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Opinie studentów kierunku Zdrowie Publiczne na temat kształcenia w zakresie statystyki i informatyki

Streszczenie

Wprowadzenie. Z uwagi na znaczenie informatyki i statystyki oraz oprogramowania specjalistycznego we współczesnej służbie zdrowia, niezbędnym jest zapoznanie studentów z tym oprogramowaniem i sposobami jego wykorzystania.

Cel. Celem badania było poznanie opinii studentów na temat zakresu znajomości narzędzi statystycznych oraz przydatności w pracy zawodowej wiedzy i umiejętności zdobytych na zajęciach z informatyki i statystyki, jak również chęci poznania specjalistycznych programów statystycznych.

Materiał i metoda. Badaniem objęto grupę 164 studentów niestacjonarnych IV roku Wydziału Nauk o Zdrowiu Uniwersytetu Medycznego w Łodzi w roku akademickim 2009/2010. W badaniu wykorzystano autorski kwestionariusz ankiety. W analizie statystycznej zastosowano współczynniki zbieżności korelacyjnej Pearsona-Bravaisa V oraz Yule'a-Kendalla Q, współczynniki Czuprowa T, Cramera C i współczynnik kontyngencji Pearsona P.

Wyniki. Znacząca liczba studentów (97,4%) chce uczyć się metod statystycznych, chociaż nie zawsze widzi możliwości wykorzystania tej wiedzy w swojej pracy zawodowej. Prawie 62% ankietowanych nie wie jakie programy są wykorzystywane w ich zakładzie pracy. 72% studentów jest zainteresowanych nabyciem umiejętności pracy z programem Statistica, a niewiele mniej (prawie 62%) z programem SPSS.

Wnioski. Wskazane wydaje się podjęcie działań w kierunku rozszerzenia treści i sposobu nauczania statystyki i informatyki w zakresie zwiększenia liczby godzin zajęć laboratoryjnych z wykorzystaniem komputerów, jak również rozważenie większego zróżnicowania programu nauczania tych przedmiotów na poszczególnych specjalizacjach kierunku Zdrowie Publiczne. Biorąc pod uwagę zróżnicowany poziom studentów pod względem znajomości narzędzi informatycznych i statystycznych należy stopniowo wprowadzać pakiet statystyczny STATISTICA oraz SPSS.

Słowa kluczowe: statystyka, informatyka, zdrowie publiczne, studenci niestacjonarni.

Opinions of students of Public Health Institute on teaching statistics and informatics

Abstract

Introduction. Considering the significance of informatics and statistics in modern Health Service, it is necessary to get students acquainted with its software and ways of usage.

Aim. The goal of the research was to obtain students' opinions on statistical tools and the usefulness of knowledge and expertise attained during statistics and informatics courses as well as students' willingness to learn specialized statistical software.

Material and methods. The research covered the group of 164 students of the fourth year of extramural studies at the Institute of Health Sciences, Medical University of Łódź in 2009/2010 academic year. Author's inquiry form was used in the survey. Pearson-Bravais (V) and Yule-Kendall (Q) correlation convergence indexes as well as Czuprow's (T), Cramer (C) indexes and Pearson (P) contingency index were applied in the statistical analysis.

Results. A significant number of students (97.4%) wishes to learn statistical methods, though they not always see the opportunity to implement such knowledge in their professional life. Almost 62% of the students does not know which software is exerted on daily basis in their employing establishment. Seventy-two (72)% of the students wish to attain the knowledge of working with STATISTICA software and just a little fewer (almost 62%) with SPSS.

Conclusion. It seems advisable to take action in order to extend the matter and ways of teaching statistics and informatics by increasing the number of hours of computer laboratory classes, as well as considering higher differentiation of education programs of those subjects at particular specialisations in Public Health Institute. Taking into account unequal level of students' knowledge in terms of statistical tools and computer software, it is reasonable to make them gradually conversant with STATISTICA and SPSS statistical programs.

Key words: statistics, informatics, public health, extramural students.

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INTRODUCTION

Public health is supported by technical development and computerization, while the alterations in the way of its running are driven by civilization progress. Unquestionably, computerization plays a key role among the factors that improve the area of public health. It enables, among others, to canvass comparable data in terms of health and health care systems in the EU countries, which itself implements one of key aims of the EU strategy in the area of public health [1]. The level of computerization of public health institutions is currently nonpareil better than just a few years ago.

