

## THE POTENTIAL OF MEDICINE IN THE REPUBLIC OF CROATIA

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### Abstract

The health system is one of the most complex systems that includes sources, participants and institutions, and relates to the financing, regulation and supply of health actions. Quality health care is one of the key goals of the welfare state. Considering the resources, the Croatian health system should achieve significantly more favorable outcomes and have a positive perception. Problems in healthcare are a significant topic for experts and the general public, because failure to solve them means a potential collapse. The aim of this work is to confirm the importance of capacity and the development of potential in health care with an emphasis on medicine through statistical analysis. The scientific contribution is manifested in the highlighting of significant factors of medicine in Croatia that describe positive trends and build the health system and shape attitudes about the functioning of the same.

**Key words:** Doctors in Croatia, education, migration, problems in the health system.

### 1. Introduction

Doctors are the bearers of healthcare and there is a continuous growth in the number of doctors as well as qualitative growth in the context of scientific development in addition to professional development. So, in every respect, the profession is developing and strengthening, and all this is accompanied by an increase in the price of labor. On the other hand, negative attitudes are formed and there are problems regarding dissatisfaction and poor working conditions of doctors, which harm the public health system and patients. From which it follows that the current situation in healthcare is not satisfactory and the public's perception of the system is negative, and the employees themselves confirm the same. We learn from the media that there are no primary health care doctors in more than 50 municipalities on the mainland and on the islands. The healthcare system lacks 2,000 doctors and 4,000 nurses. Every third doctor in the system is over 50 years old. It is legally allowed to work 180 hours of overtime per year, while

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doctors work 200/300 per month, which is about 3 million overtime hours in one year (Žorić, 2022). Doctors see 80 to 100 patients a day and can devote a few minutes to them, while a doctor in general family medicine sees about 40 patients a day. In 2021, the average waiting time was 200 days, with individual tests waiting up to 600 days, in 2022 the average waiting time is 155 days (Krnić, 2023). While on the other hand, there is a small elite group of doctors who have high salaries and receive 20% of their salary from the university and 80% of their salary from the hospital for eight-hour working hours (Index.hr, 2023a). Despite large investments and strategic guidelines for the active development of healthcare and statistically excellent parameters, the sector is under fire from the public, and solving numerous problems should be approached analytically through reforms.

## 2. Methodology

The research methodology of this paper is of statistical features, where the resources in the current data sector are analyzed. Statistical data from the annual reports from the department on human resources in medicine are reviewed with the enrollment quotas of medical schools, salary growth and workplace coefficients as positive trends and negative ones in the form of the number of healthcare institutions and the number of hospitalizations with a tendency to fall with outbound labor migration, and all this is a consequence of the negative demographic trends that have characterized Croatia since its foundation.

*Table 1. Current positive and negative trends in healthcare*

Positive trends	Negative trends
Growth in the number of doctors	The decline in the number of health care insured persons as a reflection of negative demographic trends and the natural movement of the population
The growth of the salary grade, ie the coefficient of the workplace - the growth of total expenditures for employees in health care	Reduction in the number of hospitalizations (cases of hospital treatment (acute) and days of hospital treatment (acute))
The number of Ph.D. is also increasing with the selection of scientific positions	The number of medical institutions
Enrollment quotas of about 1,200 per year at medical faculties	Outbound labor migration of doctors
Foreign doctors + doctors from Bosnia and Herzegovina and Serbia	

Source: Author's analysis

## 3. Education of doctors in Croatia

Of the total number of students enrolled in higher education programs in the field of biomedicine and healthcare, 12% of students are enrolled (State Statistical

Office, 2021). In the field of biomedicine and healthcare, there are 240 study programs in the academic year 2023/24: 15 in dental medicine, 16 in pharmacy, 19 in public health and health care, 148 in clinical medical science, 16 in basic medical science and 26 in veterinary medicine (Mozvag , study program browser). The number of students enrolled in the field of biomedicine and healthcare is continuously increasing by 18,959 in 2021/22. (table 2). In Croatia, the study of medicine is conducted at five faculties: the Faculty of Medicine of the University of Zagreb with 2,937, the Faculty of Medicine of the University of Split with 1,335, the Faculty of Medicine of the University of Osijek with 735, the Faculty of Medicine of the University of Rijeka with 1,381 enrolled students in 2023/24 and at the Croatian Catholic University, where the study of medicine began only in 2021/22. There were 862 students at the Faculty of Dentistry in Zagreb, 254 at the Faculty of Dental Medicine in Rijeka, and 1,103 students at the Faculty of Dental Medicine and Health in Osijek in 2023/24. (Students in the academic year, 2022/2023).

