

Factors Affecting Primary Care Referrals to Specialised Care in the Community of Madrid

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Objective. Identification of the variables relative to the population characteristics and the primary and specialised care services provision which determine the referral rates between both levels.

Design. Cross-sectional ecological study.

Setting. Basic health zones (BHZ) of the Community of Madrid (CAM), Spain, 2001.

Participants. Population of the CAM.

Main measurements. Dependent variable: population referral rate (PRR) (referrals per BHZ in 2001 divided by BHZ population). Independent variables: population and their characteristics (income, unemployment, educational level, elderly and dependence level, marital status, immigrant rates); need of services (care frequency index and standardised mortality rate); primary care provision characteristics (number of doctors, distribution by age and sex, organisational model, number of years in primary care; specialised care provision characteristics (number of laboratory specialists, ratio of radio-diagnostic and clinical services doctors).

Results. The average PRR is 31.9 (0,87) per 100 inhabitants, with a tendency for similar values to group into three clusters. Five components which explain 81.87% of the variation have been identified: total population, demographic characteristics, socioeconomic status, need of services, and social mobility. In the regression analysis ($R^2=0.18$), the last 3 reach statistical significance.

Conclusions. The PRR is greater in the BHZ with higher levels of need of services and lower levels of socioeconomic status and social mobility. There is no relationship with either the provision or the organisation of primary care and specialised care. These variables should be included in the planning of the provision of services.

Key words: Primary care. Referrals. Affecting factors.

FACTORES DETERMINANTES DE LA DERIVACIÓN DE ATENCIÓN PRIMARIA A LAS CONSULTAS EXTERNAS DE ATENCIÓN ESPECIALIZADA EN LA COMUNIDAD DE MADRID

Objetivo. Identificar qué variables relativas a las características de la población atendida y la oferta de servicios de atención primaria (AP) y atención especializada (AE) determinan las tasas de derivación entre ambos ámbitos sanitarios.

Diseño. Estudio ecológico, transversal.

Emplazamiento. Zonas básicas de salud (ZBS) de la Comunidad de Madrid, durante el año 2001.

Participantes. Población de la Comunidad Autónoma de Madrid.

Mediciones principales. La variable dependiente analizada fue la tasa de derivación poblacional (TDP), es decir, las interconsultas por ZBS en 2001 divididas por la población de cada ZBS. Las variables independientes fueron: la población y sus características (renta, paro, nivel educativo, índice de envejecimiento y dependencia, estado civil, proporción de inmigrantes); las necesidades de servicios (frecuentación asistencial y razón estandarizada de mortalidad); las características de la oferta de AP (número de médicos, distribución por edad y sexo, modelo organizativo, antigüedad); las características de la oferta de AE (número de especialistas por área, proporción de médicos de laboratorio, radiodiagnóstico y servicios clínicos).

Resultados. La TDP media $\pm$ desviación estándar es de $31,9 \pm 0,87$ por 100 habitantes, con una tendencia a agrupar valores parecidos en 3 grupos. Se han extraído 5 componentes que explican el 81,87% de la variación: población total, características demográficas, estatus socioeconómico, necesidad de servicios y movilidad social. En el análisis de regresión ($R^2 = 0,18$), los 3 últimos alcanzan significación estadística.

Conclusiones. La TDP es mayor en las ZBS que tienen mayor necesidad de servicios y niveles más bajos de estatus socioeconómico y movilidad social. No se relaciona con la oferta y la organización de la AP y la AE. Estas variables se deberían incluir en la planificación de la oferta.

Palabras clave: Atención primaria. Derivaciones. Factores relacionados.

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A commentary follow this article (pág. 258)

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Introduction

References are made in the literature on the variation in referral rates between health care levels depending on the geographical area (rural areas compared to urban), as well as the influence of the sociodemographic characteristics of the population, their state of health, the primary care doctors, and the level of specialised services available.¹⁻⁴ This last variable appears as one of the most relevant explanatory factors.⁵

The objective of the study is to determine, in our area, and in the context of providing a public health service, what factors associated to the care population and the organisation of the providers determine the referral rates between primary care (PC) and specialised care (SC). Identifying this is important in tailoring the provision of services to the real needs, instead of basing it on the application of standard ratios.

Pacients and Methods

Design

Population-based cross-sectional ecological study (Community of Madrid) in which the unit of analysis is the basic health zone (BHZ).

