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INEQUALITIES OF POPULATION ACCESIBILITY TO HEALTH CARE SERVICES IN THE BOTOSANI COUNTY (ROMANIA)

ABSTRACT. The population access to health care services is conditioned on the offer of medical services, which being unevenly distributed determines a limited access of the population, especially in rural areas. The inequalities in the distribution of health resources in Botosani County show a different accessibility levels to health services, depending on the living environment, but also on some financial, educational and social aspects. Using statistical data in the period 2000–2013 and spatial analysis, this paper focuses on the assessing and interpretation of the population accessibility indicators to health services in Botosani county – a small county located in the NE part of the Romania, and which is part of the poorest region of the Romanian country, in order to highlight the inequalities outlined in the county between the rural and urban areas. The inequalities of population accessibility to health care services are due to the lack of medical facilities, the poor quality of transport infrastructure and the lack of income.

KEY WORDS: inequalities, health care services, spatial and temporal accessibility, indicators of accessibility to health services, Botosani county.

INTRODUCTION

The accessibility to health care is a multidimensional concept and can be defined as theability of a population to achieve health care services. It varies across space because neither health professionals nor residents are uniformly distributed [Luo and Wang, 2003].

According to the European Observatory glossary produced on Health Systems and Policies, availability of health care is defined by the World Health Organisation (WHO) in 1998 as "measuring the proportion of the population with the access to medical services".

The optimum access to health care means a state of affairs characterized by the provision of care and timely intervention of medical staff or paramedical authorized in situations that require the presence of the provider of health services to the home or place in which the patient is.

The accessibility, after Penchansky and Thomas [1981] as cited in Black M. et al. [2005] and updated by Oliver and Mossialos [2004] as cited in Black M. et al. [2005], is measured by availability, acceptability and addressability (socio-economic, ethnic, age, sex, costs) and geographical or spatial and physical accessibility.

The geographical accessibility measuring the level to which services are available and accessible to the population, being linked to the distribution of health care infrastructure in a specific region and the actual offer of the services and facilities [Final report..., 2008].

The geographical accessibility varies according to local conditions of transport, as

local topography. Geographical accessibility is calculated as physical distance, in kilometers, between the residence and the nearest available medical service, but also to the nearest hospital or ambulance station. The calculation of these distances is done either in line, or in the existing line access routes (roads, highways, paths etc.) and is the time used to accede to a medical facility. There is no consensus on what constitutes "away" for a health care service, but usually it is considered that an optimal distance from a primary health care service should not be more than 5–7 km and a larger hospital 25–35 km [Jordan et al., 2004]. It is considered a great distance to a medical facility may adversely affect health status [Guagliardo, 2004, cited Black M. et al., 2000].

More important than the distances, is the travel time required to access health services, which describes the temporal accessibility. There are international standards for maximum travel time to health care: 30 minutes for primary care, emergency health services, or general care for adults and children, and 90 minutes for general surgery [Department of Health, 2007; Fortney et al., 2000].

Inequalities in spatial accessibility to health care are pronounced in many emergingcountries but also persist in developed countries where medically underserved areas are often encountered in rural areas [Joseph and Bantock, 1982, Fryer et al., 1999, Robst and Graham, 2004].

It considers that access to health is a precondition for active participation in society. At EU level there are two approaches to the development of universal access: tackling "needs and nothing more necessary" and addressing "equality" [Busse R. Wörz Foubister M.T. et al., 2006].

Such equal access has come to be recognized as being as essential to public health as individual health status [Aday and Andersen 1974; Culyer and Wagstaff 1993; Oliver and Mossialos, 2004].

In the year 1974, Marck Lalonde emphasize that health can be influenced by four categories of factors including: economic development (50 %), genetic heritage, the lifestyle and the public health system, the main role in evaluating the quality of health returning to the quality of health services (15–20 %).

Because the Romanian health system is underfunded, as well as the health systems in Eastern European countries, the recent evaluations of the Romanian health system shows that it "has all the rankings red flashlight in European public health systems" [Deak, 2012].

In the last years the standard of living of the population has decreased continuously which is reflected in health care outcomes.

The inequalities in socio-economic development of the regions of Romania also influences health sector [Dragomiristeanu, 2010]. The limited state budget for health is responsible for the poor quality of health services system in Romania as a whole and the Botosani county. So that, a major concern of the Ministry of Health in Romania is to improve the access to health care services, especially for the rural population.

The differences between the richer regions and poorer, rural and urban, but also between people with high incomes compared to those with lower incomes are quite obvious for highlighting access to health services. [Gwatkin, 2001; Victoraetal, 2003].

Spatial accessibility to health service locations is usually measured through addressing the geographical barriers like travel distance or time [Cromley and McLafferty, 2012; Guagliardo, 2004].

