ORIGINAL

Receipt: 2016 March 31
Accepted: 2016 May 24
ePublish: 2016 June 8

IMPACT OF POPULATION MORBIDITY ON HEALTH CARE COSTS IN A HEALTH DISTRICT (*)

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The authors declare that there was no conflict of interest in the writing of this paper.

This work was partly financed by the Fondo de Investigaciones de la Seguridad Social Instituto de Salud Carlos III (FIS PI 12/0037). There was no conflict of interest.

ABSTRACT

Background: Risk adjustment systems based on diagnosis stratify the population according to the observed morbidity. The aim of this study was to analyze the total health expenditure in a health area, relating to age, gender and morbidity observed in the population.

Methods: Observational cross-sectional study of population and area of health care costs in the Health District of Denia-Marina Salud (Alicante) in 2013. Population (N=156,811) were stratified by Clinical Risk Groups into 9 states of health, state 1 being healthy, and state 9 the highest disease burden. Each inhabitant was charged with the hospital costs, primary care and outpatient pharmacy to obtain the total costs. Health status and severity by age and gender, as well as the costs of each group were analysed. The statistical tests, student t and χ^2 were applied to verify the existence of significant differences between and intra groups.

Results: The average cost per inhabitant was 983 euros which increased from 240 euros to 42,881 at the state 9 and severity level 6. Patients of health states 5 and 6 caused the largest expenditure by concentration of the population, but health states 8 and 9 had the highest average expenditure, with 80% of hospitalised cost.

Conclusions: A different composition of health expenditure per individual morbidity was corroborated, with an exponential growth in hospital spending.

Key words: Cost analysis, Risk adjustment, Hospital costs, Emergency service, Primary health care, Pharmaceutical economics, Morbidity, Health Economics, Health planning. Spain.

RESUMEN

Impacto de la morbilidad en los costes asistenciales de un departamento de salud de la Comunidad Valenciana a través de los grupos de riesgo clínico

Fundamentos: Los sistemas de ajuste de riesgo basados en diagnóstico estratifican la población según la morbilidad observada. El objetivo de este trabajo fue analizar el gasto sanitario total en un área de salud en función de la edad, el sexo y la morbilidad observada en la población.

Métodos: Estudio observacional de corte transversal y de ámbito poblacional de los costes de atención sanitaria en el Departamento de salud Dénia-Marina Salud (Alicante) durante el año 2013. Se estratificó a la población (N=156.811) según Grupos de Riesgo Clínico en 9 estados de salud, siendo sano el estado 1 y el 9 el de mayor carga de morbilidad. A cada habitante se le imputaron los costes hospitalarios, de atención primaria y de farmacia ambulatoria para obtener los costes totales. Se analizaron los estados de salud y gravedad por edad y sexo así como los costes de cada grupo. Se aplicaron las pruebas estadísticas t de student y χ^2 para verificar la existencia de diferencias significativas entre e intra grupos.

Resultados: El coste medio por habitante fue de 983 euros oscilando desde 240 hasta 42.881 en el estado 9 y nivel de gravedad 6. Los pacientes de los estados de salud 5 y 6 realizaron el mayor gasto, pero los estados de salud 8 y 9 tuvieron el mayor gasto medio, siendo el 80% hospitalario.

Conclusiones: Se corrobora una diferente composición del gasto sanitario por morbilidad individual, con un crecimiento exponencial del gasto hospitalario.

Palabras clave: Ajuste de riesgo, Análisis del costo, Atención hospitalaria, Atención primaria de salud, Costos hospitalarios, Morbilidad, Planificación sanitaria, Farmacoeconomia, Servicio de urgencia en hospital.

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Suggested citation: Caballer Tarazona V, Guadalajara Olmeda N, Vivas Consuelo D, Clemente Collado A. Impact of population morbidity on health care costs in a health district. Rev Esp Salud Publica. 2016 Jun 8;90:e1-e15.

INTRODUCTION

The health care systems in developed countries are having to face new challenges associated with ageing of the population and the consequent increase of chronic diseases and health care costs[1]. An increase of health care cost related to age has been demonstrated, but the morbidity factor has a great impact on cost[2–5]. Therefore, Diagnostic-Based Risk-Adjustment Systems make up an important tool for grouping the population according its chronic conditions and individual health care consumption patterns. These systems are useful not only for the stratification of patients and analysis of use patterns of resource consumption, but also for the planning and evaluation of health care systems, capitation financing, assigning health care resources based on the real burden derived from morbidity and the monitoring of the prevalence rate of chronic diseases.

The most used risk adjustment systems for health care at international level are: 1) Diagnostic Cost Groups (DCGs)[6] principally used in the US by Medicare[7,8]; 2) the Johns Hopkins Adjusted Clinical Groups System(ACG)[9] and 3) Clinical Risk Groups (CRG)[10,11].

In Spain, ACG have been used in Aragón[12], Badalona[13] and País Vasco[14], and CRG have been used in Madrid[15], Gerona[2,16] and the Valencia Community[11].

