Special Articles

Development and spatial representation of synthetic indexes of outpatient mental health care in Andalusia (Spain)

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SUMMARY. **Introduction** – There is a need to develop composite indicators to monitor mental health care in countries such as Spain, where there is wide variability of care systems in 17 different regions. The aim of this study is to generate and to test the usability of synthetic indexes in Andalusia (Southern Spain). **Method** – Seven mental health indicators were selected by expert opinion from a previous list of simple indicators used to compare mental health care systems across Spain (Psicost-74). A Geographical Information Systems (GIS) was used to delineate 71 sectors based on the catchment areas of the mental health centers in Andalusia. Synthetic indexes were obtained through linear combinations of simple indicators via Principal Components Analysis (PCA), using activity data from the Mental Health Information System of Andalusia (SISMA). Maps of these indexes were drawn for 71 catchment areas. **Results** – Two synthetic indexes were obtained and showed high consistency in the PCA. The Care Load Index (component 1) related to population size and total outpatient care provided within the area. The Case Load Index (component 2) related to assisted morbidity in relation to the population size. The care load index was higher in populated urban areas, whereas the case load was higher in rural areas. **Discussion** – Care and case load indexes show a different pattern in urban and rural areas. This may be related to a different underlying model of care related to the degree of urbanisation. Geographical Information Systems (GIS) improved recognition and assessment of the spatial phenomena related to the mental health care system, and support policy decision making process in mental health.
Declaration of Interest: None.

KEY WORDS: mental health, health information system, indicators, Principal Components Analysis (PCA), Geographical Information System (GIS).

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INTRODUCTION

A health indicator is a variable which helps to measure changes in a health situation directly or indirectly and to assess the extent to which the objectives and targets of a programme or a health policy are being attained (World Health Organization, 2000). Two main types of indicators can be identified: simple or classic indicators, and synthetic or composite indexes. Within the synthetic indexes we may differentiate between indicators developed by qualitative methods (qualitative composite indicators) and those developed by quantitative methods (actual synthetic indexes). Synthetic indexes are obtained by combining simple indicators and they may identify underlying phenomena related to the health care system which could not be quantified by the mere aggregation of simple indicators as this aggregation does not integrate the inner structure of the construct or it does not explain how

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simple indicators relate to each other (Jarman *et al.*, 1992; Garcia-Ortega *et al.*, 1998). In any case the information provided by the two types of indicators is complementary so they may be used jointly in health system assessment (Harrison *et al.*, 1995; Koppel & McGuffin, 1999).

Health indicators are health technology tools, and their psychometric properties should be tested before implementation. These psychometric properties may include feasibility, consistency, validity, reliability, redundancy and sensitivity to change.Unfortunately little information is available with this respect and these measures are mostly based on experts' opinion. Following a consensus based approach, WHO has proposed a listing of 155 indicators classified in 6 domains (policy and legislative framework, mental health services, mental health in primary care, human resources, public information and links with other sectors, and monitoring and research) grouped in a unique assessment instrument (The World Health Organization Assessment Instrument for Mental Health Systems – WHO-AIMS). The development of synthetic indexes within this project has been also made through qualitative methods, based on expert opinion (Saxena *et al.*, 2006; 2007).

The development of composite indicators to monitor mental health care is particularly relevant in countries such as Italy or Spain, were the devolution process has derived into divergent care systems across different regions, whilst central government should warrant equity and access throughout the whole national health system. The heterogeneity of the mental health care system across the 17 Autonomous communities of Spain has been described elsewhere (Salvador-Carulla *et al.*, 2005; 2006b).