Most existing measures of spatial accessibility are based on the potential interaction between health care providers (e.g., primary care physicians, cancer treatment centers,

hospitals, etc.) and population in needs, or offer and request [Guagliardo, 2004; Higgs, 2005; Wang, 2012].

A basic method is to measure average travel distance to nearest providers [Fryer Jret al., 1999; Goodman et al., 1992]. This method applies the straight line distance between the population point and the location of the health provider. However, travel routes are rarely straight lines in reality. It also cannot fully represent clusters of health providers in an urban setting and ignores the availability dimension of access.

Another study by Arcury et al. [2005] shows that a shorter distance between patients and physicians can increase the frequency of regular family physical exams. Other studies also confirm that early detection of disease and treatment is negatively associated with the spatial separation between medical services and patients [Campbell et al., 2000; Meyer, 2012; Monnet et al., 2006; Onega et al., 2008].

Last but not least, access to health care services is determined by the supply and demand, as this purely economic relationship functioning in health care systems.

The supply to health services characterized the access by: spatial distribution of these services; availability of staff working in these services; the quality of existing facilities; training of human resources; availability periods (program) and organizational services; type of transport, arrangements for physical access and the time required to travel. The demand affects access by individuals' attitude towards the disease, their knowledge of available services and the financial and cultural aspects of community members.

Moreover, access is also affected by timing and outcomes, and the receipt of good quality service when an individual needs it. Finally, equity in access needs to be considered for all groups in society who may differ in terms of need, socio-economic status, culture, language, and religion [Sara Allin and al., 2007].

Geographic Information System (GIS) plays an increasingly important role in understanding and analyzing accessibility to health care services, in particular, the capacity of the GIS to highlight the spatial dimensions of accessibility. GIS enables researchers to store and manage sensitive yet complicated information for both patients and health service locations [Bullen et al., 1996; Gu et al., 2010; Verter and Lapierre, 2002], measure access to health services for populations in need [Curtis et al., 2006; Lou and Wang, 2005; Wang, 2006; Wang, 2012], and analyze the evolving spatial distribution patterns of health facilities [Gesler and Albert, 2000; Higgs, 2005; Kurland and Gorr, 2012; Pedigo and Odoi, 2010; Ross et al., 1994].

In this paper we analyze the geographical accessibility of population to health care services in Botosani county in terms of distance and time required for a patient to receive health care services and according to the distribution of health resources.

The highlighting of the inequalities in people's access to health services can be for the local authorities a starting point or a premise for development and modernization of transport network that would provide a easy access to health care facilities.

DATA AND METHODOLOGY

The methodology of research work includes two types of analysis:

1. Quantitative Analysis, consist of the analysis of statistical data from INSSE databases, and data provided by the Public Health Department Botosani in the period between 2000–2013, on which we calculated by standardization and aggregation the health care services index.

To calculate the health care services index we used a total of 10 indicators which refer to the number and type of health facilities

and the number and types of health staff in Botosani county:

- number of hospitals/1000 inhabitants,
- number of general practician offices/1000 inhabitants,
- number of medical dispensaries and polyclinics/1000 inhabitants,
- number of beds/1000 inhabitants,
- number of pharmacies/1000 inhabitants,
- number of dental offices/1000 inhabitants,
- number of doctors/1000 inhabitants,
- number of nurses/1000 inhabitants,
- number of pharmacists/1000 inhabitants,
- number of dentists/100 0inhabitants.

This set of indicators was chosen to synthesize expressly health resources of the Botosani county, depending on available statistics data.

This index was calculated at the national level [Dumitrache, 2004; Dumitrache L., Dumbrăveanu D., 2008] and has values between 0 and 1, the values close to 1 showing better health services and the values close to 0 indicating poor health services. Based on this index we can outline a pattern of distribution of health care services in the Botosani county.

The accessibility's indicators to health care services were calculated based on distances and travel/driving times estimated using computer of Romania's road map available on Google in 2015, and they were verified on the field works with a personal car. The distances travel to the general practician offices were calculated from the house of patients to the general practician office, located usually in the center of the administrative unit. The distances of the travel to the nearest hospital were calculated like average distances from the center of the administrative units to the nearest hospital. But, it does not always express the real distance because the patients may find themselves closer to or further from health care provider or it is not always located just in the center of the commune. So, from this point of view the study has some gaps, for which we took into account the patients' average distance travel to an administrative unit.

In calculating the travel/driving times we taken into account the quality of the infrastructure of road and the weather conditions, that in winter increases the time necessary for a patient in order to access the health facilities. The winter meteorological conditions (blizzards, ice, fog) make that the roads become impassable and inaccessible for cars and means of public transport, making it impossible to move patients from rural areas to hospital, so that the travel time is doubles.