The main characteristic of CRG is that they classify the population into 1,075 mutually exclusive groups (version 1.6) according to the diseases registered by each patient in the electronic data base. Each category of CRG is further grouped into more generic classifications up to the most aggregated level composed of 9 health statuses. Each health status shares the number and severity of the chronic conditions, which translates into a similar health care cost. These 9 health statuses are: 1) healthy; 2) significant acute disease; 3) single minor chronic disease 4) minor chronic disease in multiple organ systems; 5) single moderate dominant or chronic disease; 6) significant chronic disease in multiple organ systems; 7) dominant chronic disease in three or more organ systems; 8) dominant neoplasms, metastases and complications; and 9) severe diseases or extreme health care needs. The level of disaggregation preceding this classification is level 3 of the CRG aggregation (ACRG3), which considers the nine health statuses plus six levels of severity.

Among the most notable practical applications of CRG we can find: predicting and explaining health care costs[11], improving assignation of health care resources according to knowledge of health status[15,17] and population needs and establishing capitation payment and chronic disease management models[10].

Several experiences have already demonstrated its validity regarding stratification of the population and support in health care management[16], strategies for approaching chronicity[18] and the monitoring of chronic diseases[14].

Some studies have focussed on some of the components of health care expenditure: pharmaceutical[12], hospitalisation or primary health care[19], others have analysed total expenditure[5], direct and indirect costs[2], the costs of determined diseases[20] and the expenditure on the paediatric or adult populations[5].

The goal of the present article is to analyse the total health care cost per inhabitant, according to age, sex and morbidity in an integrated health department of Alicante (Spain) and to distinguish between hospital, out-patient pharmaceutical and primary health care costs.

METHODS

Observational retrospective cross-section study, analytic, covering the totality of the 156,811 population assigned to the Denia-Ma-

rina Salud Health District (Alicante, Spain) for the year 2013. This integrated health district, one of 10 in the province of Alicante, includes one hospital in Denia, four integrated health care centres, eight health clinics and 34 doctor's offices. The average age of the population registered with this district was 43.57; 17.63% were under 18; 59.42% between 18 and 64 and 22.95 were over 64. Regarding sex, 48.92% were male.

The information was obtained from the Analytical Management System of Denia-Marina Salud and from the electronic data bases of the Regional Health Department (Conselleria de Sanitat Universal i Salut Pública) of the Valencia Community: the Population Information System (SIP), the Information System for Health care Activity (ISHA), the Minimum Data Set (MDS), the Electronic Pharmaceutical Prescription System (GAIA) and the Patient Classification System of the Valencia Community (SCP-CV). 3M™ Clinical Risk Grouping Software was used for the stratification of the health district population into CRG.

The estimate of the annual cost per patient (C_j) was carried out using the following expression:

$$C_j = C_{hj} + C_{apj} + C_{fj}$$

$$C_{hj} = C_{uj} + C_{qj} + C_{cej} + C_{ij}$$

$$C_{apj} = (n_j)\,(p)$$

Where:

C_{hj} = Hospital cost (specialised care) of patient j, obtained from the Analytical System of Denia Hospital, which includes the costs of intermediate activities per patient, such as diagnostic tests, laboratory and imaging tests, health care material and pharmacy consumption, as well as attendance on the patient carried out by other departments.

C_{apj} = Primary health care costs of patient j

C_{fj} = Outpatient pharmacy cost of patient j according to GAIA data

C_{uj} = Emergency room cost of patient j

C_{qj} = Operating theatre cost of patient j

C_{cej} = Outpatient consultation cost of patient j

C_{ij} = Hospitalisation cost of patient j

n_j = Number of primary health care consultations of patient j

p = Unit cost of consultation according to rates established by Regional Government[21]

From the annual cost per patient the total cost (CT) for each item was obtained (health status, age group, sex, etc.) and the average cost (Cm) for each item, using the following expressions:

$$C_T = \sum_{j=1}^{N} C_j$$

$$C_m = \frac{C_T}{N}$$

Where N is the number of patients included in the item.

With this a data base was constructed with the annual cost for each of the 156,811 population, their assigned CRG, age and sex.

The parametric statistical t Student test was applied to verify the existence of significant differences in the mean values between groups and the nonparametric Pearson χ^2 to verify significant differences between two distributions, in both cases 95%.

This research was approved by the Behavioural Research Ethics Board at the Generalitat Valenciana (Comité Ético de Investigación Clínica Corporativo de Atención Primaria de la Comunitat Valenciana, CEIC) on January 30, 2014, with protocol code RUTFAR - 2013-01, version of 19 December 2013. The Research Commission of Denia Health District approved the project on

