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Abstract

Analyze the demand for general practitioners and estimate trends in the demand for health care services, mostly based on demographic and epidemiological development. We sought to project the cost and volume of prescribing in primary care. We used the data from the National Organization for the Provision of Primary Healthcare Services (EOPYY) to design a model based on the number of prescriptions issued to a patient visit. The prescriptions are grouped by patients' age, sex, place of residence and their diagnostic evaluation. We selected eleven conditions, which are identified by the codes from the International Classification of Diseases. The forecasting model is based on the negative binomial regression. Projections are made for drug expenditure based on data taken from the World Bank and analysis of current utilization trends. We project an increase in drug expenditure in 2021, although it is expected population decline. Older adults use more health services than younger people. It is noted that female have higher medical care service utilization than male. Greeks living in rural areas have less healthcare utilization rates than their urban counterparts.

Keywords: Primary Health Care, Health Demand model, Prescribing Indicators, Negative Binomial.

JEL Classification: C25, I12.

Introduction

The Greek society is characterized by low fertility, increases in life expectancy and delayed mortality with the result of aging population. In addition, there is an epidemiologic transition from acute illness to chronic disease, which has resulted in an increased demand and need for long-term health care[1]. The ageing of the population of Greece will affect the cost and volume of prescribing in primary care.

It is of great importance to analyze the demand for healthcare services, because it has major consequences for health care expenditures and significant implication for strategic planning of services. The purpose of demands assessment in primary health care is to provide information to plan and change health services, with the ultimate goal of improving the health of a population[2]. Health needs are often differentiated as needs and demands[3]. It should be noted that there are patients who may need health care but do not demand it (e.g. homeless people). In addition, demand can also be induced by supply, whereby providers base treatment recommendations on economic rather than medical criteria.

Several studies have attempted to estimate the impact of economic factors on the demand for health care. Studies have reported that General Practitioner(GP) visiting rates are significantly higher for those on low incomes whose costs are covered by the State than for those who pay for such care[4].

Another element influencing the demand for health care is the educational level of the patient. The volume of general practitioner visits is inversely associated with educational level. Particularly, elderly individuals with a lower education level have higher probability of suffering from a chronic disease[5].

Another factor considered likely to impinge on health services demand is lifestyle choice[6]. In particular, nutrition, inactivity, obesity and stress exert influence on health outcomes and contribute to some diseases.

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[1] Goulding MR, Rogers ME. Public Health and Aging: Trends in Aging—United States and Worldwide. JAMA. 2003;289(11):1371-1373. doi:10.1001/jama.289.11.1371.

[2] Stevens A, Gillam S. Needs assessment: from theory to practice. BMJ : British Medical Journal. 1998;316(7142):1448-1452.

[3] Wright J, Williams R. Development and importance of health needs assessment, BMJ. 1998;316:1310. DOI:10.1136/bmj.316.7140.1310.

[4] Nolan B. Economic incentives, health status and health services utilisation. J. Health Econ. 1993;12:151–169. DOI:10.1016/0167-6296(93)90025-A.

[5] Fernández-Olano C, Hidalgo JD, Cerdá-Díaz R, Requena-Gallego M, Sánchez-Castaño C, Urbistondo-Cascales L, et al. Factors associated with health care utilization by the elderly in a public health care system. Health Policy. 2006;75(2):131–9. DOI:10.1016/j.healthpol.2005.02.005.

[6] NZIER. Ageing New Zealand and Health and Disability Services: Demand projections and workforce implications, 2001–2021. Discussion document. Dec 2004. Wellington: NZ Ministry of Health,2004. Available at:

In addition to the above elements, there is the impact of the value of a patient's time (travel and waiting time) on the demand for health care. In particular the negative own-time price elasticity indicates that as waiting time increases, the demand for health care services will fall[7]. Studies have reported elasticity of demand with respect to travel time ranged between -0.6 and -1, meaning that an 10% increase in the travel time would induce a reduction of 6%-10% in the demand for health care services[8].In addition, waiting times, distance, capacity and availability of private health care can affect the use of health care[9].

