SPATIAL INEQUALITIES OF SANITARY RESOURCES IN BOTOSANI COUNTY AND ITS IMPACT ON POPULATION'S ACCESSIBILITY TO HEALTH CARE

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Abstract

The economic and social changes have caused an impact on the health system and health resources in Botosani County, mainly by reducing state expenses on healthcare. State budget cuts for the healthcare system have had repercussions on health resources, leading to reorganization of health care units, medical staff dynamics, check-ups and treatments dynamics, and the number of patients.

This study is aimed at highlighting the territorial inequalities and dynamics of medical units and medical personnel in Botosani county in order to show the differences in the access of the population to the health care resources.

Using statistic analysis and spatial analysis, the study offers the possibility of comparing the rural areas with urban ones, of highlighting the dynamics and inequalities of Botosani County's health infrastructure and population accessibility to these resources through indicators such as: the number of inhabitants per doctor, per general practitioner / per nurse / per pharmacy / per dentist, and the health care services index.

The analysis of health care services index shows that the rural area is disadvantaged in terms of medical resources and compared to the urban area of Botosani county, it benefits from a limited access to health services. The low coverage of medical facilities in some areas of the county reflects on people's access to health care services.

Keywords: inequalities, medical staff, spatial distribution, accessibility, health care services index, Botosani county.

1. Introduction

Health and human care were permanent concerns of the socialist state, which resulted in the reorganization of the health network, providing free medical care and preparing a growing number of doctors and other medical staff to meet the needs of the whole population.

During the communist period the Romanian health care policy was centred more on curing the patients rather than preventing the disease which resulted in larger investments being transferred towards hospital units.

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The Romanian health system has undergone a period of deep transformations, from the stage where it was almost entirely owned by the state and was coordinated by the Ministry of Public Health through the County Departments of Public Health to the current situation when most health care units are autonomous units, owned by local and county authorities. This has led to the development of a strong private sector and an increase in the number of people working in this system.

The reform of the Romanian health care system initially started in 1990, clearly focusing on several priorities: decentralisation of the health care system, restructuring of the primary health care and separating it from secondary (the polyclinics) and tertiary care (hospitals), a change in the relationship between doctors and patients by introducing the family doctor/general practitioner (GP), improvement of the quality and efficiency of health care services.

The most significant changes occurring were concerning and focused on the health care system *infrastructure* and *medical personnel* structure, due to the gradual directing of health activities towards *primary care.*

The performance of any health care system is given by its activity which is known to be determined by the two main components: the health care infrastructure and the medical staff [Dumitrache, Dumbraveanu, 2008].

The Romanian health care network is currently organised in an infrastructure of units including: hospitals, dispensaries and enterprise dispensaries (which after 1998 have been transformed into individual medical offices), polyclinics and pharmacies. The private Treatment and Diagnosis Centers have became home to individual medical centers and only provide fee- based medical assistance, the general population having to pay for each visit or medical investigation . The continuous degradation of the general health centers means that more and more people have to travel towards the nearest hospital in order to benefit from even the most basic medical care.

The medical personnel of the Romanian health care activity is relying on the following categories: physicians, stomatologists/dentists, pharmacists/chemists, ancillary medical staff and auxiliary medical staff.

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

The standard of living of the population has decreased continuously, in the last years which is reflected in the depreciation of the popualtion’s health status.

The inequalities in the socio-economic development of the Romania’s regions influences the health sector [Dragomiristeanu, 2010]. The limited state budget for health is responsible for the poor quality of national and regional health services system. Consequently, 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 the poorer, rural and urban areas, but also between people with high incomes compared with those with lower incomes are quite obvious for highlighting access to health services. [Gwatkin, 2001; Victora *et al*, 2003]. The area of residence becomes more important in countries where the differences between urban and rural areas are large, such as Romania and Bulgaria (Precupeţu, 2008).

The differences between regions and residence (urban-rural) in communist countries become more evident after 1990, as in the urban areas were introduced new medical treatments, new technologies, and private medical services, while in rural areas the health education was absent and the medical system was based on treatment not prevention (Alber and Kolher 2004).

The access to health care services is determined by the supply and demand of health care resources. The supply of health services characterizes the access by: spatial distribution of health 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 time required to travel. The demand affects access by individuals' attitude towards ill health, their knowledge of available services and the financial and cultural aspects of community members [National School of Public Health and Health Management, 2008]

According to the principle of equity in health [WHO,1946], people should have equal access to health services, which in practice is not achieved, due to inequalities in the distribution of health resources such as health facilities and medical staff.

Health service coverage reflects the interaction between the health services and the people for whom they are intended, and depends on the ability of a health service to interact with the people who should benefit from it, the ability to transform the intention to serve people into a successful intervention for their health [Tanahashi, 1978].

Universal health coverage (UHC) has been proposed as one of the targets of the Sustainable Development Goals (SDGs): "Achieve UHC, including financial risk protection, access to quality essential health care services and access to safe, effective, quality and affordable essential medicines and vaccines for all"[2]), it is likely that the mobilization of resources committed to UHC-oriented, health system strengthening will increase [WHO, 2015].

This paper is aimed at studying the health care resources in Botosani county, meaning the distribution of medical units and medical staff in order to

[2] Mexico City Political Declaration on Universal Health Coverage 2012

highlight the inequalities between the rural and urban areas and also to show the different access to the health care services.