Also, often has been considered the available type of transport (car, means of transportation, or without transportation) and the average speed of transport in optimal weather or bad weather. The means of transport have a main role, because it facilitates the access to health care unit, for example a patient will get faster to general practician office if he uses a car than on foot.

Some limits of this study appear in the measurement of temporal accessibility, because we can not quantify the waiting time of a patient who needs health care. Sometimes, this waiting time has a major impact on the indvidual's health status.This can be materialized by waiting time of a means of transport needed to travel to the nearest medical facility or waiting time in front of the general practician office which can varies depending on the doctor's schedule or the number of patients.

2. The spatial analysis of the data consisted in mapping the spatial and temporal accessibility indicators and health care services index to highlight the poor areas served by health services in Botosani. For this type of analysis we are using GIS technique: SIGEP © which implies that the population of a village or administrative unit uses the same health care unit [Black M. et al., 2005], located usually in the center of the administrative unit or village.

This method is used for highlighting the shortage areas on access to health care services, beyond certain thresholds of time and distance, which is important for local and national authorities in finding solutions to improving access.

RESULTS AND DISCUSSIONS

Health care services index

Botosani County is located in the northeastern part of the Romania country and has a population of 412626 inhabitants (2.1 % of the total population) distributed in 78 administrative units, including 7 towns and 71 communes. It is the subject of this study because is located in one of the most disadvantaged regions of the country: the NE region. Material deprivation is a reality in Botosani county as also in the northeastern part of the country [Zamfirand all., 2015] and determines the population's uneven access to health services.

The low level of economic development and unemployment are barriers in access to health care facilities. The county's health resources are the four hospitals, 164 general practician offices, 1 ambulance station and emergency unit, 1 doctor per 679 inhabitants (3.2 doctors/1000 inhabitants), 1 nurse per 195 inhabitants (5.08 nurses/1000 inhabitants).

The unequal distribution of health resources and the poor quality of transport network in Botosani County (with only 56 % of the transport network in good condition) influence the population unequal access to health services.

In the last years the standard of living of the population has decreased continuously which is reflected in health care outcomes. A growing number of people have not opportunities to call the health services provided by private medical units and sometimes even to travel to the general practician offices if they are located at long distances. The public medical network shows large gaps, the main reason being the lack of funds and financial jams faced by most of hospitals.

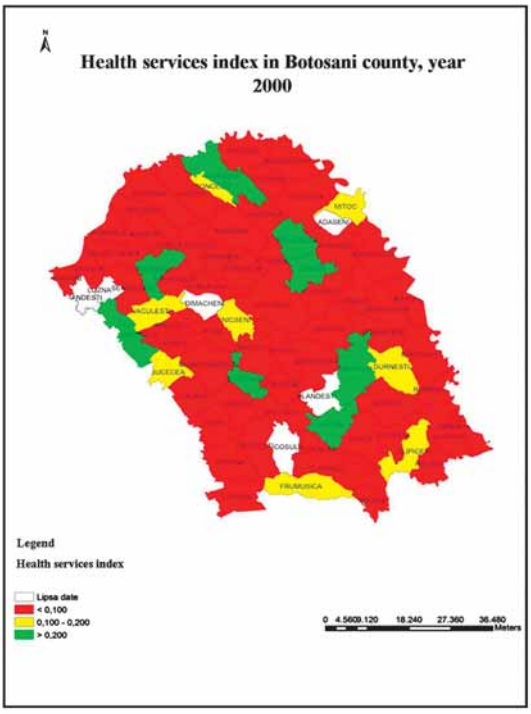
To express synthetically the quality of healthcare infrastructure in Botosani we calculated the health care services index by standardizing and aggregating health services indicators presented in the methodology part.

In 2012, the health care services index has an average value of 0.138 at county level, slightly up compared to 2000 (0.081), but below the national average of this index (0.310).

In the representation of health care services we have established three classes of index values, so lead to the shaping of health care service areas.

From the mapping representation (Fig. 1), in the 35 administrative units the health services index is rather low (values under 0.100, marked on red in the map), which indicates the poor quality of health care services and highlights those administrative units that are poorly served by health services (the NV part of the Botosani County). The two maps show that the good covered area of health care services are the urban areas, and some communes (marked on green in the maps, where the health care index has values over 0.200). This outlines a pattern of distribution of health care resources that are better represented in urban areas (hotspots areas) and poorer in rural areas (shortage areas).

The downward trend of health care services index in some administrative units is the fact that the so-called reform process of the health services has not proven to be efficiently, leading to the cancellation of public hospitals, the occurrence of private specialized medical offices, where the population access to health services is limited by the reduced income and the decreasing of the medical staff.



