

## Influence of Urbanization Level and Gross Domestic Product of Counties in Croatia on Access to Health Care

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**Aim** To examine the association of counties' urbanization level and gross domestic product (GDP) per capita on the access to health care.

**Methods** Counties were divided in two groups according to the urbanization level and GDP per capita in purchasing power standards. The number of physicians per 100 000 inhabitants, the number of physicians in hospitals in four basic specialties, physicians' workload, average duration of working week, the average number of insurants per general practice (GP) team, and the number of inhabitants covered by one internal medicine outpatient clinic were compared between predominantly urban and predominantly rural counties and between richer and poorer counties. Our study included only GP teams and outpatient clinics under the contract with the Croatian Institute for Health Insurance. Data on physicians were collected from the Ministry of Health and Social Welfare, the Croatian Institute for Health Insurance, the Croatian Institute for Public Health, and the Croatian Medical Chamber. Data on the contracts with the Croatian Institute for Health Insurance and health care services provided under these contracts were obtained from the database of the Institute, while population and gross domestic product data were obtained from the Database of the Croatian Institute for Statistics. World Health Organization Health for All Database was used for the international comparison of physician's data.

**Results** There was no significant difference in the total number of physicians per 100 000 inhabitants between predominantly urban and predominantly rural counties ( $206.9 \pm 41.0$  vs  $175.4 \pm 30.3$ ;  $P = 0.067$ ,  $t$  test) nor between richer and poorer counties ( $194.5 \pm 49.8$  vs  $187.7 \pm 25.3$ ;  $P = 0.703$ ,  $t$  test). However, there were significantly fewer GPs per 100 000 inhabitants in rural than urban counties ( $49.0 \pm 5.5$  vs  $56.7 \pm 4.6$ ;  $P = 0.003$ ,  $t$  test). GPs in rural counties had more insurants than those working in urban counties ( $1.749.8 \pm 172.8$  vs  $1.540.7 \pm 106.3$ ;  $P = 0.004$ ,  $t$  test). The working week of specialists in the four observed specialties in hospitals was longer than the recommended 48 hours a week.

**Conclusion** The lack of physicians, especially in primary health care can lead to a reduced access to health care and increased workload of physicians, predominantly in rural counties, regardless of the counties' GDP.

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Access to health care is achieved by even distribution of health care institutions and health workers across the country (1). Many countries encounter the problem of uneven regional distribution of physicians. In England and Wales, uneven distribution of general practitioners (GP) was found, with minimum changes over the twenty-year period of observation (2). In the USA, almost 20% of population that lives in rural regions is covered by only 9% of physicians, which presents a serious long-lasting problem (3-5). Many other countries have the same problem, such as France, Greece, Australia, Japan, and Chile (6-11). Uneven distribution is mostly a result of migration of physicians (11).

In Croatia, the organization of the health care and planning the network of health care institutions are conducted on a county level (12). After completing their internship and passing the Medical State Exam physicians get the Certificate from the Ministry of Health and the practicing license from the Croatian Medical Chamber (1,13-15). This license allows them to work in the entire territory of the country (16). At the beginning of 2007, the Croatian Medical Chamber had 16 354 members (17), of whom 9534 worked in the system of mandatory health insurance, ie, they provided their services on the basis of the contract with the Croatian Institute for Health Insurance. This includes physicians who worked at all three health care levels, including health institutes, as well as private physicians who have contracts with the Croatian Institute for Health Insurance (18-20). Furthermore, 156 physicians work for the Croatian Institute for Health Insurance Administration and 154 physicians work for the Ministry of Defense. Of the remaining physicians, 2692 who do not have contracts with the Croatian Institute for Health Insurance provide their services at the free market and

3818 physicians work outside the health system (21,22).

Croatia has fewer physicians per 100 000 inhabitants than Central and Eastern European, Nordic, most of the European Union countries, and former Soviet Union countries (23). In 2006 in Croatia, there were 276 physicians per 100 000 inhabitants, ie, 215 physicians per 100 000 inhabitants in the system of mandatory health insurance (21,22). However, several very rich countries, like the Netherlands and the USA, have fewer than 300 physicians per 100 000 inhabitants and UK and Japan have even fewer than 200 physicians per 100 000 inhabitants (23-25).

Our study aimed to show the distribution of physicians across Croatian counties and if urbanization level and gross domestic product (GDP) of counties was associated with the access to health care.

## **Material and methods**

### **Methods**

To show the regional distribution of physicians across Croatia, we used a county as an entity of regional autonomy, since health care organization is conducted at the county level (12).

Croatia is divided into 20 counties and a separate district of the city of Zagreb. Since the seats of the County of Zagreb and the City of Zagreb districts are both located in the city of Zagreb, and the hospitals in the city cover the population of both counties, these two counties were treated as a single one. We used data on physicians from all three levels of health care, including physicians working in institutions organized at the county level. Therefore, counties were used as units to analyze the access to health care.