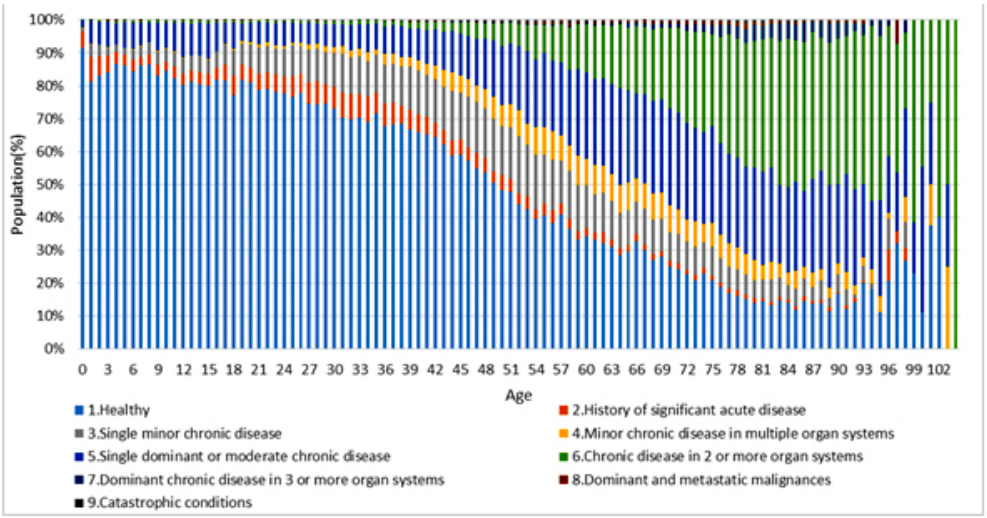
12 February 2015.

RESULTS

An increase in morbidity with age was observed, especially in health statuses 5 and 6 from 45 years old onwards (figure 1), aggravated by an increase in the population of over 60 with chronic diseases. Nevertheless, while the proportion of people in health status 5 is maintained from 50 years old on at around 25%, the corresponding proportion for those in health status 6 continues to increase with age and stabilizes at 45% for the population older than 80.

Regarding sex, statistically significant differences were found in the distribution of the health statuses (Pearson χ^2=1483.085; p value=0.000). Men showed a prevalence

Figure 1
Distribution of morbidity (CRG health status) according to population age, in years



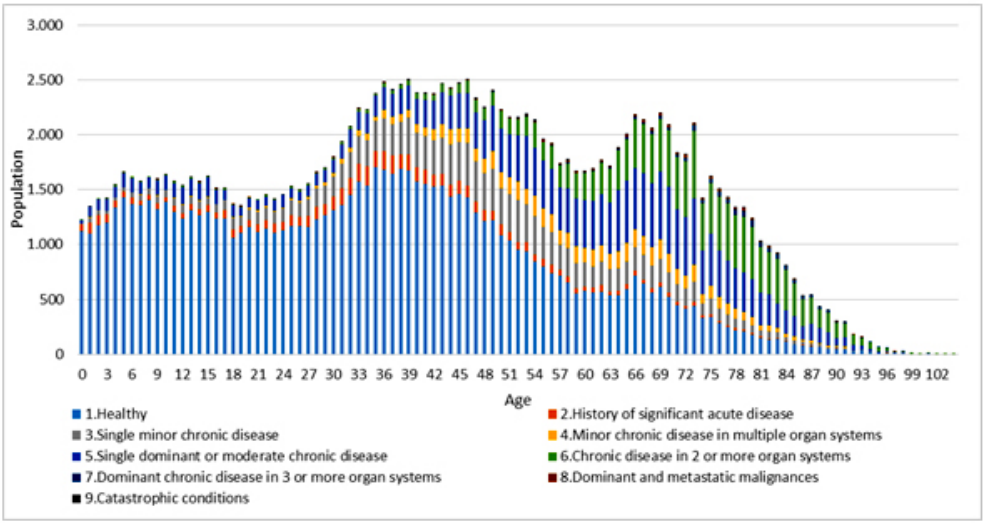
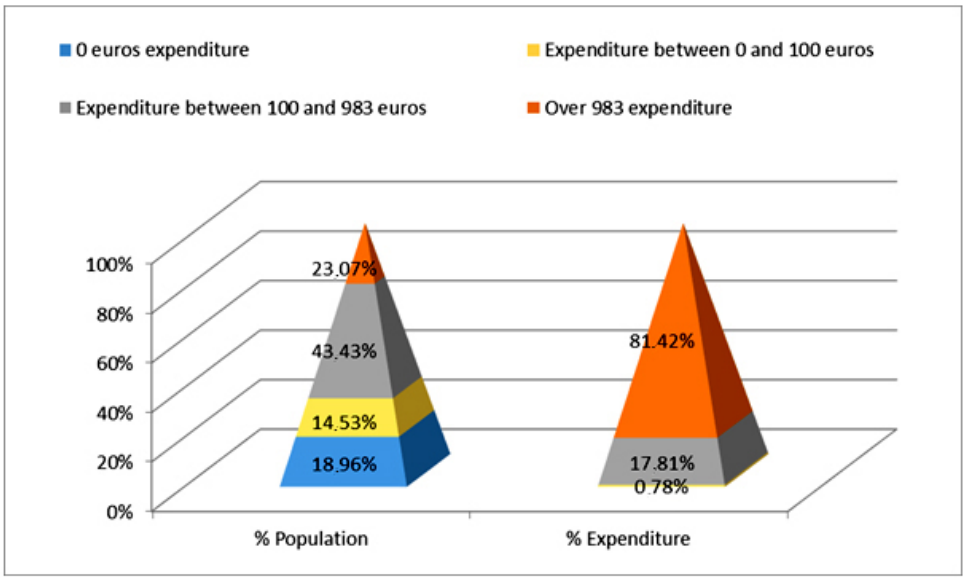


