The parameter estimate indicates that the expected number of visits to any doctor is 16% higher ($\exp(0.15) = 1.16$) if the respondent is an immigrant. The expected number of visits to a GP are 13% greater ($\exp(0.12) = 1.13$) among immigrants. The largest difference between immigrants and native-born individuals is found when modeling the number of hospital stays using the ZIP estimations. For an immigrant, the expected number of hospital stays increases by 20% ($\exp(0.18) = 1.20$) when compared to a native-born individual of the same age and gender.

We find significantly higher HCU for immigrants relative to the native-born in several countries. For instance, in Table 4 in seven countries (Belgium, Denmark, France, Germany, the Netherlands, Sweden, and Switzerland), the number of visits to the physician is significantly larger (at at least the 10% level) for immigrants; the results are similar for GP visits. Immigrants have significantly higher expected

Table 4 Parameter estimates for immigrant versus native-born populations in the individual countries and the pooled 11 country sample with age and gender controlled: model M1

Country	Physician visits		GP visits		Hospital visits			
	Negative binomial		Negative binomial		Poisson		Logit	
	β	SE	β	SE	β	SE	β	SE
Austria	0.07	(0.092)	−0.07	(0.092)	0.06	(0.222)	0.68**	(0.287)
Belgium	0.11*	(0.061)	0.16**	(0.062)	−0.21	(0.219)	−0.52*	(0.312)
Denmark	0.32***	(0.150)	0.47***	(0.141)	0.65***	(0.213)	−0.04	(0.359)
France	0.12***	(0.045)	0.08*	(0.044)	0.03	(0.191)	0.07	(0.249)
Germany	0.10**	(0.047)	0.14***	(0.047)	0.25*	(0.141)	0.22	(0.184)
Greece	0.21	(0.148)	0.07	(0.167)	−0.09	(0.470)	−0.72	(0.641)
Italy	−0.03	(0.204)	−0.05	(0.210)	−1.54	(0.962)	−4.30	(21.510)
Netherlands	0.22**	(0.090)	0.36***	(0.083)	1.06***	(0.231)	0.60**	(0.300)
Spain	−0.24	(0.160)	−0.20	(0.165)	−0.49	(0.426)	−1.21**	(0.568)
Sweden	0.35***	(0.071)	0.21***	(0.072)	0.08	(0.238)	−0.07	(0.281)
Switzerland	0.53***	(0.104)	0.56***	(0.105)	1.55***	(0.236)	0.95**	(0.378)
Total	0.15***	(0.025)	0.12***	(0.025)	0.18***	(0.067)	−0.05	(0.084)
Pseudo-R^2	49.87%		49.66%		50.04%			

M1 age and gender controlled. The model is estimated in each country and in the entire sample. For hospital visits, each column contains the results for the ZIP, the Poisson model and the logit model estimations, using the nlmixed procedure in SAS. A positive parameter in the logit equation means a higher probability of not being a hospital user

Source SHARE data, 2004 (individuals 50+)

Significance levels *** $P < 0.01$; ** $P < 0.05$; * $P < 0.1$. Standard errors in parentheses

numbers of hospital stays than non-immigrants in Denmark, Germany, the Netherlands, and Switzerland based on the Poisson estimations. For the Netherlands and Switzerland, this higher usage of hospital visits is conditional on being a hospital user, as the probability of an immigrant having any hospital visit is lower for immigrants than for natives in the two countries. The difference between the Poisson estimates and the logit estimates may reflect the behavior of different subgroups of immigrants who may both have a higher number of visits overall and a greater probability of no hospital visits. In two countries (Belgium and Spain), the parameters in the logit estimations are significantly negative, meaning that immigrants are less likely to have no hospital stays than the native-born population or that immigrants have a greater likelihood of having at least one hospital visit.