Variables and Sources of Information

The dependent variable is the population referral rate (PRR). This is obtained by dividing the total referrals of the BHZ during the year 2001 by the population of the BHZ in the same year.

The independent variables are the population of the zone and its characteristics, the measures associated to the need of services, the characteristics of the provision and the PC organisation and the SC provision (Table 1).

The sources of information used were the population census and the data base individual health cards of the year 2001, the Mortality tables in the Register of Deaths, the summary of family gross disposable income in the year 2000 from the Autonomous Community of Madrid Institute of Statistics, and the 2001 INSALUD Hospital Register data base.

The data of activity and referrals have been obtained from the PC Managers 2001 Activity Information System of each health area.

Analysis and Statistical Tests

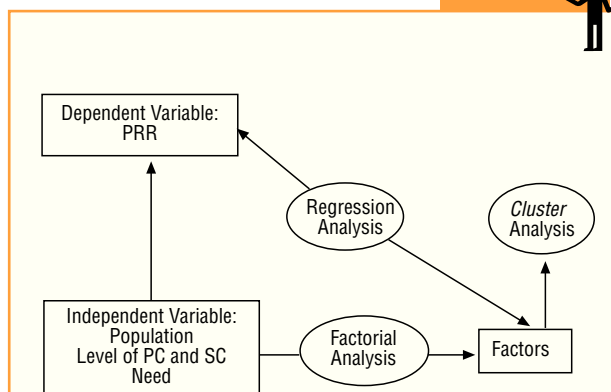
The distribution of the quantitative variables has been analysed to determine its normality, and the measures of central tendency and dispersion were calculated. The nominal variables were used as a ratio of the total in the BHZ.

A principal components factor analysis has been performed to control the multicollinearity and obtain orthogonal variables.

The extracted components have been used as independent variables. The number of components has been determined using the Scree test: these were rotated by the Varimax procedure and were included in a least squares regression analysis.

The degree of spatial autocorrelation using the Geary index on the basis of the calculation of a contiguity matrix with weight of 1 for all

Material and methods



General Scheme of the Study

Cross-sectional ecological study which analysed 1 617 349 referrals from primary (PC) to specialised (SC) care and their determining factors: population referral rate (PRR).

the zones which had contact with the zone in the study. The spatial correlation of the residuals has been calculated by re-applying the Geary I.

The principal components significantly associated with the PRR have been subjected to a hierarchical grouping analysis.

The graphical representations of the functional BHZs were produced by the Cartography of the Institutional Geographic Information System (SIGI).

The statistical analyses were performed using the SPSS (v.11) statistics package and with R software.

Results

In the year 2001, there were 1 617 349 referrals in the Autonomous Community of Madrid. The mean PRR was 31.94 ± 0.87 per 100 inhabitants. Its distribution is skewed to the right with some extreme values. The geographical distribution of the PRR values (Figure 1) shows a non-random pattern. There is spatial autocorrelation (0.84 ; $P < .0001$), with a tendency for similar values to group in certain zones.

The measures of central tendency and dispersion of the independent variables included in the factorial analysis are shown in Table 2. The Bartlett test ($P < .0001$) confirms the presence of a high degree of correlation between variables. In the analysis, there are 5 components which explain 81.87% of the variation. The commonality of some variables exceeded 95%. The first component is positively associated with variables related to ageing (state of widowhood, independence, and ageing index) and negatively associated with the female po-

TABLE 1 Description of the Independent Variables*

Population characteristics of the BHZs
Total population
No. of women between 15 and 49 years
Ageing index†
Dependency index‡
Ratio of pensioners
Ratio of population without education, with primary school education, secondary, and higher education
Ratio of unemployed
Ratio of immigrants
Ratio of widows, married, separated, and single persons
Gross family income
Indicators of the need of services in the BHZ
Frequency of health care use§
Standardised mortality rate in the <75 year olds
Characteristics of the level of service of PC in the BHZs
Total No. of doctors
Ratio of family doctors
Ratio of paediatricians
Ratio of PCT doctors
Ratio of traditional type doctors
Ratio of females and males
Mean age of the doctors
Ratio <40, 41-59, and >60 years
Ratio of doctors who have worked in SC <5 years and ≥5 years
Mean health care pressure in medicine¶
Characteristics of the level of services of SC in the health area pertaining to the BHZ
Total No. of specialists
Ratio of laboratory services doctors
Ratio of radiology doctors
Ratio of clinical services doctors

*BHZ indicates basic health zone; PC, primary care; SC, specialised care; PCT, primary care team.