In 2002 the Spanish Ministry of Health drew attention to the lack of mental health care indicators and called for action in that regard (Ministerio de Sanidad y Consumo, 2002). Ever since this call was published, three lists of simple indicators have been released in Spain: The Psicost Research Association list (Psicost-74) (Salvador-Carulla *et al.*, 2007); the list produced by the Spanish Observatory of Mental Health (Asociación Española de Neuropsiquiatría, 2007); and the official list provided at the National Strategy on the Mental Health System (Ministerio de Sanidad y Consumo, 2007). These indicators have been elaborated through consensus by expert groups, but only the Psicost listing has been tested for service assessment and comparisons either across regions within Spain (Salvador-Carulla *et al.*, 2007) or to compare care performance to other countries such as Italy (Salvador-Carulla *et al.*, 2005) or Chile (Salvador-Carulla *et al.*, 2008).

However, these initiatives are of little value unless synthetic indexes are developed to facilitate the data management and to optimize the decision making process, and these indicators should be represented and visualised through Geographical Information Systems (GIS).

The objective of this study is to create synthetic indexes through linear combinations of simple indicators and to produce their spatial representations.

METHOD

The development of composite indicators has been carried out by the Psicost scientific association following a mixed qualitative-quantitative approach and a four step procedure which includes an exploratory analysis in one Spanish region. First, a core list of simple indicators was compiled at national level by an expert panel and tested in four Autonomous Communities in Spain (Andalusia, Catalonia, Madrid and Navarre). The AC with the best information data set was selected for further analysis (Andalusia, Southern Spain). The second step included the cartographic map of the small mental health areas (SMHA) in Andalusia and the representation of a series of simple indicators by the official mental health districts SMHA in this region. Third, a reduced list of simple indicators and the outpatient Mental Health Information System of Andalusia (SISMA) were used to produce composite indicators and, fourth, these synthetic indexes were visualized in the regional maps and its usability was assessed by an expert panel.

The Psicost-74 simple indicator list followed a consensus based assessment analogous to the method used for developing WHO-AIMS indicators (Saxena *et al.*, 2007). Outcome indicators were excluded due to the absence of this information in the national and regional data bases. A preliminary list of 184 indicators was reviewed by 14 key informants with different background (managers and experts in mental health services assessment including psychologists, psychiatrists, economists and geographers). The feasibility, significance and accessibility of these indicators was assessed using an 10-point likert scale. A multidisciplinary Delphi panel selected a final list of 74 indicators that were classified in 5 domains: social and health policy (9), socio-demographic (27), services and human resources (35), and activity (3). A consensus group divided the 71 SMHA of Andalusia, according to the level of urbanization, into rural and urban. These areas were thus grouped following the following composite criteria:

- Rural areas: those with less than 100 inhab./km^2 and more than 5% of the population occupied at the primary sector.

- Urban areas: those with more than 100 inhab./km^2 and more than 50% of the population occupied at the tertiary sector.

After that, expert panel group made by 5 members of the Psicost Scientific Association and three members of the Mental Health Programme at the Department of Health of Andalusia plus a rapporteur selected a small set of simple indicators based on their capacity to inform about the mental health activity, their reliability and the degree of completion within the data base. These indicators were: the population size of the small health areas, total number of users of outpatient community care, total number of first contacts, total number of contacts, assisted prevalence per 1000 population, assisted incidence per 1000 population, and frequentation of outpatient mental health services (total contacts per 1000 population).

A map of the SMHA based on mental health centers organized by sectors was made (Garrido-Cumbrera *et al.*, 2005). The population size of the 71 small mental health areas was established using municipal information provided by the National Statistic Institute (Instituto Nacional de Estadistica – INE) using the 2001 Spanish Census. A health geographer created the maps representing the 15 official mental health districts and the 71 mental health catchment areas. The spatial borders of these areas were represented using the municipal boundaries in Andalusia on scale 1: 100.000 made by the Cartography Institute of Andalucía (Instituto Cartográfico de Andalucía – ICA). In highly populated urban areas (Seville, Córdoba, Malaga and Granada), these boundaries were drawn up using the primary health care districts map and the administrative district borders of these 4 municipalities. These sub-municipal borders were used to delineate the cartographic representation of the socio-demographic, resource and activity indicators in the 71 SMHA. The results obtained, in function of the selected components, were represented cartographically using the Geographical Information System (GIS) ArcView 3.2.

