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# Attitudes of Nursing Students and Non-Medical Students Toward Vaccination

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<sup>1,2</sup>Iva Marija Stipandić

<sup>2</sup> Janko Babić

<sup>1</sup> Health Center Zagreb-Istok, Zagreb, Croatia

<sup>2</sup> University of Applied Health Sciences, Zagreb, Croatia

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**Author for correspondence:**

Iva Marija Stipandić

Health Center Zagreb-Istok

Grižanska 4, Zagreb, Croatia

E-mail: iva20marija@gmail.com

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## Abstract

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**Introduction.** Despite the scientifically proven positive effect on the population, vaccination remains a major public health problem. The biggest problem at the moment is that attitudes are based on other

people's opinions or various scientifically unfounded information obtained via the Internet.

**Aim.** The aim of this study was to examine the attitudes and level of knowledge about vaccination of nursing students and non-medical students in Croatia and establish whether there is a difference between them.

**Methods.** The study involved 961 nursing and non-medical students from Croatia, aged between 18 and 53 years. The research was conducted using an online questionnaire program 'Google Forms' which consisted of 33 questions and was completely anonymous.

**Results.** The study shows that nursing students have better knowledge of vaccinations and vaccines. They also have a statistically more positive attitude towards vaccination in comparison to non-medical students. When it comes to obtaining information about vaccines, as in existing studies from around the world, the participants in this study stated that they first turn to doctors and nurses for information related to vaccination and its side effects.

**Conclusion.** The results of this study show that nursing students have better knowledge. Also, there was a statistically significant difference between the attitudes of nursing students and students of non-health studies, but the numerical difference is very small, which actually shows a very small difference in attitudes. Educational and health institutions play an important role in forming attitudes, as well as the importance of presenting accurate, clear, and proven information.

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## Introduction

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Vaccination has greatly contributed to the social and economic development of society at the global level by reducing hospitalizations, reducing the need for expensive medical procedures, reducing epidemics and permanent disability by limiting the long-term effects of disease, reducing productivity and absenteeism (1). Vaccination or active immunization is a process that achieves immunity over time through the injection of live, inanimate or genetically modified antigens (2). This achieves a specific immunity that protects a person from a particular infectious disease. Passive immunization involves the intake of specific ready-made antibodies (IgG, IgA, IgM, and other plasma proteins) for current protection against infection or the development of an infectious disease (3). Immunization represents a key component of primary health care and an indisputable human right. It is also one of the most profitable investments in health care. Vaccines are also crucial to preventing and controlling the epidemic of infectious diseases. An optimal vaccination program and implementation achieves individual protection and collective immunity for human-to-human-transmitted diseases, and if sufficient coverage of the population by vaccination is achieved, disease transmission will be interrupted (4). In Croatia, vaccination is available to everyone and is defined by the Law on the Protection of the Population from Infectious Diseases (5). Most vaccines today are free and covered by the mandatory national vaccination program. The mandatory vaccination program in Croatia is implemented continuously throughout the year and prescribes diseases against which vaccination is mandatory with the aim of reducing disability and mortality; prescribes procurement, distribution, storage of vaccines, deadlines, vaccines of certain characteristics, time intervals between the application of individual vaccines, contraindications, method of documenting implementation, and reporting adverse reactions (6). Despite tremendous progress, large numbers of people worldwide, including nearly 20 million newborns, still lack access to vaccines. According to the World Health Organization, about 2.5 million deaths a year are still caused by vaccine-preventable diseases, mostly among African and Asian in all age groups (7). On the other hand, more developed countries have a problem with the

anti-vaccination movement and the downward trend in vaccination. Unfortunately, although the availability of a variety of information on the Internet has its advantages, it also has some disadvantages. On the Internet, people can come across a lot of untrue and unfounded articles, and thus a variety of information about vaccines promoted by various anti-vaccination groups. There exists mistrust toward the health system and concerns about the efficacy and safety of vaccines. Based on the report of the Croatian Institute of Public Health, it can be concluded that due to the continuous decline in vaccination in the period from 2011 to 2017, the level of collective immunity has been endangered, primarily among preschool children (8). In the last two years, the negative decline in vaccination has stopped, which is a good sign, and if this positive trend continues it should be possible to avoid epidemics of infectious diseases which have been a serious threat in recent years.