Strengthening the profession from a scientific point of view is also topical. There are more and more doctors of medical science in 2024, 952 doctors of science and 330 primarius are recorded as professional titles (table 2). When looking at the number of doctoral students in biomedicine and healthcare, those in the age group of 25-29 predominate, totaling 257 of them, and in the age group of 30-34, totaling 195 of them in 2022/23. year. In the field of biomedicine and healthcare in 2022/23. there were about 780 enrolled doctoral students, and 213 of them received their doctorates in the field of biomedicine and healthcare, 40 in basic medical sciences, 125 in clinical medical sciences, 7 in public health and health care, and 20 in dental medicine in 2023 (Students in the academic year, 2022/2023). In 2022, the most PhDs were at the Zagreb Faculty of Medicine, 59 in total, 32 at the Split Faculty of Medicine, 22 at the Osijek Faculty of Medicine, and 17 at the Rijeka Faculty of Medicine in 2022. In Croatia, female doctors of science dominate numerically, the same is true for the field of biomedicine and healthcare. There are more women PhDs, medical assistants and assistant professors, but analyzing the higher titles in the profession and science, men dominate (table 2).

*Table 2. Presentation of scientific and professional titles in medicine (March, 2024)*

	<b>Men</b>	<b>Women</b>	<b>In total</b>
Academics	15	2	7
Associate academics	8	3	11
Prof. Ph.D.Sc.	183	106	289
Prof. prim. dr.sc.	90	64	154
Associate Professor, Ph.D.	137	112	249
Assoc. Prof. Prime Minister, Ph.D.	89	78	167
Assoc. Ph.D.Sc.	186	164	350
Associate Professor, Ph.D.	92	97	189
Prim. Ph.D.Sc.	171	206	377
Prim.M.Sc.	84	84	168
Prim. M.Sc.	2	1	3
Ph.D.	422	530	952
Dr.sc.biomed	1		1

	<b>Men</b>	<b>Women</b>	<b>In total</b>
Dr.sc.soic.		2	2
Primarius	156	174	330

Source: Press release from the Croatian Medical Chamber

## 4. Doctors in Croatia

In the healthcare system of the Republic of Croatia at the end of 2021, a total of 75,186 healthcare workers and associates were employed, of which 5,644 were administrative workers and 11,334 technical workers. In the same year, Croatia had 3.5 doctors per 1,000 inhabitants compared to the EU average of 3.9 (OECD, 2021). In the structure of the total number of employed healthcare workers and associates, the largest share is those with a medium level of professional education, 44.3%, the share of those with a high level of professional education is 34.1%, higher education 20.7% and lower level professional education 1.0% ( Croatian health statistical yearbook for 2021, 2022). The number of health personnel is continuously growing and today there are around 16,300 doctors working in Croatia, of which around 7,400 are in the hospital system (table 4). In 2022, there were 300 more doctors in the hospital system than in 2021 (Index, 2023b). The number of inhabitants per 1 doctor has fallen drastically in two decades, in 2000 it was 393 and in 2023 it will be 240 (table 3). The average age of doctors is 45 years, there are 3,336 doctors over 60, 71 (0.4%) are foreign nationals, 667 are pensioners who work 4 hours a day. A total of 14,747 (89.9%) of them work in public institutions. while 1,657 (10.1%) of them are in private (Atlas of Medicine HLK, 2024). The general characteristics of the medical profession in Croatia are that 36.4%, i.e. 5,963, work in the tertiary level of health care, and 31.2%, i.e. 5,124, in secondary and 24.1%, i.e. 3,959, in primary health care. 4,119 are employed in clinical hospital centers, 3,394 in general hospitals, 2,290 in health centers and 1,519 in private practice (Atlas of medicine, 2024). The most residents are family medicine, 1,095, gynecology and obstetrics 770, anesthesiology, resuscitation and intensive care medicine 767, pediatrics 753, clinical radiology 620, clinical radiology 620, psychiatry 529, cardiology 424 (Atlas of Medicine HLK, 2024). Spatial distribution of doctors is greatest in regional centers. There are 5,584 doctors in the city of Zagreb, 1,336 in the Primorje-Gorski Kotar County, 1,789 in the Split-Dalmatia County, 1,094 in the Osijek County, and 100 in the Ličko-Senj County. The density of doctors is highest in the regions of larger cities as a gravitational zone where we have a smaller number of inhabitants per one doctor. In the city of Zagreb, the number of residents per doctor is 138, in Primorje-Gorski Kotar County it is 199, in Split-Dalmatia County 238, in Osijek 237, while in Lika-Senjska there are 429 residents per doctor.

Croatia is traditionally a country with a small number of doctors, which was reflected in the entire work. It is a profession that has always been highly paid with a high job coefficient. Cumulatively, healthcare employees are among the best-paid occupations, along with the finance and IT sectors (table 5). Despite the continuous increase in the number of employees in the system, the price of labor still does not fall as the law of supply and demand. At the beginning of 2024, the growth of coefficients in healthcare is recorded. Tables 6 and 7 show the positional coefficients of positions in medicine with the increases in 2023 shown.