Botosani county is located in the northeastern part of Romania and has a population of 412,626 inhabitants (2.1% of the Romania's population) distributed in 78 administrative units, including 7 towns and 71 communes. It is the subject of this study because it is located in a disadvantaged region of the country: the NE region. Material deprivation is a reality in Botosani county, as is in the northeastern part of the country [Zamfir D, Dumitrache L et all, 2015] and influences the population's uneven access to health services.

Studying the public accessibility to health services leads to the outlining of some disadvantaged or underserved areas of health care services in Botosani county.

The highlighting of the inequalities of health care services could be for the national and local authorities a starting point or a premise for finding financial solutions to supporting the medical system and for the development and modernization of the transport network, which could provide easier access to health care facilities.

2. Data and methodology

The methodology is based on quantitative analysis, consisting of the analysis of statistical data from NIS databases, and data provided by the Public Health Department of Botosani in the period between 2000-2013, which are converted into some indicators: the degree of coverage with medical staff (the number of inhabitants per doctor / family doctor/ nurse / pharmacy / dentist), the degree of coverage with health care units – in order to show the accessibility of population to the health care resources.

By standardization and aggregation we calculate an overall index of health care services and we use a total of 10 indicators which refer to the number and type of health facilities in Botosani county (eg.: number of hospitals / 1000 inhabitants, number of general practitioner offices / 1000 inhabitants, number of dental offices/ 1000 inhabitants), and the number and types of health staff (eg: number of doctors / 1000 inhabitants, number of nurses/ 1000 inhabitants, number of pharmacists / 1000 inhabitants, number of dentists / 1000 inhabitants), which have been combined using simple additive techniques. This set of indicators has been chosen to synthesize expressly the health resources of Botosani county, depending on available statistics data.

This index was calculated at national level [Dumitrache, Dumbraveanu, 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.

Another method is the spatial data analysis, using ArcGIS software and consisting of mapping the spatial inequalities of health care services index, the

health care units, the medical staff, in order to reveal the underserved areas of health care services in Botosani county.

3. Results and discussion

3.1. The activity of health care units in Botosani county, in the period 2000-2013

The county medical facilities have been subject to administrative decentralization that began in 2002, when some buildings were passed on to local administration, which is the administration of county or local councils by Government Decision no. 562/2009 for the approval of the decentralization strategy in the health system.

Consequently, some hospitals were transformed into permanent centers, others in nursing homes, others were reopened later under pressure from reacting population in various localities profoundly adversely affected by such measures (some health care units were reopened for electoral reasons, but they were not properly technically equipped).

In 2011, due to reorganization of the health services system some hospitals were restructured, becoming divisions of Mavromati County Hospital. Such was the case of Pediatric Hospital, Obstetrics and Gynecology Hospital, Psychiatric Hospital.

The medical act is provided by other health care units : six medico-social care units (Nicolae Balcescu, Mihăileni, Săveni, Suharău, Sulita, Ştefăneşti), Guranda Tuberculosis Sanatorium (closed in 2011), Dersca Sanatorium (closed in 2011), nursery schools and orphanages present only in urban areas, Agafton Retirement Home, currently operating in Leorda village.

In 2012, the public health care network of units in Botosani county included four hospitals, six health and social units, 32 medical school offices, four pharmacies (4.44%), 18 medical laboratories.

The medical units network in the private sector is well represented by 164 general practitioner (GP) offices, 119 stomatological offices, 58 medical specialised offices, and 86 pharmacies (95.56%).

The living areas reveal that rural areas are poor in medical units, having only 84 general practitioner offices, 24 pharmacies, 32 pharmaceuticals workstations, 17 dental offices – unevenly distributed within the county.

In urban areas health care facilities are better represented and distributed, being represented by medical laboratories, dental offices, emergency stations, medical specialty offices, hospitals, which are not present in rural areas (figure no.1). Thus, the most important indicator of health care infrastructure

has become the hospital-type facilitity, which provides immediate, surgical or psychiatric care and professional services to the general population.

