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Is There Grade Inflation at Medical Schools? Case Study of the Zagreb University School of Medicine

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Aim. To investigate if students' grades at the Zagreb University School of Medicine increased since the establishment of the School in 1917.

Methods. In this retrospective descriptive study, we analyzed student sex, the length of studying, average of all grades, and grades from 5 major courses – anatomy, physiology, pathology, internal medicine, and surgery. The passing grades at the Zagreb University range from 2 (sufficient) to 5 (excellent). We analyzed data for 2,861 students from 9 representative classes, enrolled in 1920, 1930, 1940, 1950, 1960, 1970, 1980, 1985, and 1990.

Results. The number of female students constantly increased up to 1970 and hereafter the female to male ratio remained stable, 60:40. The percentage of enrolled students who graduated from the School increased from 1920 to 1940 and from 1960 to 1985. Between 1940 and 1960, the percentage of students who graduated was lower than 50%. There was a continuous increase in grades during the investigated period ($p < 0.001$), except for students enrolled in 1960, who had lower grades than those enrolled in 1950. Students who enrolled in 1990 also had lower grades than those enrolling in 1985. Grades from the individual courses mostly followed the increasing trend of total grades.

Conclusion. There has been an increasing trend in grades at the Zagreb University School of Medicine since its establishment in 1917.

Key words: *Croatia; curriculum; educational measurement; schools, medical; students, medical; universities*

Modern society demands exact measurements, proofs, and indicators of success. Indicators of student success are course grades (1,2). Student employment opportunity and chance for professional advancement largely depend on the grades, both in the developed world (1,2) and in developing and transitional countries like Croatia (3,4). Through its recent history, Croatia experienced enormous changes in political, economical, social, as well as educational system (5), and we postulated that such historical turbulences would also have an influence on medical education and student grades.

The development of the medical education in Croatia started in 1874, when the Zagreb University was founded (6). In 1877, the first issue of a medical journal Liječnički vjesnik was published, and the School of Medicine was founded in 1917 (7). The system of student selection and standards of admission to the School of Medicine greatly changed over time. During the first 40 years, there was no selection system and everyone who applied to medical school was admitted (8). Between 1957 and 1965, the selection system was introduced, based only on the candidates' success in the secondary school. After 1965, it was based mainly on the student admission test results. In the late 1970's, the state stimulated enrolment to medical schools by making employment contracts with possible candidates. Between 1978 and 1980, such candidates had priority on admission and the obligation to work after graduation in certain geographic and specialist areas, according to the state's needs. Duration of medical studies at Zagreb University also changed over time. A 5-year curriculum was substituted for a 6-year curriculum in the 1951-1956 period and since 1990 until today. During the 1968-1978 period, secondary school system also changed, from only grammar high schools to vocational schools.

The aim of our study was to compare the grades of today students with those from the past, to see if grades followed an increasing trend during the 20th century. Our analysis encompassed the whole history of the Zagreb Medical School, from its beginning in 1917 to the class enrolled in 1990.

Material and Methods

We analyzed grades of medical students enrolled to the Zagreb University School of Medicine between 1920 and 1990, taking into account only grades of generations admitted in 1920, 1930, 1940, 1950, 1960, 1970, 1980, 1985, and 1990. All students admitted in the same year were followed up to their graduation. Generation enrolled in 1985 was also included in the analysis because it was the last generation attending lectures and graduating before the war in Croatia. Student grades during the war years (1991-1995) were analyzed in a separate study (9).

Sources and Data Collection

Data were collected from the files of the Departments of Anatomy and Physiology, Student's Office at the Zagreb University Hospital Center, Dean's Office, archive, and the computer database of the Zagreb University School of Medicine.

We analyzed the following data: men to women ratio, grades, year of enrollment, grades from 5 major courses, total grade average, and the graduation year. The grades at the Zagreb University range from 2 (sufficient) to 5 (excellent). Grade 1 means that a student failed the exam and has to take it again; the record of these grades is not kept in the School's documents and thus this item could not be included in the study. We also analyzed examination grades from the five largest courses in the medical curriculum, one from each of the five study years. These exams have to be passed before advancing to the next academic year. The courses were Anatomy as the first-year course, Physiology as the second-year, Pathology as the third-year, Internal Medicine as the fourth-year, and Surgery at the fifth-year course. In total, we registered data for 2,861 students at 9 time points during the 80-year period.

