

Health Service Approachability and Distribution on the Territory

Accessibilità e Distribuzione dei Servizi Sanitari sul Territorio

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Riassunto: Lo scopo di questo lavoro è quello di trovare alcune semplici misure da associare ai comuni, afferenti ad una ripartizione amministrativa, al fine di ottenere una mappatura degli stessi in relazione alla loro distanza dai centri di prevenzione e cura approntati dal Sistema Sanitario. In tal modo successivamente sarà possibile definire opportune misure della *Costumer Satisfaction* dei fruitori. In particolare per valutare la capacità di un determinato servizio, ubicato in un certo territorio, di soddisfare la domanda proveniente da utenti residenti in luoghi diversi, saranno analizzati tra i numerosi fattori coinvolti nella determinazione del grado di attrazione della struttura stessa, l'eventuale decentramento rispetto al luogo di residenza e i tempi medi di attesa.

Keywords: Effective distance, Service evaluation, Customer Satisfaction.

1. Introduction

The different models, generally proposed in literature (Zanella 2001) for the arrangement of appropriate measure indicators of the Costumer Satisfaction for a given service, typically take into account some dimensions dealing with *the response capability* and *the reassurance capability*. Particularly, when we have to evaluate an entire Service System rather than a single service, we think that it is particularly important to evaluate, among the different variables related to the mentioned dimensions, its temporal and spatial approachability and also its perceptibility as *nearby* and consequently *helpfulness* for the user itself. So, in order to quantify - as an element of the user satisfaction/unsatisfaction - the distance separating the dwelling place and the service supply place, it seems necessary to consider those factors that ideally draw the two mentioned places farther or closer each other. So, in order to evaluate if a centre can satisfy the demand for a supply of services which could arise from users living out of the territory, it seems appropriate to analyse the different factors that determine the capability of attraction of the centre itself deriving from: the users satisfaction on previous occasions, the decentralization with respect to the dwelling place of users families, the professional skills of technical and medical staff, the suitability of the available diagnostic instruments, the occupation rate of beds, the average waiting time. The aim of this work is to determine some simple indicator to be associated with the various municipalities of an administrative area in order to classify them according to their remoteness from the nearest prophylaxis and therapy

centres arranged by the national or local Health Service. In order to evaluate the capability of a Health Service of being close enough to the users, we should consider at least three different factors: the physical distance, the accessibility and the availability. Particularly, in order to duly assess the *latent distance* between users and service supply, it is necessary to consider both the physical distance in term of kilometres and the kind of existing infrastructures, the quality and the efficiency of linking nets, the availability of services identified by average waiting times. Indeed it is often more convenient getting to a farthest but well linked place than getting to a nearer one badly linked; besides, according to the typology of the requested service, it often appears more convenient getting to far health centres if they supply their service more rapidly than the nearer ones. For example, let us consider the piedmontese municipality of Cavour (Cn), 13 kilometres from the nearer centre which supply endocrinology examinations 43 days, and being 31 kilometres far from a centre which supply the same examination within 8 days. Neglecting the other elements which could play a role in the choice of the users and considering only the physical distance, an user dwelling in the mentioned municipality, will choose the nearest place or the other one according to the degree of emergency attached to the service he requires.

2. Distance measure d_{ij} .

Let us consider an array of the d_{ijk} distances (in kilometres) dividing the i -th ($i=1 \dots n$) municipality from the nearest k ($k=1, 2 \dots K$) health centres which supply the same service (as specialist examinations or diagnostic tests) j ($j=1, 2 \dots m$) and connect to each of the mK health considered centre the waiting times (in days) needed to obtain the requested service j . In this context we neglect the accessibility factor as it would be too difficult to evaluate the quality of linking nets. Let's define, besides:

$$d'_{ijk} = d_{ijk} + \alpha_j t_{jk} \quad (1)$$

that transforms the physical distance in function of the waiting times t_{jk} and of α_j , a non negative constant suitably chosen with regard to the real or sensed emergency that leads the user to choose a farer but more rapid health centre.