*Table 3. Total number of doctors employed in state and private health institutions*

\*Fixed and indefinite contracts.

Year	Doctors of medicine	Doctors of dental medicine	Number of inhabitants per 1 doctor
2023.	16 374	3 999	240
2020.	15 417	3 840	262
2010.	13 286	3 331	334
2000.	11 162	3 012	393
1995.	10 457	2 658	454

*Source: Author's analysis of data from the Croatian Health and Statistical Yearbook by year*

*Table 4. Number of doctors, interns, residents and specialists by year*

Year	Doctors of medicine	Doctors of medicine working under supervision	Specialists in progress	Specialists	Doctors of dental medicine	Specialists of dental medicine	Specialists in progress of dental medicine
2023.	16 374	318	3 123	10 679	3 999	530	132
2022.	15 862	325	3 257	10 291	3 972	526	125
2021.	15 707	321	3 057	10 210	3 928	511	125
2020.	15 417	313	3 045	9 894	3 840	496	114
2019.	15 318	132	3 005	9 910	3 847	516	76
2018.	15 047	512	2 874	9 649	3 765	476	76
2017.	14 810	442	2 674	9 549	3 714	472	62
2016.	14 427	437	2 472	9 443	3 615	464	58
1995.	10 457	559	1 148	6 666	2 658	562	39

*Source: Author's analysis of data from the Croatian Health and Statistical Yearbook by year*

*Table 5. Average monthly net salary by sector and the number of employees in the 3 highest paid sectors*

	K - Financial and insurance activities	J - Information and communications	Q - health care and social welfare activities
Average monthly net salary in 2021.	868 - 1743 EUR	1 062 - 2 535 EUR	898 - 1630 EUR
Entrepreneurs number of employees in 2019	5 916	43 212	13 465
Entrepreneurs number of employees in 2023	5 058	53 780	16 442
Budget number of employees in 2019	536	268	75 567
Budget number of employees in 2022	593	313	79 923

*Source: Author's analysis according to data from Info.Biz and Portal MojPosao, 2024.*

*Table 6. Increase in coefficients of healthcare jobs voted in April, 2023.*

Jobs	Old workplace coefficient	New coefficient

Position coefficients of the first type			
Doctor of medicine with specialization, doctor of dental medicine without specialization		1,659	1,880
Master of Pharmacy, Master of Medical Biochemistry without specialization		1,659	1,825

Source: Author's analysis according to the data Srdoć (2023).

Table 7. Positional coefficient of healthcare jobs with salary calculation

Position	Number of employees	Hybrid coefficient	Current gross salary (in euros)	New gross salary
Directors of KBC, KB, HZJZ	11	4,889	4629	5014
Directors of other clinical constitutional and state institutes	12	4,470	4233	4649
Directors of hospital institutions	80	4,051	3826	4314
Directors of other health and healing institutions	25	3,456	3272	3598
Deputy director of hospital institutions	113	3,379	3199	3503
Assistant director of hospital institutions	248	3,153	2985	3399
Head of organizational unit	131	3,969	3758	4072
Head of organizational unit	362	3,537	3359	3598
Head of a stand-alone unit with over 40 employees	115	3,407	3226	3532
Head of a stand-alone unit with up to 40 employees	31	3,397	3216	3513
Doctor of medicine specialist primarius + doctor of dental medicine	91	3,461	3227	3494
Doctor of medicine specialist 1 + doctor of dental medicine	3527	3,432	3250	3418
Doctor of medicine specialist2 + doctor of dental medicine	452	3,290	3115	3314
Doctor of medicine specialist 3 + doctor of dental medicine	1073	3,195	3025	3219
Doctor of medicine	596	2,89	2581	2736
IN TOTAL	6 867			
Doctor of medicine on specialization	2205	2,538	2403	2556
IN TOTAL	2 205			

Source: Author's analysis according to data from the Regulation on job titles, schedule conditions and coefficients for salary calculation in public services, 2024.