Then the abridged set of indicators which were selected by the expert group were assessed at the data base of the Mental Health Information System of Andalusia (SISMA). SISMA is a specific mental health information system that registers socio-demographic data on users, activity and types of care provided in each mental health center (Moreno-Kustner, 2008). The 2004 SISMA activity data have been used in the Mental Health Atlas of Andalusia (Garrido-Cumbrera *et al.*, 2005). Data from the SMHA of San Fernando were not included in the analysis due to low completion in this SMHA during the reference year.

The synthetic indexes were developed by linear combinations of the 7 simple indicators, using Principal Components Analysis (PCA) (Almenara *et al.*, 2002; Jolliffe, 2002). The correlation between the simple indicators and the selected main components explained the contribution of each simple indicator to each component, and allowed interpretation of the synthetic indexes. Subsequently, the coefficient matrix was used to calculate the scores of the different SMHA. These scores arranged the mental health centers of Andalusia according to their care and case load. Linear combinations searched were:

$$Y_k = a_{k1}x_1 + \ldots + a_{kp}x_p = \sum a_{kj}x_j$$

where $a_{k1},\ldots, a_{kp}$ represent numerical constants, so that the new variables and/or the Principal Component (PC) has a decreasing maximum variance in sequence and they are non-correlated to each other. The analyses were made using the SPSS statistical package.

GIS was used to represent cartographically the information on synthetic indexes in each one of the 71 SMHA. This information was then analysed and discussed by the expert panel group.

The Mental Health Atlas of Andalusia and the cartographic representation of the simple indicators in this Autonomous Community has been published by the Department of Health of Andalusia (Garrido-Cumbrera *et al.*, 2005). These information is available online (http://www.aan.org.es/Atlas_SM.pdf).

RESULTS

Two synthetic indicators have been produced using a mixed qualitative-quantitative approach. The first two eigenvalues over one were selected at the PCA: l_1=3,509 which explained 50.12% of the initial variability and l_2=2,390 which explained 34.14% of the initial variability. These two values explain 84.27% of the initial variability. The Correlation matrix of the indicators measured for each mental health center is shown at Table I. Positive correlations were found between total number of users, first contacts and total number of contacts whereas there these variables showed negative correlations with assisted incidence, assisted prevalence, and frequentation.

Table II shows the correlation between the original measures of the variables and the selected principal components. The first component has higher correlations with the SMHA population size (r=0,962), total users

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(r=0,896), first total contacts (r=0,940) and total contacts (r=0,841); whilst negative correlations appear with assisted incidence, assisted prevalence and frequentation. On the contrary, the second component shows higher correlations with assisted incidence (r=0,888), assisted prevalence (r=0,820) and frequentation (r=0,823). In this case the absolute variables obtain negative values.

The variables measured as absolute frequencies such as the population size and total users had a higher weight in the first component which has been named as 'Care Load Index'. The second component, or 'Case Load Index' is characterized by a major weight of morbidity measures per 1.000 population in every area.

Table III shows the values of the 7 simple health indicators plus the new synthetic indexes developed by PCA in 71 SMHA in Andalusia.

Table I – *Correlation matrix of the variables originally measured (indicators) at 71 Small Mental Health Areas in Andalusia (Southern Spain)*