Statistics

The frequencies of examination grades were presented as contingency tables. The results of the five examinations were shown as percentages of students who scored grades 2-5. The differences were tested by chi-square test and $p<0.01$ was considered significant. For all statistical analyses, Microsoft® Office 2000 (Excell) for Windows® (Microsoft Corporation, Washington DC, USA) was used.

Results

The system of student selection, standards of admission, and duration of Medical School curriculum greatly changed over time, as well as the secondary school system (Fig. 1). During the 1920-1990 period, the number of students enrolled to the School constantly increased until 1970 (Fig. 2). After that time, it remained stable. The same trend was noted for the number of female students, which constantly increased up to 1970 (Fig. 2). Since 1970, the sex ratio remained relatively stable, 60:40 in favor of women.

The percentage of enrolled students who graduated from the School of Medicine increased in the period from 1920 to 1940, but the percentage of students to whom it took longer time to graduate was much higher than in other generations (Fig. 3). Between 1940 and 1960, the percentage of students who graduated was lower than 50%. Between 1960 and 1985, the number and percentage of graduates increased again, but on the expense of longer studying (Fig. 3).

The grades for the students enrolled in 1920 and 1930 could not be statistically compared with the grades from other years because of the narrative nature of the grades during that period. The final grades were "satisfactory" (equivalent to later grade 2 – "sufficient") or "excellent" (grade 5 later on). Also, the ar-