Professional associations in healthcare HLK - Croatian Medical Chamber, HLS - Croatian Medical Union systematically, HUBOL - Croatian Association of Hospital Doctors, KoHOM - Coordination of Croatian Family Medicine, Young Doctors Initiative systematically work to promote the rights of doctors and strengthen the profession. Citizens consider the Government and the Ministry of Health equally

responsible for long waiting lists (39%), while in third place (22%) are directors of health institutions, the survey showed, and 11% of citizens consider doctors responsible for long waiting lists. Almost 9 out of 10 respondents (87 %) support an increase in salaries for doctors, 3 out of 4 respondents (74 %) support the adoption of the Law on the Labor and Legal Status of Doctors, which would regulate the rights and obligations of doctors, separately from other public services, the survey showed survey conducted by the Ipsos agency on a sample of 603 respondents in April for the Croatian Medical Chamber (Press release HLK, 2023). More than 14,000 Croatian doctors were surveyed and 97% of them are dissatisfied with their labor-legal status, and 94% of them support one or more protest activities, 73% chose a public protest. On September 24, 2022, one of the largest protests of Croatian doctors was held, according to the official, with 900 doctors (Luetic, 2022). Medical associations ask the relevant ministry and the Government to fulfill the following requirements (HLS, 2023):

- Equalization of the coefficients of the complexity of the jobs of specialists with narrow specialists, doctors in primary health care with hospital doctors, as well as increasing the coefficients for specialists by at least 10%.

With the proposal of the Regulation on coefficients, in April 2023, the Government voted to equalize the coefficient of the complexity of the work of specialists in hospital and outpatient health care and the primary level of health care. Coefficients of Position I, which include doctor of medicine resident, doctor of dental medicine without specialization, the old coefficient was 1.659, while the new one is 1.880. (Srdoć, 2023).

- Adoption of the Law on the labor-legal status of doctors by the end of the spring session of the Parliament
- harmonizing the work of doctors at all levels of health care with time and personnel norms.
- Abolition of existing "employee" contracts for resident doctors.

Young doctors are in a particularly difficult position. 1,148 of them have a contract which, in the event of earlier termination of employment, includes an obligation to return gross wages to the employer for a period equal to the duration of specialization (usually five years), and 181 doctors have an obligation to return gross wages for double the period of specialization (most often ten years). According to the current Health Care Act, if a doctor applies for a competition for specialization and signs a contract on specialist training with a health institution and terminates the contract early, the highest amount he must pay is around HRK 250,000, depending on when the contract is terminated.

In a survey in which 1,531 young doctors participated, "Satisfaction of young doctors in the Republic of Croatia: Are we going in the right direction?" carried out by the Committee for Young Doctors of the Croatian Medical Chamber, 58% of them would leave Croatia if they were offered an opportunity somewhere abroad, and the main reasons were better working conditions, better organization of the health system and better pay (Babacanli et all, 2016). The results of the survey from 2022 for the purpose of researching the doctoral dissertation in which 1,543 doctors

participated, 82.1% of the respondents answered that they believe that radical changes are needed in Croatian health care (Stanić, 2023). All relevant research describes a negative perception of the sector itself and great dissatisfaction within the profession.

## 5. Resources of health institutions in Croatia

In 2023, a total of 1,815 health care institutions were registered, of which the number of hospitals has been the same for more than a decade, 5 clinical hospital centers, 3 clinical hospitals, 6 clinics, 22 general hospitals, 35 special hospitals, 309 polyclinics and 7 sanatoriums (Croatian Health statistical calendar, 2024). In 2019, it had 566 available hospital beds per 100,000 inhabitants, which is slightly above the EU average of 532 beds per 100,000 inhabitants (OECD, 2021). Since its independence, Croatia has already recorded negative natural growth and, since 2010, a negative migration balance (table 8). The number of insured persons using health care is continuously decreasing, and in the period of the last 8 years, a decrease of 190,258 beneficiaries is recorded, while expenditures for health care employees in the same period increase by 17,800,000 euros. The number of cases of hospital treatment in the same observed period decreased by 84,596, and the total number of hospital days also decreased by 900,908 (tables 9 and 10). The number of doctors, i.e. personnel resources, tends to increase while user resources decrease, which can be reflected in the price of work, because a resource that has many prices falls, while the price of the one that is missing can be manipulated.

*Table 8. Natural movement of the population and external migration of the Republic of Croatia 2010-2020. years*

Year	Live births	Deaths	Natural increase	Immigrants	Migration	Balance
2010.	43 361	096	8 735	4 985	9 860	4 875
2020.	35 845	023	21 178	33 414	34 046	- 632

*Source: Author's analysis according to data from Women and Men in Croatia, 2022. and data from the Central Bureau Statistics, 2022.*

*Table 9. Analysis of statistical data of the health sector*

	2016.	2017.	2018.	2019.	2020.	2021.	2022.	2023.	
Expenses for employees	30.944.066 ,34 eura	31.425.514, 13 eura	31.018.517,13 eura	32.687.563,85 eura	36.11.1664,24 eura	38.309.318 eura	41.081.296,44 eura	48.701.552,12 eura	
Cases of hospital treatment (acute)	581.744	579.784	569.099	567.560	453.061	487.199	482.778	497.148	
Days of hospital treatment (acute)	3.982.298	4.019.294	3.871.332	3.798.010	3.034.097	3.266.603	3.115.123	3.081.390	
Number of insured persons	4.298.008	4.244.232	4.203.382	4.188.658	4.161.628	4.161.628	4.148.849	4.107.750	

*Source: Author's analysis according to data from the Report on the operations of the HZZO by year*

Table 10. Number of hospitals by year 1995./2023.