In order to meet the needs and educate competent managers of institutions in the healthcare sector (health protection and promotion, prevention in case of threat to health and/or life of population) universities have introduced new courses. Considering the importance of informatics and statistics and most of all specialized software in modern health service, it is necessary to acquaint students with such software and ways of its employment. Graduates of Public Health Institute should acquire, among others, competence of active participation in fulfilling the requirements of prophylaxis and health protection in terms of socio-medical care [2-5]. It is also assumed that each graduate should have managerial skills adequate for institutions in the field of public health. In order to perform such activities, not only expertise in usage , but also data resources creation are a necessity.

AIM

The goal of this work is to present students' opinions on statistical tools, the usefulness of knowledge and expertise attained during statistics and informatics courses as well as students' willingness to learn specialized statistical software such as STATISTICA and SPSS (software for statistical data analyses).

MATERIAL AND METHODS

The research covered all students of the fourth year of extramural master studies (second degree) of Public Health Institute at the Faculty of Health Sciences, Medical University of Łódź. Among 175 students of the fourth year only 164 took part in the survey. The rest (6%) did not participate in the research due to absence in classes. The research was anonymous and was conducted in the first semester of Academic Year 2009/2010.

Author's inquiry form, compiled for the needs of the survey, was the research tool. The questionnaire contained 30 questions, four of which were multiple-choice questions, four – opened questions, and the remaining 22 were single-choice questions. Questions concentrated on statistics and informatics as tools of computer-aided management in health service. The authors of the research intended to acquire knowledge on the following subjects:

- did the students attend courses on basics of statistics and informatics earlier in their education process;
- is the knowledge of statistics and informatics useful (or will it be); if so – to what degree?
- does the number of lectures and practical classes enable sufficient acquisition of the material to implement it in one's own work;
- does the education program of those two subjects meet the needs to develop the knowledge of informatics and statistics ;
- what is students' knowledge about exerting specialized statistical software in their places of employment.

The opinions of surveyed students were analysed in terms of situational variables: gender and distinguished specialization: Emergency Medicine. Remaining specializations in Public Health Institute (Health Promotion, Epidemiology, Statistics and Informatics, Organization and Management in Health Protection, Health and Nursing Insurances) were treated together. Structure indexes: proportion/percentage (%) or relative frequency/fraction (f) was used in variables analysis depending on sample size.

Pearson-Bravais (V) and Yule-Kendall (Q) correlation convergence indexes as well as Czuprow's (T), Cramer (C) indexes and Pearson (P) contingency index were applied in statistical analysis of quantitative data [6].

RESULTS

The characteristics of population from the survey is shown in Table 1. The significant majority among 164 persons from Public Health Institute are women (102), who account for 62% of the sample group. Emergency Medicine students (71 persons) account for over 43% of the population. The distinguished specialization is dominated by men, who account for almost 2/3 of its students. More women studies on remaining specializations in Public Health Institute.

Sixty-four (64) % of respondents have begun studying within a year or two after finishing secondary school. Most often they are 23 years old and the dominant is the same for both genders. Half of the students are under 24 and the median value is identical for men and for women. The age structure of the population indicates minor share of people over the age of 29. The oldest woman is 52 and man - 50.

Despite choosing extramural studies, not all students work. Employed people (120) amount to 73.2% of all respondents. Among 44 unemployed, who stand for 26.8 % of the people questioned, 34 persons are students up to 24 years of age (4/5 of them do not work). One-fifth of all non-working students are 10 people in the age group of 25–29 years old.

Yule-Kendall correlation convergence index Q equals -0.44, which attests to moderate strength of correlation between gender and being employed. The value of the Q-index shows that in the surveyed population of 164, men are dominant among working students.

Relatively short seniority is characteristic for the surveyed group. Among 120 working persons, 78% of respondents did not attain 6 years of seniority and 55 % of them work shorter than 3 years. Most numerous groups, not only among women, but also among men, consist of people who did not yet exceed 2-year-seniority. Among women, this group accounts for 39 people (57.4% of all working women), and among men – 27 people (51.9% of all working men). Measures of central tendency for seniority, calculated for simple series, show that the average time of seniority among women amounts

TABLE 1. Research sample characteristics.

