SPATIAL DISTRIBUTION OF ELDERLY ACCORDING TO ACCESS TO HEALTH CARE IN UBERABA, STATE OF MINAS GERAIS

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ABSTRACT: This study aimed to analyze the spatial relationship between access to and distance from health services in the municipality, considering the number of morbidities and income. This was a cross-sectional household survey with 680 elderly community members from Uberaba, State of Minas Gerais. An electronic database was built using the Excel software. Instrument for sociodemographic characterization and morbidities, Mini Mental State Examination, and access to health services were used. Descriptive analyses were performed using the GNU PSPP Statistical Analysis Software (PSPP). For spatial analysis, the analyses were performed using ArcGIS 10.6 software. The search for the health unit occurs preferentially by men (23.4%); 60 70 years (27.1%); and separated (38.4%). The search for private practice predominated in women (29.4%); older elderly (32.2%); and without a partner (36.2%). There was no spatial correlation between distance and the number of morbidities and the income of the elderly. It was concluded that there is a need to rethink the access of this population to public health services, considering the less favored areas given the distance from the health units and residence of the elderly.

KEY WORDS: Elderly; Demography; Geriatric nursing; Universal access to health services.

DISTRIBUIÇÃO ESPACIAL DE IDOSOS SEGUNDO ACESSO AOS SERVIÇOS DE SAÚDE EM UBERABA-MG

RESUMO: O presente estudo teve como objetivo verificar a relação espacial do acesso com a distância dos serviços de saúde no município, considerando o número de morbidades e a renda. Trata-se de inquérito domiciliar transversal realizado com 680 idosos comunitários de Uberaba-MG. Foi construído um banco de dados eletrônico no programa Excel e utilizados: instrumento para caracterização sociodemográfica e morbidades; Miniexame do Estado Mental (MEEM); e acesso aos serviços de saúde. Procederam-se às análises descritivas por meio do programa *Statistical Package for Social Sciences* (SPSS), versão 21.0. A análise espacial foi feita no software *ArcGIS* 10.6. A busca pelo posto de saúde ocorre preferencialmente por homens (23,4%); idade de 60 70 anos (27,1%); e separados (38,4%); e a busca por consultório particular é predominante em mulheres (29,4%); idosos mais velhos (32,2%); e sem companheiro (36,2%). Não houve correlação espacial entre a distância e o número de morbidades e a renda de idosos. Conclui-se que há necessidade de repensar o acesso dessa população aos serviços de saúde públicos, considerando as áreas menos favorecidas dada a distância dos pontos de atenção à saúde e residência dos idosos.

PALAVRAS-CHAVE: Acesso universal a serviços de saúde; Demografia; Enfermagem geriátrica; Idoso.

INTRODUCTION

Aging gives rise to changes in the demands for health care, and their use is related to individual and structural factors of the services offered and to the social environment in which the elderly is inserted[1]. Thus, promoting ways for these people to access and use the health system will allow the health team to intervene and monitor the needs of this population group[2].

Access to health services is multidimensional and is associated with factors that go beyond organizational accessibility, as it also considers strategies, resources, autonomy, popular participation, social control, equity and services geared to the needs and realities of populations[3].

It is noteworthy that problems of access and use of health services among the elderly vary to a greater or lesser extent according to the country and the type of service[4]. A population-based study carried out in Pelotas, State of Rio Grande do Sul, showed that the lack of access and the time in the waiting list were greater among individuals with worse socioeconomic conditions[5].

The geographic configuration of health care systems is essential to facilitate accessibility, promoting the efficient use of resources. Balancing conflicting objectives such as accessibility, geographical dimension and planning of the clinical network is important for any type of care[6]. In this sense, Geographic Information Systems are an essential tool for planning health services at a population level that can be used to improve access to primary care for groups of underserved people[7].

Regarding the relationship between access and location of health services, research in Iran revealed that, over a 15-year period, the proportion of the population with inadequate geographical access to health centers increased from 47.3% to 58.4%. It is evident that the spatial organization and the pattern of capital investment in health care should be adjusted to meet the needs of the population[8].

In Sudan, studies have indicated that spatial accessibility to health services remains very low, with about 71% population living in areas equivalent to an hour away from a public health unit. This is mainly due to the inadequate distribution of health facilities and the inoperability of some health centers[9]. In Portugal, individuals who live close to primary health units had less use of emergency services[10].