	1995.	2000.	2017.	2018.	2019.	2020.	2021.	2022.	2023.
Clinical hospital centers	2	2	5	5	5	5	5	5	5
Clinical hospitals	12	5	3	3	3	3	3	3	3
Clinics		7	5	5	5	3	5	6	6
General hospitals	23	23	22	22	22	22	22	22	22
Special hospitals	29	30	32	33	34	34	35	35	35
Polyclinics	21	154	353	355	358	330	321	316	309

Source: Author's analysis from data from the Croatian Health - Statistical Yearbook

In 2024, 2,014 entrepreneurs and 4,421 craftsmen were registered in the health care sector. In the same period, there were 799 businesses in the City of Zagreb, 222 in Split-Dalmatia County, 177 in Primorje-Gorski Kotar and 98 in Osijek (Info.Biz, 2024). Table 11 shows companies in the health care sector according to the year of establishment, and a significant growth of newly founded companies due to the Corona crisis is evident, and the positive trend continues, which is a reflection of the favorable business climate and good opportunities in the sector.

Table 11. Presentation of the years of establishment of companies in the field of health care

Year	Number of newly established companies	Year	Number of newly established companies	Year	Number of newly established companies	Year	Number of newly established companies
1974.	Polyclinic for hemodialysis Rovinj	1998.	41	2007.	52	2016.	74
1983.	Zagreb University Hospital	1999.	24	2008.	61	2017.	66
1990.	1	2000.	24	2009.	66	2018.	80
1991.	1	2001.	41	2010.	45	2019.	99
1992.	1	2002.	41	2011.	56	2020.	100
1994.	8	2003.	48	2012.	61	2021.	110
1995.	14	2004.	35	2013.	56	2022.	117
1996.	44	2005.	33	2014.	64	2023.	136
1997.	48	2006.	40	2015.	55	October, 2024	95

Source: Author's analysis from data from Info.Biz

## 6. Migration of doctors

From 2013 to 2023, 1,309 doctors left Croatia, and another 912 doctors expressed their intention to leave Croatia. Nevertheless, at the same time, from 2016 to 2023, 2,492 doctors and 2,187 nurses were employed (Krnić, 2023). The average age of doctors who decide to migrate is 35 with about 8 years of work experience,

of which 57% are female doctors, the most preferred destination is Germany with a total of 378, Great Britain 167, Austria 126, Sweden 112. Most of them without specialization, 789 in total, therefore dominate those without a dominant employment institution (table 12 and 13) (Atlas of Medicine HLK, 2024). There is a possibility of hiring health personnel from countries outside the EU, but it is necessary to certify diplomas, which is a long-term process (Index, 2023). The number of graduates who went to work abroad by 2024 is a total of 203, of which 92 are from the Faculty of Medicine in Zagreb, 97 from the Faculty of Medicine in Split, and 14 from the Faculty of Medicine in Rijeka (Atlas of Medicine HLK, 2024).

*Table 12. Number of migrations of doctors to work abroad by year*

Year	Number of departures of doctors abroad	Number of returning doctors abroad	Number of incoming doctors (+ doctors from Bosnia and Herzegovina, Serbia)
2013.	50	3	30
2014.	122	2	19
2015.	139	2	19
2016.	96	3	22
2017.	126	1	15
2018.	130	1	11
2019.	145	0	19
2020.	102	0	11
2021.	84	3	22
2022.	125	3	14
2023.	159	2	12
2024.	31		

*Source: Atlas of Medicine HLK, 2024 and data from the Ministry of Interior issued on request*

*Table 13. Number of doctors migrating to work abroad by type of health care institution*

Institution	Number of migrations	Institution	Number of migrations
The others	491	Private practice - doctor's office	31
Clinical Hospital Centre	161	Special hospital	33
General Hospital	144	Clinic	27
County institutes for emergency medicine	147	County Institutes of Public Health	14
Health center	131	State institutes institutes	9
Clinical Hospital	66	Private practice - concessionaires	7
Polyclinic	34	Trading companies for performing health care activities	9
Spas	1	Health care institutions	2