A review of international workforce planning methodologies was carried out with particular focus on the health demand models for General Practitioners. The literature on health demand is extensive. The literature differentiates between various approaches to estimate the demand for health services[10,11,12,].

- Personnel to population ratios. The population is used as a denominator and a normative figure as the numerator. A critical issue is to determine a norm, which can be defined according to criteria set by the government or by using other countries as a reference. Norms are often copied from other countries, but might not fit the situation of a specific country. The impact of government policy such as the extension of free care for GPs will reflect the demand for healthcare services. For example in countries, such as Australia and Canada the demand for GPs is over 100 per 100.000 people, but in Ireland the ratio is at 65 GPs[13,14,15].
- Utilization and demand approach. Estimates future requirements on the basis of current levels of service utilization, adjusted to future projections of demographic

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http://www.moh.govt.nz/moh.nsf/0/E6EE108D0901CAD8CC256F73000F1F9A/$File/nzierreport-ageingnzandhealthanddisabilityservices.pdf.

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[15] McGovern E, Morris R. Medical Workforce Planning: Future Demand for General Practitioners 2015-2025. Health Service Executive, Health Service Executive - National Doctors Training and Planning, Dublin;2015. Available at: http://www.hse.ie/eng/staff/leadership_education_development/met/plan/reports/medical_workforce_planning_future_demand_for_general_practitioners_2015-2025.pdf.

profiles. An example includes the Council on Graduate Medical Education (COGME). It is a narrower measure than the needs-based approach.

- Needs-based planning. Determines the effect of the epidemiological conditions that characterize a given population, measured through morbidity and mortality rates or by the opinion of a panel of experts. In addition, future demand may be based on information about current unmet needs and changing morbidity patterns (e.g. the rise in certain chronic diseases)[16]. It requires significant amount of data that do not often exist in a consistent format. An example of this approach was the 1980 study by the Graduate Medical Education National Advisory Committee (GMALEAC), which reported an expected surplus of physicians by 2000.

A systematic literature review was performed to describe processes and models for assessing health demand and forecasting the population's future health services utilization in high and middle income countries. The review was carried out with particular focus on the health demand models for General Practitioners. Case-study examples are provided and presented in table form.

Country	**Developed by (primary author)**	**Aim of the Study**	**Models Specifications**
Australia	o Health Workforce Australia[17]. o Laurence C. et al[18].	o Health Workforce projections for 2025. o Simulation model for planning the general practice workforce.	o Demand projections are based on service utilization rates for each gender and five-year age cohort. o The demand model combines disease incidence and prevalence data with age- and gender-specific utilization rates per incident/prevalent case to estimate the aggregate level

[16] Ono T, Lafortune G, Schoenstein M. Health workforce planning in OECD countries: a review of 26 projection models from 18 countries. OECD Health Working Papers, No. 62. France: OECD Publishing. 2013;8-11. DOI:10.1787/5k44t787zcwb-en.

[17] Health Workforce Australia. Health Workforce 2025 -Volume 3 - Medical Specialties. 2012. Available at: https://submissions.education.gov.au/forms/archive/2015_16_sol/documents/Attachments/Royal%20Australasian%20College%20of%20Surgeons.pdf.

[18] Laurence C, Karnon J. Improving the planning of the GP workforce in Australia: a simulation model incorporating work transitions, health need and service usage, Human Resources for Health. 2016; V.14:13. DOI: 10.1186/s12960-016-0110-2.

			of services required over the whole population. o Annual GP utilization for each age/gender group. Analysis of the consultation length for each area of the population.
	o Harrison C[19].	o Future general practice workforce requirements in different geographic areas.	
Belgium	o SPF SPSCAE[20]	o Assess potential shortages or surpluses of physicians in the future	o Differential utilization patterns by age/sex, proxied by health service expenditure data. It is expected to decrease the number of GPs from 54.49 per 10.000 people in year 2004 to 51.35 in 2030.
Canada	o Ontario Ministry of Health[21].	o Population needs-based physician simulation model for Ontario.	o Needs module depends on factors such as disease incidence and prevalence, socio-economic and lifestyle risk factors and population demographics.
	o Basu K., et al[22].	o A physician demand and	o The demand to

[19] Harrison C, Britt H, Henderson J. Prevalence of Chronic Conditions in Australia, PLoS ONE. 2013;8(7):e67494. DOI:10.1371/journal.pone.0067494.