Table 1
Population and total health care expenditure

CRG health status	Men %	Women %	Average age	Population (%)	Total expenditure (€) (%)	Average expenditure (€/person)	Lower and upper confidence interval (95%)	Average expenditure (€) in men	Average expenditure (€) in women
1 Healthy	58.15	51.26	33.88	85,668 (54.63)	20,560.803 (13.34)	(DT)	234.98- 245.03	198.29	285.34
2 .Hystory of significant acute disease	3.39	4.42	36.93	6,142 (3.92)	6,222.537 (4.04)	1,013.11 (2,935.89)	939.52-1.086.38	834.13	1.144.32
3 Single minor chronic disease	8.82	11.04	47.32	15,610 (9.95)	10,617.774 (6.89)	680.19 (2,039.05)	648.16-712.14	662.79	693.5
4. Minor chronic disease in multiple	2.81	5.56	58.19	6,607 (4.21)	7,485.222 (4.86)	1.132.92 (1,605.44)	1,094.04-1.171.47	1,088.06	1,154.67
5 Single dominant or moderate chronic disease	15.71	15.98	55.84	24,850 (15.85)	39,865.567 (25.87)	1.604.25 (3,384.73)	1,562.10-1.646.27	1,657.36	1,554.25
6 Chronic disease in two or mor organs	9.42	10.58	69.57	15,706 (10.02)	49,875.100 (32.36)	3.175.54 (4,443.52)	3,105.85-3.244.84	3,345.78	3,030.37
7 Dominant chronic dosease in three or more organs	0.81	0.57	75.91	1,079 (0.69)	6,116.463 (3.97)	5.668.64 (6,297.42)	5,287.40-6.039.40	6,076.17	5,116.07
8 Dominant and metastatic malignances	0.50	0.38	63.83	686 (0.44)	6,693.274 (4.34)	9.756.96 (12,318.31)	5,287.40-6.039.40	9,794.94	9,709.79
9 Catastrophic conditions	0.39	0.20	52.35	463 (0.30)	6,678.068 (4.33)	14.423.47 (16,912.34)	12,849.54-15.935.28	14,783.35	13,741.95

Figure 2
Distribution of health care expenditure



of healthy subjects at 58.15%, with women at 51.26% (table 1). Health statuses 2, 3, 4 and 6 were more present in women, while both sexes showed a similar distribution for health status 5 (15.98% and 15.71%). In the statuses with higher health morbidity (statuses 7, 8 and 9) there was a slightly higher proportion of men than women (0.81%, 0.50% and 0.39% against 0.57%, 0.38% and 0.20%, respectively).

The average age of the population in each health status rose in relation to the increase in the burden of disease, from 33.88 years in the status of healthy subjects until health status 7, where the average age was 75.9, after which it decreased to 63.8 in status 8 and 52.5 in status 9.

Health expenditure for the total population of the district was 154,114,809 Euros, which represents an average expenditure per inhabitant of 983 Euros with a typical deviation of 696. Within the population, 18.96% did not produce any health expenditure and 14.53% had an expenditure of less than 100 Euros. The population with a higher than average expenditure (23.07%) constituted 81.42% of the total expenditure (figure 2).

By health status (table 1), the healthy status, including non users, only constituted 13.34% of the total expenditure, in spite of being the largest (54.63%). In health status 3 also, the proportion of population (9.95%) was slightly greater than the cost (6.89%). In levels 2 and 4 the percentages of both were similar (3.92% and 4.21% against 4.04% and 4.86% respectively). Health statuses 5 and 6 together accounted for more than 50% of the total expenditure (25.87% and 32.36% respectively) while only representing 15.85% and 10.02% of the population. Lastly, the most serious health statuses (7, 8 and 9) held only 1.42% of the population but generated 12.64% of the total expenditure.

The average health expenditure increased corresponding to the number and severity of the chronic diseases, from 240 Euros per in-

habitant in level 1 to 14,423 Euros in level 9. The average expenditure of each health status was significantly different from the others in all possible cases, as is shown by the values in the last column of table 2. By sex, the average health expenditure for women was 1,000 Euros and for men 964 Euros (p=0.007), and was also higher for women in health statuses 1, 2, 3 and 4, while in the remaining health statuses (5 to 9) men registered a greater consumption, such that the distribution of average cost by sex collected in the last two columns of table 1 by health status proved to be significantly different (p=0.000).

Differentiated by age range, sex and health status (figure 3) the total expenditure for each of the age groups 15-44 and 65-74 was in the order of 32,000,000 Euros. In the first group the total expenditure for women was 18,596,376 Euros and for men 11,814,668, a difference caused fundamentally by health statuses 1 and 2. In the age range of 65-74, expense was similar in both sexes (16,000,000 Euros) and had the same distribution by health status. The age range 75-84 was the group with the third greatest total expenditure, with 14,194,382 Euros for men and 14,502,472 Euros for women, with a similar distribution in regards to the total expenditure by health status. Looking, however, at average expenditure, this age range (75-84) had the highest, with 9,946 Euros for women and 8,696 Euros for men, the differences owing fundamentally to a greater expense in health status 9. In average expenditure, this age range was followed by, in order, that of 65-74; 55-64 and 45-54, in all of which the average expenditure on men was greater than that on women, equally due to the expenditure on those in health status 9.

