

Epidemiological usefulness of population-based electronic clinical records in primary care: estimation of the prevalence of chronic diseases

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Background. Chronic health problems are the main cause of disease, disability and death in developed countries, and their prevalence is increasing.

Objective. To estimate the prevalence of selected chronic illnesses based on electronic clinical records in primary care (ECRPC) and to assess its usefulness for epidemiological research, by comparing ECRPC data against those reported by a contemporary health survey.

Methods. *Design:* Descriptive cross-sectional study. *Setting:* All primary care medical consultations in the Madrid Regional Public Health System (PHS). *Subjects:* A total of 23 535 182 ECRPC-registered episodes of illness, generated by PHS patients over 15 years of age seeking medical care during 2005–06. *Main outcome measures:* Prevalences of chronic diseases estimated on the basis of medically examined cases registered in ECRPC and morbidity as reported by a contemporary health survey covering the same geographic area.

Results. A total of 52.5% of the adult population had some chronic health problem. The highest overall prevalences were hypertension (14.8%), mental disorders (12.0%) and allergy (11.6%). Prevalences were generally highest among women, elderly and the native population. Depending on the specific disease, ECRPC-based prevalences were similar to (e.g. diabetes), higher (e.g. chronic skin problems) or lower (e.g. asthma and dyslipidaemia) than those reported by surveys, with certain age- and sex-related variations.

Conclusions. Prevalences estimated from ECRPC and survey data present variations depending on the disease, age and sex. Both data sources provide complementary information about chronic disease prevalence. ECRPC have the advantage of generating an ongoing standardized register and entailing no additional effort for health professionals.

Keywords. Chronic diseases, computerized medical record, health surveys, prevalence, primary health care.

Introduction

Chronic health problems are the principal cause of disease, disability and death in developed countries, currently accounting for 87% of deaths in Europe and >85% of the disease burden.^{1–3} Furthermore, the prevalence of these diseases increases as life expectancy

rises—among the general population and chronic patients alike—as a result of improvements in living conditions and the effectiveness of health care. Half the population suffers from at least one chronic disease.⁴

In Spain, public health care is universal, and primary care is not only the principal gatekeeper to the health care system but also the health care level at

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which most of the contacts with the system take place. Hence, it is the level at which there are fewest differences between population-based and health care data, and this in turn means that it can afford a good approximation of the morbidity among a given population.⁵

Prevalence data are traditionally drawn from health surveys, specific studies or disease-specific registries. Generalized implementation of electronic clinical records in primary care (ECRPC) currently provides an ongoing population-wide data source, with a large number of entries, which could be extremely useful for assessment of morbidity in a community setting and could allow for data analysis broken down by a series of characteristics of interest, provided that appropriate validity and reliability parameters were met.⁶ This study aims to estimate prevalence of selected chronic health problems in the adult population, on the basis of data drawn from ECRPC and to assess the epidemiological usefulness of such records, by comparing ECRPC data against those obtained from a contemporary health survey.

Materials and Methods

Study design and population

Descriptive cross-sectional study covering the Madrid Autonomous Region for the period 2005–06.

The target study population was defined as all persons over 15 years of age included in the Madrid Regional Public Health System (PHS), up to and including the last date of the designated study period, and therefore registered in the Individualized Health Card (IHC) database. Of a total population of 6 081 689 residents, 5 125 957 (84.3%) were over the age of 15 years³ and IHC coverage was 95%.

Data sources

Health care data were drawn from ECRPC (implemented for 99% of PHS physicians during the study period). For data extraction purposes, the strategy adopted was to select all patients in respect of whom any new entry data had been made on their clinical records concerning a specific episode in 2005 and/or 2006 (23 535 182 episodes). Health care episodes were coded as per the International Classification for Primary Care (ICPC), issued by the WONCA.⁷ Health care episodes that failed to feature standardized ICPC coding were excluded from the analysis. Episodes lacking complete information on the patient's age and sex were assessed as provisional clinical histories whose data were to be subsequently consolidated, and they were likewise excluded. These exclusions accounted for 0.5% of the total. Coded episodes outside the pertinent age and sex parameters were deemed to be erroneous (<0.03% of the total).

Chronic diseases were selected from among those on which data were collected in the Madrid Regional Health Survey. All health care episodes referring to such diseases were grouped for analysis according to their ICPC codes (Table 1).

Each patient was identified by a specific code, defined by his/her respective health centre code and clinical history number. If more than one health care episode had been noted on a patient's clinical history and it was clear from the established code group that such episodes corresponded to the same group, the patient in question was counted once only. Patients' sex, nationality and age at the end of the study period were recorded.

The 2007 Madrid Regional Health Survey (2007MRHS)⁸ is based on home interviews administered to a non-institutionalized population over the age of 15 years. Using two-stage stratified cluster sampling, a sample of 12 190 residents was obtained. We used the question on physician-diagnosed chronic disease, in which interviewees were supplied with a list of chronic health problems. These were the diseases analysed, excluding fibromyalgia, urinary problems and an open-ended item, entitled 'other'.

Analysis

Shown for each of the 2 years analysed are the utilization rate (patients with at least one consultation during the period) and the percentage of the population with one or more of the selected ECRPC-registered chronic diseases. In the case of 2005, the numerator included patients aged over 14 years at 31 December 2005, having at least one entry data concerning the health problem analysed; the denominator was the IHC population at year-end 2005, excluding the proportion assigned to physicians having no records that year (a total of 52 physicians, accounting for 1% of the IHC population). In the case of 2006, the same criterion was applied for selecting the numerator, and the IHC population at year-end 2006 was used as the denominator (there being no need to correct the denominator as was done for 2005, since by this stage ECRPC implementation was 100%).

Prevalences were calculated using the ECRPC episodes for the 2 years. The utilization rate increased with time, thereby increasing the likelihood of detection and/or registration of the disease analysed. The numerator was the number of patients aged over 15 years at 31 December 2006, with at least one entry data concerning the target health problem over the course of these 2 years; and the denominator was the IHC population at year-end 2006.