[20] SPF Santé publique, Sécurité de la Chaîne alimentaire et Environnement, Direction générale Soins de Santé primaires et Gestion de crises, Cellule Planification des professionnels de santé. Perspectives d'avenir de la Commission de Planification, Offre médicale: Rapport scénario de base Médecins. 2009;43. Available at: http://organesdeconcertation.sante.belgique.be/sites/default/files/documents/planningscommissie_-_medisch_aanbod-fr/19069354_fr.pdf.

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		supply forecast model for Nova Scotia.	physician services involves three steps: a) establish the Full-Time Equivalent (FTE) for each physician. b) Calculate the FTE for each service (i.e. by patient's age, sex, most responsible diagnosis). c) Project future demand by using statistics Canada's population projections.
Germany	○ Schulz E[23].	○ Demand for curative health care workforce 2025.	○ It is used the utilization method, showing the demographic effect, taking into account changes in utilization as well as changes in productivity.
Ireland	○ Health Service Executive - National Doctors Training and Planning[24].	○ Future demand for General Practitioners 2015-2025	○ Focus on 3 major variables: a) population change, b) utilization based on consultation rates c) proportion of population eligible for free GP care.

[22]Basu K, Gupta A. A physician demand and supply forecast model for Nova Scotia, Cahiers de sociologie et de demographie medicales. 2005; 45(2-3):255-85.

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[24] McGovern E, Morris R. Medical Workforce Planning: Future Demand for General Practitioners 2015-2025. Health Service Executive, Health Service Executive - National Doctors Training and Planning, Dublin;2015. Available at: http://www.hse.ie/eng/staff/leadership_education_development/met/plan/reports/medical_workforce_planning_future_demand_for_general_practitioners_2015-2025.pdf.

			Factors affect the demand for GPs: • The increase in access to free care. • Feminization of the GP workforce will increase the number of GPs, since female GPs are more likely to work part-time. • The development of nurse-led care will reduce GP workload.
Netherlands	Van Greuningen et al[25].	○ Evaluation of GP planning.	○ The Dutch simulation demand-based model for the year 2019 was evaluated using: a) demographic data (will increase the demand for GPs by 6%), b) epidemiological developments, such as lifestyle factors (will increase the demand for GPs by 3%), c) sociocultural developments (will increase the demand for GPs by 5%), d) medical technical developments (will decrease the demand for GPs by 2%),
New	NZIER[26].	Future demand for	○ The key demand drivers

[25] Van Greuningen M, Batenburg R, Van der Velden L. Ten years of health workforce planning in the Netherlands: a tentative evaluation of GP planning as an example, Human Resources for Health. 2012;10(1):21. DOI: 10.1186/1478-4491-10-21.

Zealand		health and disability services	are: • The size/age structure of the population. • The rates of incidence of disease in the population. • The pattern of disease and disability as longevity increases.
Norway	○ Roksavaag K et al. [27].	○ Project the future supply and demand of health care personnel.	○ The demand side considers population structure, utilization rates and the economic growth.
Spain	○ Barber P. et al[28].	○ Forecasting the need for medical specialists.	○ A demand /need simulation model, which includes demographic, education and labor market variables.
Switzerland	○ Seematter-Bagnoud L.[29]	Assessment of the future requirements for physicians in	○ Assumes an optimistic scenario of a compression of morbidity and a pessimistic scenario of an expansion of

[26] NZIER. Ageing New Zealand and Health and Disability Services: Demand projections and workforce implications, 2001–2021. Discussion document. Dec 2004. Wellington: NZ Ministry of Health,2004. Available at: http://www.moh.govt.nz/moh.nsf/0/E6EE108D0901CAD8CC256F73000F1F9A/$File/nzierreport-ageingnzandhealthanddisabilityservices.pdf.