		Total users	First contacts	Total contacts	Population size	Assisted Incidence	Assisted Prevalence	Frequentation
Total users	Pearson Correlation	1	.778(**)	.715(**)	.797(**)	-.038	.395(**)	-.283(*)
	Sig. (bilateral)		.000	.000	.000	.753	.001	.017
First costacts	Pearson Correlation	.778(**)	1	.869(**)	.865(**)	.182	.015	-.241(*)
	Sig. (bilateral)	.000		.000	.000	.129	.899	.043
Total contacts	Pearson Correlation	.715(**)	.869(**)	1	.720(**)	.220	.119	.064
	Sig. (bilateral)	.000	.000		.000	.065	.322	.597
Population size	Pearson Correlation	.797(**)	.865(**)	.720(**)	1	-.276(*)	-.179	-.559(**)
	Sig. (bilateral)	.000	.000	.000		.020	.136	.000
Assisted Incidence	Pearson Correlation	-.038	.182	.220	-.276(*)	1	.501(**)	.720(**)
	Sig. (bilateral)	.753	.129	.065	.020		.000	.000
Assisted Prevalence	Pearson Correlation	.395(**)	.015	.119	-.179	.501(**)	1	.514(**)
	Sig. (bilateral)	.001	.899	.322	.136	.000		.000
Frequentation	Pearson Correlation	-.283(*)	-.241(*)	.064	-.559(**)	.720(**)	.514(**)	1
	Sig. (bilateral)	.017	.043	.597	.000	.000	.000	

* p<0.005, ** p<0.01 / Data from the Outpatient Mental Health Information System of Andalusia (SISMA): 2002.

Table II – *Correlation Matrix of the indicators and the principal components measured in 71 Small Mental Health Areas in Andalusia (Southern Spain).*

	Components			
Simple Mental Health Indicators	Care Index	Load	Case Index	Load
Population size in each cathment area	.962		-.209	
N° Total Users per Year	.896		.196	
N° First Contacts per Year	.940		.191	
N° Total Contacts per Year	.841		.366	
Prevalence (Total Users per 1.000 Population)	-.031		.820	
Incidence (First Contacts per 1.000 Population)	-.100		.888	
Frequentation (Total Contacts per User per 1.000 Inhabitants)	-.422		.823	

Method of extraction: Principal Components Analysis (PCA).
Data from the Outpatient Mental Health database of Andalusia (SISMA): 2002.

Table III – *Simple indicators and synthetic indexes in 71 Mental Health Areas of Andalusia (Southern Spain).**

