

Geographic accessibility of the elderly to primary health care at a Family Health Strategy Unit in Diamantina, MG, Brazil

Acessibilidade geográfica de idosos aos cuidados de uma unidade de Estratégia Saúde da Família, Diamantina, MG

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Resumo

Introdução: A qualidade de vida dos idosos está associada aos meios que facilitam seu acesso à saúde, entre eles a acessibilidade geográfica. Diante disso, o estudante de medicina dispõe de ferramentas que avaliam o território e suas barreiras físicas, elencando os impactos e promovendo melhor acesso aos serviços de saúde. **Objetivo:** Estudar o acesso geográfico de uma unidade de atenção primária à saúde, dentro da rede de atenção e os possíveis impactos na saúde do idoso. **Materiais e métodos:** O estudo foi realizado por meio de dados da Estratégia de Saúde da Família Centro na cidade de Diamantina-MG, como informações sobre o território e número de consultas. Ademais, dados construídos pelos autores a partir das ferramentas Google Maps e Planilhas do Google, como mapas, lista de serviços da rede de saúde e tabelas sobre tempo de locomoção/distância até os serviços. **Resultados:** Ao analisar a distribuição geográfica da ESF Centro, dividida em quatro áreas, é possível avaliar nas MA 01 e 02 uma melhor acessibilidade aos serviços de saúde por essa população, pois 94,87% das ruas com intervalo de distância de 0-400m da ESF, concentra-se nas MA 01 e 02. Outro dado relevante são os números de consultas, que do total realizadas na ESF Centro, em dias aleatórios, a participação dessas MA (01 e 02) representa 69,4% das consultas. **Conclusão:** Conclui-se que o fator distância e tempo de deslocamento até a unidade de saúde e outros serviços são índices que afetam o acesso à saúde pelos idosos.

Palavras-chave: atenção primária à saúde; acesso aos serviços de saúde; saúde do idoso, geografia médica

Abstract

Introduction: Life quality of the elderly is associated to the means that facilitate their access to health care, including geographic accessibility. Therefore, the medical student has tools to assess the territory and its physical barriers, listing the impacts and promoting better access to health services. **Objective:** To study the geographic access to a primary health care unit within the public health network and the possible effects on the health of the elderly. **Materials and methods:** The study was carried out using data, such as information about the territory and number of appointments, from the Family Health Strategy Center in the city of Diamantina, MG. In addition, data were also constructed by the authors from Google Maps tools and Google spreadsheets, such as maps, list of health network services, and tables on travel time /

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distance to services. *Results:* By analyzing the geographic distribution of the ESF-Center, divided into four areas, it is possible to observe a better accessibility to health services by the population in MA 1 and MA 2, since 94.87% of the streets are within 0-400m from the ESF. Another relevant data are the number of appointments. Of the total number of appointments in the ESF-Center, on random days, 69.4% were in MA 1 and MA 2. *Conclusion:* It can be concluded that the factors distance and travel time until the health unit and other services are indexes that affect the access of the elderly to health care.

Keywords: primary health care; accessibility to healthcare; health of the elderly; medical geography

Introduction

Primary Health Care (PHC) is the entrance to promote public health, individual or collective. The strengthening of this level of care is a priority as a communication center to the Healthcare Network (HCN) of the Brazilian Public Health System (SUS). It means that the PHC works as a filter able to organize the flow of services in the HCN, from the simplest to the most complex ones¹.

Among the aspects that involve the strengthening of the PHC, some fundamental tools have come up to better understand the situation of the community, one of them being the medical geography, aiming to know the territory. Health geography encompasses the occurrence of health problems enabling a process which gathers actions of health surveillance, diseases and their determinants, care and organization of health services, and health promotion².

Facing this reality, the National Curriculum Guidelines of the Medicine Course determine that the medical student should understand the social, cultural, behavioral, psychological, ecologic, ethic, and legal determinants, at both individual and collective levels, of the health-disease process³. Thus, the student learns about personal, family, work, epidemiological, and environmental contexts, as well as about other pertinent contexts. They also learn about Social Determinants of Health, which are a set of factors that characterize the particularities of the individuals and the

understanding of the way of life in the collective⁴.