[27] Roksvaag K,Texmon I. Arbeidsmarkedet for helse-og sosialpersonell fram mot år 2035 [Helsemod- the labor market for healthcare personel towards 2035], Report 14/2012, Statistics Norway, Oslo;2012. Available at: https://www.ssb.no/a/publikasjoner/pdf/rapp_201214/rapp_201214.pdf.

[28] Barber P, Lopez-Valcarcel B. Forecasting the need for medical specialists in Spain: application of a systems dynamics model, Human Resources for Health. 2010;28:24. DOI: 10.1186/1478-4491-8-24.

[29] Seematter-Bagnoud L, Junod J, Jaccard Ruedin H, Roth M, Foletti C, Santos-Eggiman B. Offre et recours aux soins médicaux ambulatoires en Suisse - Projections a l'horizon 2030, Document de travail 33. Observatoire suisse de la santé (OBSAN), Neuchatel;2008. Available at: http://www.obsan.admin.ch/sites/default/files/publications/2015/arbeitsdokument-33.pdf.

		ambulatory care.	morbidity.
United Kingdom	○ Centre for Workforce Intelligence[30].	Forecast medical workforce.	The key demand drivers are: • The size of the population by age and gender. • The needs of the population given the distribution of health and illness, and future risk factors. • Level of service. The service planned to be provided according to the population's level of need. • Productivity. The ability of the workforce to deliver the necessary services, taking into account factors such as skill mix and technology.
USA	○ Association of American Medical Colleges[31].	Projected future demand and supply physicians.	The demand model simulated the implications of changing demographics as the population grows and ages, along with projected changes in disease prevalence (diagnosed with

[30] CfWI - Center for Workforce Intelligence. A strategic review of the future healthcare workforce: informing medical and dental student intakes. London;2012. Available at: http://www.cfwi.org.uk/publications/a-strategicreview-of-the-future-healthcare-workforce-informing-medical-and-dental-student-intakes1/at_download/attachment1.

[31] IHS Inc. The Complexities of Physician Supply and Demand: Projections from 2013 to 2025. Prepared for the Association of American Medical Colleges. Washington DC;2015. Available at: https://www.aamc.org/download/426242/data/ihsreportdownload.pdf?cm_mmc=AAMC-_-ScientificAffairs-_-PDF-_-ihsreport.

			arthritis, asthma, cardiovascular disease, diabetes, or hypertension; history of heart attack, history of stroke), other health risk factors (body weight and current smoking status) among the population if health care use and delivery patterns remained unchanged and residence in a metropolitan or non metropolitan area.

National differences found in the consultation frequency in general practice. In 2009/2010 in Australia, there is an average of about 5.3 GP visits per head of population[32]. During 2009 the average number of visits with a GP at a primary care facility per person was 1.5 in Sweden[33]. According to the Canadian Institute for Health Information the total number of consultations and visits per 100.000 population for the period 2014-2015 was 335.683 (family doctors) and 59189 (internists)[34]. A study in UK has shown that people aged 85-89years old in 2008 had a median consultation rate of 14 per person per year, up from 6.8 per person per year for the same age band in 1966[35].

A number of lessons can be learnt from international experience with regard to project future demand for health care personnel. Of particular importance is that the key demand drivers are: a) the size and age structure of the population and b) the rates of incidence of disease in the population.

[32] Britt H, Miller GC, Charles J, Henderson J, Bayram C, Pan Y, Valenti L, Harrison C, O'Halloran J, Fahridin S. General practice activity in Australia 2009–10. General practice series no. 27,Cat. no. GEP 27. Canberra: AIHW;2010. Available at: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442472722.

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Material and Methods

We used the data from the electronic prescribing system of the National Organization for the Provision of Primary Healthcare Services to design a model based on the number of prescriptions issued to a patient visit. The amount of health care demanded is often measured by the quantity of services used or prescriptions[36,37,38].

