

## The Territorial Distribution of Public Health and Social-Sanitary Resources for the Major Population in Extremadura

**Ana Nieto-Masot**

Universidad de Extremadura

*ananieto@unex.es*

**Ángela Engelman-Moriche**

Universidad de Extremadura

*angelaengelmo@unex.es*

**Gema Cárdena-Alonso**

Universidad de Extremadura

*gemacardenas@unex.es*

Keywords: Geographic Information System, Accessibility, Spatial correlation, Territorial distribution, Aging rates.

The sociodemographic changes that have taken place in Western societies because of an increase in life expectancy are well known. The increase in the longevity of the population is the main consequence of the previous process, which is aggravated by low birth and fertility rates (Nieto, A., et al., 2015). In Spain, the phenomenon of aging is observed especially accelerated (Zamora, F., et al., 2009), as a consequence of greater longevity, taking into account that the number of people over 65 has doubled in less than 30 years. Currently, around 17% of the total population of Spain is over 65 years old (INE, 2018). The problem is highlighted in rural areas due to an important fragility, with problems of dependency and, in many cases, lack of services and absence of interventions, as occurs in the region under study of this work, Extremadura. According to data from the INE (2018), Extremadura has a population of just over one million inhabitants distributed in 388 municipalities, with a population density of 26.6 inhabitants / km<sup>2</sup> and one of the highest aging rates in Spain (with 137 people over 64 years old for every 100 children under 16). This shows an unequal distribution of the population, which has difficulties in accessing health services (Nieto, A., et al, 2017).

The main objective of this study is to analyze the planning of public health and socio-sanitary resources in Extremadura. It is intended to verify if the location of these resources meets the needs of an increasingly aging region with problems of territorial accessibility in its further and ruralized municipalities (Nieto, A. et al., 2015), as well as to determine if there are spatial inequalities that, consequently, are also social.

To carry out the analyzes planned in this paper, an alphanumeric database with the offer of health resources with information on the number of hospitals, residences and day centers, number of places, address and typology (public and private) in the year 2018 was prepared. The private resources were eliminated from the database due to their lower presence in the region (25% of the offer is private) and to the objective of analyzing public resources exclusively, so that the economic level of people does not interfere.

Afterwards, all the resources were georeferenced and the minimum time of access to them from the centroids of all the municipalities of the region was calculated, taking into account the impedance (length/speed) associated with the displacement through the network. The calculation of the minimum



access time of each locality to the nearest socio-sanitary resource shows an ideal model in which the population always approaches the closest service.

Next, two spatial distribution analysis were carried out, these are the partial autocorrelation indicator Local Moran's I and the analysis of hot spots Getis-Ord  $G_i^*$ , which are ones of the most effective tools for the analysis of patterns and the assignment of clusters (Hair, 2008). With Local Moran's I, clustered zones are obtained that represent the statistical significance according to the following code: cluster of high values (HH), cluster of low values (LL), outlier in which a high value is surrounded primarily by low values (HL), and outlier in which a low value is surrounded primarily by high values (LH). On the other hand, the Getis-Ord  $G_i^*$  analysis indicates if the functions have high or low similar values and if they tend to concentrate in a study area identifying statistically significant special clusters of high values (hot spots) and low values (cold spots), usually with respect to the average of the sample.

The latest available data show that the number of public hospitals in the region has remained practically the same since 2007, with some exceptions in the private sphere. The total number of hospitals in Extremadura is 30, with 63.3% of public management and 36.6% private. Residences and day centers have increased their offer in the region since 2015 (residencies by 8.7% and day centers by 13.7%). Socio-sanitary resources present a public offer that exceeds 70% in the case of residences and almost 80% in the day centers.

In relation to the minimum time of access to hospitals, 31.4% of municipalities and 68.7% of the population access in less than 15 minutes. These are the municipalities with the largest population in the region and with the best transport infrastructures. On the other hand, the residences and the day centers present a more dispersed distribution in the territory, since this type of centers has lower economic cost, which allows their territorial proliferation. In the case of Extremadura, the trend is to locate these services in municipalities close to the main communication routes and around large cities, leaving areas with some more empty spaces, such as the southeastern part of the region, in the border area with Portugal.

Regarding the results of Local Moran's I, the data obtained for the variable "hospitals" show only two groups: one located in the municipality of Badajoz (the main city of Extremadura) which is of the High-High type and another one in the municipality of Talarrubias with the Low-Low type. In Badajoz, 33% of hospital beds in the region are concentrated, while the Talarrubias hospital has one of the lowest capacities with only 1.13% of beds.

The residences congregate 33 groups located in the main cities of the region, such as Mérida, Don Benito, Villanueva de la Serena, Zafra or Cáceres, where High-High groups are located surrounded by groups of Low-High type. The residences located in municipalities with more than 15,000 inhabitants offer an average of 115 places, while in the municipalities surrounding them, coinciding with the areas with High-Low type groupings, the number of places decreases to an average of 64. There are 7 groups of Low-High type in municipalities near large ones, but with an average capacity of 25 places per residence. Finally, there are Low-Low clusters with an average of 22 places in areas with high old age indices.

In the case of day centers, most of the clusters are of the High-High type (11), followed by the Low-Low type (10). In total, there are 40 clusters with a distribution similar to that of the residences, that is, groups with high concentrations in the areas of Mérida, Cáceres, Zafra and irrigated areas, where the residences offer a greater number of places. On the contrary, there are areas with low extreme values (Low-Low) in centers located in municipalities with a high old-age index and with a minimum access time of more than 20 minutes.

Revista de Estudios Andaluces, núm. 37 (2019) pp. 141-160. e-ISSN: 2340-2776

<http://dx.doi.org/10.12795/rea.2019.i37.07>



Esta obra se distribuye con la licencia Creative Commons Reconocimiento-NoComercial-SinObraDerivada 4.0 Internacional

The results obtained in Getis-Ord complement the previous ones. In the case of hospitals, a hot spot is located in the municipality of Badajoz (with a hospital supply that exceeds 1,000 places). The residences group 28 hot spots located along the main communication routes, with a greater concentration in the centers of Badajoz, Merida, Cáceres, Don Benito, Villanueva de la Serena and in the irrigated areas, which offer more than 2,000 places in public residences jointly. Day centers present points of high values in the main municipalities of Extremadura. In addition, there are two important clusters, one in the influence area of the city of Navalmoral de la Mata and another one near this city, in the northeast of the region, where 3 day centers with a high number of places are located.

In conclusion, it is clear that aging is an increasingly pressing problem in modern societies, which demand a competent offer of specific health services for the elderly. In this way, Extremadura is one of the Spanish regions with the greatest demographic and accessibility problems and the results obtained in this study confirm it. It has been observed that accessibility, especially to hospitals and day centers, is still very limited, being isolated to border areas and those that have worse communication system due to its orography. Unlike the previous facilities (hospitals and day centers), the residences have increased their number during the years 2016 and 2017, which has allowed many municipalities to have access to them. However, the two pattern analyzes carried out in this study allow us to see that the capacity and spatial planning of these services can be improved in those municipalities with less population, higher old age index and worse accessibility.