The average distance related to the i -th municipality, for each service j is given by:

$$\bar{d}_{ij} = \frac{1}{K} \sum_{k=1}^K d'_{ijk} \quad (2)$$

The distance indicator D_i , connected to each municipality, is made up by the weighted arithmetic mean of the mentioned distances $\bar{d}_{ij}$:

$$D_i = \sum_{j=1}^m \bar{d}_{ij} w_j \quad (3)$$

with weights w_j given by the relative relevance that it is possible to attribute to each j -th service. To define w_j we can use the data yearly coming from the Health System regarding the supplied services classified according to the number of different typologies on instrumental tests (as pulse-echo diagnosis or X-ray) or specialist examinations (as cardiological or neurological ones).

3. User evaluation of the territorial distribution of health services.

Typically the conceptual technique used to carry out a Customer Satisfaction analysis provide the identification of discrepancies or differences - regarded as measures of unsatisfaction - between quality of expected service and quality of sensed service (Montinaro M., Nicolini G., 2002).

In this context we replace the user perception of distance with a more objective measure given by the $\bar{d}_{ij}$ computed for the dwelling municipality of user himself. Whereas the estimate of expected distance require *ad hoc* surveys (Montinaro M., Nicolini G., 2002) carried out in the various municipalities taking into account a sample of patients by a sample of family doctors and health surgeries surveyed according to a variable sampling design¹. So, to each sampling unit h -th ($h=1..H$) belonging to i -th municipality, is asked - for each health service j and on the basis of a defined scale – the maximum distances and waiting times, respectively r_{ijh} and v_{ijh} ($v_{ijh}>0$), reckoned admissible. Besides, each sampling unit is invited to attribute a weight² p_{ijh} to each health service considered and to indicate how many kilometres β_{ijh} he would cover to gain a unit of waiting time.

A measure of *expected distance* conformable to (1) can be given by:

$$r'_{ih} = \sum_j (r_{ijh} + \bar{\beta}_{ij} v_{ijh}) p_{ijh} \quad (5)$$

with $\bar{\beta}_{ij} = \frac{1}{H} \sum_h \beta_{ijh}$. Correspondingly an evaluation of user unsatisfaction can be

carried out comparing the effective distance (3) with the expected distance (5) that is: $\delta_{ih} = (D_i - r'_{ih})$. If $r'_{ih} \geq D_i$ the user is reckoned satisfied and δ_{ih} is considered equal to zero. Whereas if $r'_{ih} < D_i$ a critical situation is pointed out. The maximum δ_{ih} (and the maximum user unsatisfaction) will be for $r'_{ih} = 0$ and will be equal to D_i . In order to evaluate the user satisfaction, we propose the unbiased estimate associated with each municipality:

$$\xi_i = 1 - \sum_{\substack{h \\ \delta_{ih} \geq 0}} \frac{\delta_{ih}}{HD_i} = \frac{1}{HD_i} \sum_h r'_{ih} \quad (6)$$

¹Each family doctor or surgery having a weight given by the percentage of case-load (assisted people) on the overall population of the reference territory.

² In such a way that $\sum 100 p_j = 100$

and , associated with the overall geographic area, the weighted average:

$$\xi = \sum_{i=1}^n \xi_i W_i = \frac{1}{HP} \sum_i \sum_h \frac{r_{ih} P_i}{D_i} \quad (7)$$

where P_i , $P = \sum_i P_i$ and $W_i = \frac{P_i}{P}$ denote respectively the population dwelling in the i -th municipality, the population dwelling in the overall area and the demographic weight of i -th municipality.

Both (6) and (7) are equal to 1 in case of maximum satisfaction and set to zero when all of sampling units expressed maximum unsatisfaction.

Alternatively an estimate for the overall area can be produced carrying out a survey based on a multistage stratified sampling of municipalities by the use of a suitable

stratification variable like the average physical distance $\bar{d}_i = \frac{1}{mK} \sum_j \sum_k d_{ijk}$.

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