Accessibility is an important component of a health system at the moment when there is the process of searching for and moving to the health care unit⁵. Geographically, because of physical barriers, this lack of accessibility leads to a disturbance concerning the location of the individuals and the services, which makes it more difficult for the population to use the services⁶.

The elderly are the target of this study, since they have been increasingly in need for health services as a result of the fast rate of population aging and the frequent association of longevity to chronic conditions of diseases, which can lead to a scarcity of support programs⁷. One of the challenges consists in the geographic accessibility, regarding the barriers to mobility faced by the elderly to reach and be assisted at the health care units. Therefore, the present study aims to study the geographic access to one PHC inside the HCN and the possible effects in the health of the elderly.

Materials and Methods

Sampling and type of study

This is a transversal, observational of quantitative approach, descriptive and analytical study performed at Estratégia Saúde da Família – Centro (ESF-Centro (Family Health Strategy)) located in Diamantina, MG, Brazil. Sampling was



made by convenience. There were no ethic issues eligible for deliberation.

Research lining

A study of descriptive data was carried out through a convenience sampling of people registered in the area encompassed by the Estratégia Saúde da Família – Centro (ESF-Centro). From the data system of the ESF-Centro in the city of Diamantina, data related to the medical appointments carried out at the unity in four days randomly selected were collected. Thus, the dates 19/Dec/2019, 02/Mar/2020, 09/Mar/2020 and 11/Mar/2020 were selected, totaling 57 appointments. The data collected from each appointment were the street and micro area in which the patients assisted lived. No other data such as names were collected.

The data requested from the coordination of the ESF-Centro about the spatial distribution of the area encompassed by the health unit, and about the names of streets of the patients assisted on the selected days were available within one week. The study of the data related to the public components of the HCN was made in one day. The data related to distance and travel time were available after gathering the information related to the public components of the HCN, to the medical appointments on the selected days, and the geographic distribution of the ESF-Centro, taking one week. In total, it took two weeks and one day to collect all the data and to organize it in graphics, tables and maps.

Inclusion and Exclusion Criteria

Dates prior to December, 2019 and dates within the COVID-19 pandemic period of total isolation were excluded from sampling.

Procedures

Characterization of the territory encompassed by ESF-Centro. ESF-Centro

provided the data about the territory it encompasses, defining its streets, the division in micro areas (MAs) and the number of residents on each one of the streets. From these data, using Google Maps, a map was made to show all the territory and its division in MAs.

Characterization of the HCN in the city of Diamantina

A study and listing of the public components of the HCN in the municipality of Diamantina was made through the database of the National Record of Health Facilities (CNES in Portuguese). Through a Google spreadsheet, a table was created presenting the name of the components, their respective names, and geographic coordinates. Next, through Google Maps, a map was created showing the HCN points in the city.

Definition of distances and travel times. To measure distance and travel time between the ESF-Centro and all the streets of its territory, Google Maps was used in two modes, walking and driving. Routes of shorter distances between the geographic coordinates of the ESF and the geographic coordinates of a middle point of each street were selected. To analyze and construct the tables in the Google spreadsheet, the streets were divided in intervals according to the distance to the ESF and the average travel time was calculated for the streets of each interval. Using the same methodology, the distances and travel times between the ESF-Centro and the public components of the HCN in Diamantina were also measured.

Results

The public components of the HCN of Diamantina can be observed in Figure 1. Inside this network, it is possible to see the components of high complexity of the Consórcio Intermunicipal de Saúde do Alto Jequitinhonha (CISAJE) (Intercity Consortium of Health of the Alto Jequitinhonha Region) with the following surgery specialties (neurosurgery, general