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## Aim

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The purpose of this study is to examine the attitudes and level of knowledge about vaccination of nursing and non-medical students in undergraduate and graduate professional and university studies in Croatia and establish whether there is a difference between them.

Specific goals:

1. Examine the difference in attitudes about vaccination and vaccines among students according to the type of study
2. Compare the level of knowledge about side effects among students according to the type of study
3. Examine students' perceptions of who influences their attitudes about vaccination the most

## Hypothesis

1. Nursing students have a more positive attitude towards vaccination than non-medical students
2. Nursing students are better educated and informed about the vaccination calendar than non-medical students
3. There is no difference in knowledge between nursing students and non-medical students about the connection between vaccines and disease
4. Regardless of the type of study, students perceive that educational institutions and the internet have the greatest impact on their attitudes towards vaccination
5. Regardless of the type of study, students received most information and advice from physicians and nurses

## Methods

Using the online program 'Google Forms', respondents filled in a questionnaire which was created for the purposes of this study. The participants completed the questionnaire in the period from October 2019 to March 2020. 33 questions needed to be answered, which took about 5 minutes to complete, and participation was completely anonymous and voluntary. Each participant could withdraw from the survey at any time. The first part of the questionnaire asked for general information about the respondents (age, gender, and type of study). The second part of the questionnaire consisted of statements related to the students' attitudes towards vaccination. Participants gave their answers on a Likert scale from 1 to 5. They had to respond to individual statements by choosing one of the following options: 1 - strongly disagree, 2 - disagree, 3 - neither agree nor disagree, 4 - agree, 5 - strongly agree. The rest of the questionnaire referred to the students' knowledge of vaccination. They were offered yes/no answers and supplement-

ary questions. For statistical data processing, Microsoft Excel 2010 and the statistical program SPSS 21 (IBM SPSS Statistics for Windows) were used, along with methods of descriptive and inferential statistics.

## Results

The study involved 961 nursing and non-medical students from Croatia. According to the gender of the respondents, the largest number of respondents was female (N=785, 81.7%), while 176 were male (18.3%). The age range of participants is between 18 and 53 years, with an average age of 22 years. Table 1 shows the type of study: the sample consisted of 455 (47.3%) nursing students and 506 (52.7%) non-medical students.

Table 1. Participants according to the type of study

		N	%
STUDY	Nursing studies	455	47.3
	Non-medical studies	506	52.7
	Total	961	100

Regardless of the type of study, 796 of all respondents are in favour of mandatory vaccination for vaccines listed in the vaccination calendar, while the remaining 165 believe that vaccination should not be mandatory. The first hypothesis was that nursing students had a statistically significantly more positive attitude toward vaccination than non-medical students. This hypothesis was tested and confirmed by a nonparametric method via the chi-square test. Table 2 shows that a statistically significant difference in attitudes towards vaccination was obtained with regard to the type of study (chi-square=13.09, df=1,  $p < 0.01$ ), with nursing students significantly more supportive of the claim that vaccination should be mandatory (87.5%), as opposed to non-medical students (78.7%).

**Table 2. Students' responses to the question "Should vaccination be mandatory?" according to the type of study**

Should vaccination be mandatory for vaccines listed in the vaccination calendar?						
	YES	%	NO	%	TOTAL	%
Nursing studies	398	87.5	57	12.5	455	100
Non-medical studies	398	78.7	108	21.3	506	100
Total	796		165		961	
Chi-square	13.09*					
df	1					

$p < 0.01$

Table 3 shows that 550 of the total number of respondents stated that they had knowledge about

the vaccination calendar, while the rest stated that they did not have sufficient knowledge (N=411).