†Ageing index: ratio between the number >65 years and <14 years.

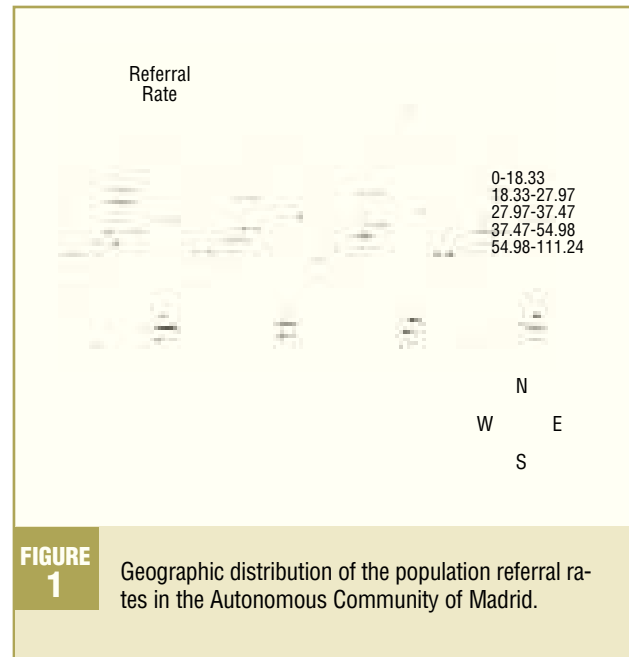
‡Dependency index: ratio of the number <14 years and >65 years, and the population between 15 and 64 years.

§Frequency of health care use: ratio of the total number of consultations (family and paediatric medicine) in 2001 and the population of the BHZ in 2001.

||Standardised mortality rate in the <75 year olds, calculated from the table of deaths of 2001 per BHZ, using the total population of the Autonomous Community of Madrid as a reference.

¶Health care pressure: ratio of the total number of consultations (family and paediatric medicine) in 2001 and the number of doctors in the BHZ multiplied by 21 working days per month.

pulation between 15 to 49 years. The second component, the socioeconomic status, maintains a positive relationship with the levels of secondary and higher education, and with high income level, and negative with no and primary education and unemployment index.

**FIGURE 1** Geographic distribution of the population referral rates in the Autonomous Community of Madrid.**TABLE 2** Measure of Central Tendency and Dispersion of the Independent Variables Included in the Factorial Analysis*

Independent Variables	Mean±SD
Dependency index	0.41964±0.09904
Ageing index	1.21078±0.61529
Ratio of pensioners	0.16351±0.06259
Ratio of women of 15 to 49 years	0.27406±0.02701
Ratio of population without education	0.12319±0.05844
Ratio of population with primary education	0.42140±0.09950
Ratio of population with average education	0.22922±0.04165
Ratio of population with higher education	0.17346±0.11396
Ratio of widows	0.05581±0.02314
Ratio separated	0.03092±0.00688
Ratio of homes with immigrants	0.03540±0.01897
Ratio unemployed	0.06506±0.01263
Gross family disposable income	11 203.962±3914.92080
Total population	23 131.90±11 207.18
Health care pressure	34.4872±6.9830
No. of doctors	14.11±6.25
Frequency of health care use	5.6062±2.1231
Standardised mortality rate	1.0029±0.2816

*SD indicates standard deviation.

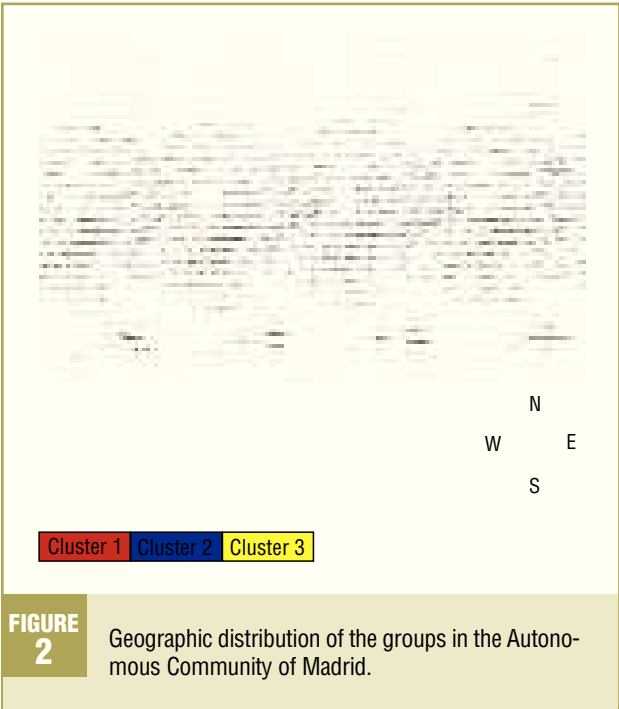
The third component, the total population, is positively associated with the total population of the area and the number of doctors. The fourth component, the need of services, is positively related with the standardised mortality rate and the care frequency. Lastly, the fifth component, which we have