It was assumed that this was a closed population, with no changes due to death or migration.

For the calculation of health-survey-based prevalences, sample weights were used. The 95% confidence intervals of the prevalence rates were computed.

TABLE 1 *ICPC codes grouped into selected chronic health problems*

Chronic health problems	ICPC-2 codes
B. Blood, lymphatics, spleen	
Anaemia	B78, B80, B81, B82
D. Digestive	
Constipation	D12
Peptic ulcer	D85, D86
F. Eye	
Cataracts	F92
K. Circulatory	
Hypertension	K85, K86, K87
Other heart diseases	K70, K71, K72, K 73, K76, K 77, K 78, K79, K80, K83, K84
Varicose veins	K95
Hemorrhoids	K96
Acute myocardial infarction	K75
Stroke	K89, K90, K91
Angina pectoris	K74
L. Musculoskeletal	
Low back pain	L03, L84, L86
Osteoarthritis/rheumatism	L83, L84, L85, L86, L87, L88, L89, L90, L91, L92, L94, L98
Neck pain	L01, L83
Osteoporosis	L95
N. Neurological	
Cephalalgia	N01, N89, N90, N02 ^a , N95
P. Psychological	
Mental disorders	P01, P03, P06, P15, P28, P70, P71, P72, P73, P74, P75, P76, P78, P79, P80, P82, P85, T06 ^a , P86, P98, P99
Anxiety disorders	P01, P74, P79, P75, P82
Depression	P03, P76, P78
Insomnia	P06
Other mental disorders	P15, P71, P72, P73, P80, P85, T06 ^a , P86, P98, P99
Dementia	P70
R. Respiratory	
Asthma	R96
COPD	R91 ^a , R79, R95
S. Skin	
Chronic skin problems	S08, S78, S79, S81, S82, S83, S86, S87, S88, S91, S97, S99
T. Endocrine, metabolic and nutritional	
Dyslipidaemia	T93
Diabetes	T89, T90
Thyroid disorders	T15 ^a , T71, T72, T81, T85, T86
U. Urology	
Urinary incontinence	U04
Chronic kidney disease	U88, U75, U95
X. Female genital system and breast	
Menopausal disorders (women)	X11, X12
Y. Male genital system	
Prostatic disorders (men)	Y06, Y73, Y77, Y85
Systemic diseases	
Allergy	A12 ^a , A92, F71, R97, S88
Malignant neoplasm	A79, B72, B73, B74, D74, D75, D76, D77, F74, H75, K72, L71, N74, R84, R85, S77, T71, U75, U76, U77, W72, X75, X76, X77, X81, Y77, Y78

^aICPC-1.

Analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 15.0 and the Survey Package for analysis of the 2007MRHS.

Results

In the study period, 76.9% (71.9% men and 81.4% women) (Table 2) of the IHC population aged over 15 years sought medical attention for an ECRPC-registered illness, with a total of 23 535 182 episodes being accumulated (35% corresponded to chronic disease). The proportion of women attended exceeded that of men across all age groups, regardless of nationality. Utilization increased with age. The proportion of the native population exceeded that of the foreign population.

ECRCP-based global prevalence of chronic disease (52.5%) was lower than 2007MRHS-based prevalence (57.1%), and both, increased with age, were higher in women than in men across all groups and were higher in Spanish subjects (Table 3). The progressive increase with age was more evident in the survey (a downward trend in the group aged ≥ 75 years was observable in ECRPC). With the sole exception of the youngest age group, the 2007MRHS was generally higher than the ECRPC-based prevalences.

According to ECRPC, the diseases with highest estimated overall prevalence (Table 4) were hypertension (14.8%), mental disorders (12.0%), allergy (11.6%) and low back pain (11.0%). Depending on the specific disease, prevalences were similar to (e.g. diabetes and low back pain), higher (e.g. chronic skin problems) or lower [e.g. asthma and chronic obstructive pulmonary disease (COPD)] than those reported by the 2007MRHS.

Analyzing the differences by sex (Table 4), prevalence among women for six groups of diseases exceeded 10%: hypertension (16.5%), mental disorders (15.8%), allergy (13.6%), low back pain (13.0%), osteoarthritis/rheumatism (11.4%) and chronic skin problems (10.9%). In the case of men, only hypertension exceeded a figure of 10% (12.9%), followed in frequency by allergy (9.5%), low back pain (8.8%), chronic skin problems (8.5%), dyslipidaemia (8.1%) and mental disorders (7.7%). Men registered higher prevalences than women for acute myocardial infarction and angina pectoris, stroke, COPD, diabetes, insomnia and peptic ulcer. In general, prevalences of most of the target diseases increased with age, though in some cases a decline was observed as from age 75 years onwards (particularly in women). Asthma (in men in particular) and allergy displayed similar distributions, with elevated prevalences among the youngest age groups. Prevalence of headaches, in contrast, decreased with age. Anaemia in women plotted a bimodal curve, with higher prevalences coinciding with

TABLE 2 Population attended and population with at least one annotation concerning a chronic health problem, broken down by year, sex, age group and nationality