	Small Mental Health Areas (**)	Total users	First contacts	Total contacts	Population size in each catchment area	Assisted incidence	Assisted prevalence	Frequentation	Care load index	Case load index
1	Costa Lepe	1759	794	10512	72659	11	24	145	-0.58	0.28
2	Huelva	3719	1925	11932	238640	8	16	50	1.6	-1.41
3	Aracena	755	376	4073	33921	11	22	120	-1,41	-0.34
4	Valverde	1188	590	7253	38528	15	31	188	-1.32	1.48
5	Condado	1413	724	6225	70346	10	20	88	-0.71	-0.79
6	Camas	3018	1582	13998	133316	12	23	105	0.65	0.18
7	Sanlúcar la Mayor	1875	948	7248	86269	11	22	84	-0.38	-0.52
8	Sanlúcar Barrameda	2157	981	8699	112234	9	19	78	-0.06	-0.97
9	Mairena del Aljarafe	1999	788	6858	111170	7	18	62	-0.21	-1.54
10	Rinconada	1732	785	7966	79382	10	22	100	-0.52	-0.49
11	Macarena Norte	2530	1658	15088	109379	15	23	138	0.38	0.93
12	Guadalquivir	2421	1071	11384	127507	8	19	89	0.23	-0.9
13	Macarena Centro	3365	1536	11693	108069	14	31	108	0.4	0.89
14	Sevilla Sur	1991	1175	8446	100578	12	20	84	-0.13	-0.45
15	Sevilla Oriente	3057	1577	12367	107562	15	28	115	0.36	0.92
16	Sevilla Este	3617	1825	16670	164132	11	22	102	1.19	0.07
17	Alcalá-Dos Hermanas	4067	1936	14955	161633	12	25	93	1.24	0.27
18	Utrera	2945	1421	10946	135200	11	22	81	0.5	-0.37
19	Jerez	3527	1776	18537	191320	9	18	97	1.43	-0.45
20	Bahía	2438	1345	16726	113968	12	21	147	0.34	0.52
21	Cádiz	4277	1841	20543	136236	14	31	151	1.19	1.65
22	Chiclana	1417	883	8142	63719	14	22	128	-0.74	0.32
23	Vejer	1734	816	9256	81098	10	21	114	-0.48	-0.37
24	Constantina	408	186	2904	21978	8	19	132	-1.7	-0.85
25	Carmona	1865	778	8207	89747	9	21	91	-0.39	-0.76
26	Morón	1750	795	6422	83069	10	21	77	-0.5	-0.82
27	Villamartín	1862	933	7833	116428	8	16	67	-0.11	-1.43
28	Algeciras	2996	1697	13831	140683	12	21	98	0.75	-0.01
29	La Línea	2090	1059	7458	96774	11	22	77	-0.2	-0.57
30	Écija	978	376	5206	52725	7	19	99	-1.1	-1.21
31	Palma del Rio	1455	793	6497	53095	15	27	122	-0.92	0.62
32	Osuna	2225	837	6569	94068	9	24	70	-0.3	-0.83
33	Ronda	1585	836	10699	56353	15	28	190	-0.86	1.48
34	Marbella	2874	1654	9288	177447	9	16	52	0.84	-1.34
35	Peñarroya	1262	704	7061	38800	18	33	182	-1.28	1.93
36	Córdoba Sur	3427	2345	11411	162627	14	21	70	1.18	-0.02
37	Montilla	2204	1260	10594	66316	19	33	160	-0.45	2.06
38	Lucena	3485	1641	17415	108313	15	32	161	0.59	1.79
39	Antequera	2443	1035	11045	104535	10	23	106	0	-0.23
40	Coín	2392	1051	10159	110710	9	22	92	0.04	-0.59
41	Fuengirola	1666	1257	10393	100835	12	17	103	-0.1	-0.38
42	Puerta Blanca	2493	1458	8724	206856	7	12	42	0.86	-2.03
43	Málaga Oeste	5237	2187	19478	130080	17	40	150	1.4	2.61
44	Pozoblanco	1369	761	8669	45253	17	30	192	-1.13	1.79
45	Montoro	902	461	4386	45041	10	20	97	-1.18	-0.79
46	Córdoba Centro	1803	1925	18853	171498	11	11	110	1.03	-0.5
47	Cabra	1951	1020	11824	83964	12	23	141	-0.3	0.39
48	Loja	2159	695	8186	61783	11	35	132	-0.7	0.72
49	Málaga Norte	7731	973	9331	181684	5	43	51	1.49	-0.16
50	Málaga Centro	2990	1494	16647	142174	11	21	117	0.76	0.11
51	Axarquía	3475	1526	15550	119336	13	29	130	0.62	0.98
52	Andújar	1472	788	6634	61214	13	24	108	-0.8	0.05
53	Martos	841	500	4122	53582	9	16	77	-1.07	-1.36
54	Alcalá Real	1130	488	6407	39545	12	29	162	-1.3	0.69
55	Santa Fe	1829	954	9673	84431	11	22	115	-0.37	-0.14
56	Granada Sur	4959	2779	20871	228689	12	22	91	2.47	0.35
57	Motril	2020	1259	12705	99128	13	20	128	-0.02	0.26
58	Linares	3457	1815	12291	128536	14	27	96	0.73	0.58
59	Jaén	3724	1747	15361	193560	9	19	79	1.36	-0.67
60	Granada Norte	5042	2594	15696	204331	13	25	77	2.03	0.345