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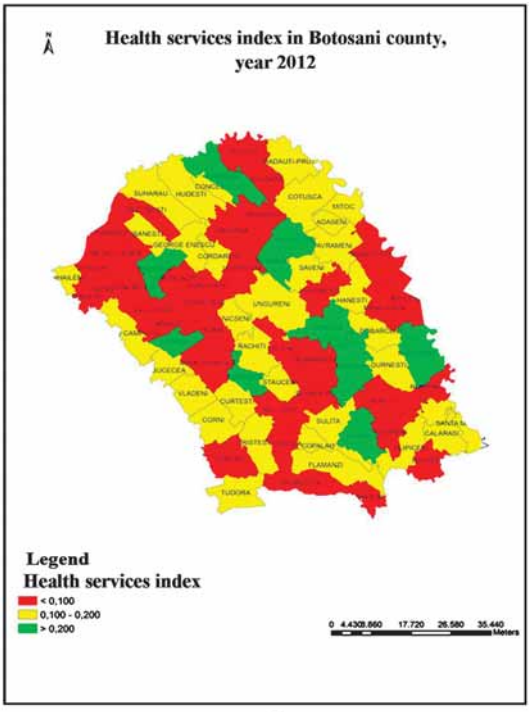

b

Fig. 1. The health services index in Botosani county, in 2000 (a) and 2012 (b)

The low coverage with medical facilities in some areas of the county reflects on people's access to health care services, which is just prevented by the lack of medical facilities or that they are located far from the patient.

The accessibility factors of health care services

The access to the health services in Botosani county is influenced by several factors (Fig. 2):

– physical-geographical factors: the relief, the weather conditions(forecasts);

– socio-economic factors: the transport network (the quality of roads, type of transport), which means the time needed for traveling the distance to fulfill the request for medical services, or to use the services of an establishment providing health services, conditioned by the quality of transport network and the weather conditions, lack of financial resources.

– health factors: the health resources (number of medical units, number of beds, number of medical staff).

In Botosani county, the analysis of physical-geographical factors is simple because the county's hilly relief is not a barrier to access the health facilities but the weather conditions may influence access to health services only in winter (snowstorm).

A limiting factor for access to health services in Botosani county is the quality of road network with only 56 % in good conditions (unpaved rural roads that become impracticable in winter) which determine higher times of transportation (travel time) for administrative units situated far away from urban centers providing health services (travel distance).

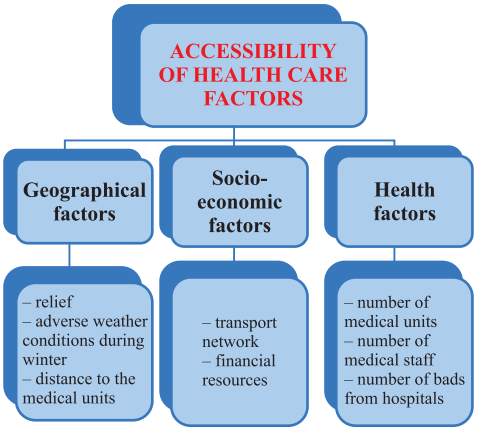

Fig. 2. The factors influencing the accessibility of health care services

THE ANALYSIS OF SPATIAL ACCESSIBILITY

In appreciation of spatial accessibility to health services, a main role is held by transport infrastructure development. Most times, a long distance can be corrected or adjusted by the existence of a well-developed transport infrastructure (eg. paved road between the two points or proper development of a communication network that emergency services can reach the namely place). Regarding the quality of roads one can say that in many administrative units of the Botosani county there are not paved road, and in a quarter of communes the distance from the nearest paved road is over 5 km. So, from the 650 km of county roads, only 56 % are in good condition.

The spatial accessibility of public health services was analyzed taking into account the average distance, that the patient has to cover up to the nearest medical unit (general practician office, hospital, permanent center, emergency unit).

In order to calculate the distances we considered the straight line distance between the nearest health care provider (which usually is located in the center of administrative units in the Botosani county) and the house of the patient who has health care needs.

Average distance from GP office is 4.8 km, which is above the average value recorded in Romania (4.2 km)[1] [Ciutan, 2008, p. 29].

These distances were calculated using road distance calculator available on Romania's road map (on the website: http://pe-harta.ro/distante-rutiere.html) provided by Google in 2015.

From the map below (Fig. 3) we can see that 27 communes (32.6 % of total county population) are located at less than 4 km distance from a GP office, 28 communes (34.89 % of total county population) are located between 4–6 km from a GP office, 23 communes (32.5 % of total county population) are situated more than 6 km from a GP office (in some communes the access to health care services provided by GP offices is a longer distance of 7.8 km like in Santa Mare commune or 12 km like in Ripiceni).