With regard to research with the elderly, a survey in Australia showed that there are links between the accessibility to some services and the distribution of the elderly population. The distribution of people aged 75 and over is better explained by access to services than socioeconomic data, migration or housing-related data[11].

The possible relationship between access and the spatial location of health units is evident, as well as the scarcity of national studies in the geographical perspective of access by the elderly. Thus, it is questioned whether there is a spatial relationship between the distance from and access to health services in Brazil. It is important to understand the location and characteristics of the places where people seek health care. The behavior of seeking these services is relevant to planning and evaluation, resource allocation and the formulation of public policies[7,12].

However, research on the theme is incipient[11], and a gap in this theme emerges. Thus, it is intended to contribute to broaden the discussion on the subject, favoring reflection on the relationship between access to health services and spatial distribution of the elderly. This debate can encourage the development of actions that promote improvements in health care services considering the aging of the population.

In this sense, the objective of this study was to analyze the spatial relationship between access to and the distance from health services in the municipality, taking into account the number of morbidities and income.

METHODS

The study is part of a larger project entitled "Active Aging, Global Functionality and Quality of Life among elderly people in the Health Micro-Region of Uberaba (State of Minas Gerais)". In all, 823 elderly people were interviewed, of whom 808 completed the full interview, and 15 showed cognitive decline.

The place of study was the urban area of Uberaba, a pole municipality of the Southern Triangle Macro-Region in Minas Gerais, comprising 27 cities. The estimated population of the city is 333,783 inhabitants

(data from 2019)[13], a territorial area of 4,523,957 km² and a demographic density of 65.43 inhab./km². According to data estimated by the Brazilian Institute of Geography and Statistics (IBGE), from the last Census in 2010, there are 36,703 elderly people aged 60 years or over, which represents 12.5% of the total population[13].

To calculate the sample size, a prevalence of functional disability in instrumental activity of daily living (IADL) of 28.8% was used, considering other studies with elderly community people (10%)[14] (28.8%)[15], with a precision of 1.5% and 95% confidence interval for a finite population of 36,703 (total number of urban elderly in Uberaba), reaching a sample of 808 elderly. Taking into account a 20.0% sampling loss, the maximum number of attempts was 970 elderly. A total of 823 elderly people was interviewed, but those who reported using the same health unit added up to 680, which comprised the sample of this study.

For the selection of the population in the urban area, multistage cluster sampling (two-stage) was used - the clusters refer to the division of the municipality into census sectors. For the sampling of the elderly, in the first stage, an arbitrary draw of 50% census sectors in the municipality was considered through systematic selection, organizing a single listing of the sectors, but identifying the neighborhood to which they belong. The sample interval (SI) was calculated using the formula $SI = Ncs/ncs$, where Ncs is the total number of census sectors, and ncs, the number of census sectors drawn (approximately two). The first census sector was randomly drawn, and the others, according to the SI.

In the second stage, the number of households was given by the number of elderly people in the sample previously calculated (n = 808). Then, this number of households was divided by the number of census sectors drawn (202 sectors), in such a way that a similar number was reached within each census sector (approximately four elderly people per sector). Finally, within each census sector, the first household was selected and the others, from household to household, in a standardized way, until saturating the sample of that sector.

Data were collected at the elderly's home from June 2017 to June 2018 through a direct interview conducted by ten professionals with previous experience in this activity, who were trained in how to fill out the instruments and how to approach the participants. They also wrote down the complications (absences, refusals and others) in a field spreadsheet. Systematic meetings were held between the researchers and the interviewers for training, monitoring and guidance regarding the task.

Supervisors were selected, who checked each interview in order to verify the completion and consistency of the items, ensuring quality control. The researchers also held systematic meetings with this group for training, monitoring and guidance.

The inclusion criteria considered were: being 60 years of age or older and living in the urban area of Uberaba (State of Minas Gerais). Hospitalized and/or institutionalized elderly were excluded; as well as those with communication problems such as deafness, not corrected by a hearing aid, and severe speech disorders; with cognitive decline. The elderly were assessed by the Mini Mental State Examination (MMSE), following the following cut-off points: ≤ 13 for illiterates, ≤ 18 for average schooling (from 1 to 11 years) and ≤ 26 for high schooling (over 11 years)[16], without an informant to answer the Functional Activities Questionnaire (PFEFFER) and a final score ≥ 6 points[17].