	Year ^a					
	2005		2006		2005–06	
	Attended N (%)	Chronic problem n (%)	Attended N (%)	Chronic problem n (%)	Attended N (%)	Chronic problem n (%)
Total	3 160 968 (61.0)	2 002 695 (38.7)	3 501 527 (65.4)	2 261 651 (42.3)	4 115 895 (76.9)	2 809 329 (52.5)
Sex						
Male	1 370 305 (55.6)	805 114 (32.7)	1 506 575 (59.3)	907 261 (35.7)	1 827 166 (71.9)	1 151 908 (45.3)
Female	1 790 663 (65.9)	1 197 581 (44.1)	1 994 952 (71.0)	1 354 390 (48.2)	2 288 729 (81.4)	1 657 421 (59.0)
Age group (years)						
16–24	399 782 (62.6)	140 654 (22.0)	436 439 (73.7)	161 310 (27.2)	480 519 (81.1)	224 433 (37.9)
25–34	645 830 (55.3)	272 001 (23.3)	749 540 (62.3)	335 135 (27.8)	899 106 (74.7)	465 063 (38.6)
35–44	559 401 (52.1)	296 774 (27.7)	628 937 (55.2)	350 374 (30.7)	783 596 (68.8)	468 897 (41.1)
45–54	453 717 (58.8)	305 906 (39.7)	499 800 (61.2)	347 833 (42.6)	596 781 (73.1)	435 296 (53.3)
55–64	424 974 (68.9)	348 340 (56.5)	460 480 (71.5)	383 126 (59.5)	525 851 (81.7)	447 896 (69.6)
65–74	360 244 (79.3)	318 661 (70.1)	385 569 (83.3)	344 068 (74.3)	415 814 (89.8)	382 734 (82.7)
75+	317 020 (69.2)	320 359 (69.9)	340 762 (69.1)	339 805 (68.9)	414 228 (84.0)	385 010 (78.1)
Nationality ^b						
Immigrants	392 033 (48.0)	196 967 (24.1)	508 784 (54.0)	266 574 (28.3)	614 511 (65.2)	346 341 (36.8)
Natives	2 761 783 (63.3)	1 791 391 (41.1)	2 964 470 (67.2)	1 978 146 (44.9)	3 472 113 (78.7)	2 439 544 (55.3)

Madrid Autonomous Region, 2005–06.

^aDenominator used for 2005 was population holding IHCs at 31 December 2005. Denominator for 2006 and for 2005–06 was IHC population at 31 December 2006.

^bDue to missing values, the sum of these two numbers falls short of the overall total (<1%).

fertile age and old age. Comparison with sex- and age-based prevalences from the 2007MRHS showed inverse sex-related variations for some diseases, such as low back pain and headaches, with ECRPC-based prevalences being higher than survey-based prevalences for men and ECRPC-based prevalences being lower for women. In the case of urinary incontinence, the contrary occurred. In terms of age-related differences between the two sources, special mention should be made of the fact that ECRPC-based prevalences for osteoarthritis/rheumatism, neck pain and low back pain were higher in the younger age groups and lower in the older age groups than their survey-based equivalents; with allergy, the opposite occurred.

Prevalences were generally lower among foreign patients (Table 5), though in the younger age groups prevalences higher than those of the native population were observed for headaches, varicose veins, anaemia, low back pain, peptic ulcer and constipation. On comparing these against nationality- and age-based prevalences obtained from the 2007MRHS, the differences between the two sources displayed no important variations.

Discussion

This is the first study to analyse morbidity recorded in a primary care setting for a broad spectrum of the adult population, in the context of a universally accessible PHS with a high level of information-system use. Overall prevalence data for the chronic illnesses

analysed proved close to those obtained in health surveys covering the same population, with the added advantage that use of ECRPC allowed for robust analysis of prevalence according to variables, such as age, sex and nationality.

The 2-year utilization rate was just <80%. Joint analysis of the 2 years furnished estimated population prevalences that were higher than those yielded by analyzing just 1 year (data not shown). It is to be expected that persons with chronic diseases will be more inclined to seek medical advice, so that these prevalences can be more closely aligned with reality.

Prevalence of chronic health problems

In general, prevalence of chronic health problems is higher in women and increases with age. When ECRPC were used, the prevalence curves for most of the illnesses analysed were seen to decline in the oldest age group, a finding that is in line with the results of other studies⁹ and could in part be due to the higher mortality among elderly chronic-disease sufferers ('healthy survivor' bias) and their greater degree of institutionalization (which might lead to a reduced presence in ECRPC).

Prevalences by disease

Hypertension, COPD, dyslipidaemia and diabetes are included under chronic care protocols in the primary care service portfolio. Their prevalences were similar to those obtained in studies conducted in other

TABLE 3 Age-specific and overall prevalences of chronic health problems^a estimated from ECRPC and the 2007MRHS broken down by sex and nationality

	Age group (years)						Total
	16-24	25-34	35-44	45-54	55-64	65-74	75+
Total							
ECRPC	37.9	38.6	41.1	53.3	69.6	82.7	78.1
2007MRHS (95% CI)	32.6 (30.5-34.8)	40.3 (38.5-42.1)	49.4 (47.4-51.3)	60.1 (58.0-62.2)	76.9 (74.8-78.8)	86.7 (85.1-88.2)	91.4 (90.0-92.6)
Sex							
Males							
ECRPC	32.3	31.4	34.3	45.3	63.9	79.5	77.6
2007MRHS (95% CI)	29.4 (26.7-32.2)	36.1 (33.7-38.6)	42.8 (40.0-45.7)	55.2 (52.2-58.1)	73.5 (70.5-76.4)	83.0 (80.3-85.2)	87.2 (84.2-89.7)
Females							
ECRPC	43.5	45.8	47.9	60.7	74.6	85.3	78.3
2007MRHS (95% CI)	36.0 (32.8-39.2)	44.7 (42.1-47.3)	56.0 (53.2-58.6)	64.7 (61.8-67.4)	79.8 (77.1-82.2)	89.8 (87.8-91.5)	93.7 (92.2-95.0)
Nationality							
Immigrants							
ECRPC	28.8	32.1	36.9	42.6	50.0	58.2	66.4
2007MRHS (95% CI)	24.3 (19.8-29.4)	36.8 (33.2-40.6)	43.6 (39.0-48.4)	58.9 (52.3-65.2)	65.9 (55.0-75.3)	82.0 (64.0-92.0)	92.2 (74.0-98.0)
Natives							
ECRPC	39.9	40.5	42.1	55.1	71.0	83.3	77.0
2007MRHS (95% CI)	35.2 (32.8-37.6)	41.7 (39.7-43.7)	51.0 (48.9-53.0)	60.3 (58.1-62.5)	77.4 (75.4-79.3)	86.8 (85.2-88.3)	91.4 (90.0-92.6)

CI, confidence interval.