In lower levels of severity (ACRG3) (table 2), the population group with the greatest average expenditure was health status 9, with severity level 6 (42,881 Euros), in spite of severity level 1 having an average expenditure one tenth of this (4,163 Euros). Within health statuses 6 and 7, the variability between severity levels was very great, with differences of up to 8,000 Euros between the most extreme levels.

The average number of primary health care contacts was close to 9 per inhabitant, going from 3.81 contacts in the healthy status to its highest value (37) in health state 7 (table 2). This means that no continuous increase in contacts related to worsening health was observed, rather that the number of contacts decreased for the worst health statuses 8 and 9 to 23 and 28 respectively. The same occurred with the increase in severity within health statuses 5, 7, 8 and 9, with the number of contacts descending in the last severity status.

An average of 0.27 hospital emergencies per inhabitant was seen. The health status for healthy subjects had an average of 0.16 emergencies, while health status 7 produced 1.13. Health statuses 8 and 9 had fewer emergencies than status 7.

Total hospital admissions were 13,911, which represented an average of 0.09 admissions per inhabitant. In health status 8 the average number of admissions was at 1.10, in health status 7 at 0.54 and in 9 at 0.53.

An itemised breakdown showed hospital expenditure at 75,933,585 Euros (49.27%), primary health care at 36,562,637 (23.72%) and that of outpatient pharmacy at 41,618,585 Euros (27.01%). Health statuses 6 and 5 (figure 4) held the largest share of hospital expenditure (22,033,722 and 18,353,528 Euros respectively), of primary health care (9,343,135 and 8,746,380 Euros respectively) and of outpatient pharmaceutical expenditure (18,498,242 and 12,765,659 Euros).

Average hospital expenditure was 484.24 Euros/inhabitant, that of primary health care 233.16 Euros/inhabitant and that of outpatient pharmacy 265.41 Euros/inhabitant. The distribution between the three items changed according to worsening health status (figure 5). Those in health status 2 registered a hospital expenditure of 57.34%. In health statuses 3 to 7, the outpatient pharmacy expenditure

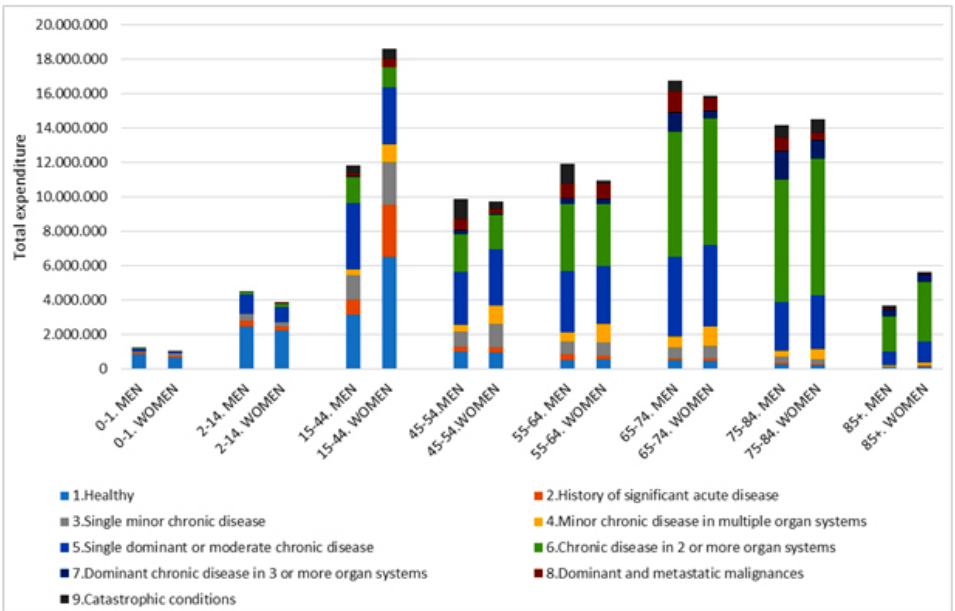
Table 2
Population, average cost (€/inhabitant), primary health care contacts, hospital emergencies and admissions by health status and severity level

Health status		Severity level							
		0	1	2	3	4	5	6	Total
1 Healthy	Population	85,668							85,668
	Average expenditure	240.01							240.01
	PHC contacts	3.81							3.81
	Emergencies	0.16							0,16
	Admissions	0.03							0.03
2 .Hystory of significant acute disease	Population	6,142							6,142
	Average expenditure	1.013.11							1,013.11
	PHC contacts	9.95							9.95
	Emergencies	0.39							0,39
	Admissions	0.14							0.14
3 Single minor chronic disease	Population		14,805	805					15,610
	Average expenditure		632.95	1,549.00					680.19
	PHC contacts		8.24	23.09					9.00
	Emergencies		0.24	1.05					0.28
	Admissions		0,06	0.020					0.07
4 Minor chronic disease in multiple	Population		4,088	1,425	988	106			6.607
	Average expenditure		931.83	1.288.19	1,629.93	2,168.29			1,132.92
	PHC contacts		11.07	13.75	20.10	29.00			13.28
	Emergencies		0.29	0.33	0.53	0.67			0.34
	Admissions		0.08	0.13	0.19	0.26			0.11
5 Single dominant or moderate chronic disease	Población		18,364	4,495	1,483	183	313	12	24,850
	Gasto medio		1.360,43	1,990.82	2,663.04	4,806.29	3,301.94	5.962.24	1,604.25
	Contactos AP		12.01	17.87	19.52	25.31	22.66	13.33	13.75
	Urgencias		0.28	0.47	0.47	0.73	0.62	0.50	0.33
	Ingresos		0.11	0.17	0.19	0.30	0.32	0.42	0.13