Communes situated farther than the average value of 4.8 km from the GP office can be considered disadvantaged in terms of accessibility to primary health care.

The distance to the nearest hospital is an average of 21.9 km in Botosani county, which is close to the national average value calculated for this indicator in Romania (22 km)[2] [Ciutan, 2008, p. 30].

From the analysis of the map (Fig. 4) according to this indicator we can make the following remarks: 16 administrative units (which includes 35 % of county's population) are situated less than 10 km from the nearest hospital (urban centers and the surrounding villages); 45 administrative units (48.5 % of county's population) are located between 10–30 km from the nearest hospital; 13 administrative units (14 % ofcounty's population) are located between 31–50 km from the nearest hospital, (mainly communes in the SE of the county); and 4 administrative

[1] Marius Ciutan, Aspects of health service delivery in rural areas, Health Management, 2008, p. 29.
[2] Marius Ciutan, Aspects of health service delivery in rural areas, Health Management, 2008, p. 30.

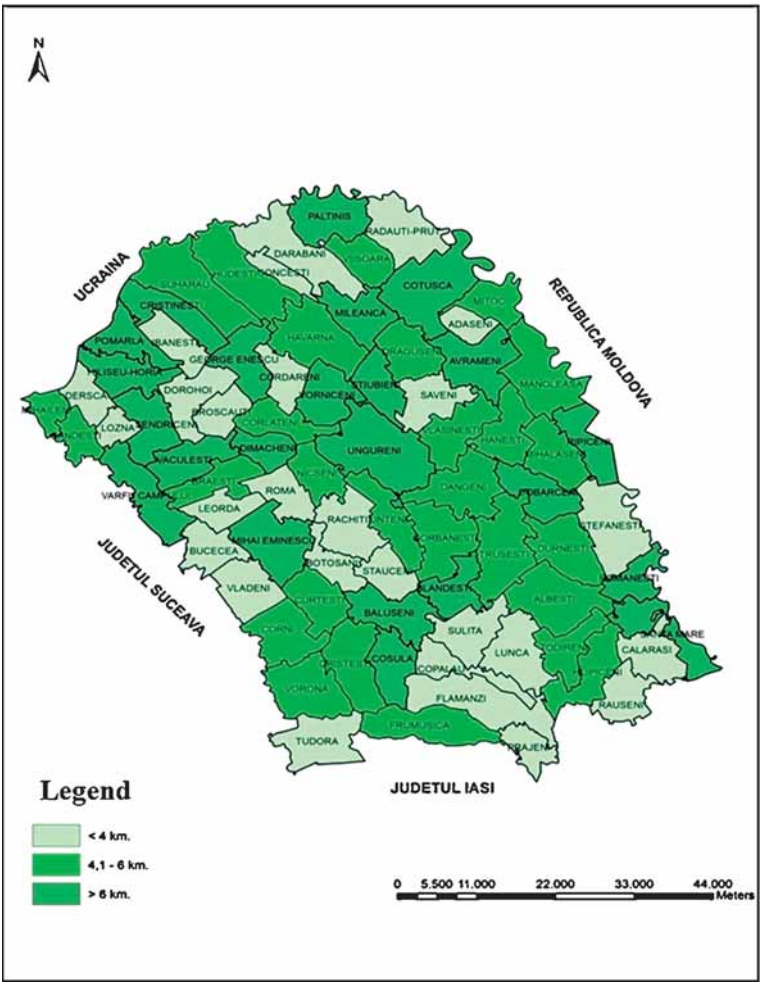

Fig. 3. Distribution of administrative units in Botosani county by average distance to GP office

units (2,5 % of county's population) are situated more than 50 km from the nearest hospital (Răuseni, Romăneşti, Santa Mare, Călăraşi).

The patients from the 17 administrative units situated in the SE of the county (which represents 16.5 % of the county's population) travel a longer distance to the nearest hospital, outlined a disadvantaged area in the county.

The average distance traveled to the nearest ambulance station. In Botosani county there is only one ambulance station located in Botosani town, which is supplemented by an emergency unit. The distance to the nearest ambulance station has an average value of 39.5 km, well above the national average of 20 km, so that the optimal access to this health service can not be provided.

The spatial distribution of administrative units after this distance indicates: 14 administrative units travel less than 20 km to the nearest ambulance station (administrative units located near the Botosani city); 24 administrative units travel between 20–40 km to the nearest ambulance station; 29 administrative units travel between 40–60 km to the nearest ambulance station.