Counties were divided in two groups according to the urbanization level (Table 1). Definition of urban and rural areas has changed over time. From the 1970s, urban

area has been defined as an area with minimum 10000 inhabitants and the population density of 1000 inhabitants per square mile (386 inhabitants per square kilometer) (27,28).

In Croatia, there are no official criteria for division into urban and rural areas, but the Croatian Law of Local and Regional Autonomy defines the city as a settlement with an administrative status of the center of a county or every settlement with more than 10000 inhabitants, which represents an urban, historical, natural, economical, and social entity. For the purpose of our study, the counties with more than 50% of inhabitants living in settlements with more than 10 000 inhabitants were defined as predominantly urban counties, while counties with more than 50% of inhabitants living in settlements with less than 10 000 inhabitants were defined as predominantly rural counties.

Counties were also divided into two groups according to the GDP per capita, measured in purchasing power standards (Table 1). The first group included 10 counties with higher

GDP per capita, while the second group included 10 with lower GDP per capita.

The number of physicians in the system of mandatory health insurance per 100 000 inhabitants and the number of physicians working in hospitals in four basic specialties (internal medicine, general surgery, gynecology and obstetrics, pediatrics) per 100 000 inhabitants was compared between predominantly urban and predominantly rural counties and richer and poorer counties. Number of physicians per 100 000 inhabitants was used as the indicator of the access to health care (2,9,10,29).

The workload of physicians in hospitals was determined by the duration of their working week in hours and the number of inhabitants covered by one internal medicine outpatient clinic. Both regular work and duties were included in the duration of the working week. General practitioner's workload was determined by the average number of insurants per general practice (GP team). Our study included only GP teams and outpatient clinics under the contract with the Croatian Institute for Health Insurance (CIHI).

Average duration of working week (in hours) of physicians in hospitals was compared between predominantly urban and predominantly rural counties and between richer and poorer counties.

The average number of insurants per GP team and the number of GPs was compared between predominantly urban and predominantly rural counties and between richer and poorer counties. The number of internal medicine specialists was compared with the number of inhabitants covered by one outpatient clinic. The number of inhabitants covered by one internal medicine outpatient clinic was compared between predominantly urban and predominantly rural and between richer and poorer counties.

**Table 1.** Demographic characteristics and gross domestic product (GDP) per inhabitant in Croatian counties

County	No. of inhabitants	GDP per capita measured in purchase parity standard (in Euros)*	Percentage of urban inhabitants
Krapina-Zagorje	142 432	7219	9.1
Međimurje	118 426	8187	25.7
Virovitica-Podravina	93 389	7665	40.1
Vukovar-Srijem	204 768	5977	41.0
Varaždin	184 769	9020	41.9
Lika-Senj	53 677	13 359	43.6
Koprivnica- Križevci	124 467	9545	44.4
Zadar	162 045	8283	44.9
Slavonski Brod -Posavina	176 765	6123	45.5
Požega-Slavonija	85 831	7488	47.9
Bjelovar-Bilogora	133 084	7793	50.2
Primorje-Gorski kotar	305 505	11 978	55.0
Istra	206 344	14 414	56.0
Dubrovnik-Neretva	122 870	9949	57.0
Šibenik-Knin	112 891	7425	59.1
Karlovac	141 787	7781	61.1
Sisak-Moslavina	185 387	7843	61.8
Osijek-Baranja	330 506	8097	62.7
Split-Dalmatia	463 676	8357	71.3
Zagreb	1 088 841	15 838	89.9
Total	4 437 460	10 531	69.7

\*GDP data for 2004 (26).

**Data sources**

The number of physicians, structure, duration of working week, and the number of insurants were taken from the database of the Ministry of Health and Social Welfare, CIHI, the Croatian Institute for Public Health, and the Croatian Medical Chamber (18,21,22,30). Data on the contracts with CIHI and health care services provided under these contracts were obtained from the database of the Institute (18,31). Population and GDP data were obtained from the Database of the Croatian Institute for Statistics (26). Data from the World’s Health Organization’s Health for All Database were used for the comparison between Croatian physicians and physicians from the neighboring countries (24).

**Statistical analysis**

Data are presented as mean ± standard deviation (SD). Parametric statistics, *t* test, and Pearson correlation were used to analyze the differences in scores between different the groups of counties (urban vs rural and richer vs poorer) and to test the relationship between the number of GPs and insurants per GP team, and the number of internal medicine specialists and inhabitants per internal medicine outpatient clinic. The level of statistical significance was set at *P*<0.05. Data were analyzed with STATISTICA software (Stat-Soft Inc, Tulsa, OK, USA).