The instruments used were: Mini Mental State Examination (MMSE) for cognitive assessment, translated and validated in Brazil[16]; characterization of sociodemographic data and morbidities built by the Research Group on Public Health/UFTM; and access to health services assessed through five questions from the National Household Sample Survey (PNAD)[18].

The study variables were: socioeconomic: sex, age group, marital status, education, housing arrangement, individual income in minimum wages; number of morbidities; Access: search for the same place of health care, place of search for health care, medical consultation in the last 12 months, use of continuous medication, consultation with the dentist.

The interviews were carried out using printed instruments, and as performed, they were handed over to the supervisors, who took care of the reviews. When necessary, they were returned for the interviewer to supplement the information. After this stage, data were consolidated, and, for this, an electronic database was built

in the Excel® software and then imported into the GNU PSPP Statistical Analysis Software (PSPP) 1.0.1 for analysis. Statistical analysis was carried out through the distribution of absolute and percentage frequencies.

For spatial analysis, the planialtimetric chart of the urban area of Uberaba was used as a base map for the definition and location of the events. All the products generated were adjusted to the same horizontal datum, SIRGAS 2000, and the coordinates in UTM. The method used was the Service Area, which considers a network, in this case, that of city streets, and analyzes distances or travel time based on a service area.

Service areas are concentric to the point of interest (in this case, health units) and irregular, as they follow the shape and length of the traffic routes (streets, avenues) to calculate the distance that the individual has to travel to the central point (health unit). When thematic colors are applied to the service areas, the distances to the health units are highlighted: on the maps, the warm colors (red, orange and yellow) indicate areas with greater accessibility - hot spots -, and the cold colors (shades of light to dark green), less accessibility.

The study used geospatial layers: the street network of the city, obtained from the OpenStreetMap project (https://www.openstreetmap.org); Planning and Management Unit of the Municipality of Uberaba (Planning and Management Department); points of the Primary Care Units; and points in the homes of the elderly with specification of location, income and morbidities.

The analyzes were run using ArcGIS 10.6 software, application of the Network Analyst extension for analysis of the service area. It was applied to bands of 300 meters of coverage up to the maximum threshold, so that 100% elderly were covered within the service area according to the type of care (primary, secondary or tertiary). Thus, in the case of primary care, the maximum threshold was reached with ranges from 300 m to the threshold of 1,800 m, with a 300-m interval; in secondary care, the maximum threshold was reached with ranges from 300 m to the threshold of 5,100 m, with a 300-m interval; finally, in tertiary care, the maximum threshold was reached with ranges from 300 m to the threshold of 7,200 m, also with a 300-m interval.

An addendum to the project was requested with opinion number 2.053.520, which is approved by the Research Ethics Committee of the Federal University of Triângulo Mineiro. The research subjects were contacted at their homes, and they were presented with the objectives of the study and the Informed Consent Form (ICF), as well as relevant information was provided. Only after the interviewee agreed and signed the term, the interview was conducted.

RESULTS

Of the total of elderly people who reported seeking the same health service when they need (84.2%), the highest percentage reported that they seek private practice (27.2%), followed by a health unit associated with another location (24.3%) and only the health unit (21.2%). Regarding medical consultation in the last 12 months, 88.4% said they had visited up to three times (53.8%), and four to six times (28.4%). Most answered that they use continuous medication (90.9%), having received it free of charge (43.6%); however, 31.7% had not obtained free medicine.

Those elderly who claimed to have been to the dentist three years or more (58.9%) prevailed, followed by others who resorted to this service less than a year ago (21.0%) - among these, the majority referred that dental care was not covered by a health plan (82.4%); 79.4% paid for the service.

The search for the health unit occurred preferably by men; 60 ⊢70 years; separated; with less education; income below a minimum wage; and who lived alone. In the case of the private practice, it was predominant among women; older elderly; with and without a partner and widowed; higher schooling; who lived alone, with caregivers, with spouses and others of their generation; without income and those with higher income. Also noteworthy was the search for a health unit/other services among those with less education, who lived with children and grandchildren; and a minimum wage income. This set of information is detailed in Table 1, below.

Table 1. Sociodemographic data of the elderly interviewed according to the place of search for health services.