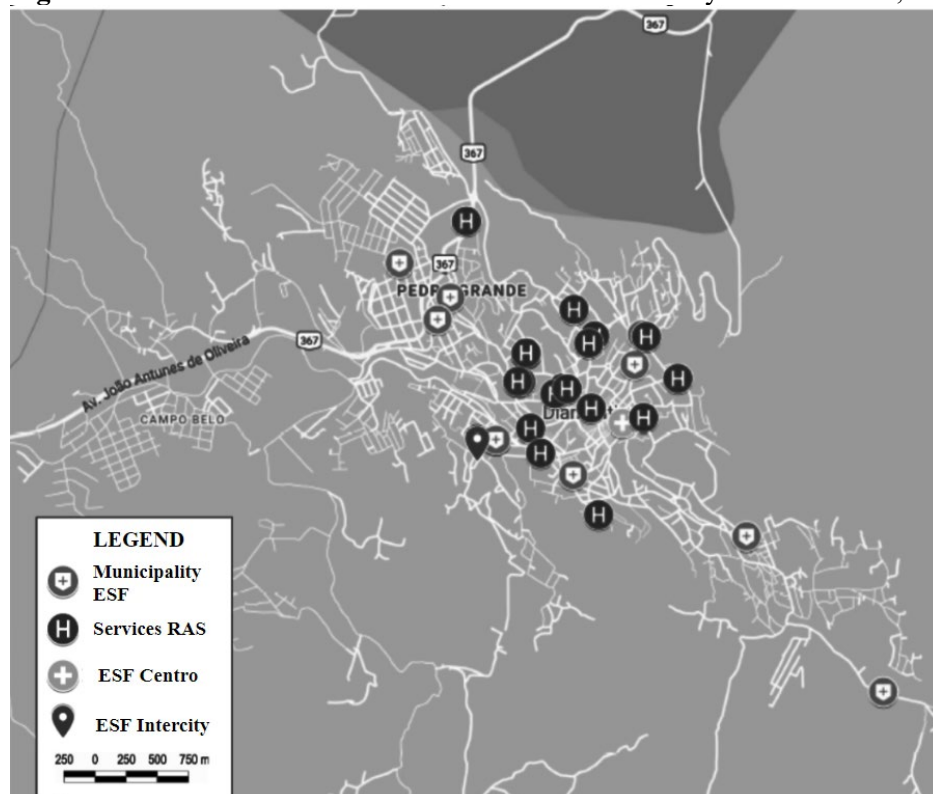


surgery, cardiovascular, gynecologic, obstetrics, nephro-urology, orthopedic traumatology, otorhinolaryngology, and oral and maxillofacial surgery) and clinical specialties (pneumology, neurology, nephro-urology, geriatrics, dermatology, cardiology, mental health, neonatology, obstetrics, pediatrics, and general clinic).

This network is regulated by the Superintendência Regional de Saúde (SRS) of Diamantina, which manages 34 cities

with a total of 446,753 inhabitants. Generally speaking, the network has two hospitals (with ambulatory and medium and high complexity hospital activities, with clinical, laboratory, surgical, hemotherapy services, and neonatal, pediatric and intense care beds), 11 municipal units of PHC and 13 intercity units, a clinical analyses laboratory, a basic pharmacy and a blood bank.

Figure 1. Units of the Public Healthcare Network in the city of Diamantina, MG.



The area encompassed by the ESF-Centro is divided into four MAs. In this unit, there were 3,067 people registered, of whom 24.3% are older than 60, 8.2% are younger than 12, and 67.5% are between 12 and 60 years old.

By calculating a point of reference from the streets in the MAs until the ESF-Centro, it was possible to obtain the time-distance ratio, reported in Table 1. The average distance and time spent, driving and walking, from the streets of the four MAs until the ESF-Centro shows discrepancies due to different routes and speeds available for both modes. In MA 1, 66.66% of the streets are at a distance between 0 and 400 meters until the ESF-Centro, with an average travel time of 3 minutes walking and 1.3 minutes driving. 27.77% of the streets are within an interval of 401m to 800m, and the average travel time is 10 minutes walking and 3.2 minutes driving. 5.57% of the streets are at over 801m of distance, with average travel time of 16 minutes walking and 5 minutes driving.

Table 1. Distance and travel time between the streets of the four micro areas and the ESF-Centro.