TABLE 3 Results of the Hierarchical Grouping*

Factors	Grup	N	Mean	95% CI	P
Demographic characteristics	1	58	0.2345672	0.0041874 to 0.4649469	<.000
	2	105	-0.6320078	-0.7823480 to -0.4816677	
	3	72	0.7327212	0.5483851 to 0.9170573	
	Total	235	0.0000000	-0.1285187 to 0.1285187	
Socioeconomic status	1	58	1.2246024	1.0249790 to 1.4242257	<.000
	2	105	-0.3312464	-0.4732898 to -0.1892029	
	3	72	-0.5034176	-0.6519589 to -0.3548764	
	Total	235	0.0000000	-0.1285187 to 0.1285187	
Population	1	58	-0.0288348	-0.3046175 to 0.2469479	<.000
	2	105	0.4243744	0.2441783 to 0.6045704	
	3	72	-0.5956513	-0.7644206 to -0.4268819	
	Total	235	0.0000000	-0.1285187 to 0.1285187	
Need of services	1	58	0.0971249	-0.1227092 to 0.3169589	<.000
	2	105	-0.2659090	-0.3942693 to -0.1375487	
	3	72	0.3095445	-0.0127187 to 0.6318077	
	Total	235	0.0000000	-0.1285187 to 0.1285187	
	1	58	0.6644700	0.3502393 to 0.9787006	<.000
	2	105	-0.2242935	-0.3432016 to -0.1053854	
	3	72	-0.2081727	-0.4565448 to 0.0401993	
	Total	235	0.0000000	-0.1285187 to 0.1285187	

*CL indicates confidence intervals.

called social mobility, is positively associated with the ratio of homes with immigrants and the level of marriage separations. Only 3 of the components achieved statistical significance in



the regression analysis ($R^2=0.18$). The functional relationship is positive with the degree of need ($B=3.58$) (95% confidence intervals [CI], 2.01-5.1). The socioeconomic status component had a negative coefficient of 3.26 (95% CI, -4.8 to -1.7) and the relationship with the social mobility component $B=-2.92$) is also negative (95% CI, -4.5 to -1.4). In the hierarchical grouping analysis 3 different groups have been detected (Figure 2 and Table 3) and all the factors in the analysis of variance reached statistical significance ($P<.0001$).

Discussion

The PRR is greater in the BHZs which have a greater need of services and lower socioeconomic and mobility levels, and do not appear to be associated with the provision and the organisation of the PC or SC services. This is in contrast to that found in the English literature, where the referral rate is higher when there is a higher provision of specialised services. The interesting aspect of our study lies in its range (more than 5 million users), the unit of analysis (BHZ) and the fact that it refers to a universal system of health service provision, as well as having investigated all the dimensions associated with referrals from PC to SC pointed out in the literature reviewed.

**Discussion
Key points**
What Is Known About the Subject

- The referral rates between health care levels varies according to geographical zones.
- The influence of the sociodemographics of the population, its state of health, the primary care doctors, and the level of specialised services as regards the referral rates between health care settings has been documented.
- The level of specialised services appears to be the most relevant variable.

What This Study Contributes

- The interest stems from the width of the study, the unit of analysis, the reference to a universal system of health service provision, and the investigation of all the dimensions associated with referral rates from primary care to specialised care pointed out in the literature reviewed.
- The population referral rate is higher in the basic health zones which have a higher need of services and lower levels of socioeconomic status, and they do not seem to be associated with the level and organisation of the primary care and specialist services, in contrast to that found in the English literature.