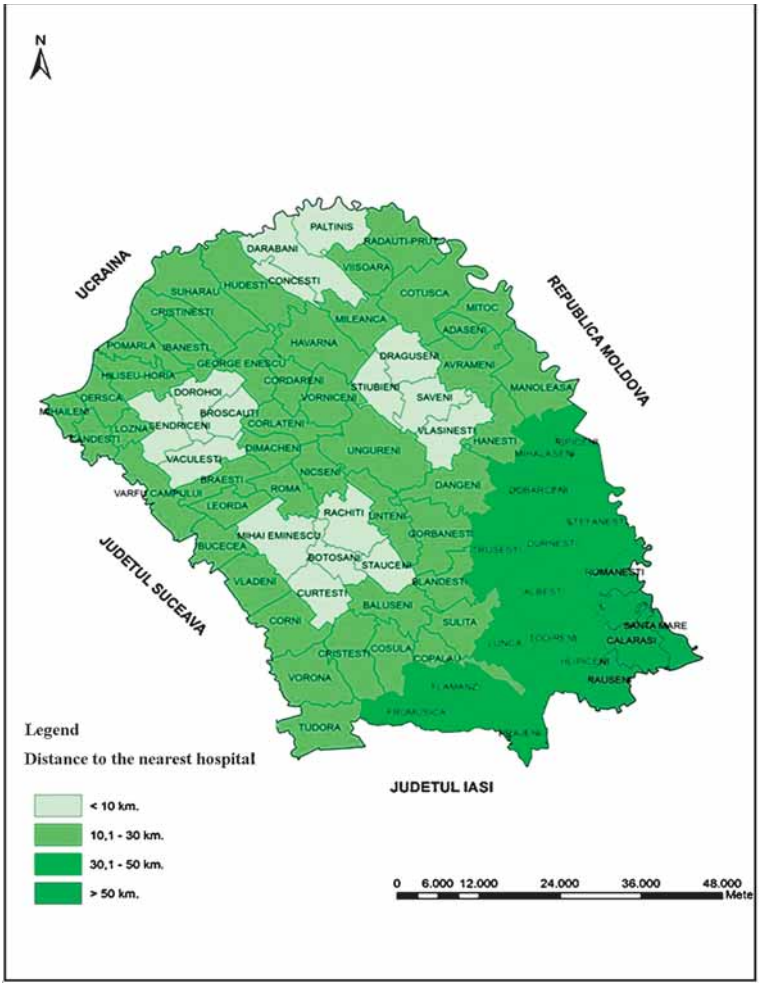

Fig. 4. Distribution of administrative units in Botosani county by average distance to the nearest hospital

The patients from11 administrative units (8.79 % of county's population) located in the N and SE part of the Botosani county travel a longer distance than 60 km to the nearest ambulance station).

The long distance to the nearest ambulance station means long travel time and some risk to the patients' health status.

In traveling these distances should be considered not only the necessary means of transport (car, minibus), but also the costs of transport which increase with the distance, and depending on the costs of fuels (gasoline, diesel).

It may be noted that the statistical indicators are almost identical to the average distances to the nearest hospital or to the nearest ambulance, explaining this by close historical relations between the location of ambulance stations and hospitals.

Due to the unequal distribution of health care resources and different distances traveled by patients to health care providers, a part of the population can not get access to health services, which can have consequences on population's health status by the occurrence of diseases or even deaths.

The analysis of temporal accessibility

The travel time, which depends on the type of transport that the patient has available, is more important to highlight the accessibility of health care.

The temporal accessibility was analyzed according to the time that the patients need in order to cover the distance to the nearest medical unit.

The calculation of this parameter (***travel/ drivetime***[3]) is difficult to perform and should be individualized depending on local and specific conditions such as type of road access (paved road, gravel, unimproved etc.), condition of road access (dismantled, impractical in winter condition or raining etc.), communication systems (telephony etc.), organization of ambulance, the type of transport (pedestrian travel, personal car or means of public transport), etc. [Ciutan, 2008, p. 96].

Travel time is influenced by type of health care sought; pacients will travel further for specialty health care needs than for primary health care [Basu J., Friedman B., 2001] and for complex medical cases than for simpler health problems.

Because the travel time is an indicator difficult to quantify in terms of actual data (requires assessment on site), we tried an analysis in terms of the following indicators:

- travel time by the patient walking to the GP office;
- travel time by the patient walking to the GP office in winter;
- driving time by car / means of urban public transport to the GP offices,
- driving time by car / means of urban public transport to the hospital,
- driving time by car / means of urban public transport to the hospital, in winter.

Travel time by the patient walking to the GP office. Depending on the distance calculated by a GP office and because we are knowing that a patient walks 1 km in 15 minutes we can calculate the travel time to the GP offices closest to all administrative units of the county.

The average walking time to the GP office averages to 72 minutes per county. The cartographic representation shows that the time required for a patient to reach the GP office varies between 45–90 minutes or more, being determined by the long distance to the GP office. Thus, there are communes where walking time to the nearest GP office exceeds 100 minutes (1 hour and 30 minutes) such as communes Mileanca, George Enescu, Sendriceni, Vorniceni Cristineşti, Santa Mare, Ripiceni Coşula,Coţuşca (Fig. 5).