Micro area 1

Distance walking

Intervals	Number of streets	Number of people	Average travel time
0 - 400	12	395	3 min
401 - 800	5	177	10 min
Over 801	1	204	16 min

Distance driving

Intervals	Number of streets	Number of people	Average travel time
0 - 400	12	395	1.3 min
401 - 800	5	177	3.2 min
Over 801	1	204	5 min

Micro area 2

Distance walking

Intervals	Number of streets	Number of people	Average travel time
0 - 400	25	257	3.5 min
401 - 800	11	513	7.3 min
Over 801	-	-	-

Distance driving

Intervals	Number of streets	Number of people	Average travel time
0 - 400	11	76	1.9 min
401 - 800	16	225	3.8 min
Over 801	9	469	5.9 min

Micro area 3

Distance walking

Intervals	Number of streets	Number of people	Average travel time
0 - 400	2	172	6 min
401 - 800	10	597	9.7 min
Over 801	-	-	-

Distance driving

Intervals	Number of streets	Number of people	Average travel time
0 - 400	-	-	-
401 - 800	5	417	4 min



Over 801	7	352	5 min
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Micro area 4			
Distance walking			
Intervals	Number of streets	Number of people	Average travel time
0 - 400	-	-	-
401 - 800	2	229	10.5 min
Over 801	6	523	13.7 min
Distance driving			
Intervals	Number of streets	Number of people	Average travel time
0 - 400	-	-	-
401 - 800	1	224	3 min
Over 801	7	528	4.6 min

In MA 2, 69.44% of the streets within its territory are at a distance between 0 and 400m until the ESF-Centro with an average travel time of 1.3 minutes walking. The other 30.56% of the streets are within an interval of 400m to 800m with an average travel time of 7.3 minutes walking. The streets distribution has a variation when considering travel time driving, 30.55% of the streets are within the interval of 0 to 400m with an average travel time of 1.9 minutes; 44.44% of the streets are within the interval between 401m to 800m with an average travel time of 3.8 minutes; and 25.01% of the streets are at over 801m of distance and the travel time is 5.9 minutes.

In MA 3, considering the routes walking, 16.66% of the streets are at a distance between 0 and 400m with an average travel time of 6 minutes and the other 83.34% of the streets are within the interval of 401m to 800 m with an average travel time of 9.7 minutes. The distribution in this MA also presents variation when considering the travel time driving, 41.66% of the streets are within the interval of 401m to 800m with an average travel time of 4 minutes; and 58.34% of the streets are at over 801m of distance with an average travel time of 13.7 minutes.

In MA 4, to reach the ESF-Centro walking, 25% of the streets are at a distance between 401m and 800m with an average travel time of 10.5 minutes; the other 75% of the streets are at over 801 meters of distance with an average travel time of 13.7 minutes. In this MA, the distribution of the streets also has variation when driving. 12.5% of the streets are within the interval of 401m to 800m until the ESF-Centro with a travel time of 3 minutes; 87.5% of the streets are at over 801m of distance with an average travel time of 4.6 minutes.

The area of the ESF-Centro is composed of 74 streets, of which 9.46% are longer than 800m and are mostly (85.7%) located in MA 4. Moreover, the ESF assists a total of 3,067 people, 23.7% of whom live in houses on streets located at over 800m of distance from it.

Table 2 describes the distance and travel time leaving from the ESF-Centro towards the other integrative services of the HCN. It can be observed that the farthest facility is the Policlínica Regional, at 2.4km of distance walking, taking 32 minutes, the longest travel time to one service of the HCN.