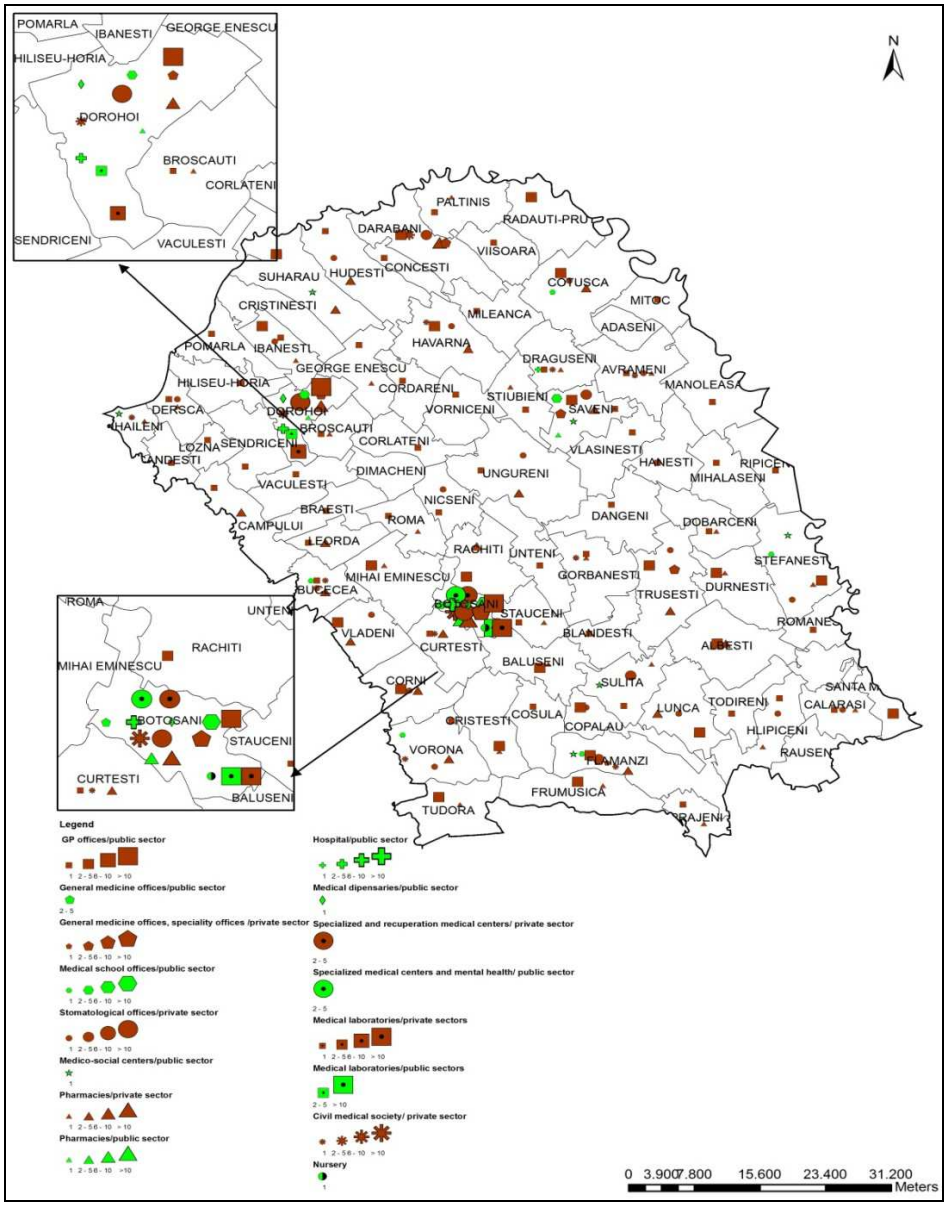


Fig. 1. Distribution of health care units in Botosani county, in 2012

The continuity of primary health care is ensured in rural areas by permanent medical centers. The permanent medical centers are organized forms of medical activity in the health system, fixed or mobile, without legal personality, operating outside the program of the family doctors, established and stipulated in the contract for delivery of primary health care services, according to the National Health Insurance House. In Botosani county the permanent centers were established in 2002 as a link in the emergency system between GP offices and hospitals. In 2013 there were functioning 13 permanent centers (12 fixed centers and one mobile center) with 73 physicians, of whom 68 physicians are under contract with the Botosani Health Insurance House.

The extent of coverage with health care units serving the population of Botosani county can be seen in table no. 1 and shows the 4 hospitals in Botosani County serving 185,505 inhabitants in the urban area and 256,911 inhabitans from the rural area. This results in the fact that one hospital serves an average of 46,376 inhabitants from the urban area (24.9% of the urban population) and 64,227 people from the rural area (24.9% of the rural population).

From the table no.1 can be inferred the following:

- One GP office serves 2,318 urban residents and 3,058 rural inhabitants;
- One pharmacy serves an average of 2,810 inhabitants of the urban area and 107,704 inhabitants of rural areas;
- One stomatological office serves 1,818 residents from the urban area and 15,112 rural residents;
- One ambulance unit serves 92,725 inhabitants of the urban area and 128,455 inhabitants of rural areas.

The inequalities in the coverage of the population with medical units are obvious between the two areas of life, which is due to several causes: the level of development of the two regions; the higher number of rural population; the poor quality of transport network; the lack of appeal of rural areas to the medical staff.

Thus rural areas are more poorly covered with medical units than the urban area, which results in a polarization of medical facilities in the urban area and poor coveage of the rural ones with medical facilities.

Table 1

Indicators of coverage/uncoverage with medical units in Botosani county

Indicators of coverage/uncoverage	Urban areas	Rural areas	Overall county
Number of villages without familiy doctors	0	1	1
Number of villages without familiy doctors and nurses	0	1	1
Number of villages without GP offices	0	2	2
Number of villages without permanent centers	1	35	36
Number of villages without speciality medical offices	0	14	14
Number of villages without pharmacies	0	27	27
Number of inhabitants/hospital	46376.25	64227.75	110604
Number of inhabitants/ GP office	2318.81	3058.46	2697.659
Number of inhabitants/ pharmacy	2810.68	10704.63	4915.733
Number of inhabitants/ dental office	1818.67	15112.41	3717.782
Number of inhabitants/emergency unit	92752.5	128455.5	221208

Source of data: NIS, 2013

3.2. The activity of medical staff

The dynamics of the medical staff oscillated and was relevant for Botosani county in the period 2001-2013 (figure no. 2).

The number of doctors was decreasing from 2001 (597 physicians) to 2007 (533 physicians) and then there was a slight increase in the number of medical staff which in 2013 consisted of 587 physicians, unequally distributed: 450 physicians in urban areas and 103 physicians in rural areas.