*Source: Atlas of Medicine HLK, 2024.*

## 7. Conclusion

A number of positive trends and strengthening of human resources in qualitative and quantitative terms are noted in Croatian health care. The number of available beds in hospitals in Croatia is above the EU average, and the number of residents per 1 doctor is decreasing. Research conducted on a sample of doctors indicates a negative perception of the profession, despite the fact that the capacities of human resources and advancement in the profession are increasing, therefore there are twice as many doctors of science and scientific staff in the field of biomedicine than professional titles of primarius, which is characteristic of healthcare, as well as the number of residents and specialist in health care institutions is growing. Medical professional associations aim to promote positive policies with the aim of solving numerous problems in healthcare, the biggest of which are related to human resources, which further burden migration. The Ministry of Health is making great efforts and is openly advocating for building a positive image of the department, and there is a continuous increase in salaries in the sector, there are numerous proposals for better working conditions. Entrepreneurship in health care shows a positive trend, and from the former 50 to 60 newly founded companies, in the last 5 years, about 120 have been recorded annually, which is a reflection of good opportunities in the sector. Statistically, all econometric data presented in this paper have a favorable sign: the capacities of the medical staff are growing and are among the highest-paid activities and are developing scientifically, while the user capacities of service seekers tend to fall, the volume of work is decreasing in terms of the number of hospital treatment cases (acute) and the number of days of hospital treatment (acute) as a direct consequence of the continuous decline number of inhabitants in Croatia. However, there is still great dissatisfaction within the medical profession and a negative perception of the public as users of health services.

## REFERENCES

- [1] Babacanli, A., Balen, I., Brechelmacher, A., Dodig, D., Đula, K., Gulić, S., Hostić, V., Juras, J., Katavić, M., Kopjar, T., Kust, D., Pintarić Japec, V., Štefančić, V., Vučemilo, L., Vučur, K., Goluža, T. (2016). Zadovoljstvo mladih liječnika u Republici Hrvatskoj: idemo li u pravom smjeru?, *Liječnički vjesnik*, 138(7–8), 179–188.
- [2] Državnog zavoda za statistiku (2022). Hrvatska u brojaka, Zagreb.  
[https://podaci.dzs.hr/media/l2wkiv1a/croinfig\\_2022.pdf](https://podaci.dzs.hr/media/l2wkiv1a/croinfig_2022.pdf)
- [3] HLS - Hrvatski liječnički sindikat (2023). Rezultati ankete liječničkih udruga.  
<https://www.hls.hr/hr/rezultati-ankete-lije%C4%8Dni%C4%8Dkih-udruga-97-lije%C4%8Dnika-nezadovoljno>
- [4] Hrvatska u brojkama, 2023. Hrvatski zavod za statistiku, Zagreb.  
[https://podaci.dzs.hr/media/rh0njfqjt/croinfig\\_2023.pdf](https://podaci.dzs.hr/media/rh0njfqjt/croinfig_2023.pdf)
- [5] Hrvatske liječnice (2020). Kolike su razlike u mogućnostima žena i muškaraca u medicini?, Liječničke novine, br 191, godina XX.  
<https://www.hlk.hr/EasyEdit/UserFiles/lnpdf/2020/ln191.pdf>

- [6] Hrvatski zdravstveno-statistički ljetopis za 1995 (1996). Hrvatski zavod za javno zdravstvo, Zagreb. [https://www.hzjz.hr/wp-content/uploads/2015/07/Ljetopis\\_1995.pdf](https://www.hzjz.hr/wp-content/uploads/2015/07/Ljetopis_1995.pdf)
- [7] Hrvatski zdravstveno-statistički ljetopis za 2000 (2001). Hrvatski zavod za javno zdravstvo, Zagreb. [https://www.hzjz.hr/wp-content/uploads/2015/07/Ljetopis\\_2000.pdf](https://www.hzjz.hr/wp-content/uploads/2015/07/Ljetopis_2000.pdf)
- [8] Hrvatski zdravstveno-statistički ljetopis za 2010 (2011). Hrvatski zavod za javno zdravstvo, Zagreb. [https://www.hzjz.hr/wp-content/uploads/2013/11/Ljetopis\\_2010.pdf](https://www.hzjz.hr/wp-content/uploads/2013/11/Ljetopis_2010.pdf)
- [9] Hrvatski zdravstveno-statistički ljetopis za 2016. (2017). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/periodicne-publikacije/hrvatski-zdravstveno-statisticki-ljetopis-za-2016-tablicni-podaci/>
- [10] Hrvatski zdravstveno-statistički ljetopis za 2017. (2018). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/periodicne-publikacije/hrvatski-zdravstveno-statisticki-ljetopis-za-2017-tablicni-podaci/>
- [11] Hrvatski zdravstveno-statistički ljetopis za 2018. (2019). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/hrvatski-zdravstveno-statisticki-ljetopis/hrvatski-zdravstveno-statisticki-ljetopis-za-2018-tablicni-podaci/>
- [12] Hrvatski zdravstveno-statistički ljetopis za 2019. (2020). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/periodicne-publikacije/hrvatski-zdravstveno-statisticki-ljetopis-za-2019-tablicni-podaci/>
- [13] Hrvatski zdravstveno-statistički ljetopis za 2020. (2021). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/hrvatski-zdravstveno-statisticki-ljetopis/hrvatski-zdravstveno-statisticki-ljetopis-za-2020-tablicni-podaci/>
- [14] Hrvatski zdravstveno-statistički ljetopis za 2021. (2022). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/hrvatski-zdravstveno-statisticki-ljetopis/hrvatski-zdravstveno-statisticki-ljetopis-za-2021-tablicni-podaci/>
- [15] Hrvatski zdravstveno-statistički ljetopis za 2022. (2023). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/hrvatski-zdravstveno-statisticki-ljetopis/hrvatski-zdravstveno-statisticki-ljetopis-za-2022-g/>
- [16] Hrvatski zdravstveno-statistički ljetopis za 2023. (2024). Hrvatski zavod za javno zdravstvo, Zagreb. <https://www.hzjz.hr/hrvatski-zdravstveno-statisticki-ljetopis/hrvatski-zdravstveno-statisticki-ljetopis-za-2023-g-tablicni-podaci/>
- [17] Hrvatskoj i plaćenim prekovremenim satima. 'Odgovor u 10 točaka, Jutarnji.hr. <https://www.jutarnji.hr/vijesti/hrvatska/vlada-lijećnicima-ovo-je-pravista-o-broju-doktora-u-hrvatskoj-i-placenim-prekovremenim-satima-15322075>