The results appear consistent with that observed in daily practice. The people who use the health services more often are normally chronic patients, with multiple diseases and medication, which require monitoring by one or more specialists. In the BHZs with higher income levels, the PRR is lower, probably associated with higher levels of health and use of private SC providers. The lower level of use by the separated and divorced group is noted, and in the case of immigrants, it could be related to the barriers associated with accessibility by this sector.

The non-random geographic pattern of PRR is explained on placing the BHZs of the Madrid Community into 3 groups: Group 1, population with medium values of ageing component, high income level and a low need component; group 2, population with low values of ageing, socioeconomic level and need; and group 3, population with high values of ageing and need components and low socioeconomic level. The PRR of groups 2 and 3 are similar and are significantly higher than those in the BHZs of group 1. The population of groups 1 and 2 are probably the majority users of public services.

However, and to conclude, it has to be emphasised that the study is based on an ecological design and its results are subject to ecological fallacy. The group results obtained, in the strict sense, cannot be extrapolated or considered that they are individually applicable. This fact may be due to the absence of a correlation between the PRR and the level of services.

However, our work serves to demonstrate that in the planning of health care provisions, predefined ratios can no longer be applied. The need to use the available resources efficiently requires the planners to take the variables associated with the population characteristics into account, their level of health at the time of quantifying the health service provision and its typology.

Acknowledgements

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COMMENTARY

The Possibilities of Data Base Systems

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Data base systems contain valuable information to determine the use of health services, variability in clinical practice, and the health care processes, or to evaluate the impact of health service reforms.¹

The progressive generalised use of the health card in our country has given a considerable boost to investigation in this field. The increasing computerisation of the health services will also help to make these types of study more popular. The article by Alberdi et al¹ is a clear example of a study centred on system databases. It links the information provided from different sources. It uses the health card census, but by only using this register it does not achieve sufficient information to associate the sociodemographic characteristics and the health of each patient with their use of the services. It is surprising that the health care institutions themselves have such difficulty in integrating data from their own registers, particularly when, as regards the autonomous regions, each citizen has had a unique identifier for such a long time. The number of health care cards is used in every one of the events which are produced in the health care process: to arrange an appointment in the primary care centre, to record clinical data in the computerised clinical history, to collect all their drugs from the pharmacy, to be admitted into hospital, and come out with a discharge report. It should not be so difficult to make this combined information on the citizen available for use in the evaluation and planning of health services, as well as in individual clinical care.

It is interesting that the authors should find a territorial pattern in the use of services.² As they point out, some demographic, socioeconomic and health characteristics partially explain this association. However, it is possible that other factors not analysed in this study could have a decisive influence. In a country like ours, where patients are captive within a sectorised health system, I fear that a large part of this geographic factor is also determined by the level of health services themselves. Aspects such as geographic accessibility, hours and culture of the specialist centres, the variability in clinical practice itself, or the different referral protocols agreed with the family doctors could help to explain this observation. The authors cannot confirm with conviction, that in their territory, the level of services might not explain the use, when many of

Key Points

- System databases can allow the determination of use of services, the variability in clinical practice, the health care processes, or the evaluation of the impact of health service reforms.
- The use of the health care card must allow the integration of the health information contained in different databases and help in the study of health care processes.
- The analysis of the total frequency of the specialised field cannot be an indicator of the quality of the care provided by the family doctor.

the variables which characterise it have not been considered.

It is also important for us to understand the limitations of analysing referrals to specialised care based exclusively on a quantitative perspective. We have to consider that a large number of referrals are associated with a limited ability to restrict, and as a result, with a lower clinical quality of the family doctor. But this simplistic interpretation is very wrong.

A comparative analysis of the specialist referrals in the United Kingdom compared to the 5 health plans of the United States shows that, with the same patient load, the British family doctors refer 13.9% of patients, as opposed to the 30% to 36.8% of the Americans.³

It is easy to think the differences in these health, legal, and cultural models of both countries explains the variation. But we cannot conclude that the British doctors may be more resolute and, as a result, more efficient than the North American health plans. A more detailed analysis showed that the Kaiser Permanente model of the plan of a

Californian non-profit organisation was much more efficient than the British National Health Service. Effectively, it had a higher participation of specialist care, but the health processes were more resolute. The secret of the Californian success consisted of, being a more integrated system, some better managed hospitals, working in a competitive environment and they had invested more in information technology.⁴

The analysis of system data bases is an interesting investigation source which will allow us to better determine the needs of our patients and the ways of approaching them. The information which helps us can have an immediate practical use in improving our health care processes.

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