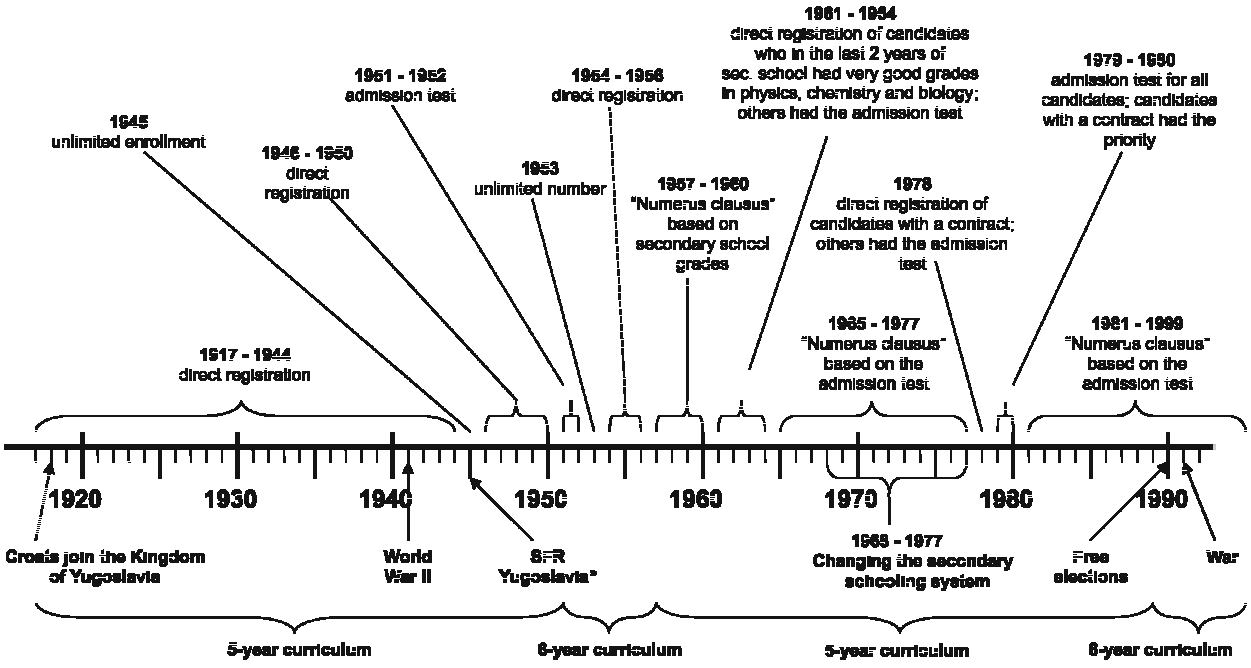

Figure 1. The system of student selection for admission to the Zagreb University School of Medicine. The time-line shows the years included in the research. Above the line are the selection systems. Below the line are some key historical and socio-political events in Croatia and the duration of medical curriculum. The curriculum duration changed during the studied period: 5-year curriculum was substituted with 6-year curriculum for generations enrolled in medical school from 1951 to 1956 and from 1990 until today. From 1978 to 1980, some candidates had an employment contract with the Government, which gave them priority on admission. Asterisk – Socialist Federative Republic of Yugoslavia (1945-1991).

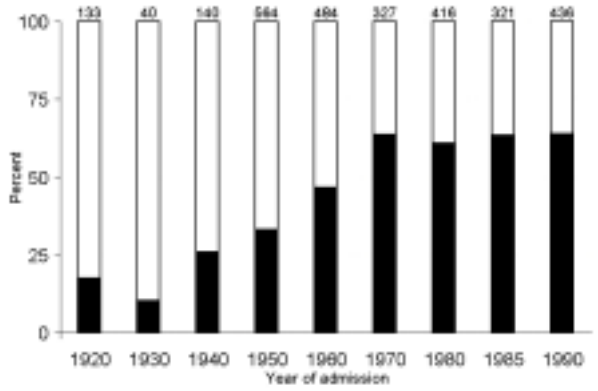

Figure 2. Distribution of the students enrolled in the Zagreb University School of Medicine from 1920 to 1990. The ordinate shows the ratio of enrolled female (black) to male (white) students. The number of registered students in the analyzed years is at the top of each column.

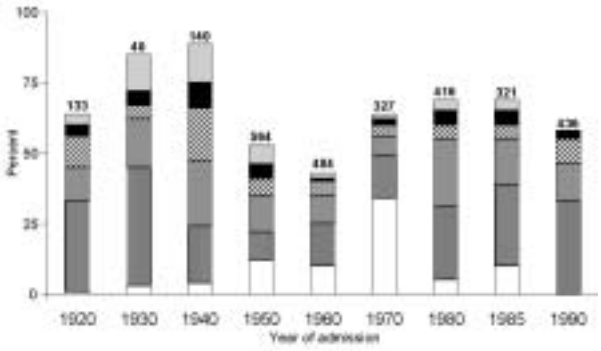

Figure 3. Distribution of students according to the years of studying until graduation in the period from 1920 to 1990. The ordinate shows cumulative frequencies. Length of studying: white – 5 years, vertical lines – 6 years, dark gray – 7 years, diagonal lines – 8 years, black – 9 years, light gray – 10 years or more. The height of the column shows the percentage of those who graduated. The number of registered students is above each column. The year of admission is shown below each column.

chiving of data was poor and many files from that time were missing.

Between 1940 and 1950, there was a continuous increase in the grades in 5 subjects we analyzed ($p < 0.001$) (Fig. 4). In 1960, the grades were significantly lower than in 1950 ($p < 0.001$). Since 1960, the grades had been continually increasing until 1985 ($p < 0.001$), when they started to decrease again until 1990, when they become significantly worse than grades in 1985 ($p < 0.001$). We found the same increasing trend when the grades were analyzed for each course individually, with a few exceptions. The Physiology grades decreased from 1940 to 1970, and followed the general increasing trend from 1970 until 1990 (Fig. 4). The Internal Medicine grades decreased from 1940 to 1960, and then followed the general increasing trend until the last year analyzed. The same was true for the Surgery grades, except that they continued to increase even in 1990 generation, when