Tabla 2
Population, average cost (€/inhabitant), primary health care contacts, hospital emergencies and admissions by health status and severity level

Health status		Severity level							
		0	1	2	3	4	5	6	Total
6 Chronic disease in two or mor organs	Population		8,244	3,606	2,137	1,202	480	37	15,706
	Average expenditure		2,337.18	3,468.69	4,182.39	4,924.83	5,964.16	10,244.73	3,175.54
	PHC contacts		19.27	24.34	28.96	35.77	42.97	49.11	23.81
	Emergencies		0.41	0.56	0.72	0.98	1.10	1.32	0.56
	Admissions		0.20	0.28	0.36	0.47	0.54	0.59	0.27
7 Dominant chronic dosease in three or more organs	Population		292	219	423	96	39	10	1.079
	Average expenditure		3,894.45	4,863.09	6,242.86	8,122.91	9,780.43	11,230.08	5,668.64
	PHC contacts		24.73	35.07	42.00	47.00	60,69	52.30	37.13
	Emergencies		0.66	0.97	1.28	1.90	1,92	1.60	0.56
	Admissions		0.32	0.045	0.60	0.89	0.92	1.40	0.54
8 Dominant and metastatic malignances	Population		107	249	226	81	23		686
	Average expenditure		7,138.87	9,657.32	10,445.96	11,475.03	10,194.70		9,756.96
	PHC contacts		15.14	20.69	27.65	31.63	14.70		23.21
	Emergencies		0.53	1,13	1.22	1.51	0.078		1.13
	Admissions		0.49	0.76	0.80	0.83	0.91		1.10
9 Catastrophic conditions	Population		59	221	87	59	28	9	463
	Average expenditure		4,163.80	7,835.88	25,808.31	21,020.09	29,615.70	42,880.79	14,423.47
	PHC contacts		16.36	17.53	38.45	52.20	53.36	37.78	28.29
	Emergencies		0.41	0.47	1.38	1.66	1.71	2,89	0.90
	Admissions		0.14	0.23	0.90	0.90	1.04	2.78	0.53
Total	Population	91,810	45.959	11,020	5.344	1,727	883	68	156,811
	Average expenditure	291.73	1,296.32	2,698.81	4.068,91	5.777,93	6.049,22	13.953.38	982.81
	PHC contacts	4.22	12.11	20.23	25.83	35.24	36.14	41.76	8.93
	Emergencies	0.17	0.30	0.55	0.69	1.04	0.98	1.43	0.27
	Admissions	0.04	0.11	0.22	0.33	0.49	0.50	0.97	0.09

Figure 3
Total health expenditure (€) and average (€/inhabitant) by sex, age range and CRG health status