The simplest form of data is available on individual use of medical care services and is based on a six months period from September 2012 to February 2013. International studies have tended to use individual data in order to model the impact of various non financial factors on demand for services[39].

Data has been drawn from the National Organization for the Provision of Healthcare Services, we calculate the mean number of primary care physician office visits per person, defined as visits to a general practitioner, family physician, or general internists. There are also data based on the Greek population projections derived from the World Bank.

This model is based on the demographic and epidemiological developments. Many studies have represented an epidemiologically-based approach to needs assessment model, viewing need in terms of the occurrence of specific diseases rather than in terms of felt need[40,41]. The design of the model is based on patient visits. A number of studies have investigated the demand for medical care by using discrete measures, such as the number of physician visits[42].

The model is used to explain variability in prescribing. The prescriptions are grouped by patients' age, sex, place of residence and their diagnostic evaluation. The model has adapted to recognize the International Classification of Diseases (ICD10) codes and the data are grouped according to cause under eleven broad categories. We chose chronic diseases that are commonly occurring and with the highest morbidity[43]. The prediction equations in our

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[36] Wilkinson J, Murray S. Assessment in primary care: practical issues and possible approaches, British Medical Journal.1998;316(7143), 1524:1528. DOI:10.1136/bmj.316.7143.1524.

[37] Ringel J, Hosek S, Vollaard B, Mahnovski S. The Elasticity of Demand for Health Care: a review of the literature and its application to the Military Health System, National Defense Research Institute, Health Rand;2002. DOI:10.1222/0833031090.

[38] García Rodríguez LA, Pérez Gutthann S. Use of the UK General Practice Research Database for pharmacoepidemiology, British Journal of Clinical Pharmacology. 1998;45:419–425. doi:10.1046/j.1365-2125.1998.00701.x

[39] Roberts A, Charlesworth A. Future demand for health care: a modelling study. Lancet. 2012;380(S20). DOI:10.1016/S0140-6736(13)60306-2.

[40] Williams R, Wright J. Epidemiological issues in health needs assessment, British Medical Journal. 1998;316: 1379-82. DOI:10.1136/bmj.316.7141.1379.

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[43] Østbye T, Yarnall KSH, Krause KM, Pollak KI, Gradison M, Michener JL. Is There Time for Management of Patients With Chronic Diseases in Primary Care? Annals of Family Medicine. 2005;3(3):209-214. DOI:10.1370/afm.310.

model are based on patient characteristics. We have compared utilization in particular three geographic areas: Attica (population is over 1.000.000 people), Magnesia(population is over 150.000 people) and Xanthi (population is under 150.000 people). The modeling was undertaken in Stata.

Our response variable is a discrete count, non-negative variable and thus count data models provide appropriate estimation techniques[44,45]. In addition, the observed data are over dispersed. The unconditional mean of our outcome variable is much lower than its variance and therefore a Negative Binomial model is appropriate. The confidence intervals are narrower as compared to those from a Poisson regression model. Factors influencing the demand for health services are often modeled using negative binomial regression[46,47,48,49].

We sought to project the cost and volume of prescribing in primary care that will be required from 2021 onward. We take into account projected population growth and changing demographics from 2012 to 2021. We assume that current needs are a proxy for past needs, and the current utilization is a proxy for future utilization[50]. Therefore the rate of use per person remains constant.

Results

The response variable of interest is quantity if medicine prescribed, Qtyprescribed. Each variable has 196.054 valid observations and their distributions seem quite reasonable.

The response variable is the number of prescribed items issued at a patient level (QtyPrescript). The variable CostPrescript indicates the cost of each prescription. The variables sex, age, district and morbidity are categorical variables and are included in the model as a series of indicator variables. From the p-value, we can see that the model is

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[44] Trivedi PK. Introduction: econometric models of event counts events. J. Appl. Econom. 1997;12:199–201. DOI: doi:10.1002/(SICI)1099-1255(199705)12:3<199::AID-JAE442>3.0.CO;2-R.