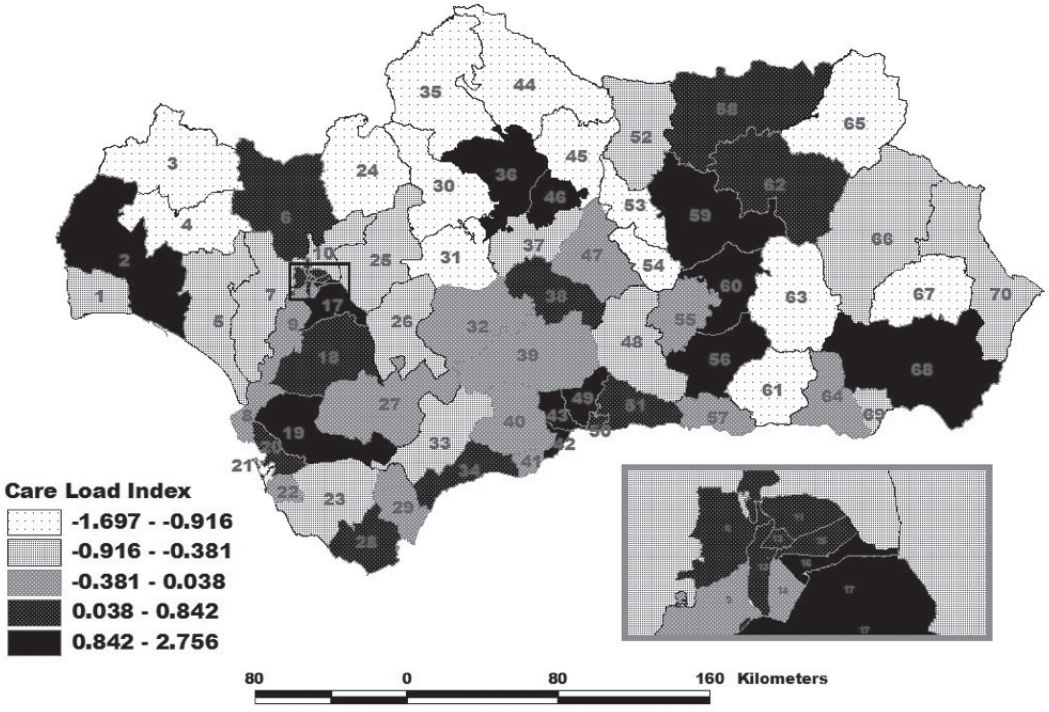
(segue)

Table III – *Segue*

	Small Mental Health Areas (**)	Total users	First contacts	Total contacts	Population size in each catchment area	Assisted incidence	Assisted prevalence	Frequentation	Care load index	Case load index
61	Alpujarra	914	388	5444	31781	12	29	171	-1.51	0.73
62	Úbeda	2143	1022	8891	130610	8	16	68	0.11	-1.38
63	Guadix	1562	798	7114	49862	16	31	143	-0.96	1.21
64	Poniente	2194	1284	8421	100622	13	22	84	-0.05	-0.18
65	Villacarrillo	971	393	4319	40340	10	24	107	-1.27	-0.47
66	Baza	1638	800	9089	58954	14	28	154	-0.81	0.94
67	Albox	1208	715	5811	44861	16	27	130	-1.11	0.79
68	Almería	6039	2734	19671	251571	11	24	78	2.76	0.19
69	Roquetas	1309	817	6321	75540	11	17	84	-0.65	-0.87
70	Levante	766	511	5534	73904	7	10	75	-0.86	-1.96

*Data from the Small Mental Health Area of San Fernando has not been included due to problems in completion at the Mental Health Information System (SISMA) during the reference year (2002).
**Small Mental Health Areas have been numbered from East to West

Given the exploratory value of this information the cartographic representation of the synthetic indexes is let to visual interpretation. The values of the Care Load Index (main component '1') have been plotted and are shown in Figure 1. The greater values are concentrated in highly populated urban areas such as Huelva, Jerez, Sevilla, Malaga, Córdoba, Granada, Jaén and Almería. On the other hand, the smaller values of this synthetic index are located in rural areas such as Aracena, Constantina, Peñarroya, Pozoblanco (Sierra Morena); Villacarrillo, (province of Jaen); Palma del Rio, Écija and Montoro (Guadalquivir valley); or Alpujarras (Sierra Nevada).



Small Mental Health Areas (SMHA) have been numbered from East to West. The name of each numbered area is provided at Table III. The information has been classified in 5 Quantiles, equal numbers of features are placed in each class. The SMHA in the macrourban area of Sevilla are enlarged in the frame placed at the right bottom.