**Table 3. Students' responses to the question: "I am well informed about the vaccination calendar and what are certain vaccines used for?" according to the type of studies**

I am well informed about the vaccination calendar and what are certain vaccines used for?						
	YES	%	NO	%	TOTAL	%
Nursing studies	341	74.9	114	25.1	455	100
Non-medical studies	209	41.3	297	58.7	506	100
Total	550		411		961	
Chi-square	110.76*					
df	1					

$p < 0.01$

The second hypothesis claims that nursing students are better educated and instructed in the vaccination calendar than non-medical students. The chi-square test resulted in a statistically significant difference according to the type of study (chi-square=110.76, df=1,  $p < 0.01$ ), with nursing students (74.9%) significantly more informed about the vaccination calendar and what certain vaccines are used for in comparison

to non-medical students (41.3%). Furthermore, it can be seen that the majority of all students do not agree that the vaccination calendar in Croatia is too extensive (N=841), while the remaining students (N=120) agree with such an assessment. Depending on the type of study, there is a statistically significant difference (chi-square=6.27, df=1,  $p < 0.05$ ) between nursing students (9.7%), who believe significantly

less strongly that the vaccination calendar in Croatia is too extensive, and students of non-medical studies (15%). On the question about the risk of new vaccines over old ones, there is no statistically significant difference with regard to the type of study (chi-square=0.21,  $df=1$ ,  $p>0.05$ ). Nursing students (53.4%) show greater knowledge about the side effects of vaccines than non-medical students (34.4%). According to the type of study, there is a statistically significant difference (chi-square=35.28,  $df=1$ ,  $p<0.01$ ). As part of this question, all students who answered positively ( $N=417$ ) were also able to answer an open-ended question and write about the side effects of the vaccine. Most of them wrote: pyrexia (fever), local redness and pain at the injection site, allergic reactions (rash, urticaria, and anaphylactic shock), headache, nausea, vomiting and gastrointestinal problems. Most of the side effects written by students correspond to the register of side effects of vaccines, which indicates good knowledge among the students who provided a positive answer to this question. The third hypothesis (zero) says that there is no difference in knowledge between nursing students and non-medical students about the connection between vaccines and disease. Nursing students ( $M=2.13$ ,  $sd=1.00$ ) are statistically significantly less likely to think that vaccines cause other diseases ( $t=-2.05$ ,  $df=959$ ,  $p<0.05$ ) than students of non-health studies ( $M=2.27$ ,  $sd=1.10$ ). The t-test also shows that nursing students ( $M=1.64$ ,  $sd=0.97$ ) are statistically significantly less likely ( $t=-3.26$ ,  $df=959$ ,  $p<0.01$ ) to believe that vaccines cause autism than non-medical students ( $M=1.87$ ,  $sd=1.14$ ). Regardless of the type of study, the ratio of all students who would vaccinate their children ( $N=890$ ) according to the mandatory vaccination calendar is significantly higher than the number of students who said they would not do so ( $N=71$ ). Considering the type of studies, nursing students are more likely to agree to the vaccination of their children with the mandatory vaccine (95.2%) than non-medical students (90.3%), with a statistically significant difference (chi-square=8.23,  $df=1$ ,  $p<0.01$ ). In comparison with the previous question, where the majority of students provided a positive answer, the responses to this question were divided. Regardless of the type of study, 504 students would vaccinate their children with an additional vaccine that is not on the list of the mandatory vaccination calendar, while the remaining students would not ( $N=459$ ). Nursing students (60.4%) are statistically significantly (chi-square=22.14,  $df=1$ ,  $p<0.01$ ) more