In M2, including the presence of health problems, the differences between immigrants and the native-born population are reduced for physician visits; about half of the significant relationships disappear meaning that differences in the presence of health problems play a role in differential HCU (Table 5). The pooled sample results indicate 11, 6, and 21% higher frequencies of physician visits, GP visits, and hospitals stays in the last 12 months, for immigrants. This compares to the 16, 13, and 20% reported above from M1.

In Switzerland, significant differences between immigrants and the native-born population persist for all three indicators of HCU but the parameter estimates are substantially reduced for physician and GP visits. In Belgium and Denmark, for physician visits, in France, for GP visits, and Germany, for both, the differences in health service usage between native-born population and immigrants vanish when controlling for health conditions. In the Netherlands, M2 in Table 5 indicates no difference between immigrants and native-born individuals in the expected number of visits to the physician, however, strongly significant differences are still found for GP visits and now the expected number of hospital stays appears to be significantly higher (at 1%) for immigrants compared to the native-born population. In Sweden, the expected number of GP visits for immigrants and native-born populations differ less when compared to M1. The significant coefficient of immigrant status on hospital stays disappears for Germany, while it appears to be significantly negative in Italy (at 1%) even with the controls for health status.

Table 6 shows the results based on M3 which controls for socioeconomic variables and voluntary supplementary health insurance to examine whether differences in education, employment status, and extra health insurance affect the differences between immigrant and native-born health care consumption. The results for the whole sample are very similar to the ones obtained in M2; the expected number of physicians visits is 12% larger for immigrants, the expected number of visits to the GP is 8% higher and

Table 5 Parameter estimates for immigrant versus native-born populations in the individual countries and the pooled 11 country sample with the addition of controls for health status: model M2

Country	Physician visits		GP visits		Hospital visits			
	Negative binomial		Negative binomial		Poisson		Logit	
	β	SE	β	SE	β	SE	β	SE
Austria	0.08	(0.088)	−0.08	(0.088)	0.01	(0.240)	0.50	(0.333)
Belgium	0.08	(0.056)	0.13**	(0.056)	−0.28	(0.229)	−0.56	(0.397)
Denmark	0.08	(0.139)	0.23*	(0.131)	0.60***	(0.230)	0.27	(0.394)
France	0.12***	(0.042)	0.06	(0.042)	0.14	(0.190)	0.23	(0.271)
Germany	−0.04	(0.043)	−0.01	(0.045)	0.20	(0.153)	0.44**	(0.223)
Greece	−0.01	(0.137)	0.04	(0.159)	−0.31	(0.987)	−1.25	(2.009)
Italy	−0.03	(0.190)	−0.07	(0.197)	−1.54***	(0.477)	−5.30	(4.677)
Netherlands	0.13	(0.084)	0.27***	(0.078)	1.31***	(0.243)	0.94***	(0.345)
Spain	−0.17	(0.151)	−0.15	(0.159)	−0.33	(0.382)	−1.16**	(0.534)
Sweden	0.27***	(0.067)	0.13*	(0.069)	0.08	(0.253)	0.11	(0.358)
Switzerland	0.28***	(0.098)	0.31***	(0.098)	1.37***	(0.252)	1.31***	(0.451)
Total	0.10***	(0.023)	0.06**	(0.024)	0.19***	(0.068)	0.05	(0.093)
Pseudo-R^2	49.38%		48.87%		50.33%			

M2 age, gender, number of symptoms, heart and vascular diseases, lung conditions, cancer, diabetes and fractures controlled. The model is estimated in each country and in the entire sample. For hospital visits, each column contains the results for the ZIP, the Poisson model and the logit model estimations, using the nlmixed procedure in SAS. A positive parameter in the logit equation means a higher probability of not being a hospital user

Source SHARE data, 2004 (individuals 50+)

Significance levels *** $P < 0.01$; ** < 0.05; * $P < 0.1$. Standard errors in parentheses

Table 6 Parameter estimates for immigrant versus native-born populations in the individual countries and the pooled 11 country sample with the addition of controls for education, employment, extended access, and payment for health care: model M3