^aExpressed as number of cases per 100 population holding IHCs.

European countries which have used primary care records^{9,11} and in the case of diabetes and hypertension, similar to those reported in the health survey. This also agrees with the position described in studies that compare self-reports and physician-reported medical histories of these two diseases (diabetes in particular) with a high degree of accuracy.¹¹⁻¹⁴ In the case of COPD, previous studies have found that this disease tends to be more frequently reported by patients in surveys than by primary care physicians in clinical histories,¹⁵ a finding that would seem to be confirmed by our study.

In theory, illnesses that do not generate a high demand for health care or, when they do, are not recorded in the clinical history due to their short importance could register prevalences lower than those obtained via surveys (e.g. varicose veins, constipation or hemorrhoids). In these types of diseases, it is probable that the episode is only registered in ECRPC in the most severe cases and/or in those which lead to some specific action (referral to specialized care, drug prescription, etc.). In our study, ECRPC prevalence data for some of these illnesses (constipation and hemorrhoids) were similar to those drawn from the 2007MRHS.

Despite being defined as chronic by health surveys, some of the illnesses analysed might appear sporadically or might even be completely cured. This would apply to anaemia, peptic ulcers, certain mental health problems, cataracts, varicose veins, hemorrhoids and problems of menopause. In such cases, the survey-based prevalences would be probably higher because it estimates lifetime prevalences. In the case of peptic ulcer, a study conducted in Italy obtained lower prevalences from primary care records than it did from health surveys.¹⁰ Furthermore, a number of studies state that osteoarticular disorders tend to be reported less frequently by patients than by clinical records.^{13-15,17}

In illnesses that are essentially diagnosed and followed up in specialized care (such as myocardial ischaemia, stroke, osteoporosis, neoplasms and some mental disorders), the prevalences obtained in our study were similar to or slightly lower than those reported in health surveys. It must be borne in mind that these patients have to visit their primary care physician for administrative procedures of a work nature (sick leave, etc.) and prescription requests, times at which a note of these patients must necessarily be entered on ECRPC. In a study conducted in Italy, prevalence of angina pectoris was slightly higher using primary care databases than self-report information,¹⁷ and both figures were higher than those obtained by us. The concordances observed between self- and physician-reported medical history of cardiac disease and cancer were high.^{14,17}

Chronic kidney disease displayed a prevalence lower than that obtained in the survey. This difference might be attributable to registration problems because the

TABLE 4 Prevalence (%) of chronic health problems by sex and age group: 2005–06 ECRPC versus the 2007MRHS