The oscillating dynamics of the number of physicians in the health system is due to the artificial disappearance of jobs in the health care system due to personnel leaving the system through retirement or the migration of doctors and nurses to other countries, caused by the low level of payment for the medical staff.

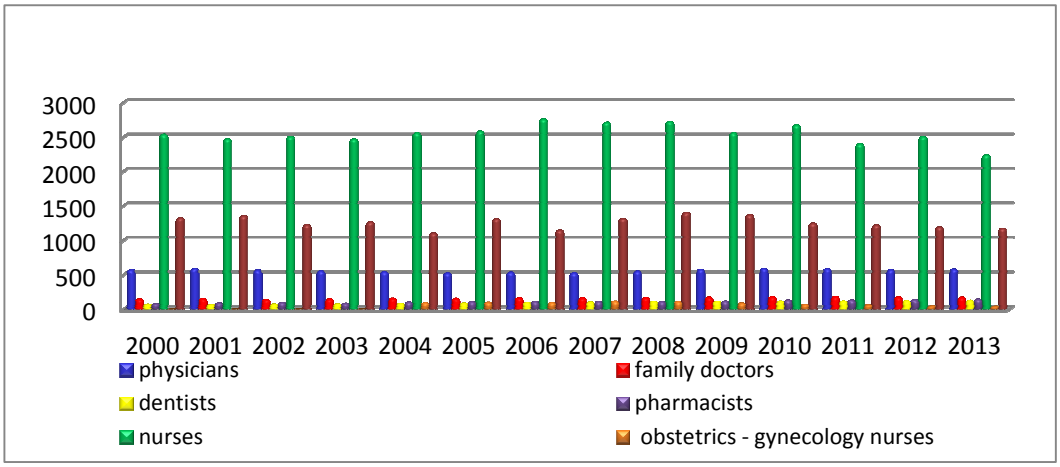


Fig. 2. Dynamics of medical staff in Botosani county in the period 2000-2013
Source of data: NIS, 2013

The number of nurses is greater, with an upward trend between 2001-2007, up from 2,522 nurses in 2001 to 2,730 nurses in 2008, followed by a downward trend to 2013, reaching a number of 2,241 nurses, their migration actually due to better paid jobs abroad.

An upward trend can be seen in the number of pharmacists and dentists. Thus the number of pharmacists increased from 82 in 2000 to 151 in 2013, due to the establishment of pharmacies in rural areas. The number of dentists increased from 72 in 2000 to 134 in 2013.

The proportion of medical staff from Botosani county highlights that: nurses exist in the highest percentage - 50%, auxiliary staff have a percentage of 26%, physicians -13%, family doctors - 4 %, pharmacists and dentists - 3%.

The distribution of medical staff reveals inequalities between the two areas of life (figure no. 3):

- With the exception of family doctors, the other medical staff are better represented in urban areas than in rural areas, pointing to the polarization of medical personnel in urban centers (Botosani, Dorohoi, Săveni Flămânzi) and the emergence of disadvantaged regions in rural areas (in the east of the county, along the Prut Valley).
- There is a lack of some categories of medical staff such as pharmacists in many administrative units of the county (Albesti, Braiesti, Cândeşti Dimăcheni, etc.) and dentists, who are present in urban areas and only in 17 communes (Avrămeni, Corni, Vlădeni, Vorona, Ibăneşti, Lunca, Mihăileni), missing in other communes.

The number of family doctors varies in the two areas of life, between 1 doctor and 2 doctors in rural areas and over 5 family doctors in urban areas.