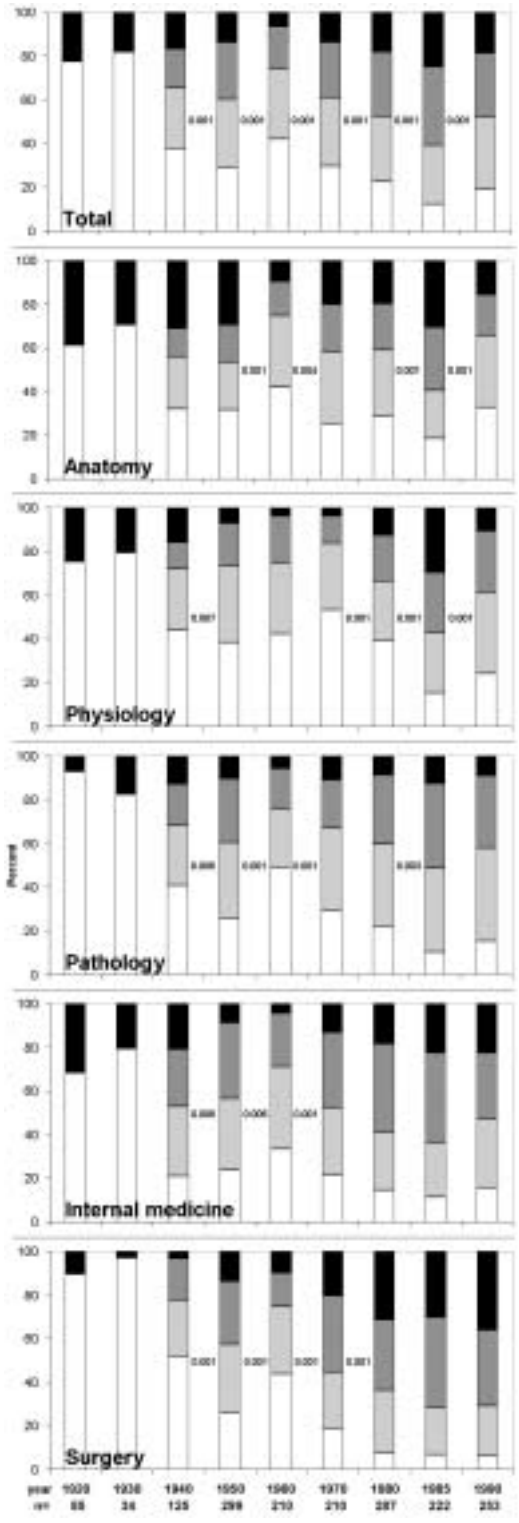

Figure 4. The grades earned in 5 main courses by students at the Zagreb University School of Medicine during the period between 1920 and 1990. Only passing grades (2, 3, 4, and 5) were analyzed. Percentage of students who earned the grades is shown on the ordinate. The year of admission is noted below each column. The number of graduated students is shown below the year of admission. The p value is shown between the columns. The worst (passing) grade was 2 (sufficient), and the best 5 (excellent). White – grade 2, light gray – grade 3, dark gray – grade 4, black – grade 5.

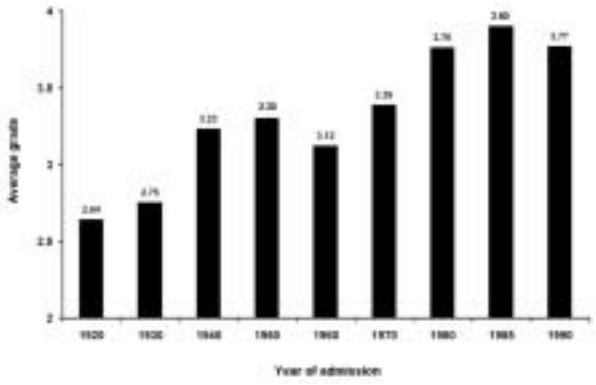

Figure 5. Total average grade of students who enrolled at the Zagreb University School of Medicine during the period between 1920 and 1990. The exact average grade is shown at the top of each column.

they were better than in 1985. Total grades' average followed a similar increasing trend (Fig. 5).

Discussion

Our study showed the variability of student grades at the Zagreb University School of Medicine over the 80-year period, with an increasing trend towards the 1990's. It seems that grade inflation, described for western medical communities (2,10), also affects small academic communities, such as Croatia.