Chronic health problems	Males (age group in years)								Females (age group in years)								Total
	16–24	25–34	35–44	45–54	55–64	65–74	75+	Total	16–24	25–34	35–44	45–54	55–64	65–74	75+	Total	
B. Blood, lymphatics, spleen																	
Anaemia	0.5	0.3▼	0.4	0.6▲	1.1	2.5	5.7	1.0	4.1▲	3.9	5.3	6.2▲	2.1	3.5▲	7.0▲	4.7▲	2.9▲
D. Digestive																	
Constipation	0.3	0.3	0.4	0.5	1.1	3.1▲	6.3▲	1.1▲	1.7▲	1.7▲	1.4	2.0	2.7	4.8	7.3▲	2.7▲	1.9▲
Peptic ulcer	0.1▼	0.1▼	0.3▼	0.6▼	0.9▼	1.2▼	1.1▼	0.5▼	0.1	0.1▼	0.2▼	0.4▼	0.5▼	0.7▼	0.6▼	0.3▼	0.4▼
F. Eye																	
Cataracts	0.0▼	0.0▼	0.1	0.4	1.7	5.5▼	8.4▼	1.3▼	0.0	0.0▼	0.1	0.4	1.6▲	6.9▼	9.1▼	1.9▼	1.6▼
K. Circulatory																	
Hypertension	0.6	1.4	4.1	12.2▼	27.0	42.0▲	43.3	12.9	0.3▼	0.7▼	2.6	11.1	29.3	50.9▲	53.3▲	16.5▲	14.8▲
Other heart diseases	0.5	0.5	0.6	1.4	3.8	8.4	14.9	2.7▼	0.3▼	0.4▼	0.5▼	1.2	2.9	7.0▼	13.5	2.9▼	2.8▼
Varicose veins	0.2▲	0.4	0.7	1.0▼	1.6▼	2.1▼	2.4	0.9▼	0.9	1.8▼	2.7▼	4.2▼	6.4▼	8.5▼	6.4▼	3.9▼	2.5▼
Hemorrhoids	0.4	1.1▲	1.4	1.7	2.1	2.8	2.1	1.5	0.4▲	1.4	1.8	2.3	3.0	3.6▲	2.5	2.0	1.8▲
Acute myocardial infarction	0.0	0.0▼	0.2	1.0	2.7▼	4.6▼	5.3▼	1.3▼	0.0	0.0▼	0.0	0.1▼	0.3▼	0.9▼	1.6▼	0.3▼	0.8▼
Stroke	0.0	0.0▼	0.1▼	0.4▼	1.2	2.7	5.1▼	0.8▼	0.0▼	0.0▼	0.1▼	0.2	0.6▼	1.7	3.9▼	0.7▼	0.8▼
Angina pectoris	0.0	0.0	0.1	0.5	1.7	3.4	4.4	0.9▲	0.0	0.0▼	0.0	0.2	0.6	1.8	2.8	0.6	0.7
L. Musculoskeletal																	
Low back pain	4.7▲	6.3	7.9	9.6	12.4	14.2▲	12.7▼	8.8▲	5.3▲	9.7▲	10.8	14.4	18.8	21.4	15.4▼	13.0▼	11.0
Osteoarthritis/rheumatism	2.5▲	2.8▲	4.2	6.4	9.7▼	11.7▼	10.4▼	5.7▼	3.6▲	5.1▲	6.9	12.6▼	19.3▼	24.3▼	18.3▼	11.4▼	8.7▼
Neck pain	3.1▲	3.0▲	2.9	3.0	3.5▼	3.8▼	3.0▼	3.1	5.7▲	6.5▲	7.2	8.2▼	7.5▼	6.4▼	3.7▼	6.6▼	4.9▼
Osteoporosis	0.0▼	0.0	0.0▼	0.1	0.3▼	0.7	0.8▼	0.2▼	0.0	0.0	0.2▼	2.6	10.0	12.6	7.1▼	3.6▼	2.0▼
N. Neurological																	
Cephalalgia	3.7▲	3.0▲	2.6	2.5	2.6	2.7▲	2.1	2.8▲	7.9▲	7.1	6.4▼	6.9▼	6.1▼	5.0	3.0▼	6.2▼	4.6
P. Psychological																	
Mental disorders	3.7▲	5.7▲	7.2	8.6	9.7▲	10.7	13.2	7.7▲	8.1▲	11.2▲	14.0▲	18.2▲	20.8	21.7	22.0▼	15.8▲	12.0▲
Anxiety disorders	2.4▲	3.4▲	3.8▲	3.7	3.5	3.0	2.7	3.3▲	5.9▲	7.6▲	8.8▲	9.7	9.3	7.9	5.6▼	7.9	5.8▲
Depression	0.6	1.1	1.5	2.0▼	2.6▼	2.7	3.5▼	1.8▼	1.6▲	2.9	4.2	6.7	8.5▼	8.9▼	8.0▼	5.4▼	3.7▼
Insomnia	0.8	1.0	1.7	2.3	2.3▼	1.9▼	1.1▼	1.6▼	1.1	0.8	0.9▼	1.2▼	1.1▼	1.0▼	0.8▼	1.0▼	2.0▼
Other mental disorders	0.4	0.6	0.9▼	1.3	2.1▲	3.5▲	4.3▲	1.4	0.6	0.8	1.3	2.5▲	4.0▲	5.7▲	5.9▲	2.5▲	1.2
Dementia	0.0	0.0	0.0	0.0▼	0.1▲	0.6	3.0	0.3	0.0	0.0	0.0	0.0	0.1▲	0.7	4.8▲	0.6▲	0.5▲
R. Respiratory																	
Asthma	3.4	2.0	1.5▼	1.2	1.3▼	1.5▼	1.2▼	1.7▼	3.6	2.7▼	2.5▼	2.6	3.0	3.7▼	2.8	2.9▼	2.3▼
COPD	0.0▼	0.0▼	0.2▼	0.8	3.0▼	7.7	11.4	1.9▼	0.0▼	0.0▼	0.1▼	0.4▼	0.8▼	1.6▼	2.2▼	0.6▼	1.2▼
S. Skin																	
Chronic skin problems	7.2▲	6.8▲	6.7▲	7.6▲	10.4▲	14.2▲	13.7▲	8.5▲	10.7▲	9.6▲	9.0▲	10.4▲	12.5▲	14.7▲	13.4▲	10.9▲	9.7▲
T. Endocrine, metabolic and nutritional																	
Dyslipidaemia	0.4▼	1.5▼	4.6▼	10.7▼	18.0▼	22.2	15.1▼	8.1▼	0.6	1.0▼	2.1▼	8.6	21.9	29.5▼	19.5▼	9.5▼	8.8▼
Diabetes	0.4	0.5▼	1.2	4.4▼	10.9	17.5▲	17.4	5.1	0.4	0.7	1.1	2.3	6.7	14.2	15.9	4.6	4.8
Thyroid disorders	0.4	0.4	0.5	0.9	1.3	1.6	1.7	0.8	1.7	2.7▼	4.0▼	6.9	9.3	8.7▲	5.8	5.2	3.1
U. Urology																	
Urinary incontinence	0.1	0.1	0.1▼	0.1	0.3▼	1.0▼	3.3	0.4▼	0.1	0.2	0.5	0.9	1.4	2.9	7.5▲	1.6▲	1.0
Chronic kidney disease	0.1▼	0.1▼	0.1▼	0.3▼	0.4▼	0.6▼	0.5▼	0.2▼	0.1▼	0.1▼	0.1▼	0.2▼	0.3▼	0.3▼	0.3▼	0.2▼	0.2▼

TABLE 4 Continued

Chronic health problems	Males (age group in years)							Females (age group in years)							Total		
	16-24	25-34	35-44	45-54	55-64	65-74	75+	Total	16-24	25-34	35-44	45-54	55-64	65-74		75+	Total
X. Female genital system and breast																	
Menopausal disorders (women)																	
Y. Male genital system																	
Prostatic disorders (men) ^a	0.1	0.2	0.4	2.1	9.5	19.9	21.8	4.8									
Systemic diseases																	
Allergy	13.3▼	9.9▼	8.1▼	7.3▼	8.7▲	11.7▲	10.4▲	9.5▼	16.8	13.8▼	12.5▼	12.5	14.1▲	15.4▲	11.1▲	13.6	11.6▼
Malignant neoplasm	0.2	0.2	0.4	1.1	3.3▲	7.3▲	10.0▲	2.0▲	0.2▼	0.4	0.9▼	2.2	3.5	4.5	4.3▲	2.0	2.0▲

ECRPC-based compared to 2007/MRHS-based prevalence: shown in bold are ECRPC values within the 2007/MRHS 95% confidence interval (CI). Filled downward triangle indicates a value below the lower limit of the 95% CI of the 2007/MRHS. Filled upward triangle indicates a value above the upper limit of the 95% CI of the 2007/MRHS.

^aNot comparable with the 2007/MRHS.