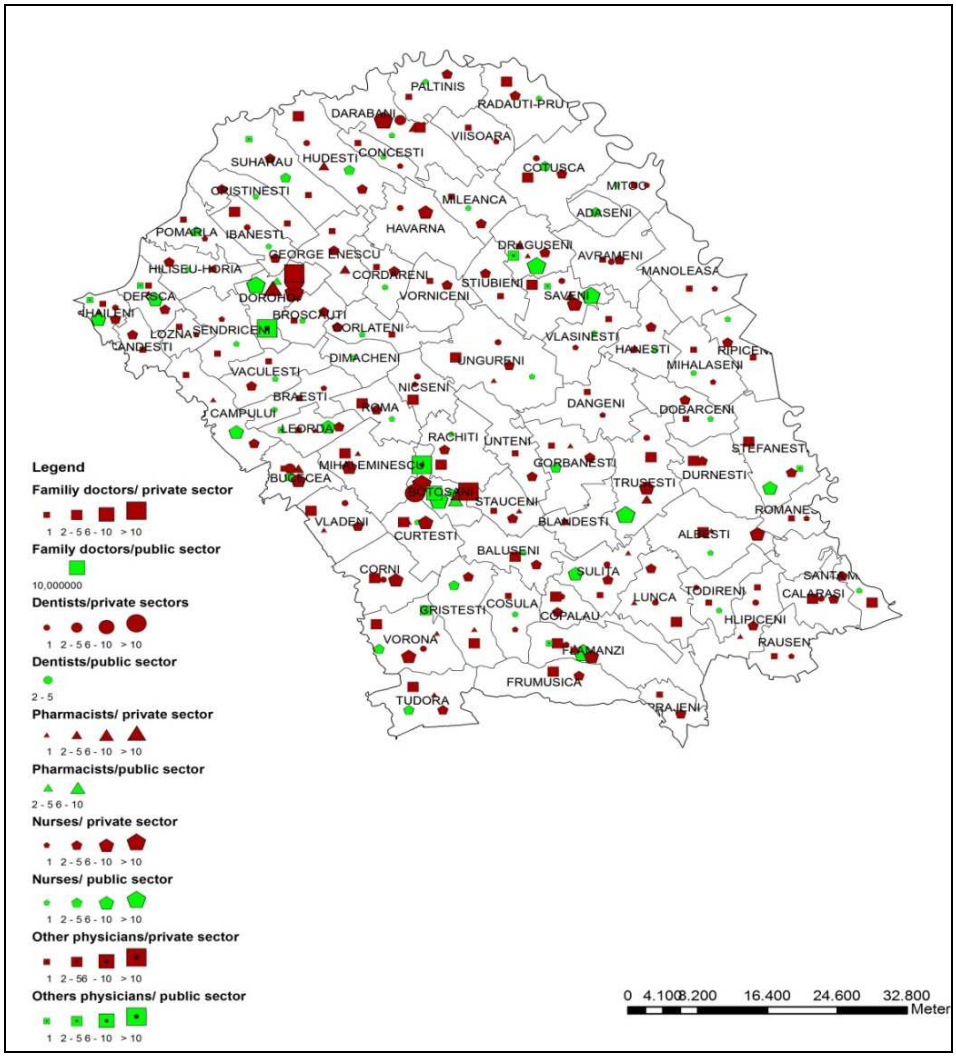
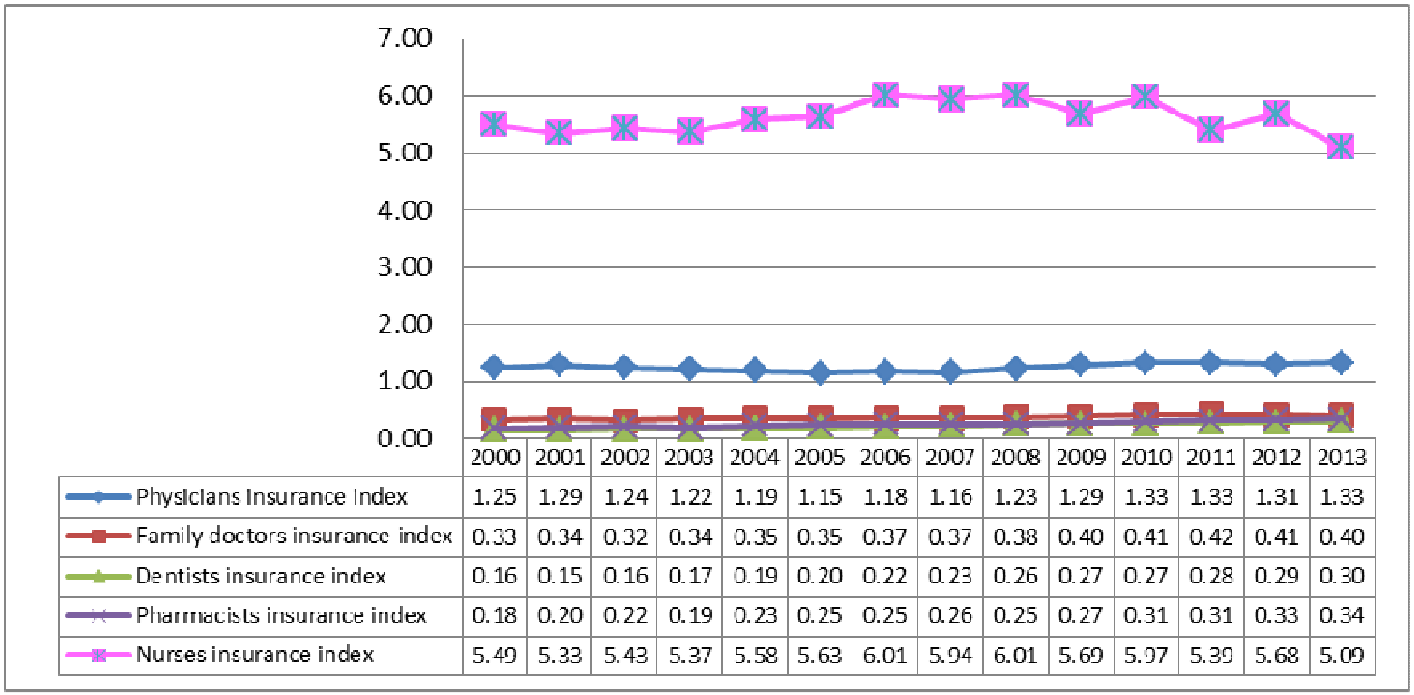


Fig. 3. Distribution of medical staff in Botosani County in 2012

The existence of medical staff expressed by insurance index can be seen in figure no. 4, which demonstrates an upward trend in the case of physicians insurance index, family doctors/ dentists/ pharmacists insurance index and a downward trend in the case of nurses insurance index.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Physicians Insurance Index	1.25	1.29	1.24	1.22	1.19	1.15	1.18	1.16	1.23	1.29	1.33	1.33	1.31	1.33
Family doctors insurance index	0.33	0.34	0.32	0.34	0.35	0.35	0.37	0.37	0.38	0.40	0.41	0.42	0.41	0.40
Dentists insurance index	0.16	0.15	0.16	0.17	0.19	0.20	0.22	0.23	0.26	0.27	0.27	0.28	0.29	0.30
Pharmacists insurance index	0.18	0.20	0.22	0.19	0.23	0.25	0.25	0.26	0.25	0.27	0.31	0.31	0.33	0.34
Nurses insurance index	5.49	5.33	5.43	5.37	5.58	5.63	6.01	5.94	6.01	5.69	5.97	5.39	5.68	5.09

Fig. 4. Dynamic of insurance indices of medical staff in Botosani county, in the period 2000-2013 (per 1000 inhabitants)
Calculated by: data of NIS and Public Health Department of Botosani 2013

The nurses insurance index decreased from 5.49 in the year 2000 to 5.09 in the year 2013, because they left the national health system and migrated to better paid jobs in EU countries.