Variables	Health center/ unit N (%)	Private Practice N (%)	Clinic N (%)	Health center/ unitand other places N (%)	Private Practice and other places N (%)	Other N (%)
Sex						
Male	54 (23.4)	53 (22.9)	17 (7.4)	48 (20.8)	13 (5.6)	46 (19.9)
Female	93 (20.7)	132 (29.4)	32 (7.1)	117 (26.1)	30 (6.7)	45 (10.0)
Age group (in years)						
60 ├ 70 years	66 (27.1)	56 (22.9)	14 (5.7)	55 (22.5)	16 (6.6)	37 (15.2)
70 ├ 80 years	52 (18.3)	80 (28.2)	25 (8.8)	74 (26.1)	14 (4.9)	39 (13.7)
> 80 years	29 (19.1)	49 (32.2)	10 (6.6)	36 (23.7)	13 (8.6)	15 (9.9)
Marital status						
Never married or lived with a partner	14 (29.8)	17 (36.2)	1 (2.1)	8 (17.0)	4 (8.5)	3 (6.4)
Lives with spouse or partner	51 (17.6)	78 (26.9)	22 (7.6)	71 (24.5)	22 (7.6)	46 (15.9)
Widowed	54 (20)	80 (29.6)	20 (7.4)	69 (25.6)	16 (5.9)	31 (11.5)
Separated or divorced	28 (38.4)	10 (13.7)	6 (8.2)	17 (23.3)	1 (1.37)	11 (15.1)
Education (study years)						
0	29 (25.4)	13 (11.4)	8 (7.0)	41 (35.9)	2 (1.8)	21 (18.4)
1 ├ 4 years	35 (24.1)	32 (22.1)	9 (6.2)	41 (28.3)	10 (6.9)	18 (12.4)
4 ├ 8 years	66 (24.7)	61 (22.9)	24 (8.9)	66 (24.7)	15 (5.6)	35 (13.1)
8 years	8 (17.4)	19 (41.3)	2 (4.35)	6 (13.0)	7 (15.2)	4 (8.7)
> 9 years	9 (8.3)	60 (55.6)	6 (5.6)	11 (10.2)	9 (8.3)	13 (12.0)
Housing arrangement						
Alone	35 (29.7)	36 (30.5)	7 (5.9)	23 (19.5)	5 (4.24)	12 (10.17)
With caregiver	1 (25.0)	3 (75.0)	-	-	-	-
With spouse	52 (17.9)	78 (26.9)	22 (7.6)	69 (23.9)	22 (7.6)	46 (15.9)
With others of his/her generation	5 (17.9)	10 (35.7)	1 (3.6)	5 (17.9)	3 (10.7)	4 (14.3)
With children	49 (24.8)	46 (23.2)	14 (7.1)	57 (28.8)	9 (4.6)	23 (11.6)
With grandchildren	4 (16.7)	5 (20.8)	4 (16.7)	7 (29.2)	2 (8.3)	2 (8.3)
Other people	1 (5.6)	7 (38.9)	1 (5.6)	4 (22.2)	2 (11.1)	3 (16.7)
Income (in minimum wage)						
0	12 (24)	18 (36)	4 (8)	9 (18)	4 (8)	3 (6)
< 1	5 (45.5)	-	-	4 (36.4)	-	2 (18.2)
1	73 (22.6)	64 (19.8)	29 (8.9)	95 (29.4)	18 (5.6)	44 (13.6)
1 ├ 3	55 (21.5)	78 (30.5)	15 (5.9)	54 (21.1)	17 (6.6)	37 (14.5)
3 ├ 5	1 (3.9)	16 (61.5)	1 (3.6)	2 (7.7)	4 (15.4)	2 (7.7)
> 5	1 (7.1)	9 (64.3)	-	1 (7.1)	-	3 (21.4)

Source: prepared by the authors.

As for the spatial analysis, there was no correlation between distance and the number of morbidities and income of the elderly, but it was possible to verify that many need to travel a long distance to reach a health unit. In addition, in primary care, the lowest access is in the central regions of the municipality (Figures 1A and 1B); in the secondary and tertiary, it is found in the peripheral areas (Figure 1C, 1D, 1E and 1F).