ICPC classification has no specific code for kidney failure or chronic kidney disease. As a result, related diagnoses are possibly being classified under less specific codes.

For chronic skin problems, a single generic item was used in the survey, a factor that may go towards explaining the low prevalences detected (very much lower than those obtained on the basis of ECRPC). It has been pointed out that, when it comes to surveys, formulation of items is important, in that the probability of self-reporting is better when items are formulated with precision.¹⁶ Moreover, skin disease is one of the conditions that is less frequently reported by patients than it is in clinical histories.¹⁶

Prevalences in immigrant population

The lower prevalences obtained for the immigrant population could be attributed to the healthy migrant effect since in Spain most immigrants are healthy young persons who have come here to work. The occurrence of diseases is related to assimilation of Western lifestyles and to their working and socio-familial conditions. They essentially seek medical advice for acute complaints. The prevalences obtained could also be underestimated in view of the fact that this is a highly mobile population.

Attention should be drawn to the higher prevalences of headaches, low back pain and anaemia among the foreign population (particularly the youngest age groups) than among the native population. Previous studies point to the first two complaints as being the reason for more frequent consultation among the foreign population.¹⁸ This finding is not only in line with the higher prevalences found, but could also be linked to the types of work mainly carried out by immigrants and their working conditions, and could—in view of the psychological component of these ailments—even be an indirect indicator of some type of disorder in this regard. Anaemias were fundamentally ferropenic (>80%) and more prevalent among foreign women of fertile age. This could be due to better detection; thanks to analytical tests performed during pregnancy since no such nationality-related difference was evident among men.

Underdiagnosis of chronic diseases in the immigrant population could be of a magnitude similar to or even higher than that seen in the native population. Immigration is in itself a mental health risk factor. A number of factors have been described which can lead to underdiagnosis of mental illness in immigrants, including linguistic, cultural and racial barriers, unwillingness to disclose all symptoms to the doctor, focussing on somatic symptoms, insufficient probing by the clinician, etc.¹⁹ all of which could justify the lower prevalences observed for these illnesses among the foreign population.

Limitations

Studies that use electronic clinical records as their data source are subject to the limitation of a possible lack

TABLE 5 Prevalence (%) of chronic health problems by nationality and age group: 2005–06 ERCPC versus the 2007MRHS

Chronic health problems	Immigrants (age group in years)								Natives (age group in years)							
	16–24	25–34	35–44	45–54	55–64	65–74	75+	Total	16–24	25–34	35–44	45–54	55–64	65–74	75+	Total
B. Blood, lymphatics, spleen																
Anaemia	3.0	2.4	3.1	3.1	1.3	2.2	4.8	2.7	2.2▲	2.0▼	2.7	3.6▲	1.7	3.1▲	6.5▲	2.9▲
D. Digestive																
Constipation	1.1▲	1.1▲	1.1	1.2	1.5▼	2.7▲	5.6▲	1.3	1.0▲	0.9	0.8	1.3	2.0	4.1▲	6.9▲	2.1▲
Peptic ulcer	0.1▲	0.2▼	0.2▼	0.4	0.5	0.5▼	0.6▼	0.2▼	0.1▼	0.1▼	0.2▼	0.5▼	0.7▼	0.9▼	0.8▼	0.4▼
F. Eye																
Cataracts	0.0	0.0▼	0.1	0.2▼	1.0▲	3.6	6.8	0.3▼	0.0▼	0.0▼	0.1	0.4	1.7	6.3▼	8.8▼	1.9▼
K. Circulatory																
Hypertension	0.3	0.7	2.5	7.8▼	17.3	28.4▼	36.6	4.4	0.4	1.2	3.6	12.3	29.1	47.5▲	49.3▲	16.9▲
Other heart diseases	0.3▼	0.3▼	0.4	0.7	1.7	4.1▼	10.5	0.7▼	0.5	0.5▼	0.6▼	1.4	3.5	7.8▼	13.8	3.2▼
Varicose veins	0.5	1.2	1.9▼	2.7▼	3.4▼	4.1▼	3.8	1.7▼	0.5	1.0▼	1.6▼	2.6▼	4.2▼	5.6▼	4.9▼	2.6▼
Hemorrhoids	0.6▲	1.1	1.4	1.6	1.6▲	1.6	1.6▲	1.2	0.6▲	1.3▲	1.6	2.1	2.7	3.3▲	2.3	1.9▲
Acute myocardial infarction	0.0	0.0	0.0	0.3▲	0.8	1.7	2.7▼	0.2	0.0	0.0▼	0.1	0.6▼	1.5▼	2.6▼	2.9▼	0.9▼
Stroke	0.0	0.0	0.1	0.2	0.5	1.4	3.5	0.2	0.0▼	0.0▼	0.1▼	0.3▼	0.9▼	2.2▼	4.3▼	0.9▼
Angina pectoris	0.0	0.0	0.0	0.2▲	0.8	1.7	3.2▲	0.2	0.0	0.0	0.1	0.4	1.1	2.5	3.3	0.8
L. Musculoskeletal																
Low back pain	5.6▲	8.3	9.9▲	11.0	11.2▼	11.4	10.6▼	9.1	5.0▲	7.8▲	9.1	12.3	16.1	18.4	14.4▼	11.3
Osteoarthritis/rheumatism	2.2	3.0▲	4.5▲	6.9▼	9.4▼	11.5▼	11.1▼	4.6	3.8▲	4.3▲	5.8	10.1	15.2▼	18.8▼	15.4▼	9.5▼
Neck pain	2.3▲	3.0▲	4.1▲	4.6	4.0▼	3.2	2.3▼	3.5▲	5.2▲	5.4▲	5.3	5.8▼	5.7▼	5.3▼	3.5▼	5.2▼
Osteoporosis	0.0▼	0.0	0.1▲	0.7▲	3.0	5.0▼	4.6	0.5	0.0	0.0	0.1▼	1.6	5.7	7.3	4.8▼	2.3▼
N. Neurological																
Cephalalgia	6.3▲	5.5	5.5	5.6	4.5	3.8▼	2.3▲	5.5	5.9▲	4.8	4.2▼	4.6▼	4.4▼	4.0	2.6▼	4.4▼
P. Psychological																
Mental disorders	3.8	5.0	6.9▲	8.2	10.0	10.6▼	15.7	6.4▲	6.6▲	9.7▲	11.7▲	14.6▲	16.0	16.9	18.6▼	13.0▲
Anxiety disorders	2.2	3.1	4.0▲	4.1	4.4	4.0▼	3.6▲	3.5▲	4.3▲	6.3▲	7.0▲	7.3	6.8	5.7	4.5▼	6.2▲
Depression	0.6	1.0	1.6	2.2▼	3.2	3.2	4.9▲	1.6▼	1.1	2.3	3.2	4.9	5.9▼	6.2▼	6.3▼	4.1▼
Insomnia	0.4▲	0.6	1.1	1.8▼	2.6	3.3▼	4.7	1.1	0.5	0.7▼	1.1▼	1.9▼	3.2▼	4.7▼	5.3▼	2.2▼
Other mental disorders	0.7▲	0.5	0.6	0.7	0.7▲	0.8▲	0.7▲	0.6	1.0	1.0	1.5	1.9	1.7▲	1.4▲	0.9▼	1.4
Dementia	0.0	0.0	0.0	0.0	0.1▲	0.4▲	3.5▲	0.1▲	0.0	0.0	0.0	0.0▼	0.1▲	0.6	4.0	0.5
R. Respiratory																
Asthma	1.2▼	1.4	1.8	1.8	1.9▲	2.1	1.8▲	1.6▼	4.7	2.6▼	2.1▼	1.9	2.2▼	2.7▼	2.2▼	2.5▼
COPD	0.0▼	0.0▼	0.1	0.2	0.6	1.8▲	3.4▲	0.2▼	0.0▼	0.0▼	0.1▼	0.6▼	1.9▼	4.4▼	5.5▼	1.4▼
S. Skin																
Chronic skin problems	7.1▲	6.4▲	6.6▲	6.9▲	7.5	8.6▲	10.2▲	6.8▲	10.4▲	8.8▲	8.1▲	9.4▲	11.8▲	14.7▲	13.4▲	10.4▲
T. Endocrine, metabolic and nutritional																
Dyslipidaemia	0.3▼	0.8▼	2.2▼	5.5▼	11.2	15.1	13.4	3.0▼	0.6	1.3▼	3.7▼	10.4	20.8	26.7	17.8▼	10.0▼
Diabetes	0.2▲	0.3	1.0	2.5▼	5.8	9.7	11.2	1.5	0.4	0.7	1.2	3.4	8.9	15.9	16.3	5.5
Thyroid disorders	0.7	1.0	1.6	2.8	4.2	4.4	4.1▲	1.7	1.1	1.7	2.4▼	4.2	5.6	5.5▲	4.2	3.4
U. Urology																
Urinary incontinence	0.1	0.1	0.3	0.5	0.8	1.4▼	4.9	0.4▼	0.1	0.1	0.3	0.5	0.9	2.0	5.9	1.1
Chronic kidney disease	0.1▼	0.1▼	0.1▼	0.2▼	0.2▼	0.3▲	0.4▲	0.1▼	0.1	0.1▼	0.1▼	0.2▼	0.4▼	0.5▼	0.6▼	0.2▼