Feature	Male		Female		Total	
	n	f	n	f	n	%
Specialization						
Emergency Medicine	46	0.74	25	0.25	71	43.3
Other	16	0.26	77	0.75	93	56.7
Total	62	1.00	102	1.00	164	100.0
Age in years						
under 25	32	0.52	54	0.53	86	52.4
25 - 29	22	0.35	36	0.35	58	35.4
30 - 34	6	0.10	4	0.04	10	6.1
35 and more	2	0.03	8	0.08	10	6.1
Total	62	1.00	102	1.00	164	100.0
Professional activity						
working	52	0.84	68	0.67	120	73.2
not working	10	0.16	34	0.33	44	26.8
Total	62	1.00	102	1.00	164	100.0
Seniority in years						
up to two years	27	0.52	39	0.57	66	55.0
from three to five years	15	0.29	13	0.19	28	23.3
from six to eight years	3	0.06	6	0.09	9	7.5
from nine to eleven years	4	0.08	3	0.05	7	5.8
12 years or more	3	0.05	7	0.10	10	8.3
Total	52	1.00	68	1.00	120	100.0
Employment sector						
public	41	0.79	45	0.66	86	71.7
private	11	0.21	23	0.34	34	28.3
Total	52	1.00	68	1.00	120	100.0

Source: own calculations

to 4.0 years with the standard deviation of 6.7 years. Among men, in turn, it is 3 years with the standard deviation of 4.5 years. Women most often did not attain even yearly seniority, whereas the most numerous group of men have yearly work experience behind them. The median for both genders is the same and amounts to 2 years, which means that half of the population has been working for two years or shorter. We can observe strong right-side asymmetry among groups of female as well as male students – the asymmetry index for women's seniority equals 0.64 and respectively for men's – 0.54, which supports the above mentioned thesis (the most often occurring value is lower than the average being resultant of all the values in the distribution and characteristics of higher than average are more diverse). The outcome for seniority given in years concentrates around low values.

Among 120 working students, 86 people are employed in the public sector, which stands for 72% of the total and 34 people (28%) are employed in the private sector.

It is worth considering whether it can be said that there are significant differences in the employment sectors between men and women? Pearson-Bravais V index equals – 0.14. Such a value indicates weak dependence among genders and employment sectors. The foregoing statement finds confirmation in the value of Yule-Kendall correlation index Q = -0.3. Convergence indexes show that women more often work in the private sector.

Ten percent (10%) of working students are employed in more than one place. The only significant group among 12 people working in two or three places were Emergency Medicine students employed in the hospital and ambulance service. The biggest number of interviewees is employed in hospital, which stands for 30.8 % of the total. Having two jobs at a hospital and ambulance service occurs only among Emergency Medicine students. No one from that group is employed in ambulatory, laboratory, health clinic or even help centre. Among 54 working students of Emergency Medicine almost 2/3, that is 36 people, is employed in ambulance service. Most interesting is, that among those 36 respondents 2/3 of them have begun to work for ambulance service during their education process, therefore they found employment in accordance with their studies' specialization, one-third, in turn, had been employed there before their studies and just then chose specialization lining up with their professional life. Among 66 students of other Public Health specializations only 4 people were hired in ambulance service. Among 40 students, who work for ambulance service (one or more places of employment), there are twice more men than women.

New medical technologies nowadays cannot dispense with computer-aid infrastructure. We are witnesses of an increase of knowledge unmanageable without information technology (IT). Quantitative data analysis is often combined with necessity to perform many mathematical calculations. Specialized software such as STATISTICA or SPSS is remarkably helpful. Owing to such software, it is possible to perform fast, extensive and comprehensive data analysis and to concentrate on substantive analysis of the problem and interpretation of the results. Not everyone has access to such software, but nearly everybody knows the electronic Excel worksheet.

In the conducted survey students were asked about exerting and popularizing the electronic MS Excel worksheet as well as two specialized statistical software programs: STATISTICA and SPSS in their workplace. The choice between those three programs was imposed by ubiquity of usage and popularization of MS Excel and usefulness of most commonly known and increasingly used statistical software, especially in hospitals. The level of knowledge on usage of Excel or specialized statistical software at workplace among working students is presented in Table 2.

Almost 62% of respondents do not have any knowledge concerning types of software exerted in their workplace. In case of "Do not know" answer, which was selected by 74 people, more than half of them (55 %) study Emergency Medicine. It can be assumed that the key reason of lack of knowledge and weak understanding of specialized statistical software in their workplace results from short seniority and type of duties performed by them. Surprisingly, not many interviewees were able to point out the software exerted in their workplace. Only 12 people (therein 2 from Emergency Medicine) pointed out MS Excel and the same number pointed out other specialized statistical software. Though the question in the questionnaire obliged them

TABLE 2. Knowledge of respondents on software exerted in their place of employment.