- [18] Index.hr (2023)a. Kekin: Postoji jedna mala, elitna skupina liječnika koja dobiva 160 posto plaće, portal Index.hr.  
<https://www.index.hr/vijesti/clanak/kek-in-postoji-jedna-mala-elitna-skupina-liječnika-koja-dobiva-160-posto-place/2452084.aspx>
- [19] Index.hr (2023)b. Mladi liječnici: Tražimo da se do listopada ukinu robovlasnički ugovori, portal Index.hr.  
<https://www.index.hr/vijesti/clanak/mladi-ljecnici-zelimo-bolju-specijalizaciju-i-ukidanje-robovlasnichih-ugovora/2459320.aspx>
- [20] ISVU - Informatički sustav visokih učilišta.  
<https://www.isvu.hr/visokaucilista/hr/pocetna>
- [21] Izvješće o poslovanju Hrvatskog zavoda za zdravstveno osiguranje (2023).  
Hrvatskog zavoda za zdravstveno osiguranje, Zagreb.  
[https://hzzo.hr/sites/default/files/inline-files/Izvje%C5%A1e%C4%87e%20o%20poslovanju%20HZZO-a%20za%202023.%20godinu\\_0.pdf](https://hzzo.hr/sites/default/files/inline-files/Izvje%C5%A1e%C4%87e%20o%20poslovanju%20HZZO-a%20za%202023.%20godinu_0.pdf)
- [22] Izvješće o poslovanju Hrvatskog zavoda za zdravstveno osiguranje (2022).  
Hrvatskog zavoda za zdravstveno osiguranje, Zagreb.  
[https://hzzo.hr/sites/default/files/inline-files/IZVJE%C5%A0%C4%86E%20O%20POSLOVANJU%20HZZO-a%20za%202020.g\\_0.pdf](https://hzzo.hr/sites/default/files/inline-files/IZVJE%C5%A0%C4%86E%20O%20POSLOVANJU%20HZZO-a%20za%202020.g_0.pdf)
- [23] Izvješće o poslovanju Hrvatskog zavoda za zdravstveno osiguranje (2021).  
Hrvatskog zavoda za zdravstveno osiguranje, Zagreb.  
[https://hzzo.hr/sites/default/files/inline-files/IZVJE%C5%A0%C4%86E%20O%20POSLOVANJU%20HZZO-a%20za%202021\\_0.pdf](https://hzzo.hr/sites/default/files/inline-files/IZVJE%C5%A0%C4%86E%20O%20POSLOVANJU%20HZZO-a%20za%202021_0.pdf)
- [24] Izvješće o poslovanju Hrvatskog zavoda za zdravstveno osiguranje (2020).  
Hrvatskog zavoda za zdravstveno osiguranje, Zagreb.  
<https://hzzo.hr/sites/default/files/inline-files/IZVJE%C5%A0%C4%86E%20O%20POSLOVANJU%20HZZO-a%20za%202020.g.pdf>
- [25] Izvješće o poslovanju Hrvatskog zavoda za zdravstveno osiguranje (2019).  
Hrvatskog zavoda za zdravstveno osiguranje, Zagreb. <https://hzzo.hr/wp-content/uploads/2020/07/IZVJE%C5%A0%C4%86E-O-POSLOVANJU-HZZO-a-za-2019.pdf>
- [26] Izvješće o poslovanju Hrvatskog zavoda za zdravstveno osiguranje (2018).  
Hrvatskog zavoda za zdravstveno osiguranje, Zagreb. [https://hzzo.hr/wp-content/uploads/2019/05/Izvjesce\\_o\\_poslovanju\\_hzzo\\_za\\_2018.\\_godinu.pdf](https://hzzo.hr/wp-content/uploads/2019/05/Izvjesce_o_poslovanju_hzzo_za_2018._godinu.pdf)
- [27] Izvješće o poslovanju Hrvatskog zavoda za zdravstveno osiguranje (2017).  
Hrvatskog zavoda za zdravstveno osiguranje, Zagreb. [https://hzzo.hr/wp-content/uploads/2018/04/Izvjesce\\_o\\_poslovanju\\_hzzo\\_01122017.pdf](https://hzzo.hr/wp-content/uploads/2018/04/Izvjesce_o_poslovanju_hzzo_01122017.pdf)
- [28] Krnić, I. (2023). Odgovor u 10 točaka. Vlada liječnicima: 'Ovo je prava istina o broju doktora u Hrvatskoj i plaćenim prekovremenim satima'.  
<https://www.jutarnji.hr/vijesti/hrvatska/vlada-ljecnicima-ovo-je-prava-istina-o-broju-doktora-u-hrvatskoj-i-placenim-prekovremenim-satima-15322075>