in favour of vaccinating their own children with an optional vaccine than non-medical students (45.3%). Regardless of the type of study, the majority of 874 students oppose the abolition of the mandatory vaccination calendar, while 87 are in favour of abolishing it. Comparing the attitudes with respect to the type of study, there is a statistically significant difference (chi-square=10.21,  $df=1$ ,  $p<0.01$ ), with non-medical students (11.9%) significantly more in favour of abolishing the calendar than nursing students (5.9%). 605 students believe that children who have not been vaccinated should be forbidden to enrol in kindergarten, and 356 believe that the ban should not be introduced. When students are divided by the type of study, there is no statistically significant difference (chi-square=1.02,  $df=1$ ,  $p>0.05$ ). Of the total number of students, 511 think that parents who did not vaccinate their children should be fined, while 450 disagree. Regarding the type of study, there is no statistically significant difference in attitudes (chi-square=0.61,  $df=1$ ,  $p>0.05$ ). Most of the students stated that they had never been vaccinated against influenza ( $N=779$ ), while 182 had been vaccinated at least once in their lives. When students are divided by the type of study, there is no statistically significant difference (chi-square=0.92,  $df=1$ ,  $p>0.05$ ). In the next part of the study, the respondents were able to choose from seven answers when asked to indicate who had the greatest influence on their opinion about vaccination (Table 4). The fourth hypothesis was partially confirmed by descriptive data, which shows that students perceive that their attitudes about vaccination are mostly influenced by health facilities and the internet. The hypothesis was not fully confirmed, as students stated that they were mostly influenced by educational (35.1%) and health institutions (27.4%).

**Table 4. Influences on students' opinions about vaccination regardless of the type of study**

Of the following, who or what has had the greatest influence on your opinion about vaccination?		
	N	%
Educational institutions	337	35.1
Healthcare facilities	263	27.4
No one	142	14.8
Family / friends	114	11.9
Internet	59	6.1
Multiple answers	35	3.6
TV / newspaper	11	1.1
Total	961	100

The fifth hypothesis was that regardless of the type of study, students received most information and advice from doctors and nurses. This hypothesis was not fully confirmed, as a large percentage of students stated that they sought or received most advice from a doctor (39.8%), or that they had never sought or received any advice or information (21.5%). Of the seven possible answers to the question shown in Table 5, nurses as a source of information are only in the 6th place, with 3.9%, while the fewest number of students selected the answer "Pharmacist" (1.1%).

**Table 5. Sources of information and advice about vaccinations and vaccines regardless of the type of study**

You have asked for or received information and advice about vaccines and vaccination from the following sources:		
	N	%
Doctors	382	39.8
I have never asked for or received any advice or information	207	21.5
Via the Internet / TV / newspaper	116	12.1
Croatian Institute of Public Health	114	11.9
Family members / friends	94	9.8
Nurses	37	3.9
Pharmacist	11	1.1
Total	961	100

Nursing students ( $M=4.65$ ,  $sd=0.70$ ) statistically significantly ( $t=3.79$ ,  $df=959$ ,  $p<0.01$ ) more strongly believe that vaccines help prevent infectious diseases when compared to non-medical students ( $M=4.44$ ,  $sd=0.95$ ). Regarding the question of vaccination benefits, the t-test ( $t=4.10$ ,  $df=959$ ,  $p<0.01$ ) also shows that nursing students ( $M=4.55$ ,  $sd=0.82$ ) statistically significantly more strongly believe that the benefit of vaccination is greater than its side effects when compared with non-medical students ( $M=4.28$ ,  $sd=1.11$ ). The answers to the question about the safety of vaccination ( $t=3.93$ ,  $df=959$ ,  $p<0.01$ ;) show that nursing students ( $M=4.19$ ,  $sd=0.90$ ) significantly more strongly believe that vaccines are safe and well-controlled when compared with non-medical students ( $M=3.92$ ,  $sd=1.14$ ). Students of non-medical studies ( $M=2.61$ ,  $sd=1.33$ ) statistically significantly more strongly believe that the pharmaceutical industry has more benefits from vaccines than the general population when compared with nursing students ( $M=2.21$ ,  $sd=1.22$ ;  $t=-4.86$ ,  $df=959$ ,  $p<0.01$ ).