TABLE 5 Continued

Chronic health problems	Immigrants (age group in years)							Natives (age group in years)								
	16-24	25-34	35-44	45-54	55-64	65-74	75+	Total	16-24	25-34	35-44	45-54	55-64	65-74	75+	Total
X. Female genital system and breast																
Menopausal disorders (women)	0.0	0.0	0.7▲	7.4▲	6.2	1.7▲	0.5▲	1.8▲	0.0	0.0	0.5	9.1▲	10.3▲	2.6▲	0.6▲	3.2▲
Y. Male genital system																
Prostatic disorders (men) ^a	0.1	0.2	0.3	1.4	5.7	13.3	16.7	1.1	0.1	0.2	0.5	2.2	9.8	20.1	21.7	5.5
Systemic diseases																
Allergy	9.9	10.2▼	10.6▼	9.9▼	9.4	9.7	8.9	10.2▼	17.4	12.3▼	10.2▼	10.0	11.7▲	13.8▲	10.8▲	12.0▼
Malignant neoplasm	0.2	0.3	0.5	0.9	2.0	3.7	5.1▲	0.6	0.3	0.4	0.7▼	1.8	3.5	5.8▲	6.3▲	2.2▲

ECRPC-based compared to 2007MRHS-based prevalence; shown in bold are ECRPC values within the 2007MRHS 95% confidence interval. Filled downward triangle indicates a value below the lower limit of the 95% CI of the 2007MRHS. Filled upward triangle indicates a value above the upper limit of the 95% CI of the 2007MRHS.

^aNot comparable with the 2007MRHS.

of registry completeness and quality. This study revealed a good level of ECRPC use, with a mean of >3500 health care episodes per physician per annum and an average of 3.6 episodes per patient per annum. Previous studies in other countries have observed that morbidity coding quality in primary care consultation is variable; for instance, diseases with clear diagnostic criteria, such as diabetes, achieve better registry quality than others for which diagnosis relies on more subjective criteria.^{20,21}

The strategy employed did not allow for retrieval of episodes previously entered on ECRPC, or those in respect of which no annotation was made during the study period and that no information was included on the population that made no use of the PHS. Furthermore, primary care data supplemented with data drawn from other health care levels (outpatient and inpatient hospital care) enable prevalence estimates to be enhanced.⁹

It would be appear advisable for studies to be undertaken with the aim of analyzing longer time periods, i.e. though it is to be expected that all prevalent patients with chronic disease would have visited their GP at least once in 2 years, it has nevertheless been observed that, even beyond the 2-year mark, the number of chronic patients who visit their medical practitioner's surgery for the first time continues to increase²² and, moreover, that the requisite period may well differ according to the disease.⁹ Prevalence of diseases that are quickly fatal, transient or subclinical could be affected by Neyman bias.