[45] Deb P, Holmes A.M. Estimates of use and costs of behavioural health care: a comparison of standard and finite mixture models. Health Econ. 2000;9(6):475–489.

[46] Moineddin R, Meaney C, Agha M, Zagorski B, Glazier RH. Modeling factors influencing the demand for emergency department services in ontario: a comparison of methods. BMC Emergency Medicine. 2011;11:13. doi:10.1186/1471-227X-11-13.

[47] Phuc Hong Le. An Empirical model to Estimate the Demand for Primary Care in Urban Settings, The University of Texas School of Public Health. Policy & Community Health, ProQuest;2009.

[48] Greene W. Functional forms for the negative binomial model for count data, Economics Letters. 2008;99:585-590. DOI: 10.1016/j.econlet.2007.10.015.

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statistically significant. The two degree-of-freedom chi-square test indicates that age, sex, district and morbidity are statistically significant predictors of Qtyprescribed (Table 1).

The variable CostPrescript has a coefficient 0.006, which means that for each one increase on CostPrescript, the expected log count of the QtyPrescript increases by only 0.006.

The indicator variable 2.age is the expected difference in log count between age range (25-34) and the reference group (age range 0-24). The same applies to the others variables 3.age (range 35-44), 4.age (range 45-54), 5.age (range 55-64), 6.age (range 65-74), 7.age (range 75+). As a result, the older the age group the greater is the utilization of health care services. Moreover, it is noted that Females have higher medical care service utilization than Males. The difference in the logs of expected counts is expected to be 0.1069 unit higher for females compared to males, while holding the other variables constant in the model. A number of previous studies have explored health services utilization and morbidity patterns by age and gender[51,52,53,54,55].

The morbidity data are grouped by ICD-10 diagnostic categories. The variables 2.morbidity(diseases of the respiratory system - antihistamines), 3.morbidity(diseases of the respiratory system -obstructive pulmonary disease) 4.morbidity(diseases of the respiratory system - nasal decongestant), 5.morbidity(disease musculoskeletal system), 6.morbidity(heart disease), 7.morbidity(heart disease - hypertension), 8.morbidity(heart disease - hyperlipidemia), 9.morbidity(Osteoporosis), 10.morbidity(diseases of the digestive system) and 11.morbidity(diabetes) are dummy-coded indicator variables. These indicator variables show the expected difference in log count with the reference group (other diseases).

Dummy variables were created for the nominal variable of district, by fitting 1.district (rural area), 2.district (urban area) and 3.district (metropolitan area). The output below indicates that the incidence rate for 2.district is 0.279 times the incidence rate for the reference rural area. Likewise, the incidence rate for 3.district is 0.910 times the incident rate for the reference group holding the other variables constant. Results show that Greeks living in rural areas have less healthcare utilization rates than their urban counterparts. These

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[51] Bertakis KD, Azari R, Helms LJ, Callahan EJ, Robbins JA. Gender differences in the utilization of health care services. J Fam Pract. 2000;49 (2): 147-152.

[52] Redondo-Sendino Á, Guallar-Castillón P, Banegas JR, Rodríguez-Artalejo F. Gender differences in the utilization of health-care services among the older adult population of Spain, BMC Public Health. 2006;6:155. DOI:10.1186/1471-2458-6-155.

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54 Vegda K, Nie J, Wang L, Tracy S, Moineddin R, Upshur R. Trends in health services utilization, medication use, and health conditions among older adults: a 2-year retrospective chart review in a primary care practice. BMC Health Services Research. 2009;9(1):217. DOI: 10.1186/1472-6963-9-217.

55 Carretero MT, Calderón-Larrañaga A, Poblador-Plou B., Prados-Torres A. Primary health care use from the perspective of gender and morbidity burden, BMC Female's Health. 2014;14:145. DOI:10.1186/s12905-014-0145-2.

findings are consistent with other international studies that have found disparities in health care utilization between rural and urban areas[56,57,58].