Country	Physician visits		GP visits		Hospital visits			
	Negative binomial		Negative binomial		Poisson		Logit	
	β	SE	β	SE	β	SE	β	SE
Austria	−0.02	(0.091)	−0.10	(0.091)	−0.05	(0.252)	0.43	(0.372)
Belgium	0.07	(0.060)	0.10*	(0.061)	−0.42*	(0.248)	−0.81**	(0.483)
Denmark	0.02	(0.141)	0.22*	(0.133)	0.74***	(0.239)	0.55	(0.434)
France	0.13***	(0.044)	0.04	(0.044)	0.35*	(0.186)	0.39	(0.265)
Germany	−0.03	(0.046)	−0.03	(0.046)	0.27*	(0.148)	0.56*	(0.223)
Greece	0.04	(0.143)	0.09	(0.163)	1.02***	(0.375)	0.49	(0.526)
Italy	0.03	(0.191)	0.05	(0.198)	−1.13**	(0.490)	−3.41	(2.468)
Netherlands	0.14*	(0.085)	0.28***	(0.078)	1.30***	(0.258)	0.96***	(0.352)
Spain	−0.10	(0.152)	−0.03	(0.159)	−0.32	(0.383)	−1.19**	(0.734)
Sweden	0.31***	(0.069)	0.17**	(0.071)	0.22	(0.258)	0.27	(0.374)
Switzerland	0.25*	(0.142)	0.28**	(0.142)	1.69***	(0.338)	1.58*	(0.871)
Total	0.11***	(0.024)	0.08***	(0.025)	0.19***	(0.072)	0.08	(0.099)
Pseudo-R^2	49.31%		48.72%		50.49%			

M3 age, gender, number of symptoms, heart and vascular diseases, lung conditions, cancer, diabetes, fractures, years of education, employment status, extended access, and full coverage controlled. The model is estimated in each country and in the entire sample. For hospital visits, each column contains the results for the ZIP, the Poisson model and the logit model estimations, using the nlmixed procedure in SAS. A positive parameter in the logit equation means a higher probability of not being a hospital user

Source SHARE data, 2004 (individuals 50+)

Significance levels *** $P < 0.01$; ** $P < 0.05$; * $P < 0.1$. Standard errors in parentheses

the Poisson parameters show that the expected number of hospital stays is 21% higher for immigrants when compared to the native-born population with the same age, gender, health conditions, socioeconomic circumstances, and extra health insurance. When looking at the results in Table 6 for each country, we find evidence of higher usage of health care for immigrants only in France (visits to the doctor and hospital stays), in Germany and Greece (visits to the hospital), in Denmark (visits to the GP and hospital stays), in Sweden (visits to the physician and to the GP), and in the Netherlands and Switzerland (on the three medical care services). We find evidence of significantly lower usage for immigrants only in Belgium and Italy, where the exponential of the Poisson parameter estimate equals 0.66 (exp(−0.42)) and 0.32 (exp(−1.13)), respectively, which means that in Belgium and Italy the expected number of hospital stays is 34 and 68% lower for an immigrant than for a native with the same characteristics. In all other countries, we do not find any significant effects.

The differences between results with these controls and the earlier model show that France has higher physician visits for immigrants and Switzerland lower physician visits for immigrants when compared to the native-born population, and for hospital stays a significant negative effect for immigrants appears in Belgium and positive significant effect appears in France, Germany, and Greece.

Finally, we include the indicators of the country-level health care policies into the equations along with the individual-level variables included in M3 (Table 7). Because of the high correlation between the percent of GDP spent on health care and the indicators of payment methods and density of physicians, we run two separate equations: M4 adds the health expenditure indicator to M3 shown in Table 6, M5 adds the density of physicians, whether the payment to physicians was capitated, fee-for-service, or salary (reference category) and whether a GP acts as a gatekeeper to M3. When relative expenditures on health care are controlled, there is a little change in the coefficient of immigrant status. Higher relative expenditure on health care is linked with more physician and hospital visits.