Table 2

Coverage with medical staff indicators in Botosani county, 2013

County/ Region	Number of inhabitants per a family doctor	Number of inhabitants per a nurse	Number of inhabitants per a pharmacist	Number of inhabitants per a dentist	Number of inhabitants per community nurse	Number of nurses per a family doctor	Number of inhabitants per a health mediator [1]	Number of romas served by a mediator[2]
Botoşani	**2430,85**	**1091,89**	**1368,46**	**1421,082**	**2328,5**	**1,4**	**14**	**184**
Urban	2547,76	361,21	2295,42	4436,486	-	-	-	-
Rural	2707,78	1163,93	1277,07	1123,789	-	-	-	-

Calculated by: data of NIS and Public Health Department of Botosani 2013

The data in the above table (table no. 2) highlights the inequalities in coverage with medical personnel, in the two areas of life, the poor coverage with medical staff of rural area compared with urban areas. For example, the number of inhabitants per family doctor is lower in urban areas (2,547 inhabitans/ one family doctor) and higher in rural areas (2,707 inhabitants/family doctor). Hence, the polarization of medical staff in urban areas, while the rural areas are underserved by medical staff.

3.3. The population's accessibility to health care services

The degree of coverage of Botosani county's population, calculated by reporting the number of doctors to the total population of that locality (figure no. 5), was in the year 2013 of 679 inhabitants per one doctor, which means an insurance index of 3.2 doctors per 1,000 inhabitants.

However, there are administrative units without family doctors (0.35% of the county population does not benefit from family doctor services) and 8.59% are not registered with a family doctor.

Compared to the average value, its recorded the great inequalities between the two areas of life in Botosani County, the doctors are unevenly distributed in the county, so that the values of coverage's degree with doctors are different.

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[1] *Map of access to health services in Romania: Challenges for the Roma population*, 2013, p. 35.

[2] Idem, 2.

The number of inhabitants per doctor reveals inequalities in the county, which leads to different population's access to health care services provided by physicians.