- [29] Luetić, K. (2022). Gdje si bio 24. rujna 2022.? *Liječničke novine*, god. XXII, br. 213. <https://www.hlk.hr/EasyEdit/UserFiles/lnpdf/2022/ln213.pdf>
- [30] Mojaplaća. <https://www.mojaplaca.hr/placa/medicina-i-socijalna-skrb>
- [31] Organisation for Economic Co-operation and Development. (2021). Hrvatska: pregled stanja zdravstva i zdravstvene zaštite 2021. In *State of Health in the EU*. Paris: OECD Publishing.
- [32] Priopćenje za medije (2023). Istraživanje Ipsosa pokazalo i visoku podršku štrajku liječnika, Hrvatska liječnička komora. [https://www.hlk.hr/EasyEdit/UserFiles/priop%C4%87enja/2023/istraziva\\_nje-ipsosa-pokazalo-i-visoku-podrsku-strajku-ljecnika.pdf](https://www.hlk.hr/EasyEdit/UserFiles/priop%C4%87enja/2023/istraziva_nje-ipsosa-pokazalo-i-visoku-podrsku-strajku-ljecnika.pdf)
- [33] Srdoć, S. (2023). *Povećani koeficijenti za izračun plaća u zdravstvu, uvodi se i novo radno mjesto*. Tportal. <https://www.tportal.hr/vijesti/clanak/povecani-koeficijenti-za-izracun-placa-u-zdravstvu-uvodi-se-u-novo-radno-mjesto-20230427>
- [34] Statističkog izvješće Visoko obrazovanje u 2021. [https://podaci.dzs.hr/media/argmpctk/si-1704\\_visoko-obrazovanje-u-2021.pdf](https://podaci.dzs.hr/media/argmpctk/si-1704_visoko-obrazovanje-u-2021.pdf)
- [35] Stanić, Z. (2022). *Upravljanje ljudskim resursima u Hrvatskom zdravstvu kao determinanata migracija liječnika* [Doktorska diestracija, Sveučilište Josipa Jurja Strossmayera u Osijeku].
- [36] Studenti u akademskoj godini 2022./2023. [https://podaci.dzs.hr/media/arac4gkx/si-1726\\_studenti-u-akademskoj-godini-2022\\_2023.pdf](https://podaci.dzs.hr/media/arac4gkx/si-1726_studenti-u-akademskoj-godini-2022_2023.pdf)
- [37] Uredbe o nazivima radnih mjesta, uvjetima za raspored i koeficijentima za obračun plaće u javnim službama (2024). Narodne novine 22/2024. [https://narodne-novine.nn.hr/clanci/sluzbeni/full/2024\\_02\\_22\\_354.html](https://narodne-novine.nn.hr/clanci/sluzbeni/full/2024_02_22_354.html)
- [38] Žene i muškarci u Hrvatskoj (2020). Državni zavod za statistiku RH, Zagreb. [https://www.dzs.hr/Hrv\\_Eng/menandwomen/men\\_and\\_women\\_2020.pdf](https://www.dzs.hr/Hrv_Eng/menandwomen/men_and_women_2020.pdf)
- [39] Žorić, S. (2022). A prekovremeni? Nakon objavljenih plaća liječnika u Jutarnjem, iz HUBOL-a bijesni na Beroša; Sin: 'Moj tata živi u bolnici', portal Juranji.hr. <https://www.jutarnji.hr/vijesti/hrvatska/nakon-objavljenih-placa-lijecnika-u-jutarnjem-iz-hubol-a-bijesni-na-berosa-sin-moj-tata-zivi-u-bolnici-15225617>

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