Software exerted in the place of employment	Emergency Medicine		Other specializations		Total	
	n	f	n	f	n	%
Excel	2	0.04	10	0.15	12	10.0
STATISTICA	2	0.04	2	0.03	4	3.3
SPSS	0	0.00	1	0.01	1	0.8
STATISTICA and SPSS	0	0.00	3	0.05	3	2.5
Other specialized statistical software	7	0.13	5	0.08	12	10.0
Two or more of the four abovementioned programs	2	0.04	4	0.06	6	5.0
No statistical software	0	0.00	8	0.12	8	6.7
Do not know	41	0.75	33	0.50	74	61.7
Total	54	1.00	66	1.00	120	100.0

Source: own calculations

to specify the name of such software, none of the 12 people did it.

Table 3 contains information on types of software most often used by students. Out of 164 only seven people (4.3%) did not select any variation of the answer and therefore their answers were not included in the analysis. The MS Excel worksheet is used by 2/3 of the students. The percentage of people who in general do not use Excel or any other statistical software equals 22.9%. Single persons mentioned two or more software options from the questionnaire (Excel, STATISTICA, SPSS and other specialized statistical software). In each case it comprised only 0.6% of the population, which is why they were shown inclusive (3.2%) in Table 3. Among students who selected more than one answer to the question concerning their individual work with the software, four of them claim that they use other specialized statistical software as well as Excel.

TABLE 3. Software used be students.

Individual work on software	n	%
Excel	106	67.5
STATISTICA	1	0.6
SPSS	0	0.0
other specialized statistical software	5	3.2
any statistical software	36	22.9
other specialized statistical software and Excel	4	2.5
two or more software programs	5	3.2
Total	157	100.0

Source: own calculations

The surveyed issue, which is software used by students, is neither gender nor specialization specific (the value of correlation convergence indexes is below 0.2). Despite the level of knowledge on exerting specialized statistical software at workplace being low and a significant number of people use only Excel in their individual work, the respondents showed high interest in familiarizing with statistical software – more with STATISTICA than SPSS. The reason for greater interest in STATISTICA software may be the fact that since December 2009, Medical University in Łódź made a full version of STATISTICA 8.0 PL accessible to install and use on private computers for all students.

Due to popularity and accessibility of the MS Excel worksheet, which is also an analytical tool, the next question from the survey involved the level of knowledge about that worksheet. None of the respondents demonstrated advanced command of Excel software. The statement of basic knowledge was dominant (51.8%). Self-evaluation of the level of command of Excel was quite similar among men and women. It should be stressed that the research covered the extramural master's studies students who are graduates of bachelors' studies of various Polish universities which have different education programs. Programs' differences refer not only to different number of hours of statistics and informatics courses during the studies, but also to the matters covered during lectures. Ten point four (10.4) % of the people surveyed stated that they have no command of MS Excel and these were people over 35 years of age, who most likely did not have an opportunity to familiarize with the worksheet in earlier phases of their education process.

Among all the interviewees, 72.0% people are interested in attaining command of STATISTICA software and 61.6% -SPSS. Out of 102 of the surveyed women, over two-thirds wish to be familiarized with STATISTICA software, men, in turn, interested in the software stand for over 3/4 of 62 men total. The interest in attaining command of SPSS software is a little lower than that of STATISTICA. Out of 164 of the surveyed students, 61.6% wish to get to know SPSS software. Out of 102 of the surveyed women, almost 3/5 of them are interested in getting familiarized with SPSS and in the group of 62 men – two-thirds.