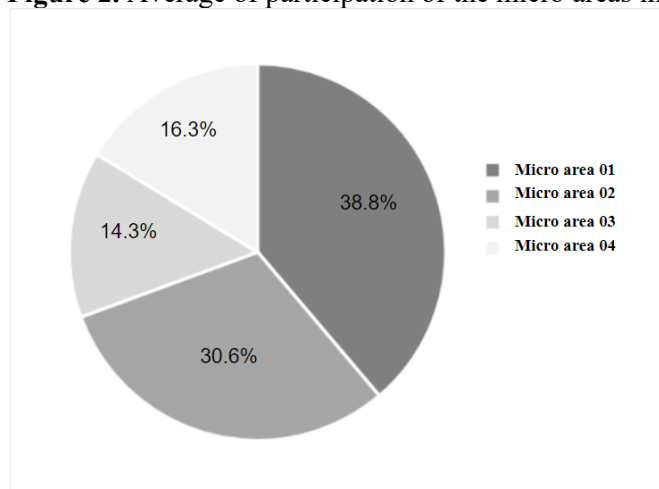
Table 2. Distance and travel time between the ESF-Centro and the units of the Healthcare Network.

Healthcare Service	Distance (walking)	Travel time (walking)	Distance (driving)	Travel time (driving)
Santa Casa de Caridade de Diamantina e Pronto Socorro	0.60 km	09 min	1.20 km	06 min
Núcleo de Apoio Psicológico	0.65 km	10 min	1.30 km	07 min
CER Diamantina - Centro Especializado em Reabilitação	0.95 km	12 min	1.20 km	05 min
Hospital Nossa Senhora da Saúde	0.85 km	10 min	0.85 km	05 min
Policlínica Regional Dr. Lomelino Ramos Couto	2.40 km	32 min	3.10 km	10 min
CISAJE - Consórcio Intermunicipal de Saúde do Alto Jequitinhonha	0.35 km	05 min	1.30 km	06 min
Hemominas - Fundação Centro Hematologia e Hemoterapia de Minas Gerais	1.00 km	15 min	1.50 km	07 min
Caps II Renascer	2.10 km	33 min	2.80 km	10 min
Caps Ad Diamantina	0.75 km	10 min	0.85 km	04 min
SAE- Serviço de Assistência Especializada em HIV/Aids	0.60 km	09 min	1.20 km	06 min
Farmácia Popular	1.10 km	16 min	1.60 km	08 min
SES- Secretaria de Estado da Saúde Minas Gerais	1.10 km	17 min	1.60 km	08 min
Secretaria Municipal de Saúde	1.00 km	16 min	1.50 km	08 min
SRS- Superintendência Regional de Saúde	1.10 km	17 min	1.60 km	08 min

Graphic 1 (Figure 2) shows that out of the 57 appointments carried out in the ESF-Centro, on random days, 30.6% were to assist residents of MA 3 and MA 4. This

percentage is equivalent to the number of MA 2 residents assisted and lower than the number of MA 1 residents assisted.

Figure 2. Average of participation of the micro areas in the services offered by the ESF-Centro.



Discussion

The access to healthcare is one of the main government targets of many democratic countries⁸, considering the importance of egalitarian access in reducing the disparities in health and the improvement in life quality⁹. In Brazil it is not different, SUS has made efforts to meet the population health needs, especially highlighting actions to promote, prevent and protect from grievances¹⁰. One example is the complex organization and integration arrangement of the technical, logistic and management system of the HCN, which acts to provide integral access to healthcare to the population of Vale do Jequitinhonha, MG. But most attention is to the primary health care, considering the efficiency of this system to solve health issue at low cost¹¹, although it still faces challenges regarding accessibility and effectiveness.

The objective of this study was to assess the accessibility of the elderly to the PHC services within the area encompassed by one ESF in the city of Diamantina, MG, Brazil, and the impact on the health of this population. The results show that, in the area of the ESF-Centro, the elderly account for a considerable part of the population, 24.3% of 3,067 people, when compared to the national average of 14.07%¹². The demographic transition, with population aging, poses a challenge to public policies¹³, especially concerning health, since the elderly is the part of the population who most need medical-hospital services¹⁴ and generate most expenses in the health budget, with hospital admissions which, mostly, come from avoidable causes¹⁵ that could be treated at the PHC.

Geurs and Wee¹⁶ state that there are four main components in the assessment of accessibility: means of transportation, individual conditions, spatial distribution and time analysis. In this study, our focus

was on the three first aspects of these authors, since they are more relevant in the analysis of elderly accessibility. Thus, by analyzing the spatial distribution inside the area encompassed by the ESF-Centro, it is evident a great geographic and socioeconomic discrepancy when comparing MA 1 and MA 2, located in downtown, where the health unit is, with MA 3 and MA 4, located in the peripheral areas and distant from the unit.