Table 1: Negative binomial regression results

qtyprescript	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
costprescrip	.0062144	.0000269	230.67	0.000	.0061616	.0062672
morbidity						
2	-.1238436	.0132073	-9.38	0.000	-.1497295	-.0979578
3	-.2101932	.0137927	-15.24	0.000	-.2372263	-.18316
4	-.0842992	.014019	-6.01	0.000	-.111776	-.0568224
5	.0781673	.0092926	8.41	0.000	.0599542	.0963804
6	.3898642	.0084839	45.95	0.000	.3732359	.4064924
7	-.0231252	.0066599	-3.47	0.001	-.0361783	-.0100721
8	-.1146438	.0101832	-11.26	0.000	-.1346024	-.0946852
9	-2.089921	.0723854	-28.87	0.000	-2.231794	-1.948049
10	-.0500284	.0087306	-5.73	0.000	-.0671401	-.0329167
11	-.0790854	.0167535	-4.72	0.000	-.1119217	-.0462491
age						
2	.0963251	.0150844	6.39	0.000	.0667603	.1258899
3	.2953465	.0145723	20.27	0.000	.2667853	.3239077
4	.4919326	.0141182	34.84	0.000	.4642614	.5196038
5	.6494744	.0137179	47.35	0.000	.6225879	.6763609
6	.7603675	.0137062	55.48	0.000	.7335038	.7872313

[56] Begashaw B, Tesfaye T. Healthcare Utilization among Urban and Rural Households in Esera District: Comparative Cross-sectional Study, American Journal of Public Health Research. 2016;4(2):55-61. DOI: 10.12691/ajphr-4-2-3.
[57] Salinas J, Al Snih S, Markides K, Ray LA, Angel RJ. The rural-urban divide: health services utilization among older Mexicans in Mexico, Journal of rural health. 2010;26(4):333-341. DOI: 10.1111/j.1748-0361.2010.00297.x.
[58] Oladipo JA. Utilization of health care services in rural and urban areas: a determinant factor in planning and managing health care delivery systems. African Health Sciences. 2014;14(2):322-333. DOI:10.4314/ahs.v14i2.6.

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7	.890876	.0137247	64.91	0.000	.8639761	.9177759
2.sex	.106893	.0052374	20.41	0.000	.096628	.117158
district						
2	.2793902	.0074765	37.37	0.000	.2647366	.2940438
3	.9100199	.0070067	129.88	0.000	.8962871	.9237528
_cons	.1342479	.0143782	9.34	0.000	.1060671	.1624286

According to the study by the National Organization for Healthcare Provision (EOPYY), which reported by 2014, the average number of visits with a primary care physician is 4.1 per person and the percentage of the population having consulted general practitioner/internist is at 26.4% of total visits. The aim of the projections is to provide estimates of the cost of prescription drugs by general practitioners from 2021 onward. The projections are based on the Greek population projections published by the World Bank. The table below shows the cost of prescription drugs for the year 2012 and 2021. The proportion of Greece's population aged 75+ will rise to 8.38%, while there is a 3.62% decrease in total population.

Variable	Population 2012	Population 2021	Prescription Cost 2012	Prescription Cost 2021
0-24 Male	1.419.773	1.280.000	9621337	8674141
25-34 Male	794630	601.000	18276270	13822834
35-44 Male	844256	779.000	38068067	35125630
45-54 Male	745758	801.000	66990515	71952835
55-64 Male	633362	674.000	97439775	103691741
65-74 Male	497524	547.000	119740139	131647631
75+ Male	471512	504.000	128361382	137205706
0-24 Female	1355380	1.217.000	10750618	9653014
25-34 Female	751683	568.000	22373098	16905956
35-44 Female	838016	750.000	43955294	39338713
45-54 Female	790796	816.000	82244579	84865852

55-64 Female	684940	756.000	114630520	126523014
65-74 Female	570596	644.000	130448053	147229469
75+ Female	646785	708.000	151793298	166159782

Source: World Bank and author's own

The results from the below table show that the number of prescriptions issued annually to a patient increases with age and morbidity, a result similar by other researchers[59]. The expected number of prescriptions for men and women aged 75or more are 14.53 and 16.11.