It is very difficult to explain the increase in the student grades because many factors could be involved, from the selection of students on admission test to general socioeconomic situation in the society. For example, one of the probable explanations for lower grades and lower percentage of graduates in generations enrolled from 1920 to 1950 could be absence of admission criteria and thus, absence of stu-

Table 1. The literature for 5 major courses at the Zagreb University School of Medicine

Subject	Textbook	No. of pages	Used in the period
Anatomy	Rauber-Kopsch, Sieglbauer. Anatomy. 2nd ed. 1938-1942. 4 volumes.	634	1938-1957
	Perović D. Human anatomy (Textbook based on D. Perović's lectures.) Beograd and Zagreb: Medicinska knjiga; 1957. 2 volumes.	748 (3rd ed; 1957) 693 (6th ed; 1966)	1957-1982
	Krmpotić-Nemanić J. Functional anatomy of the nervous system and senses. Zagreb: Medicinska naklada; 1971.	237	1971-1982
	Krmpotić-Nemanić J. Functional anatomy of the locomotor's system. Zagreb: Medicinska naklada; 1974.	355	1975-1982
	Krmpotić-Nemanić J. Human anatomy (the viscera and blood system). Zagreb: Medicinska naklada; 1977.	379	1977-1982
	Krmpotić-Nemanić J. Human anatomy. 3rd ed. Zagreb: JUMENA; 1982.	902	1982-1999
Physiology	Manuscript according to Prof F. Smetanka's lectures. Zagreb: Yugoslav academy club "Jurislav Janušić"; 1928.	527	1928-1942
	Physiology (script). Zagreb; 1942. 2 volumes.	350	1942-1947
	Rein H. Human physiology (script). Zagreb: The professional department of the Zagreb University Students' Youth organization; 1947. 2 volumes.	514	1947-1957
	Silobrčić V, Nigrović V. Physiology of blood (part I); Physiology of the nervous system and senses (part II). Zagreb: Medical Students' Party; 1957.	320	1957-1958
	Boranić M. Physiology of the substance exchange and internal excretion (script). Zagreb: Medical Students' Party; 1958. 2 volumes.	242	1958-1959
	BoŽović Lj. Physiology of the blood system, respiratory system and corporal liquids (script). Zagreb: Medical Students' Party; 1959. 2 volumes.	415	1959-1963
	Guyton AC. Physiology. Beograd i Zagreb: Medicinska knjiga; 1963.	1,115 (2nd ed; 1961) 1,159 (3rd ed; 1965) 1,072 (4th ed; 1969) 1,206 (7th ed; 1981)	1963-1993
	Berne RM, Levy MN. Physiology. 3rd ed. St. Louis (MO): Mosby; 1993.	992	1993-1998
Pathology	Saltykow S. Pathology:		
	Pathologic morphology – general. Zagreb: The section of Croatian Printing-house; 1948. 2 volumes.	838	1948-1979
	Pathologic morphology – special. Zagreb: Nakladni zavod Hrvatske; 1948-1959. 12 volumes.	2,178	
	Grčević N, Hirtzler R, Kopač Z. Pathologic anatomy - general. Zagreb: Zagreb University; 1964.	245 (1964) 248 (1966) 301 (1969)	1964-1979
	Grčević N, Hirtzler R, Kopač Z. Pathologic anatomy – special. Zagreb: Zagreb University; 1965.	140 (1965) 181 (1968)	1965-1979
	Robbins SL. The pathologic base of diseases. Zagreb: Školska knjiga; 1979. 2 volumes.	1,716	1979-1999
Internal medicine	Botteri IH. Internal diseases. Zagreb: V. Cvitković; 1944. 2 volumes.	397	1944-1946
	Botteri IH. Internal diseases. Zagreb: V. Cvitković; 1946. 4 volumes.	1,453	1946-1950
	Botteri IH. Internal medicine. Zagreb: Nakladni zavod Hrvatske; 1950.	1,146 (1st ed; 1950) 1,108 (6th ed; 1961)	1950-1982
	Davidson S, Macleod J. Internal medicine – principles and praxis. Zagreb and Beograd: Stvarnost and Medicinska knjiga; 1974.	980	1974-1991
	Mimica M. Internal medicine in practice. Zagreb: Školska knjiga; 1975.	410	1975-1982
	Radošević Z. Internal medicine. Zagreb: JUMENA; 1982.	579	1982-1983
	HadŽić N. The handbook of Internal medicine. Zagreb: Školska knjiga and JUMENA;1983.	779	1983-1991
	Vrhovac B. Internal medicine. Zagreb: Naprijed; 1991.	1,818	1991-1999
Surgery	Surgery (script). Zagreb: Croatian Medical Students Club; 1941. 2 volumes.	357	1941-1948
	Garre K, Borchard P. Surgery. Zagreb: Nakladni zavod Hrvatske; 1948. 2 volumes.	1,013	1948-1960
	Hellner H, Nissen R, Vossschulte K. Textbook of surgery. Beograd and Zagreb: Medicinska knjiga; 1960.	1,059	1960-1982
	Bradić I. Surgery, symptoms and clinical examination. Zagreb: JUMENA; 1982.	334 (1st ed; 1978) 700 (2nd ed; 1982)	1982-1995
	Bradić I. Surgery. Zagreb: Školska knjiga; 1995.	970	1995-1999