The values calculated for Botosani county are above the maximum travel time to healthcare, which is 30 minutes for primary health care.

Travel time by walking to the GP offices in winter. In winter the walking time to the GP office can double due to the impracticable roads, that can be covered with snow; glazed frost or snow storm conditions are hampering the walking.

The average walking time to the GP office in winter averages to 144 minutes. The patients from 51 administrative units travel the distance in 120 minutes, but in some cases more than 200 minutes.

Travel time by car/means of public transport to the GP offices was calculated taking into account the fact that 1 km is traveled by car with the average speed of 40km/hour in 1,2 minutes.

The average driving time for the patients from the administrative units of the Botosani

[3] Marius Ciutan, National School of Health Management, Proposal for developing a strategy to target a state program focused on improving access to basic health services in underserved areas, 2008, pp. 96.

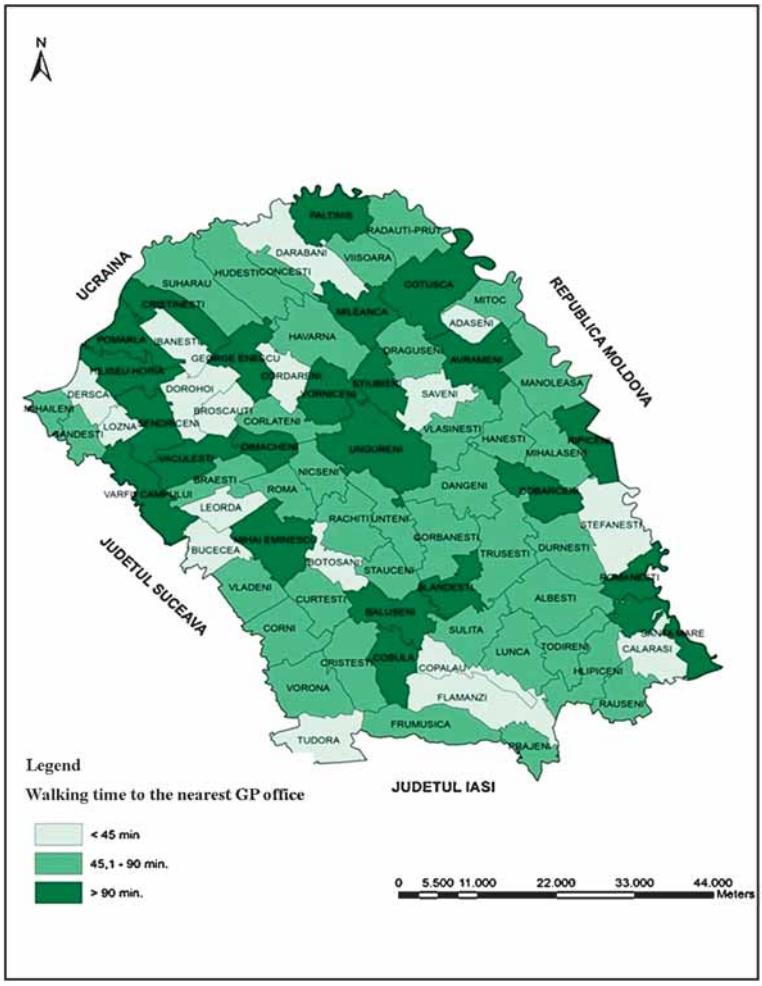

Fig. 5. Distribution of administrative units in Botosani county by average walking time to the GP office

county, is 4.8 minutes, but in some communes it is up to 8 or more minutes (for the patients from 13 administrative units).

Travel/driving time by car to the nearest hospital was calculated taking into account the transport networks, the quality of county roads and weather conditions. Considering that hospital facilities are located only in urban areas, the patients from the rural areas are forced to use their personal car for transportation or means of public transport (bus, minibus). In summer the average driving time for patients who go to a hospital is 24.2 minutes, at the county level. In Botosani county this driving time varies between 24–50 minutes, morefor patients incommunes situated in the SE part of the county, the farthest from Botosani County Hospital. For patients who do not have a car, the access to healthcare services can be prevented by waiting time of the means of public transport to move towards the hospital.