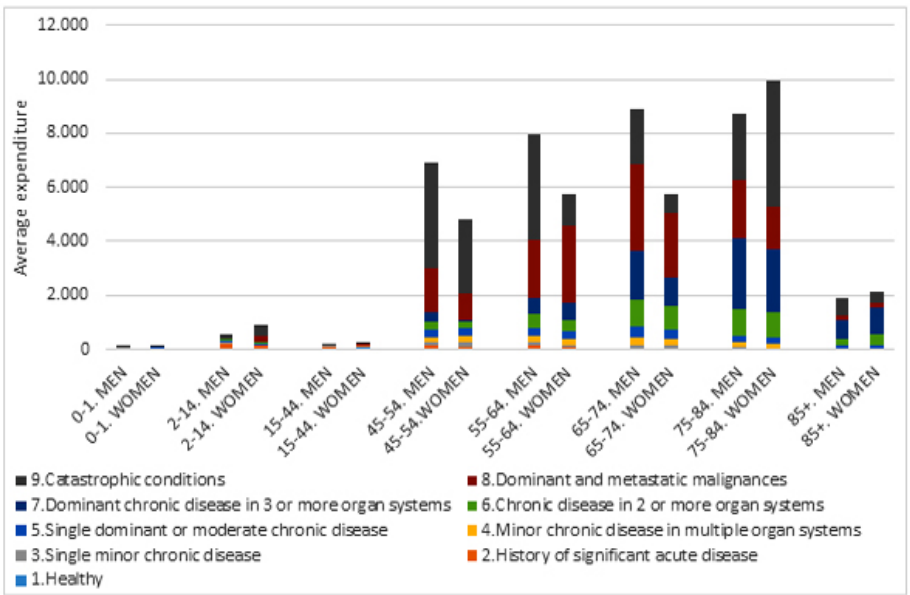


Figure 4
Distribution of total health care expenditure (€) by CRG health status

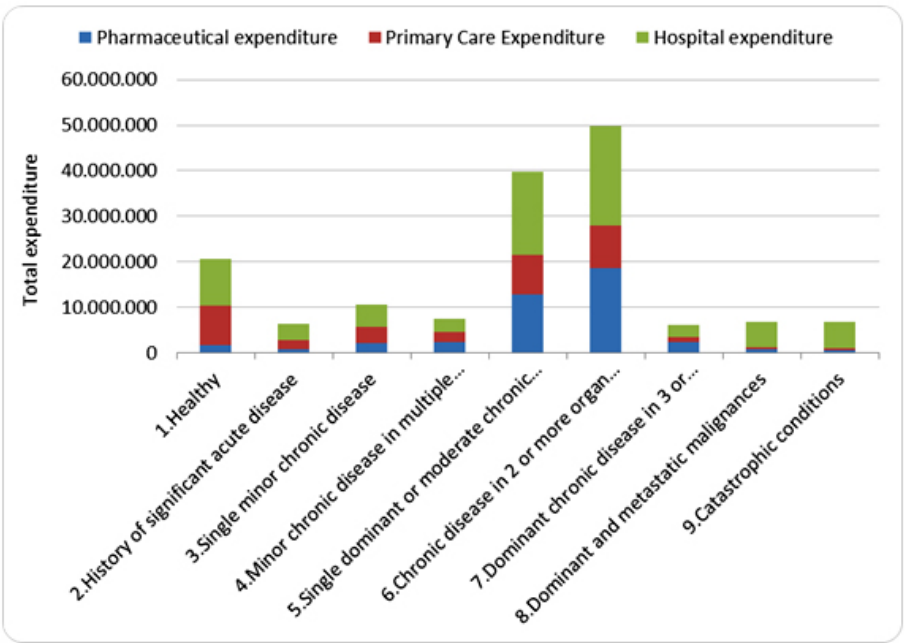
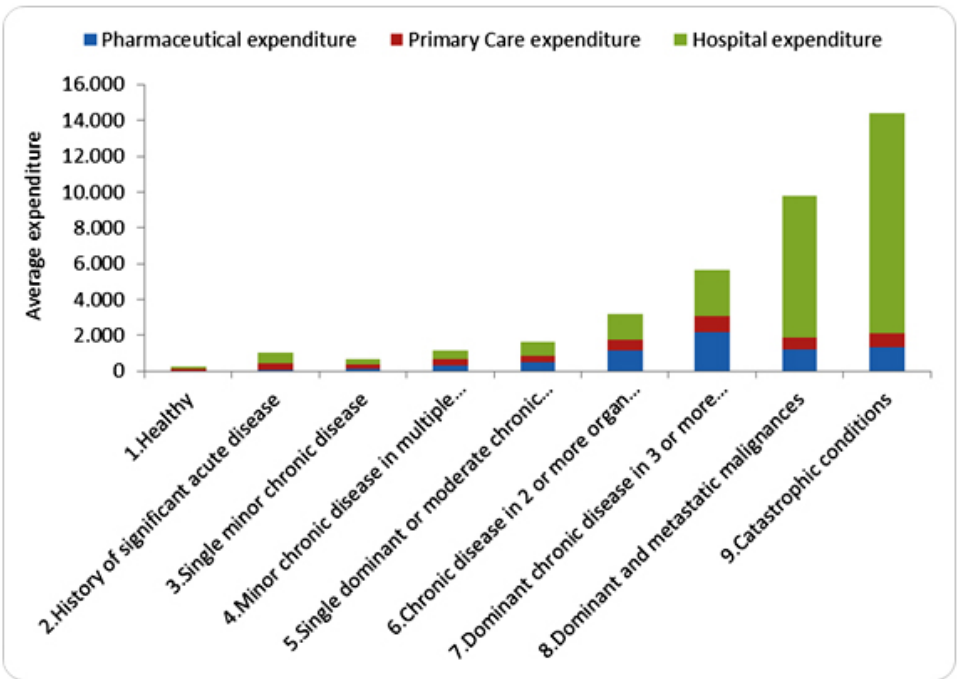


Figure 5
Distribution of average health care expenditure (€/inhabitant) by CRG health status



increased to reach 38.77% in health status 7, while at the same time primary health care expenditure decreased. This tendency in the distribution changed drastically in health statuses 8 and 9, in which hospital expenditure (80.86% and 85.23% respectively) increased considerably at the expense of the other two expenditure items.

Differentiated by sex, average hospital expenditure was significantly greater for men (499.06 Euros) than for women (470.04 Euros) (p=0.012), the opposite to primary health care, which was lower for men (209.18 Euros against 256.13 Euros for women) (p=0.000), as was outpatient pharmacy (256.06 Euros for men and 274.35 Euros for women) (p=0.000). Regarding health statuses, no statistically significant difference by sex were found in statuses 3, 4, 8 and 9. In health statuses 1 and 2, however, the average total expenditure was less for men (198.29 Euros against 285.34 Euros in status 1 and 834.13 Euros against 1,114.32 Euros in status 2), while in health statuses 5, 6 and 7 men were responsible for a greater expenditure, specifically 1,657.36, 3,345.78 and 6,076.17 Euros respectively, compared with women who had an average expenditure of 1,554.25 in status 5, of 3,030.37 in status 6 and of 5,116.07 Euros in status 7.