Conclusions

Prevalences estimated from ECRPC and survey data present variations depending on the disease, age and sex. Both data sources provide complementary information about chronic disease prevalence, and none of them could be considered a 'gold standard' respect to the other. The great volume of information provided by electronic medical records renders it possible for an analysis to be performed with a detailed breakdown by the respective variables of interest (person, place or time), something that may not be feasible with a survey. They also have the advantage of generating an ongoing standardized register and entailing no additional effort for health professionals, inasmuch as completing them forms part of standard practice.

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References

- ¹ World Health Organization. *Mortality and Burden of Disease Estimates for WHO Member States in 2002*. 2004. <http://www.who.int/healthinfo/bod/en/indez.html> (accessed on 4 February 2008).
- ² Gènova R, Álvarez E, Morant C. Carga de enfermedad y tendencias de morbilidad de la población española. In Puyol R, Abellán A (eds). *Envejecimiento y dependencia. Una mirada al panorama futuro de la población española*, Madrid: Mondiale Assistance, 2006: pp. 107–24.
- ³ Dirección General de Salud Pública y Alimentación. *Informe del Estado de Salud de la Población de la Comunidad de Madrid*. Consejería de Sanidad. Comunidad de Madrid, 2007. http://www.madrid.org/cs/Satellite?cid=1142404413760&language=es&pagename=PortalSalud%2FPage%2FPTSA_pintarContenidoFinal&vest=1156329914003 (accessed on 20 February 2008).
- ⁴ Rubiera LG, Riera V Jr. Program to improve care in chronic illnesses: application of the model of care in chronic illness. (in Spanish). *Aten Primaria* 2004; **34**: 206–9.
- ⁵ Juncosa S, Bolibar B. Measuring morbidity in primary care (in Spanish). *Aten Primaria* 2001; **28**: 602–7.
- ⁶ Hassey A, Gerrett D, Wilson A. A survey of validity and utility of electronic patient records in a general practice. *BMJ* 2001; **322**: 1401–5.
- ⁷ WONCA. *International Classification of Primary Care. ICPC-2*, 2nd edn. Barcelona: Masson, 1999.
- ⁸ Madrid Regional Health Survey. 2007. Consejería de Sanidad. Comunidad de Madrid. http://www.madrid.org/cs/Satellite?cid=1142341580032&language=es&pageid=1156329914003&pagename=PortalSalud%2FPTSA_Generico_FA%2FPTSA_pintarGenerico&vest=1156329914003 (accessed on 28 April 2008).
- ⁹ Wirehn AB, Karlsson HM, Carstensen JM. Estimating disease prevalence using a population-based administrative healthcare database. *Scand J Public Health* 2007; **35**: 424–31.
- ¹⁰ Cricelli C, Mazzaglia G, Samani F *et al*. Prevalence estimates for chronic diseases in Italy: exploring the differences between self-report and primary care databases. *J Public Health Med* 2003; **25**: 254–7.
- ¹¹ Goldman N, Lin IF, Weinstein M, Lin YH. Evaluating the quality of self-reports of hypertension and diabetes. *J Clin Epidemiol* 2003; **56**: 148–54.
- ¹² Kehoe R, Wu SY, Leske MC, Chylack LT Jr. Comparing self-reported and physician-reported medical history. *Am J Epidemiol* 1994; **139**: 813–8.
- ¹³ Kriegsman DM, Penninx BW, van Eijk JT, Boeke AJ, Deeg DJ. Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly. A study on the accuracy of patients' self-reports and on determinants of inaccuracy. *J Clin Epidemiol* 1996; **49**: 1407–17.
- ¹⁴ Haapanen N, Miilunpalo S, Pasanen M, Oja P, Vuori I. Agreement between questionnaire data and medical records of chronic diseases in middle-aged and elderly Finnish men and women. *Am J Epidemiol* 1997; **145**: 762–9.
- ¹⁵ Mohangoo AD, van der Linden MW, Schellevis FG, Raat H. Prevalence estimates of asthma or COPD from a health interview survey and from general practitioner registration: what's the difference? *Eur J Public Health* 2006; **16**: 101–5.
- ¹⁶ Metzger MH, Goldberg M, Chastang JF, Leclerc A, Zins M. Factors associated with self-reporting of chronic health problems in the French GAZEL cohort. *J Clin Epidemiol* 2002; **55**: 48–59.
- ¹⁷ Filippi A, Vanuzzo D, Bignamini AA *et al*. The database of Italian general practitioners allows a reliable determination of the prevalence of myocardial infarction. *Ital Heart J* 2005; **6**: 311–4.
- ¹⁸ Pena MM. Motives for consultation and demographic characteristics of a community of “undocumented” immigrants in the district of Usera-Villaverde (Madrid). (in Spanish). *Aten Primaria* 2001; **27**: 25–8.
- ¹⁹ Bhugra D, Mastrogianni A. Globalisation and mental disorders. Overview with relation to depression. *Br J Psychiatry* 2004; **184**: 10–20.
- ²⁰ Thiru K, Hassey A, Sullivan F. Systematic review of scope and quality of electronic patient record data in primary care. *BMJ* 2003; **326**: 1070–4.
- ²¹ Jordan K, Porcheret M, Croft P. Quality of morbidity coding in general practice computerized medical records: a systematic review. *Fam Pract* 2004; **21**: 396–412.
- ²² Hoogenveen R, Westert G, Dijkgraaf M, Schellevis F, de Bakker D. Disease prevalence estimations based on contact registrations in general practice. *Stat Med* 2002; **21**: 2271–85.