Figure 1. – *Territorial distribution of the Care Load Index in 71 small mental health areas in Andalusia.*

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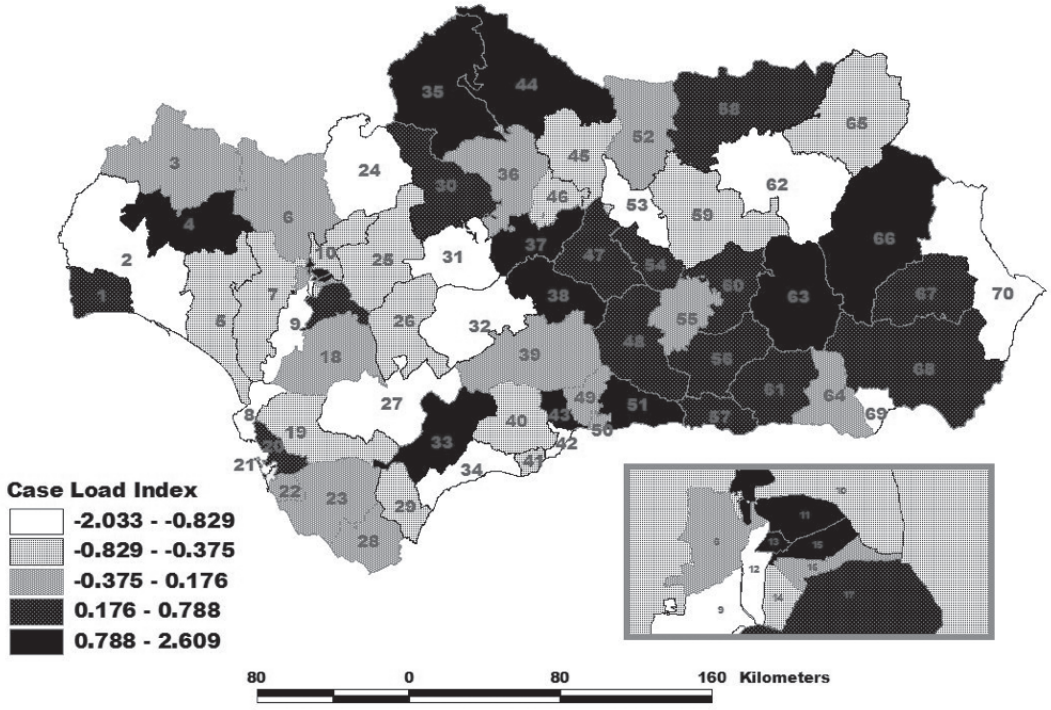

Small Mental Health Areas (SMHA) have been numbered from East to West. The name of each area is provided in Table III. The information has been classified in 5 Quantiles, equal numbers of features are placed in each class. The SMHA in the macrourban area of Sevilla are enlarged in the frame placed at the right bottom.

Figure 2. – *Territorial distribution of the Case Load Index in the 71 mental health small areas.*

The Care Load Index values (main component '2') are shown in Figure 2. The higher values are concentrated in the areas of Peñarroya and Pozoblanco, located in the Cordoba province (Sierra Morena), in Valverde del Camino (province of Huelva); and in the areas of Ronda and Lucena, located (Sierra Betica); Montilla, (Guadalquivir valley); Axarquía, (Malaga coast); and in the areas of Guadix and Baza (province of Granada).

DISCUSSION

The development of indicators to compare and to monitor mental health systems constitutes a global priority, particularly in mental health (Jacob *et al.*, 2007; Saxena *et al.*, 2007).