However, the pattern is random; elderly people with many diseases do not necessarily live far from health units, and vice versa; the same applies to income.
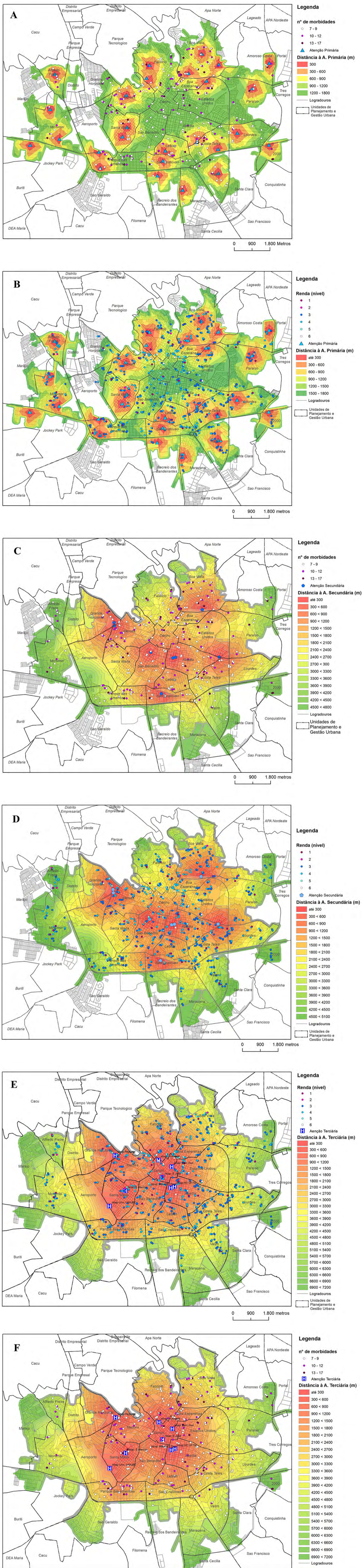
Figure 1. Spatial distribution of the relationship between distance and number of morbidities and income of the elderly according to the level of health care: primary (A, B), secondary (C, D) and tertiary (E, F).

DISCUSSION

This study revealed that a higher percentage of the elderly reported seeking private practice, having had a medical consultation in the last 12 months, using continuous medication and having gone to the dentist three years ago or more. The search for the health unit occurs preferably by men; 60 ├70 years; separated; with less education; with income below a minimum wage; and who live alone. In turn, the search for a private practice was predominant among women; older elderly; with and without a partner and widowed; higher schooling; who lived alone, with caregivers, spouses and others of their generation; without income and those with higher income. There was no spatial correlation between distance, number of morbidities and income.

With regard to the socioeconomic data for characterizing the sample, the results are similar to the data from the National Household Sample Survey (PNAD), which observed that 34.6% elderly used a private practice covered by the health plan; and 80.5% seek the same service when they need it[18]. Another study carried out with elderly people in southern Brazil showed a high prevalence of private practice care (66%)[19], higher than in the present study. Divergent data were found in a research carried out in Montes Claros (State of Minas Gerais), in which a higher percentage of use of the public health service (68.8%) was observed, followed by the elderly who have a medical insurance (17.5%)[20].

It is inferred that the demand for private consultations identified in this study is related to the greater need of this population for health care, requiring less waiting time.

Regarding medical consultation in the last 12 months, a population-based study showed that 91.1% elderly sought care[21], an aspect consistent with this research. This reinforces the need to seek care that may not be being provided by public health services.

As for the use of continuous medication, a lower percentage received medication free of charge, according to research data based on the PNAD (31.1%); 14.0% did not have access to any medication[21].

As for the last visit to the dentist, the majority reported having gone for more than a year (73.2%), with private consultation (73.5%)[22], consistent with the present study. This evidence reinforces the need for reflection on the oral health of the elderly in the municipality. It is relevant that nurses are aware of this aspect, considering their role within the primary health care unit.

In a population-based study carried out in Montes Claros (State of Minas Gerais), it was demonstrated that the majority of the elderly seek private service (62.4%), while 27.5% seek the public service[23], which is consistent with this research.

The results found in this investigation, in relation to sociodemographic data and their distributions, are partially similar to those present in the literature.

With regard to the search for a health unit, the predominance of men verified herein is consistent with a study based on the PNAD[24] and diverging from data from the National Health Survey (PNS), in which women prevailed (54.9%)[25]. However, most lived with their partner, according to a PNS study (55.9%)[25], which is different from this investigation. Low education was also obtained in the PNS; 41% reported incomplete elementary education[25].

As for the search for a private practice, the higher prevalence of women is similar to the PNS data (59.9%)[25] and diverges from a study based on the PNAD, in which most of them sought the health unit (42.4%)[24]. In the PNS study, most of them also lived with a partner (59.8%) and had a higher level of education (41.9%)[25].