M5 shows that in countries where doctors are paid a capitation fee, the usage of physicians, GPs, and hospital stays are lower than in places where physicians are salaried. Fee-for-service payment also seems to result in somewhat lower GP visits. Where GPs act as gatekeepers in the system, the frequency of visits to the physicians and GPs is lower, and hospital visits are greater. Somewhat counter intuitively, a greater density of physicians is associated with less usage of physician and GP services. The results indicate little change in the association of immigration status with HCU when these health system variables are introduced as the effects are quite similar to those in Table 6.

When interaction terms between the health system variables and immigration status or continent of origin are included in these equations (data not shown), the interaction coefficients are significant in a number of cases. High relative expenditure on health services increases immigrant usage of physician visits relative to the native-born. Where there is a fee-for-service, immigrant usage of physicians is increased relative to native usage. The interaction of immigration with capitation is not significant, except for increasing hospital visits among immigrants in a capitated system. The interaction of immigrants and GP as a gatekeeper is not significant. The greater the density of doctors, the greater the use of physicians among immigrants relative to the native-born.

In order to determine whether the origin of immigrants affected their HCU, we reproduced the analysis in Table 7 substituting continent of origin for immigrant status (data not shown). Disaggregating immigrants' status of origin into America, Africa, Asia, and Europe and comparing these categories to non-immigrants, we found significantly higher use of physicians and hospital stays by European and Asian immigrants (except for GP visits in Asian immigrants). Immigrants from Africa and America did not differ from native-borns in their HCU.

Examining the interaction of place of immigrant origin with organizational factors showed that high relative expenditure on health increased European and Asian immigrant usage of physician visits and European number of GP visits relative to the native-born, but decreased American immigrant's usage of physicians and GPs. The interaction with hospital stay is not significant. The interaction with continent of origin and capitation indicated increased physician usage for Asian, African, and European immigrants relative to natives and decreased usage for American immigrants in the three types of services. Immigrant usage of physicians is also lower for American immigrants relative to native usage, where there is a fee-for-service. When a GP acts as a gatekeeper, Asian and African immigrants have increased use of physicians' relative to natives. The same occurs for African immigrants in the use of GPs.

We also substituted length of time since arrival for immigrant status in another set of analyses (data not shown) to examine the possibility that the immigrant effect varies with length of stay. We analyzed the length of residence in equations similar to M4/M5 using three categories: (a) less than 10 years, (b) between 10 and 20 years, and (c) more than 20 years. The higher usage of immigrants characterizes individuals living more than 20 years and less than 10 years in the country of destination. Immigrants between 10 and 20 years in the country of destination do not differ significantly from natives when age, sex, health, socioeconomic characteristics, supplementary health insurance and contextual variables were

Table 7 Parameter estimates for immigrant versus native-born populations in the pooled 11 country sample