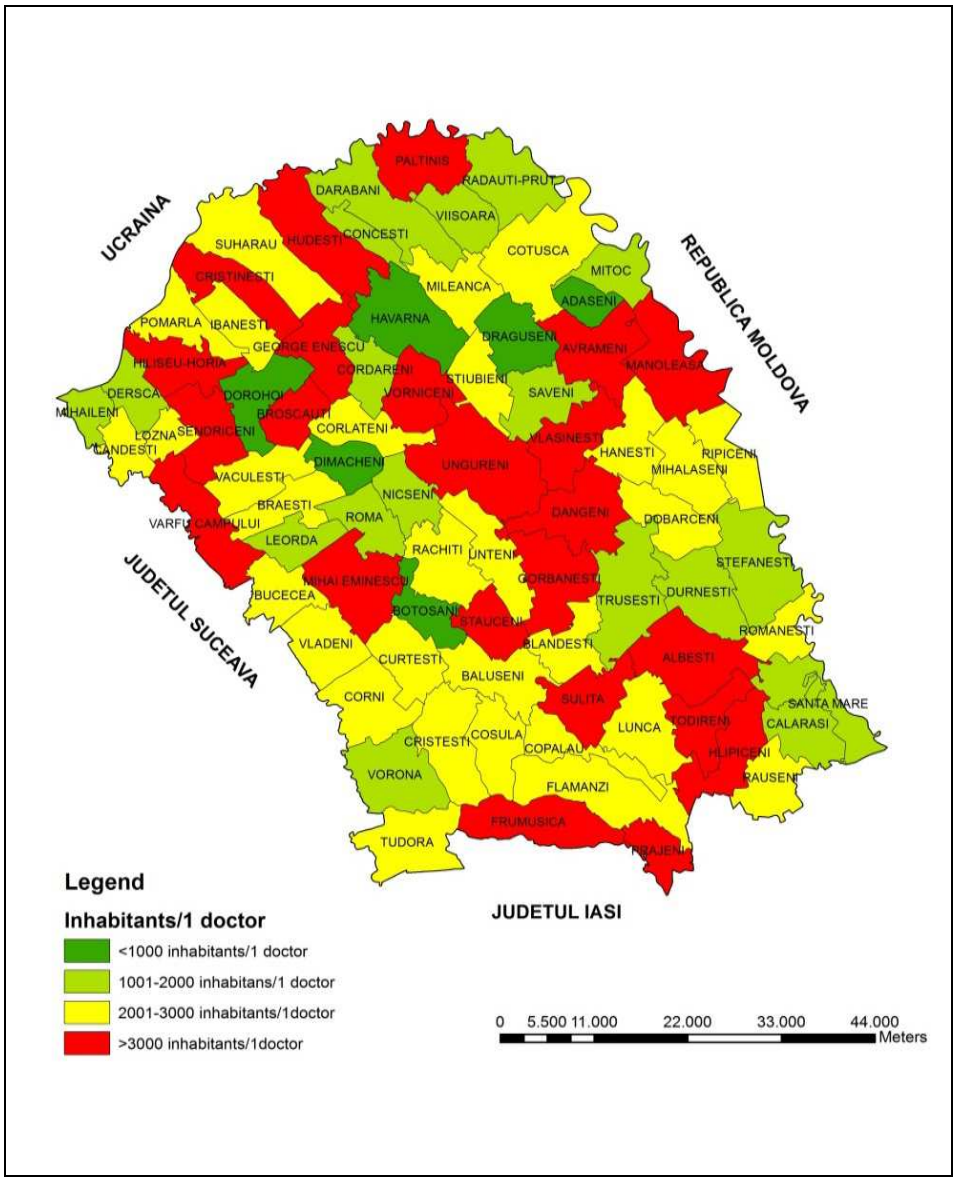


Fig. 5. The degree of coverage with doctors in Botosani county, 2012

The map below highlights the number of inhabitants per doctor in each administrative unit of Botosani county and outlines areas underserved by doctors.

We need to highlight the following areas:

a. well served areas by doctors: with less than 1,000 inhabitants/doctor: Botosani and Dorohoi, Dimăcheni, Adâşeni, Havârna etc.;
b. adequately served areas by doctors: between 1,000-3,000 inhabitants/ doctor: Mihaileni, Dersca, Viişoara, Darabani, Radauti Prut, several other administrative units situated in the SE of the county: Bucecea, Vlădeni, Corni, Cristeşti etc.
c. underserved areas by doctors: up to 3,000 inhabitants/doctor: Stăuceni, Mihai Eminescu, Avrămeni, Manoleasa, Vlăsineşti and even 4,000 inhabitants/ doctor (Sendriceni and Vorniceni).

The number of people that are serves by a nurse had an average value of 189 inhabitants in 2000, and in the year 2013 a nurse served 195.5 inhabitants (significantly above the national average of 1 nurse/170 inhabitants[3]). The nurse coverage index in 2013 was 5.08 nurses / 1,000 inhabitants, down from 2000 when there were 5.48 nurses/ 1,000 inhabitants. The degree of coverage with nurses is ranging between under 1,000 inhabitants. /1 nurse and 2,000 inhabitants/1 nurse.

3.4. Health care services index

In the last years the standard of living of the population has decreased continuously, which is reflected in healthcare outcomes. A growing number of people have not opportunities to resort to the health services provided by private medical units and sometimes even to travel to the general practitioner 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 health care infrastructure in Botosani we calculated the health care services index by standardizing and aggregating health services indicators presented in the methodology section.

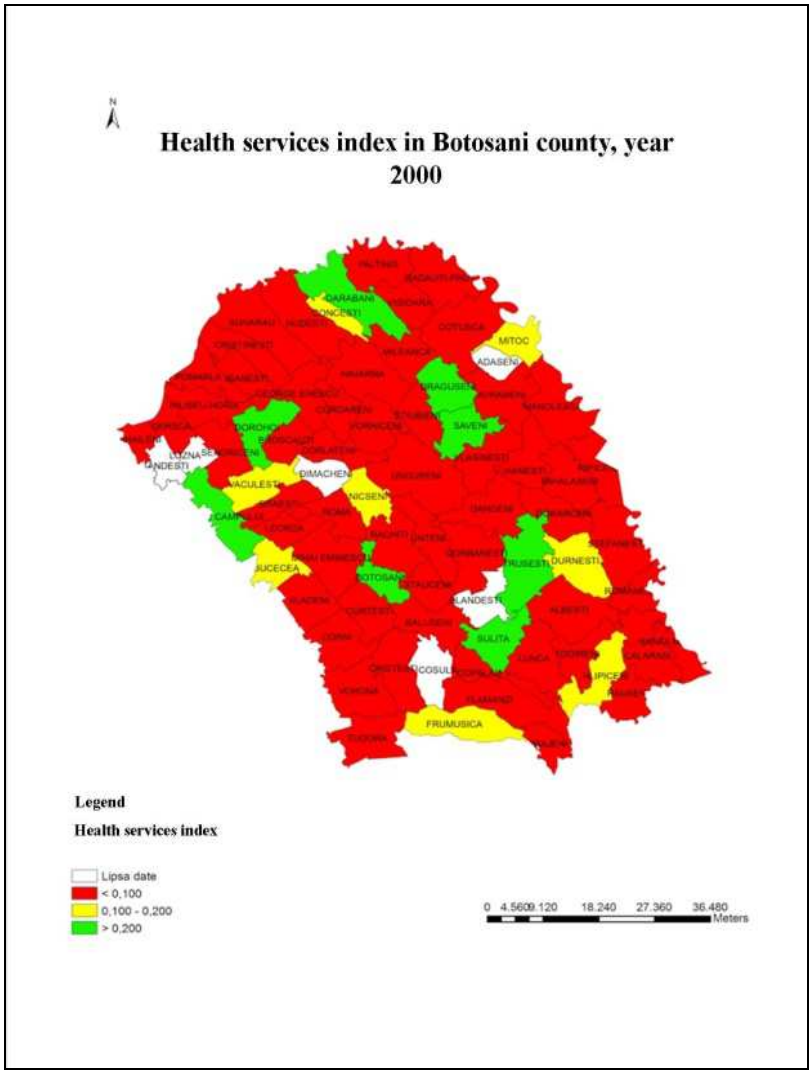
In 2012, the health care services index had an average value of 0.138 at county level, slightly up compared to 2000 (0.081), but below the national average of this index of 0.310.