**Results**

There were no significant differences in the number of physicians per 100 000 inhabitants between predominantly urban and predominantly rural counties (Table 2) or between richer and poorer counties (Table 3).

Significantly fewer GPs per 100 000 inhabitants were found in rural counties (Table

**Table 2.** Characteristics of physicians in urban and rural counties

Area of involvement	No. of physicians per 100 000 inhabitants in (mean±SD)		<i>P</i>	<i>t</i> (df=18)
	urban counties	rural counties		
Mandatory health insurance	206.9 ± 41.0	175.4 ± 30.3	0.067	-1.956
General practitioners	56.7 ± 4.6	49.0 ± 5.5	0.003	-3.431
Specialists*	41.6 ± 13.1	37.4 ± 12.3	0.470	-0.737

\*Internal medicine, general surgery, gynecology and obstetrics, pediatrics.

**Table 3.** Characteristics of physicians in richer and poorer counties

Area of involvement	No of physicians per 100 000 inhabitants in (mean±SD)		<i>P</i>	<i>t</i> (df=18)
	richer counties	poorer counties		
Mandatory health insurance	194.5 ± 49.8	187.7 ± 25.3	0.703	-0.388
General practitioners	55.2 ± 6.6	50.5 ± 5.3	0.091	-1.788
Physicians specialists*	36.5 ± 12.7	42.5 ± 12.3	0.303	1.060

\*Internal medicine, general surgery, gynecology and obstetrics, pediatrics.

2), but there was no significant difference between richer and poorer counties (Table 3).

In Croatian hospitals in 2006, there were altogether 849 internal medicine specialists, 490 surgery specialists, 298 gynecology and obstetrics specialists, and 345 pediatrics specialists.

The number of specialists in the four observed specialties per 100 000 inhabitants was not significantly different between predominantly urban and predominantly rural counties (Table 2), nor between richer and poorer counties (Table 3).

Physicians’ workload in hospitals was determined as the average duration of their working week in hours. The working week of specialists in the four observed specialties lasted for 59.7 ± 4.9 and 61.5 ± 6.1 hours (*t*<sub>18</sub> = 0.727; *P* = 0.477, *t* test) in predominantly urban counties and predominantly rural counties, respectively. The working week of specialists in the four observed specialties lasted for 59.9 ± 4.9 and 61.4 ± 6.1 hours (*t*<sub>18</sub> = 0.594; *P* = 0.560, *t* test) in richer counties and poorer counties, respectively.

GPs' workload was determined according to the number of insurants per GP team. Average number of insurants per GP team in Croatia amounted to  $1645 \pm 410$ . The greatest number of insurants per one team was found in Slavonski Brod-Posavina County ( $1971 \pm 316$  insurants) and the smallest number ( $1390 \pm 339$ ) was found in the Primorje-Gorski Kotar County. At the same time, the fewest GPs per 100 000 inhabitants ( $n = 43$ ) worked in the Slavonski Brod-Posavina County, while the GPs per 100 000 inhabitants ( $n = 64$ ) worked in the Primorje-Gorski Kotar County. The number of GP teams per 100 000 inhabitants in certain counties and the number of insurants per team were negatively correlated (Figure 1).

The number of insurants per GP team was  $1540.0 \pm 106.3$  in predominantly urban counties and  $1749.0 \pm 172.8$  in predominantly rural counties. The number of insurants per GP team was significantly smaller in predominantly urban counties than in predominantly rural counties ( $t_{18} = 3.259$ ;  $P = 0.004$ ,  $t$  test).

The number of insurants per GP team was  $1588.2 \pm 174.1$  in richer counties and  $1702.3 \pm 167.1$  in poorer counties. There was no significant difference between richer and

poorer counties in the number of insurants per GP team ( $t_{18} = 1.495$ ;  $P = 0.153$ ,  $t$  test).

No significant difference was found in the number of inhabitants covered by one internal medicine outpatient clinic between predominantly urban ( $19286.4 \pm 7750.5$ ) and predominantly rural counties ( $18892.0 \pm 5687.6$ ) ( $t_{18} = -0.130$ ;  $P = 0.900$ ,  $t$  test) nor between richer ( $19926.1 \pm 6503.6$ ) and poorer counties ( $18252.3 \pm 6975.1$ ) ( $t_{18} = -0.555$ ;  $P = 0.586$ ,  $t$  test).

The number of internal medicine specialists per 100 000 inhabitants and the number of inhabitants covered by a single internal medicine outpatient clinic were negatively correlated ( $r = -0.81$ ,  $P < 0.001$ , Pearson correlation).

## Discussion

This study showed that there was an insufficient number of physicians in certain counties. The greatest number of physicians per 100 000 inhabitants worked in predominantly urban counties, ie, in big urban centers. On the other hand, in certain predominantly rural counties the number of physicians per 100 000 inhabitants was smaller than 150. This uneven distribution of physicians is not characteristic only of Croatia, but it is also evident in many other countries (2-10,29). Unlike in other countries, the salaries of Croatian physicians cannot be an explanation for uneven distribution of physicians between richer and poorer counties (32-34).