dent selection based on their previous academic success. Better grades after 1960 are most probably related to the introduction of the admission test, which selected better candidates (4,11,12). The continuous growth in grades culminated in the generation that was admitted to the School in 1985. In comparison with all other years, this generation was the best. A decrease in grades observed for the generation enrolled in 1990 could be explained at least partly by the effects of war, because these students attended lectures and passed examinations during the 1991-1995 war in Croatia (9).

War has certainly been an important factor for the Croatian students in the history of medical studies. The generation that entered the School at the beginning of World War II (1940) graduated after the war, and with best success (80%), compared with the 1960 generation (less than 50% of them graduated). The war was most probably the reason why it took longer time for 1940 generation to graduate. The need for physicians after the war could have influenced examiners' criteria and their benevolence towards student grades. During the 1991-1995 war in Croatia, the students took part in many extracurricular activities related to humanitarian and medical help to war victims (13), but their grades suffered (9). War can affect adversely the studying success, probably because of the stress and other factors, such as time available for studying, the quality of lectures, and ability and willingness of students to attend lectures (9). Also, the 1991-1995 period was the time when written and interim examinations were introduced in the curriculum of the Zagreb University School of Medicine (9), which could easily have influenced students' grades.

Some authors speculate that grade inflation could be an outcome of student demands for high grades combined with the School faculty willingness to accommodate them (2). Others believe that the problem is related either to the lack of faculty knowledge about evaluation methods, or to their quest for positive student evaluations, which the faculty needed for promotion, tenure, and merits (14). Better grades are in contrast with the enormous growth of medical knowledge, which is reflected in the increase of textbook pages. For example, the first edition of the "The Merck Manual", published in 1899, had 192 pages and the page size was twice smaller than the page size of the 17th edition, which was published a hundred years later and counted 2,833 pages (15,16). This makes the 17th edition almost 30 times bigger than the first edition. The increase in the volume of medical textbooks is visible from the list of mandatory readings for the five big courses at Zagreb School of Medicine (Table 1).

The variability in grades we observed could not be related to the changes in the female/male ratio at the medical school because they showed different trends. The 1960's were obviously the years when men to women ratio at the Zagreb Medical School changed in favor of women. The number of female students continued to increase until the 1970's and remained unchanged thereafter. Increase in the number of female students at medical schools has been shown in other academic communities, as well, such as in the USA, where the increase occurred in the 1980 (10,17), at least a decade after the increase in Zagreb School of Medicine (18).

Our study has several limitations, including the design of the study, which did not allow us to draw conclusions about causative relations. Also, it was not possible to investigate factors such as examiner criteria, student motivation to earn better grades, change of student-teacher relationship, availability of information, and the influence of socio-political changes.

Despite these limitations, our study clearly showed increase in the grades over the 80 years of the Zagreb School of Medicine. We believe that student grades may be a sensitive indicator of changes in education system and society, and therefore suggest a systematic institutional assessment of grades and other factors related to the student academic success. With the recent introduction of electronic examination databases at the Zagreb School of Medicine, we hope that the School's authorities will use it to assess and improve the medical curriculum.

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