In Spain, the Strategy in Mental Health of the National Health System (Ministerio de Sanidad y Consumo, 2007), includes a series of activity indicators to monitor the mental health system, such as the income rate or treated or assisted prevalence. It highlights the need of health care maps and indicators suitable for the planning and management of mental health services in the Autonomous Communities (ACs). The Psicost Scientific Association has developed and used simple mental health indicators in several prior studies to describe the mental health financing in Spain (Salvador-Carulla *et al.*, 2006b), compare SMHA across different Spanish regions (Salvador-Carulla *et al.*, 2006a), spatial analysis (Vazquez-Polo *et al.*, 2007), and to select a core set of indicators to assess technical efficiency across different small health areas (Salvador-Carulla *et al.*, 2007). These studies include international comparisons of mental health care at small health area level between Spain and Italy (Salvador-Carulla *et al.*, 2005) and between Spain and Chile (Salvador-Carulla *et al.*, 2008). This is the first study to produce synthetic indexes of mental health care in Spain.

The Autonomous Community (AC) of Andalusia was selected for this study due to the availability of information. The mental health care system of Andalusia has been described at the Mental Health Atlas of Andalusia (Garrido-Cumbrera *et al.*, 2005). This AC has also pro-

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duced a standardized set of mental health care processes (Consejera de Salud, Junta de Andalusia, 2006), and it has implemented an efficient outpatient Mental Health Information System (SISMA) (Moreno-Kustner, 2008). SISMA allows assessing and monitoring the mental health care system using simple indicators such as total number of users, first contacts, total contacts, emergency contacts, or pharmacology treatment. However, these indicators are one-variant measurements and they *before* offer a partial vision of the activity developed in each service. The synthetic indexes provide an assessment of the global activity registered in each service.

A number of limitations should be highlighted. The reliability and the degree of completion of the data provided by the SISMA database show a variability across the different SMHA due to a number of factors. An analysis of these differences was provided to the Mental Health Programme of Andalusia and it is available from the authors. The variables selected were limited to outpatient community care, as the database does not include enough information on intermediate care, and the information on acute residential care provided by the Spanish Minimum Basic Set of Data for Hospital Discharge database (Conjunto Minimo Basico de Datos al Alta Hospitalaria – CMBD) can not be linked with this database. The variables were selected by expert consensus and other variables may provide better information. They may also proved to be redundant. However the behaviour of the variables was clearly different in the two principal components. Other limitation refers to the cartographic representation of the synthetic health indexes. We selected quartiles to represent variability across SMHAs but other alternatives may have been chosen. The variables selected were not adjusted by age, but this work was carried out in a previous study where not differences with the crude values were found.

The PCA and the cartographic representation shows the internal consistency of the synthetic indicators of outpatient activity in Andalusia. The two synthetic indexes obtained through PCA produced a classification of the existing community mental health centers and related SMHA according to care load and case load. These synthetic indexes provided information on the activity in each center which was complementary to the information provided by simple indicators.

Care and Case Load Indexes differ in the 71 SMHA of Andalusia. The metropolitan and urban SMHAs register greater activity or care load, whereas the services located in rural areas display a higher case load. Assisted morbidity (incidence, prevalence and frequentation) is not related to the population size, while the total volume of activity is related to it. This finding may suggests a separated underlying model in rural and urban areas. In the rural areas there are less day and intermediate services as well as a lower access to acute care. The accessibility to intermediate and acute hospital services in the SMHA of Andalusia has been described at the Mental Health Atlas of Andalusia (Garrido-Cumbrera *et al.*, 2005). Therefore many users in rural areas receive only outpatient care in mental health community centers. The degree of urbanization may be a major factor in the definition, planning, provision and monitoring of mental health care (Veugelers *et al.*, 2003; Wang, 2004). In the next future it will be necessary to explore the extent to which different indicators should be used to assess rural and urban mental health care systems. To ensure generalisability these synthetic indexes should be tested in other Spanish regions.

The cartographic representation and spatial analysis provided by Geographical Information Systems (GIS) facilitate the observation and understanding of the spatial phenomena related to the mental health care. In the next future evidence-base planning in mental health care should be based on decision support systems which incorporate synthetic indexes, packages of care, related costs and GIS (Salvador-Carulla *et al.*, 2006; Grigoletti *et al.*, 2006).

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