One of the explanations can be the migration of physicians (11). Physicians choose the place of their employment depending on the offer and demand on the labor market and on the advantages that each environment offers. As early as during their internship, physicians mostly choose to work in the City of Zagreb, rather than in other parts of Croatia (35), since an urban environment may offer more possibilities for physicians in their professional and private life (36,37).

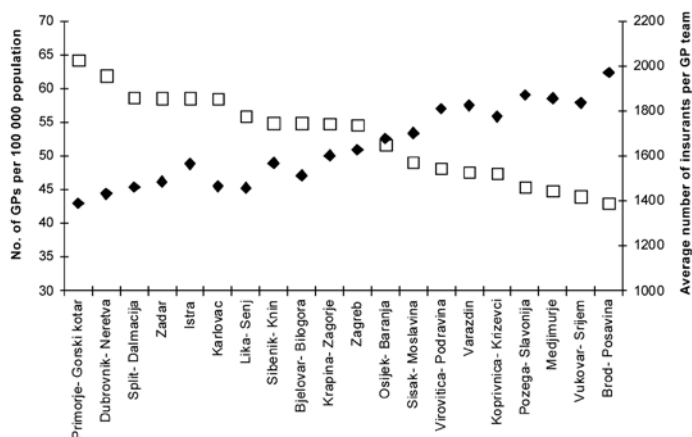


Figure 1. Relationship between the number of general practitioners per 100 000 inhabitants (open squares) and the average number of insurants per one contractual team (closed rhombs) ( $r = -0.96$ ,  $P < 0.001$ , Pearson correlation).



We did not find an uneven distribution of physicians between richer and poorer counties. Although counties are responsible for health organization on their territory, they do not contribute considerably in the financial sense. The physicians' incomes are defined on the national level, and the counties participate in financing the costs of health care with only 1% of the budget (38,39), so it cannot be expected that the GDP of a county considerably affects the migration of physicians.

In spite of the uneven distribution of specialists among the counties, no significant difference was found in specialists' workload, shown through the duration of the working week in hours.

Urbanization and GDP of the counties did not have an effect on the specialists' workload shown as the duration of the working week in hours; but this may not be true for the general workload of specialists. Physicians in hospitals work 60 hours a week, which is far more than 48 hours recommended by the Directive on the Working Time of the European Union and the Croatian Law of Health Care (12,40,41).

In spite of the fact that no difference in the workload of specialists in hospitals was found between the counties, higher GPs' workload was found in predominantly rural than in predominantly urban counties.

Uneven distribution of physicians between urban and rural counties influences the workload of GPs, since physicians in rural areas have on average more insurants than physicians in urban environments, which is directly reflected on the access to primary health care. Apart from the access, the insurants in rural environments also have a limited choice of GPs, and believe that they are provided with lower quality of health care than urban inhabitants (42). According to the observed criteria, the GDP of the county does not influence the access to primary health care.

Since almost 3818 physicians, members of the Croatian Medical Chamber, do not directly participate in the process of treating patients, they could be a possible source of the workforce (17). This could contribute to reaching the minimum necessary number of physicians according to the Regulations introduced by the Ministry of Health (43), decrease the workload of physicians with the duration of the working week, and increase the access of health care.

The insufficient number of physicians is a problem in more and more countries and the question arises how the medical society will be able to adequately treat the growing number of older people suffering from many chronic diseases. The long-term efforts to decrease the number of physicians on the labor market have obviously led to a shortage of physicians (44). While in the mid 1990s the health administration struggled with a large number of unemployed physicians and medical schools were suggested to decrease the number of enrolled students, Croatia is today facing a need for possible import of physicians (23).

Increased emigration of physicians from new EU member countries like Poland, Slovakia, and Hungary to older EU members was noticed soon after their accession (45,46). It is possible that emigration of Croatian physicians will increase after the accession to the EU, as will the emigration from other countries in region (22,23,47). Emigration of physicians can further increase the differences in the number of physicians between urban and rural regions (45).

We used the county as a unit of analysis, since most of the physicians work in hospitals, which are organized at the county level. However, primary health care is organized at the municipal level, so using a county as a unit of analysis can be considered a limitation of the study.

The right to health is one of the basic human rights and is, as such, guaranteed by the Constitution of the Republic of Croatia. Therefore, greater commitment from all stakeholders is required to uphold that right. To increase the number of physicians, it is necessary to offer some incitements for medical students and young physicians, such as the existing salaried internship and residency programs or solution to the housing problem. However, due to significant differences between counties, the incentives should be tailored to the needs of a specific environment rather than applied to all counties uniformly.

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