	Physician visits		GP visits		Hospital visits			
	Negative binomial		Negative binomial		Poisson		Logit	
	β	SE	β	SE	β	SE	β	SE
M4-GDP								
Immigrant	0.08***	(0.025)	0.06**	(0.025)	0.23***	(0.073)	0.23**	(0.101)
Age	0.00**	(0.000)	0.01***	(0.001)	0.01***	(0.002)	−0.02***	(0.003)
Sex	0.06***	(0.013)	0.06***	(0.014)	0.13***	(0.042)	0.18***	(0.060)
% GDP spent	0.06***	(0.009)	0.04***	(0.001)	0.10***	(0.032)	−0.35***	(0.045)
No of symptoms	0.18***	(0.004)	0.16***	(0.005)	0.06***	(0.011)	−0.21***	(0.017)
Hear and vascular diseases	0.11***	(0.005)	0.12***	(0.005)	0.02	(0.016)	−0.11***	(0.021)
Lung conditions	0.09***	(0.014)	0.10***	(0.015)	0.14***	(0.034)	−0.03	(0.052)
Cancer	0.42***	(0.027)	0.21***	(0.029)	0.47***	(0.055)	−0.78***	(0.093)
Diabetes	0.37*	(0.021)	0.36*	(0.022)	0.18***	(0.062)	−0.66***	(0.093)
Fractures	0.08***	(0.043)	0.08*	(0.044)	0.05	(0.095)	−1.02***	(0.190)
Years of education	−0.02***	(0.002)	−0.03***	(0.002)	0.00	(0.005)	−0.01	(0.007)
Employment	−0.36	(0.018)	−0.33***	(0.019)	0.61***	(0.082)	−0.11	(0.101)
Extended access	−0.02	(0.021)	0.00	(0.021)	0.04	(0.066)	−0.08	(0.093)
Full coverage	0.15***	(0.020)	0.16***	(0.020)	0.05	(0.066)	−0.07	(0.093)
Pseudo-R^2	49.30%		48.72%		50.50%			
M5-Dr. Pay, density, gatekeeper								
Immigrant	0.07***	(0.025)	0.03	(0.025)	0.20***	(0.072)	0.19*	(0.101)
Age	0.00*	(0.001)	0.01***	(0.001)	−0.01***	(0.002)	−0.02***	(0.003)
Sex	0.06***	(0.013)	0.06***	(0.014)	−0.14***	(0.044)	0.18***	(0.060)
Capitation	−0.27***	(0.022)	−0.33***	(0.022)	−0.37***	(0.077)	−0.55***	(0.100)
Fee-for-service	−0.08	(0.027)	−0.08***	(0.023)	−0.02	(0.081)	−0.73***	(0.113)
Salary	–		–		–		–	
GP gatekeeper	−0.16***	(0.024)	−0.13***	(0.025)	0.32***	(0.070)	0.16	(0.101)
Dr. per 1,000	−0.18***	(0.027)	−0.17***	(0.028)	−0.06	(0.088)	−0.14	(0.119)
No of symptoms	0.18***	(0.005)	0.15***	(0.004)	0.07***	(0.011)	−0.20***	(0.017)
Heart and vascular diseases	0.10***	(0.005)	0.12***	(0.005)	0.01	(0.016)	−0.11***	(0.022)
Lung conditions	0.10***	(0.014)	0.11***	(0.014)	0.14***	(0.035)	−0.03	(0.053)
Cancer	0.43***	(0.028)	0.22***	(0.029)	0.46***	(0.055)	−0.79***	(0.094)
Diabetes	0.36***	(0.021)	0.35***	(0.021)	−0.19***	(0.063)	−0.67***	(0.102)
Fractures	0.08*	(0.043)	0.07*	(0.044)	0.02	(0.093)	−0.96***	(0.186)
Years of education	−0.02***	(0.002)	−0.03***	(0.002)	0.00	(0.005)	0.00	(0.007)
Employment	−0.35***	(0.018)	−0.33***	(0.019)	−0.56***	(0.082)	−0.07	(0.100)
Extended access	0.00	(0.022)	−0.02	(0.022)	−0.20*	(0.068)	−0.28***	(0.096)
Full coverage	0.11***	(0.009)	0.11***	(0.020)	−0.07	(0.068)	−0.05	(0.096)
Pseudo-R^2	49.30%		48.63%		41.74%			

M4 age, gender, immigrant status, health, GDP socioeconomic status, and supplementary insurance coverage

M5 age, gender, immigrant status, Dr. pay, GP gatekeeper, Dr. density, health, socioeconomic status, and supplementary insurance coverage. Dr. type of payment: Capitation, Fee-for-service, and Salary (reference category). GP acts as a gatekeeper: YES or NO (reference category). For hospital visits, each column contains the results for the ZIP, the Poisson model and the logit model estimations, using the nlmixed procedure in SAS

A positive parameter in the logit equation means a higher probability of not being a hospital user

Source SHARE data, 2004 (individuals 50+)

Significance levels *** $P < 0.01$; ** $P < 0.05$; * $P < 0.1$. Standard errors in parentheses

controlled, except for a higher usage of hospital visits for immigrants as compared to natives.

