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Equity in the Geographical Accessibility to Hospitals. The Case of de Basque Country

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The aim of this article is to analyse the spatial equity and efficiency of the geographical distribution of hospital resources in the Basque Country managed by the Basque Health Service (Osakidetza), from the perspective of the new model of integrated health organisation. The interest of the study, apart from the mere knowledge of the optimum distribution of health resources in the Basque Country, lies in making geographical science converge with the distribution of these resources and, together with them, the economic sustainability that results from an efficient geographical allocation of the hospitals.

Osakideza is the organisation that has been responsible for providing public health services in the Basque Country since 1983. Subsequently, in the period from 2011 to 2016, the complete deployment of a new organizational model is completed and a reform of the organizational structure is undertaken, evolving towards the new care paradigm of integrated health organization. This model overcomes the fragmentation between Specialized and Primary Care, integrating the Hospitals and the Primary Care Region of its geographical demarcation into a single organization. It also facilitates collaboration between professionals and care services, teamwork, the sharing of action protocols and clinical information, all under a single, joint management. On the other hand, it is an alternative to the problems of inefficiency and duplication in the management of resources and the loss of continuity in care processes, offering better care to patients, who do not perceive gaps between both levels but rather continuity and coherence in their care. Finally, it means a greater orientation towards the patient, allowing us to face the challenge of chronicity and the progressive ageing of the population, as opposed to the traditional approach to the acute patient.

Osakidetza has thirteen integrated health organisations, distributed throughout the three provinces of the Basque Country (Alava/Araba, Bizkaia and Gipuzkoa), which, in total, include 13 acute hospitals, 153 health centres and 160 consulting rooms.

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To achieve the proposed objective, firstly, the exact and complete address of every one of the health centres, consulting rooms and hospitals has been obtained, available in the Osakidetza centre directory. Next, they are located in the Google Earth geographic software, verifying each case by means of the Street View option and checking that the images of the health device registered in the application correspond to the address of the directory. In a next phase, the geographic coordinates are obtained and the time and distance to the corresponding hospital is recorded by extracting the geographically referenced location files "Keyhole Markup Language" (KML) and its compressed format (KMZ). The Google Earth application has made it possible to extract the coordinates, without the need for other more complex computer tools. Furthermore, an optimal measurement result of time and distance parameters can be obtained on the virtual map of the programme's road network.

The methodology applied is as follows: firstly, a descriptive statistical analysis is carried out and later on a multivariate one, taking into account the shortest time and distance needed to travel from the primary care facility (health centre/outpatient clinic or doctor's office) to the reference hospital or hospitals of the integrated health organisation that centralises the specialised care services.

In the initial phase of the study, which has given rise to this article, the possibility of including public transport as a variable was considered. Yet, this option was finally rejected, since the frequency and timetables are heterogeneous throughout the day, and therefore there is a bias in the data and comparability of the results, which would not be compensated for by the resulting extra information. In the end, the only option chosen was to travel by road, by "car" and in some cases sporadically "walking", when the proximity for this type of journey required less time. The analysis does not include as a condition the state of the traffic since this parameter can vary according to the time of day and for each day of the year, which would result in a loss of the homogeneity, which is essential for the analysis. For this reason, what is reflected here are the ideal or standardised theoretical conditions, with the result that although the distance travelled remains unchanged, the duration, in real circumstances, can be affected by traffic conditions.

The descriptive statistical analysis has been carried out comparatively at the level of the whole of Osakidetza, Health Area and integrated health organisations, calculating for all of them, the arithmetic mean, standard deviation and variation coefficient of time and distance from each of the Primary Care centres.

The multivariate statistical analysis is carried out at the same levels as the descriptive one by means of a simple linear regression analysis in order to verify, in principle, a significant statistical correlation, which perhaps would allow us to pose, a posteriori, the existence of some kind of causality.

The previous hypothesis, when selecting the variables of the study, is that a greater population density in the municipality where the health centre or surgery is located should correspond to a shorter journey time or distance to the point where the reference hospital of the integrated health organisation is located and vice versa. Therefore, the explanatory or independent variable (X) is the population density and the explained or dependent variable (Y) is the journey time in minutes or, where appropriate, the distance quantified in kilometres.

However, from an initial phase of the extraction of the variables, the population density had to be disregarded, as it was not an optimal parameter as it generated an important distortion, which was evident when comparing the municipal data (population, surface area, density). Therefore, the explanatory variable (X) finally selected for the study was the municipal population, although it is necessary to specify the fact that this decision is not exempt from the risk of distortion either, as will be seen later in the results and in the discussion.

In multivariate statistical analysis, the equations of the least squares method of Linear Regression, to obtain the Pearson Correlation Coefficient as well as the values (a and b) of the equation of the line: $y = a + bx$.

The study has also been complemented with a population accessibility analysis carried out with respect to the arithmetic mean of time and distance from the Primary Care facilities (health centre, outpatient clinic or doctor's office), located in a given municipality, to the reference hospital of the integrated health organisation.

The result of the study has enabled an assessment of the territorial distribution of hospitals in the Basque Country (Osakidetza), establishing an optimum level of territorial coverage in 90% of the municipalities. The

remaining municipalities (10% of the study), which require more decisive action to improve their results, have reached the following conclusions and areas for improvement.

Reorganization of the health map of the integrated health organizations, studying the possibility of reorganizing the health map in some, to optimize their accessibility.

Establishment of Collaboration Agreements with neighbouring Autonomous Communities. Some municipalities are closer to hospitals belonging to other Autonomous Communities than the one corresponding to their integrated health organisation. This circumstance, which also occurs inversely, and given that the establishment of collaboration agreements between neighbouring Autonomous Communities for supra-community health care is not a new circumstance, it might be possible to extend this figure.

Improving road communication infrastructures and interurban public transport. One way of bringing accessibility to health care facilities can be achieved by acting on communications infrastructures: motorways, roads, public transport, etc.

Finally, it should be noted that the above areas for improvement, based on the results and discussion of the work, are not a closed list and it may be possible to adopt other different measures to achieve a similar result in terms of accessibility and equity in access to health resources. In any case, public administrations, in order to provide their services, must adapt to the geographical and social realities of their territories (size, orography, weather conditions, population, etc.) and the solutions that are valid for some may not be so valid for others.