Analyzing the geographic distribution of MA 1 and MA 2, it is clear that this population has a better accessibility to the health services, as shown in Table 1. 94.87% of the streets in the area of ESF-Centro which are within a distance between 0 and 400m are in MA 1 and MA 2. So, a shorter distance directly leads to a higher use of medical services¹⁷. As shown in Figure 2, from the total appointments carried out in the ESF-Centro, on random days, the participation of these MA 1 and MA 2, together, represents 69.4%. This fact impacts directly in better results in the health of these elderly, considering the preventive action of the primary health care, avoiding chronification of several pathologies common to the elderly, such as pneumonia and cataract, and in the early diagnosis and treatment of others (cancer, diabetes, hypertension, and Alzheimer's disease), which directly improves the life quality of the public assisted¹⁸.

Moreover, analyzing the public components of the HCN (Table 2), it is important to highlight the shortest distances that the downtown streets are from the main HCN services (Popular Pharmacy, Hospital Nossa Senhora da Saúde, and Hemominas blood bank), besides the commerce and cultural services, which directly affect the binomial health – disease, based on an analysis of

social, cultural, environmental, and economic determinants of health¹⁹.

On the other hand, when analyzing MA 3 and MA 4, the outcome is the opposite, with all the streets more distant from the ESF-Centro. According to Table 1, 83.3% of the streets in MA 3 are within an interval between 400m and 800m, and 75% of the streets in MA 4 are at over 801m of distance. This increase in the distance means a decrease in the access to healthcare services²⁰. As Vaz et al.²¹ emphasizes, every 10% increase in the distance to healthcare decreases 10%-20% its use, especially when the causes of demands are not serious. This decrease in the access associated to the greater distances is evident in the results of this study, with the participation of MA 3 and MA 4, together, in the services of the ESF-Centro, accounting for less than 30.6% (Graphic 1). Thus, in the long term, this disparity in the access leads to a higher mortality rate because of prostate and lung cancer²², asthma²³, and heart attack²⁴, that is, diseases of avoidable deaths upon early diagnosis.

Regarding the impact of elderly individual conditions on the accessibility of healthcare services, it is relevant the fact that the elderly have more prevalence of noncommunicable diseases (NCDs) which leads to a decline in the functional capacity and a higher dependence for everyday activities²⁵. This disability is evident when comparing the walking speeds of adults and the elderly, with and without ailments. Thus, as pointed out by Costa et al.²⁶, the speed of adults is on average 4.5 km/h, of the elderly without comorbidities is 3.5 km/h, but of an old person with comorbidity is 1.6 km/h. This fact directly impacts our issue of accessibility, once the speed difference between healthy adults and

unhealthy old people represents a 68% reduction in the average speed of the tables, and a proportional increase in the time spent to access the healthcare services.

The economic difference is another factor that is directly related to inequalities in the access to healthcare services. Downtown residents have higher income and better health conditions, as they have their own transport and access to public and private healthcare services, whereas most of the elderly who live in MA 3 and MA 4 have worse socioeconomic conditions, do not have their own transportation, and are limited to public healthcare. According to Buzza et al.²⁷, the cost of transport represents a barrier in the access to health for the patients who are economically fragile, which results in worse access rates.

This implies the need for public policies on accessibility, such as the use of information and communication technologies, as a possible solution to face distance as an accessibility barrier, promoting early detection of pathologies and avoiding negative endings, besides contributing to health²⁸.

Conclusion

It was possible to conclude that residents of MAs located closer to the ESF-Centro have higher access to the unit when compared to those who live in more distant MAs, according to what has been described in the literature. Thus, the factors distance and travel time to the ESF and other facilities of the HCN are related to the health of the elderly since improvements in life quality are attained when there is better access to the services, due to their contribution to the preventive role of the primary health care¹⁸.

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