The highest percentage of elderly people in the age group of 80 years or more who seek care in a private practice obtained in this investigation differs from a study conducted in the interior of the State of São Paulo; however, it is similar to the predominance of elderly people aged 70 to 79 years (38.1%)[26].

In this investigation, there was prevalence of elderly with an individual income of five or more minimum wages who sought care in private offices. These results are consistent with a study that showed that elderly people with access to private practice belong to the most favored economic classes[26].

Regarding the higher level of education of the elderly who seek care in private practices, a similar data was observed in a study in the interior of the State of São Paulo, which revealed that 52.3% completed high school or had completed higher education[26], and in the PNS, which

found that the higher the education level, the greater the access to private practices[27].

A recent systematic review evaluated the socioeconomic determinants related to elderly access to health services and verified the presence of inequality in access to medical care in developing countries and in some developed countries[4]. Understanding the inequities that affect access to health services can favor the work carried out by a multidisciplinary team in the Family Health Strategy and, thus, contribute to improving access to public health services with equity, resolution and universality among the elderly.

As for spatial analysis, studies have been conducted, such as that carried out in Iran, whose results have been consistent with this investigation for the levels of secondary and tertiary care; residents of peripheral regions had less access to health services[8].

Another study in Canada reported that those who lived in poor neighborhoods and who were most cared for in health care were more likely to have a family physician on a regular basis. The probability of contact with primary care professionals was influenced both by individual characteristics and by elements of the place (neighborhood, availability of health services and characteristics of the municipalities)[28]. It is inferred that the possibility of greater contact with health care units, especially primary units, may favor positive outcomes in the health of the elderly.

A study developed in Australia found that, although the elderly live closer to health services in a given location, geographic access to a general practitioner was less than in other regional centers[7]. As in the present research, inequality in the distribution of health services was noticed, a fact that can impact care, making it difficult to monitor the health of this population.

The lower access to primary care in the central regions of the municipality may be related to its expansion through the Family Health Strategy, especially in areas less favored by the public and private assistance provision[29]. Nevertheless, an investigation carried out in the southeastern region of Brazil revealed that, among the main cities of Minas Gerais, Juiz de Fora and Uberaba have a high average of inhabitants per primary care unit, correlated with regions in the opposite situation. This

evidences the non-compliance, in a satisfactory way, with the equity and instruction regarding the establishments in this level of care[30].

As for socioeconomic analysis, a study in Australia suggested that health services were adequately located in areas of greatest need[7]. It is believed, therefore, that the identification of the most vulnerable places in health can contribute to optimizing the distribution of these services.

Geographic Information Systems provide a means of mapping the characteristics of the population in relation to the places of service in order to assist in the strategic development and in the location of future health units[7]. As the relationship between space and access to health services becomes clearer, it will be possible to leverage this knowledge in policies aimed at reducing inequalities in this access[28].

Thus, the relationship between the location of potential users and that of health services can indicate weaknesses in access to health systems, which can cause difficulties in attending and monitoring the health situation of the elderly. A practical action resulting from this spatial separation is the coordination of the Family Health Strategy, which is able to detect elderly populations that may be penalized for the distance from services and, thus, coordinate the actions of health agents with these patients. This fact becomes relevant to the extent that it can favor organization and reflection on how services can meet the needs of the population.

The spatial analysis takes into account the distances to the different levels of primary care; however, it is not possible to state that the surrounding population is looking for the health service that is closest to them. Thus, it should be noted that this study considers the distance of potential access to the nearest health service.

It was not possible to assess travel time to health services. Such characterization is significant for the analysis of access considering this variable and can provide indications for emergency care. Nonetheless, for such characterization it is necessary to have data on the modes of transportation, traffic and speeds on the circulation routes.

CONCLUSION

There was no spatial correlation between distance and number of morbidities and between distance and income of the elderly. In addition, the need to rethink the access of this population to health care, especially public services, is evident, considering the areas in which it is less favored given the distance from the health units, as well as the socioeconomic characteristics of this population.

It is inferred that the provision of services by the Unified Health System (SUS) is not able to cover the demands of the elderly; in this case, the use of the private practice may represent a faster access strategy. Thus, it is necessary to have measures that enable a more careful look at the real needs of this clientele and that can result in integrated and effective public policies.

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