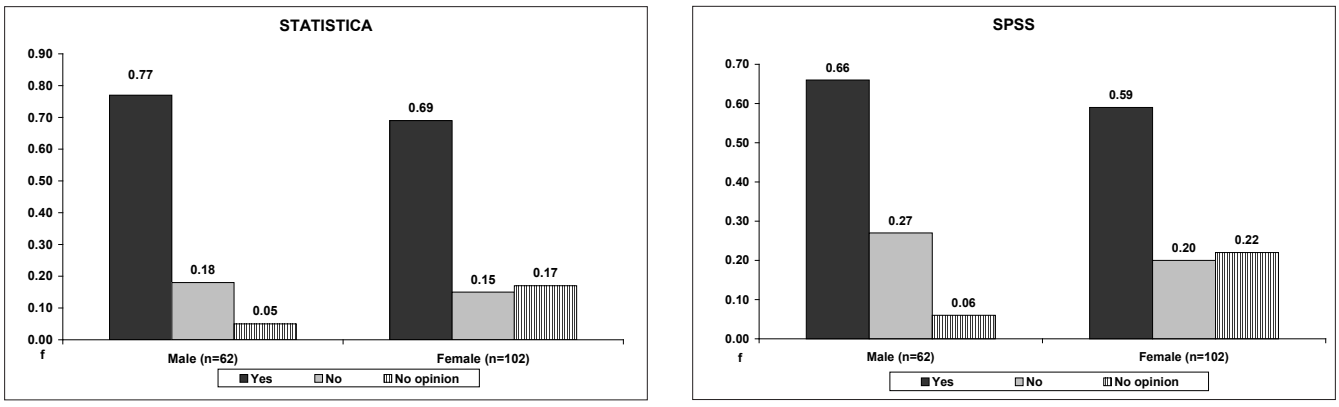

FIGURE 1. The structure of interviewees according to gender and interest in classes using software.

The calculated values of correlation convergence indexes indicate that in case of Statistica (c2 with Yates correction = 3.88, Czuprow index T = 0.183, Cramer C = 0.154, Pearsons' contingency index P = 0.152, Pmax = 0.765, Pkor = 0.199) as well as in case of SPSS (c2 Yates correction=5.60, Czuprow index T = 0.220, Cramer C = 0.185, Pearsons' contingency index P = 0.182, Pmax = 0.765, Pkor = 0.237) we cannot speak of significant differences among men and women in declared willingness of getting to know any of the software.

The degree of evaluation of usefulness of the earlier acquired knowledge of statistics is presented in Figure 2. The evaluation concerned only 114 people who had had classes of this subject during their bachelors' education process. Fifty students, in turn, were not included in the analysis because of their statement of not having a course in statistics till the moment of the research. The belief of very low usefulness of statistics in professional life is dominant among 114 students. Though 1/3 of those who had earlier became familiar with the basics of statistics (as well as the ones who did not have any prior experience with statistics) and claim that the acquired knowledge is not of much help in their job performance, wish courses in specialized statistical analysis to be included in the education program. The evaluation of usefulness of the acquired knowledge of statistics was analyzed in terms of gender and distinguished specialization. In case of gender, the value of correlation convergence indexes indicates the incidence of weak dependence between evaluation of usefulness and gender (c2 with Yates correction=7.13;T=0.27; C=0.21; P=0.2; Pmax=0.8; Pkor=0.26). It may mean that to a low degree the evaluation of usefulness is connected with gender. In case of Emergency Medicine students, the evaluation shows no significant differences in proportion to the one stated by students of other specializations (the value of correlation convergence indexes is close to zero).

It was more difficult for women than for men to assess the level of usefulness of the knowledge of statistics: almost every third woman selected "It is hard to say" answer, whereas among men it was chosen by nearly every fourteenth (0.07). A little over 1/3 of the surveyed women (0.37) and half of men (0.50) claim that such knowledge will or would be useful for them to a low degree (Figure 2).

The degree of evaluation of usefulness of the earlier acquired knowledge of informatics is presented in Figure 3. The belief that acquired knowledge of informatics is useful to a distinctive degree, is dominant among the respondents. Such an answer was given by more than half of women and more than half of men and that means there are no significant differences in the evaluation of usefulness of computer science knowledge according to gender as well as specialization (the values of correlation convergence indexes are close to zero). Three people who claimed that such knowledge would be useless for them, are men studying Emergency Medicine.

In the assessment of the number of hours in statistics only 114 out of 164 persons who had had classes in this subject during their bachelors' education process, were taken into consideration. Among them, the dominant belief is that the number of hours is sufficient. The values of correlation convergence indexes are close to zero and point to the fact that neither gender nor specializations do differentiate such respondents' statements. The students claim that knowledge of statistics is useful and also that the number of lectures and practical classes which are necessary to attain the material at an appropriate level is sufficient (55.3%) or should be greater (35.1%). Only three people of all students of Public Health claimed that there should be no statistics courses in their education program and eight of them stated that knowledge of statistics is of no use for them. A significant number of students (97.4%) wish to be taught statistical analysis methods, though currently they do not see the opportunity to implement statistics in their professional life.