Travel time by car to the nearest hospital in winter. In winter the driving time of patients to hospital units increases due to weather conditions and difficult county roads, with an average travel time of 40 minutes (at the county level), for 14 administrative units from SE just over 60 minutes. In bad weather, the

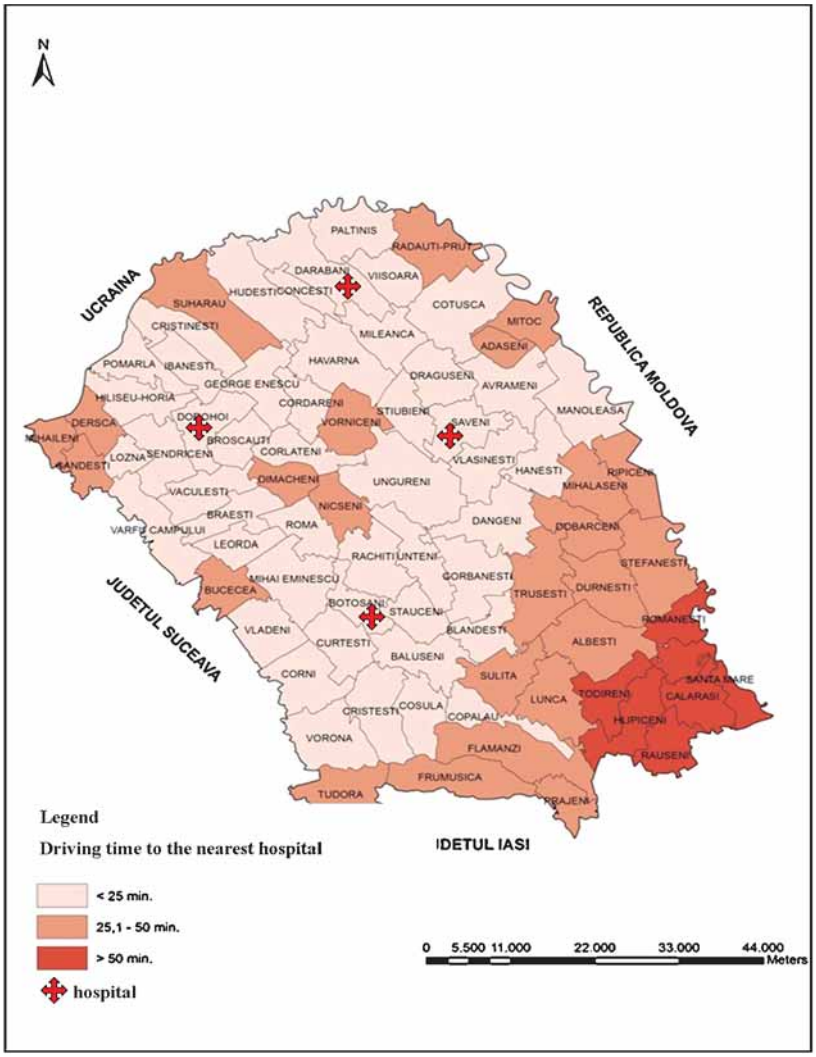

Fig. 6. Distribution of administrative units in Botosani county by average driving time to the nearest hospital

roads become impracticable and inaccessible for cars and means of public transport, making it impossible to move from rural areas to the hospital.

Travel time by car to the nearest ambulance station. At the county level, the driving time to the ambulance station is 42 minutes, a long time considering that there are patients suffering from chronic diseases and who are dependent on medical services. For the communes situated in the SE part of the county the driving time to reach the ambulance station is 60 minutes.

The long time access to health services is determined by the poor quality of county roads, 44 % of which are in mediocre condition and poor functionality.

The inequalities in travel time reflects on the population health outcomes, that may occur through worsening diseases if access to health services is not made in optimal time or badly, these may cause even deaths.

CONCLUSIONS

The analysis of available data shows that in rural areas, hospitals and ambulance stations are located at a distance over 30 km for the half of communes, so that it can not ensure better access of the population to hospital or emergency services. The time required for a patient to receive health services from hospital or ambulance station is also large enough for the rural population (over40 minutes).

The long distances to health care provider units and the long time needed to benefit on health care services determines the low accessibility to health care services in Botosani county which is caused by:

- the poor quality of transport networks of Botosani county, which causes long travel time to healthcare providers (even longer in winter),
- the poor quality and insufficient health care resources, which determines the long distance traveled by patients to the health care providers,
- the adverse weather conditions in winter, which determine difficult county roads, thus increasing the time needed to travel to the nearest medical facility/hospital / ambulance station,
- the insufficient financial and material resources, which is expressed by poverty and material deprivation, thus constituting a barrier to public access to health care.

The low accessibility of the population to health care services overlaps with urgent needs areas and high deprivation areas, which is reflecting on the population health outcomes.

There are strategies to improve the transport network in the Botosani county, but they should be correlate with the improvement of health infrastructure, so that these would reduce the inequalities in people's access to health services. ■

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Received 31.10.2015 **Accepted 25.01.2016**

DOI: 10.15356/2071-9388_01v09_2016_06

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