Discussion

The comparison of use of health services among older immigrant and native-born populations in European countries indicates that immigrants use health services more than native-born individuals with the same characteristics in the sample pooled across countries and within some individual countries. The higher use of medical care among immigrants characterizes both physician visits and hospital stays. Much of the immigration analyzed in these countries occurred many years ago, and we see differences in medical care usage at older ages, when health deterioration generates more demand on the health care system.

Differences remain after controls for health, socioeconomic indicators, and indicators of better access to care and payment for care. Controls for differences in health, reduce the difference between immigrants and native-borns indicating that the worse health of immigrants plays a role in their higher usage. Health differences between the native-born population and immigrants explain about half the total disparity in the use of physician services.

Our results confirm that higher usage is greatest among recent immigrants as compared to long-stay immigrants. It is possible that immigrant usage converges with length of time to that of natives. It is also possible that short stay immigrants are different from long-stay immigrants.

Differences between immigrants and natives also remain with controls for country-level relative health expenditures and health system characteristics. Country-level indicators of relative expenditures or organization of the health care system affect HCU. Where indicators of the health system or expenditures have a differential effect, our data indicate that they are more important for immigrants, especially for Asian and European immigrants. The finding that macro factors affect HCU but not as much as health differences have been previously reported [35].

Our hypothesis that differences between immigrants and natives in usage would differ across countries is supported in our results. In Belgium, Denmark, France, Germany, the Netherlands, Sweden, and Switzerland immigrants have significantly greater usage of services with controls for all the characteristics (except for physician visits in Belgium and Denmark, and hospital stays in Belgium and Sweden).[1] Three of the six countries (Belgium, France, and Switzerland) are countries where a higher proportion of GDP is spent on health. In the Netherlands and Sweden, capitation is the type of payment to doctors. While in Belgium, Denmark, France, and Switzerland doctors are paid a fee-for-service. In countries where GPs are paid through a fee-for-service system, the GP does not act as a gatekeeper, and the density of doctors is among the highest in these countries, the number of visits to a GP for European immigrants is greater; while visits to all physicians are smaller.

We hypothesized that a number of factors affect health care usage in addition to immigrant status. As expected, higher age and being female are linked to greater usage. Despite the availability of universal coverage for health services, economic factors influence the use of health care. Higher education and being employed is linked to lower usage. Extended access is not significant but full coverage of costs increases the usage of the three types of services.

There are some limitations in this research. Some immigrants may return to their countries of origin after becoming ill affecting the observed differences. This is known as the salmon effect. In addition, there are differences across countries in response rates, which could affect our results. We should note again, that the lowest response levels were in Switzerland.

The major innovation of this paper is that it uses a comparable dataset to model the demand for medical care services for a group of European countries to examine health care usage differences between immigrants and natives. This contributes to the HCU literature by providing a unique statistical, demographic and economic approach to clarify how older immigrant populations use medical services. The results of this study add to our understanding of the behavior of older persons across Europe. Moreover, while our results suggest that it is important in planning for HCU to consider the impact of recent migration increase in Europe; however, we note that our results represent waves of immigrants that took place more than 20 years ago. Current immigrants may not have the same characteristics or behavior as more recent movements. European countries have recruited working-age migrants to fill labor and skill shortages, resulting in high levels of immigration since the 1990s and predicted to increase in coming decades.

The differences we observe across countries may require further exploration within individual countries, to see whether additional features of the culture or political climate could affect the propensity to use health services. More extensive study is also warranted on how the particular characteristics of each health system affect the use of care services among immigrant and non-immigrant groups of the older population.

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[1] We refer to the number of visits to the doctor but we mean the expected number given the explanatory characteristics.

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