There is a dominant belief among 164 respondents that the number of hours of informatics courses is insufficient (91 people, i.e. 55.5%) and only six people (3.7%) claim that there are too many of them. Only 2 Emergency Medicine students stated that this subject should be excluded from the curriculum.

The question concerning a preferable form of teaching statistics was of a multiple-choice type. Among those who selected more than one answer, the respondents combining practical classes and computer workshops comprise the group of significance (i.e. 17.7%) (Table 4).

Practical classes (38 people, i.e. 37.3%) are a dominant choice among 102 women, whereas among 62 men the computer workshops are the most frequent choice (26 people, i.e. 41.9%). Students who prefer practical classes are the most numerous group among 164 respondents. All the surveyed adamantly favoured other forms of education over lectures, which was chosen by the total of 14 people, i.e. less than 9% of the students.

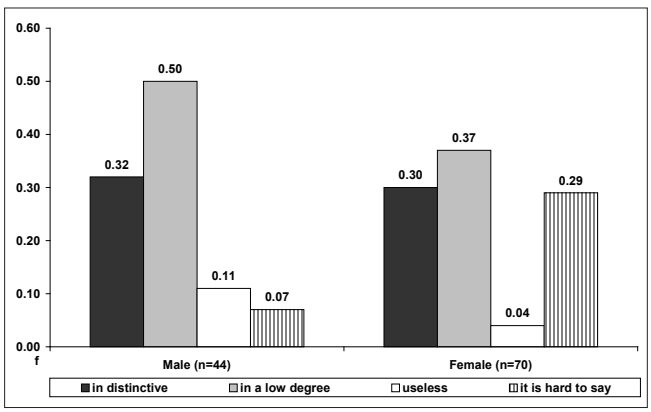

FIGURE 2. Evaluation of usefulness of acquired statistical knowledge according to gender (n=114).

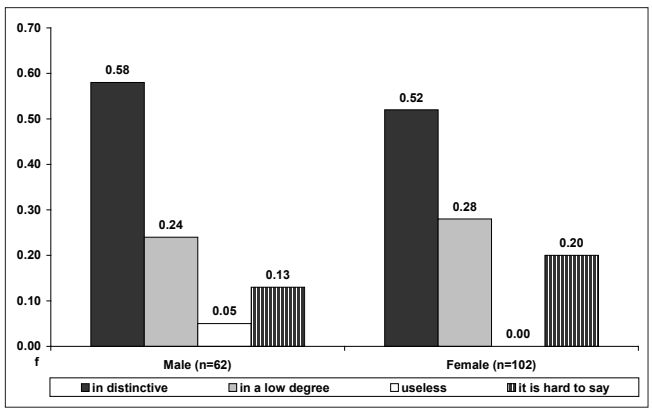

FIGURE 3. Evaluation of usefulness of acquired computer science knowledge according to gender (N=164).

TABLE 4. Preferred form of teaching statistics according to gender.

	male		female		Total	
Preferred form of teaching statistics	n	%	n	%	n	%
lectures	1	1.6	3	2.9	4	2.4
practical classes	18	29.0	38	37.3	56	34.1
computer workshops	26	41.9	24	23.5	50	30.5
lectures and practical classes	0	0.0	3	2.9	3	1.8
practical classes and computer workshops	10	16.1	19	18.6	29	17.7
lectures, practical classes, computer workshops	1	1.6	6	8.8	7	6.1
no opinion	6	9.7	9	5.9	15	7.3
Total	62	100.0	102	100.0	164	100.0

Source: own calculations

CONCLUSIONS

It seems advisable to take action in order to extend the matter and ways of teaching statistics and informatics by increasing the number of hours of computer laboratory classes, as well as considering higher differentiation of education programs of those subjects at various Public Health faculties. Taking into account unequal level of students' knowledge in terms of statistical tools and computer software, it is reasonable to make them gradually conversant with STATISTICA and SPSS statistical programs.

There are already thousands of users employing STATISTICA and SPSS software for different analyses. Government and local authorities, financial institutions and universities are among them. It should be emphasised that all entrepreneurships or public health facilities make decisions of purchasing more advanced, and what goes with it, more expensive specialized software. Statistical analysis software, which is of high interest among students, even if statistical analysis becomes a commonly taught subject at universities and widely exerted in public health facilities, will not eliminate the basic tool, which is Excel. This electronic worksheet is ubiquitous as part of MS Office system while today's mathematical statistics can also be performed with the use of this worksheet.

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