DISCUSSION

The results of this study show a concentration of health expenditure in a reduced group of patients of greater age and comorbidity according to Clinical Risk Groups. A different distribution by itemised expenditure according to levels of morbidity and severity was also observed.

A grouping by morbidity according to stratification by Clinical Risk Groups was obtained that was similar to another study previously carried out, also in the Valencia Community[11], but that presented differences with respect to other studies undertaken in other parts of Spain[3,15,16]. In the case of our study, the percentage of health statuses[4,5] and 6 was greater, but the percentage of the status for healthy and non-users and status 2 was lower. This could be due to the year of the study[16] and especially to a different population structure[2-4], given that in the health district analysed a much older population was found as a consequence of the high number of elderly people from other European countries residing in the Marina Alta area. Nevertheless, these differences could also originate due to a better codification of the electronic registers, which have been improved over recent years by the medical practitioners.

The increase in the greater morbidity health statuses with age agrees with other works[3,4,20], and there is also an increase in the status for healthy subjects in the group of over 85, a phenomenon known as "hypothesis of compression of morbidity"[22].

The average expenditure per inhabitant of 983 Euros agrees with the value obtained in other studies carried out in Spain, which obtained an average expenditure of 842.8 Euros[13] in 2005 and 685.5 Euros in 2007[4], and in Canada, where the average expenditure for subjects over 19 was $1,382 in 2014[5]. The differences in expenditure may be due to a different morbidity, but above all to the way of calculating the expenditure and the items included. According to data from the Ministry of Health in 2013 the consolidated public health expenditure in the Valencia Community was 1,109 Euros/inhabitant and for all Spain together 1,208 Euros[23], which included capital expenditure and the global functioning of the Spanish health system.

As in previous works[2-5], this average expenditure increased progressively from the milder health statuses to the more complex, with the exception of level 3 that showed a lower average health expenditure, practically half, than that of the patients of the lower level 2, possibly due to acute patients requiring a greater hospital consumption than chronic patients. Moreover, in all the works studied, the cost of health status 9 showed a

much higher value in comparison to the rest of the statuses.

Lastly, it is noteworthy that the average expenditure for health statuses 6 and 7 is double that of statuses 5 and 6 respectively, as occurred in another previous work[2].

The distribution of expenditure by sex and morbidity showed a greater average cost for women in health statuses 1 to 4, contrary to what occurs in the rest of the more serious states, possibly due to the greater life expectation of women, and which is contradicted by other works where women had a higher expenditure in all health statuses[3].

In all the age groups, the total expenditure was slightly higher for men than women, except in that of over 85, where the number of women is greater than that of men, and above all in the group 15-44 due to health statuses 1 and 2, possibly owing to pregnancies.

As well as contrasting the distribution of population by morbidity and average expenditure with other works carried out in Spain and other countries, the main contribution of this study is to analyse activity in primary and hospital health care and the distribution of the individual expenditure between hospital, primary health care and outpatient pharmacy for the whole population of a health district, an analysis for which there is no data available from other works for comparison. Some studies have analysed the activity in each area, but not the expenditure[2].

An increase was observed in primary health care activity with the health statuses and the severity level within each state, with the exception of the worst states and severity levels, which may be due to these requiring greater hospital care, something corroborated by the higher number of admissions and hospital emergencies carried out in health statuses 7, 8 and 9.

Although the average hospital expenditure in the district was the highest of the three expenditure items studied, followed by that of outpatient pharmacy and primary health care, this was not so for all the health statuses. For example, for the population of health state 2 the weight of the hospital expenditure was greater than average, due to their condition of acute patients without chronic disease. In health statuses 3 to 7, however, an increase in outpatient pharmacy expenditure was observed due to the greater consumption of pharmaceuticals for the treatment of the chronic diseases. This coincides with other works that have studied outpatient pharmaceutical expenditure in relation to chronic conditions[11] in such a way that the present work confirms the importance of this kind of expenditure per patient in health statuses 6, 7 and 8.

This study also observed the significant average hospital expenditure in these health statuses (6, 7 and 8) and strikingly in status 9, all above average. Although it is difficult to compare these results with those of other countries such as Canada and with other classification systems[5], it has been possible to confirm an increase of average hospital expenditure with morbidity, exponentially so for the most severe statuses (health statuses 8 and 9).

Nevertheless, despite the average expenditure growing exponentially in the most severe statuses, it is health statuses 5 and 6 that contain the greatest total expenditure in all their components, due to the particularity of the very elderly population served by the district.

Thus, the results of this article offer a descriptive map of the distribution of population regarding health statuses and health care consumption and the distribution by items of expenditure for each health status, basic information for preparing any management strategy or health care policy. The next line of research will be to replicate this study in other health districts in the Valencia Community to verify the results and extrapolate their

consumption structure and health statuses for the whole of the Valencia Community.

The modelling of the expenditure of the burden of disease will allow the establishment of systems of capitation financing based on diagnostics and strategies for management of chronic patients.

In general, these classification systems are fundamental to know the state of health of the population in the interest of greater precision in focusing and directing policies for prevention, awareness and management of diseases. As such, this study represents a useful contribution to the state of the art in a research field still in its initial phase in Spain.

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