Table: prescriptions issued by age and sex.

Variable	Median number of prescriptions
0-24 Male	3.79
25-34 Male	4.55
35-44 Male	6.51
45-54 Male	9.31
55-64 Male	11.50
65-74 Male	13.72
75+ Male	14.53
0-24 Female	4.82
25-34 Female	5.96
35-44 Female	7.40
45-54 Female	10.46
55-64 Female	12.99
65-74 Female	14.14
75+ Female	16.11

Discussion

It should be noted, that in Greece are expected changes in primary health service delivery models. Any re-organisation in health service delivery will have an impact on health workforce requirements (different number and mix of providers). For example, the

[59] Omar RZ, O'Sullivan C, Petersen I, Islam A, Majeed A. A model based on age, sex, and morbidity to explain variation in UK general practice prescribing: cohort study, BM. 2008;337:a238. DOI:10.1136/bmj.a238.

implications of strengthening a gate-keeping system will increase the demand for GP services.

The growing numbers of patients with long-term conditions and complex health needs will require more professional input and longer consultations. It is important to note that consultations time for elderly people are longer than for younger people[60.] Therefore, the total supply of GP services, expressed in terms of hours of service, grows faster than the nominal growth in the number of services. Lengthening the consultation will allow the needs of the patient to be adequately discussed and enable enhanced communication between the patient, their careers and different healthcare providers[61]. The size of the general practice workforce will have grown to reflect need.

A 24/7 personalized care to patients with complex comorbidities will increase the requirements for GP services. An alternative view is that patients face time and travel costs and these variables can be proved significant determinants of service use.

Besides the manpower planning of primary health physicians, we must increase the focus on prevention care and in primary health care infrastructure. A strong primary health care sector will reduce pressure on hospitals.

Limitations

Data sets that contain information on all the variables that affect need are expensive to generate. The distribution of services by age and sex does not take into account the existing unmet demand and the current inequalities resulting from the maldistribution of the health workforce. There is also some uncertainty as to whether current trends will continue into the future[62.] The narrow availability of data might constrain the ability to build a meaningful empirical model of the need for health care.

There are some measurement issues with utilization. In the analysis, we have used GP services from EOPYY. Without doubt, these services account for the major part. However, primary health care extends beyond those services. Some services rendered in hospital outpatient and emergency departments are also primary health care services. Other primary

[60] Access Economics. An analysis of the widening gap between community need and the availability of GP services. Australian Medical Association. Canberra;2002. Available at: https://ama.com.au/sites/default/files/documents/210202_Access_Ec_GP_Workforce_Report.pdf .

[61] Royal College of General Practitioners. A Vision for General Practice in the future NHS. London;2013. Available at: http://www.rcgp.org.uk/policy/rcgp-policy-areas/general-practice-2022.aspx.

[62] Cornwall J, Davey J. Impact of Population Ageing in New Zealand on the Demand for Health and Disability Support Service and Workforce Implications. Background Paper. Wellington: Ministry of Health New Zealand;2004. Available at: https://www.health.govt.nz/system/files/documents/publications/cornwallanddavey.pdf.

health care services may be rendered by medical practitioners. Another drawback is that information about utilization of private services is not available.

Conclusion

It is useful to estimate the future demand for medical services, in order to ensure that manpower and facilities are available in the proper quantity to meet demand. The analysis and the estimation of future health demand has potential application in policy decisions on the allocation and planning of healthcare resources. The impact of the projected demographic changes on future health demand is a growing concern as a contributing cause of healthcare expenditure.

The dependent variable reflected annual use of health care services, while the explanatory variables consisted of the demographic characteristics, medical conditions and geographical factors. It becomes apparent from the analysis that the age/gender profile of the patients is statistically significant in explaining the utilization of GP services. The changing age distribution of the population is likely to have an impact on health workforce planning. Although, Greece's population is declined the cost of prescription drugs will rise by 2021, if we stay on our current course.