In the representation of health care services we have established three classes of index values, which influence the shaping of health care service areas.

From the mapping representation (figure no.6), in the 35 administrative units the health services index is rather low (values under 0.100, marked with

[3] Activity of medical units, 2012 accesed in 3 february 2016 http://www.insse.ro/cms/files/publicatii/Activitatea%20unitatilor%20sanitare%202012.pdf

red on the map), which indicates the poor quality of health care services and highlights the administrative units that are poorly served by health services (the NW part of Botosani county). The two maps show that the adequately covered areas by health care services are the urban areas, and some communes (marked with green on the maps, where the health care index has values over 0.200). This outlines a pattern of distribution of health care resources, which are better represented in urban areas (hotspot areas) and are poorer in rural areas (shortage areas).



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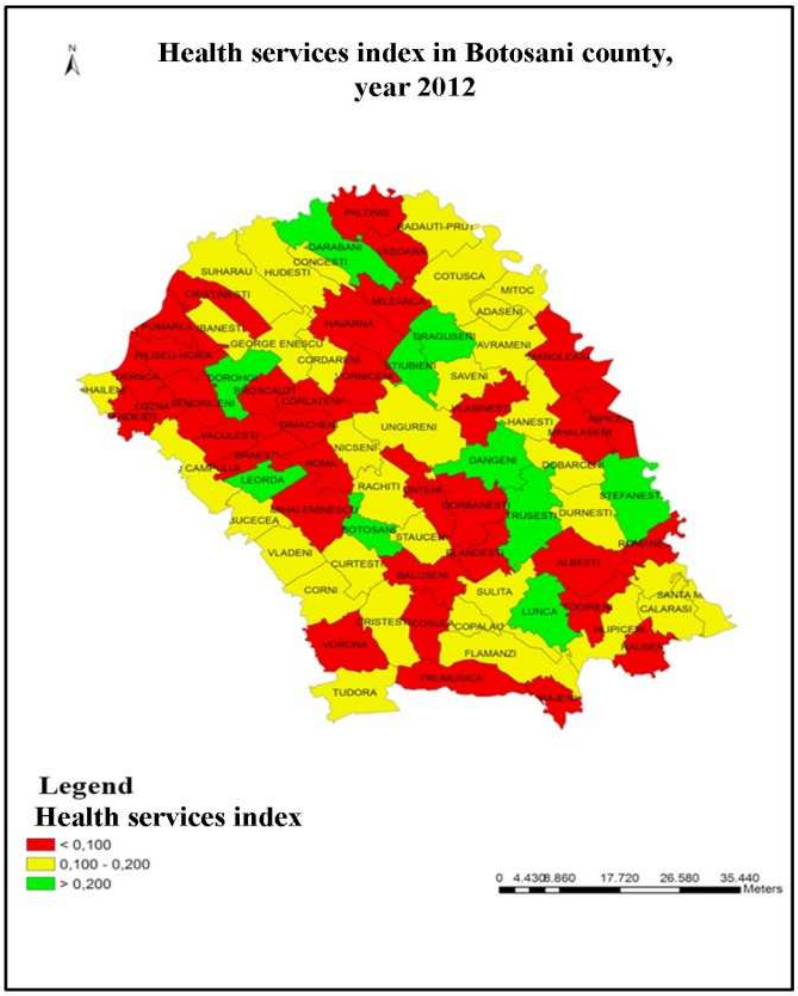

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Fig. 6. The health services index in Botosani county,in the years 2000 (a) and 2012 (b)

The downward trend of health care services index in some administrative units is due to the fact that the so-called reform process of the health services has not proven to be efficient, leading to disappearance of public hospitals, the emergence of private specialized medical offices, to which the population's access to health services is limited by the reduced income and the decreasing numbers of the medical staff.

The low coverage with medical facilities of some areas of Botosani county reflects on peopulation's accessibility to health care services, which is

prevented by the lack of medical facilities, especially in rural areas or which are located far from the patient.

4. Conclusions

The analysis of the health care units and medical personnel shows many inequalities in the rural and urban areas of Botosani county, which is reflecting in the low degree of coverage with medical units and medical staff of rural areas, that determine an unequal population's access to health care services.

The disparity between increasing demand and low offer in health care services results in several effects: increasing costs of health, limited accessibility for certain population groups (usually the ones with low income), decreasing of medical services demand in disadvantaged areas due to lack of trust in the health infrastructure and quality of care provision, increasing pressure on the medical staff and the health care infrastructure in urban centers with high health care focus, which must also serve inhabitants of disadvantaged areas, thus becoming overcrowded (especially hospitals).

Inadequate location of health care resources and medical staff at county level have led to the concentration of health care infrastructure and highly specialised medical staff in urban areas only, while rural areas are disadvantage .

The inequalities in population assistance with health care resources have a negative impact on equal provision of services, limiting the access to the health care services and in the mean time raising the health costs at both public and individual level.

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