Table 6. **Students' responses to the question about the connection between vaccines and autism and other diseases**

	Vaccines cause some other diseases		Vaccines cause autism	
Mean	2.21		1.76	
Median	2.0		1.0	
Mode	1		1	
Standard deviation	1.06		1.07	
Minimum	1		1	
Maximum	5		5	
	Nursing studies		Non-medical studies	
Arithmetical mean	2.13	2.27	1.64	1.87
Standard deviation devijacija	1.00	1.10	0.97	1.14
Total	961		961	
t	- 2.05		- 3.26	
df	959		959	
	$p < 0.05$		$p < 0.01$	

## Discussion

This study analysed differences in attitudes and basic knowledge between nursing students and non-medical students in Croatia. Regardless of the type of studies, students generally have positive attitudes toward vaccination, which supports claims that people with a higher level of education are more in favour of vaccination than people with a lower level of education (9). When the types of study are taken into consideration, the difference in arithmetic means is significant (which is not unexpected, considering the sample size), but it is numerically very

small, which means that it shows a very small difference in attitudes. The study also shows that nursing students have a more positive attitude towards compulsory vaccination with vaccines listed in the vaccination calendar, which in Croatia consists of a three-year vaccination program (2019-2021) (10). The results show that nursing students are better informed about vaccines and the vaccination calendar. Such results are to be expected if one takes into consideration that nursing students undergo additional education and practice. We can conclude from this that additional education and national programs would help change the thinking of individuals advocating for the anti-vaccination movement, and thus reduce the spread of infectious diseases. Many studies, especially in recent years, have examined

the attitudes of the population toward vaccination. The main reason for this is numerous media articles and public statements of people who express their scientifically unfounded opinions about the harmfulness of vaccination. Disclosure of such information that has not been scientifically proven is very harmful and threatens the implementation of one of the most important public health programs in any country – the protection of public health through vaccination (5). Information sources represent a very important link in education. Information used by students and the rest of the population should be reliable and based on verified facts. According to a 2015 study by Kulić, the most commonly used sources are doctors, followed by the Internet and nurses (11). Table 5 confirms this, showing that doctors and the Internet were sources of information for most of the respondents. It is interesting to note that few of the respondents selected the answer “Nurses”, which is only in sixth place. Also, considering the general interest in the topic of vaccination and the level of education of the respondents, it is very alarming that the majority of all participants stated that they had never asked for or received advice and information about vaccination. Another study from 2005 found that the results of searching for the word “vaccination” on the Internet consist of 60% of anti-vaccination content (12). The negative attitudes of the respondents mostly stem from a lack of information about the serious consequences of the diseases against which vaccination is carried out, both for individuals and the community as a whole. The key to better understanding and building trust lies in a system of training professionals to be able to answer all questions and monitor the effects of vaccination, as well as in educating the general public. At the same time, more emphasis needs to be placed on verified and credible sources of information that are neglected today. Such efforts will help strengthen the bond of trust between medical workers and patients, as well as provide a way to change negative beliefs about vaccination through arguments. It is important to inform the public about the consequences of avoiding vaccination, especially the fact that being unprotected is of greater risk than being protected (13). Students, regardless of the type of studies, mostly agreed with the statement that the benefits of vaccination are significantly greater than its side effects, but when comparing attitudes by type of studies, nursing students have a more positive attitude. A similar study shows that 100% of physicians surveyed in Croatia,

76% in Romania, 75% in France, and 55% in Greece believe that the benefits of vaccination outweigh the possible side effects (14). A study from 2007 has shown that reactions to vaccines can be expected in most cases (15). Most often, these side effects are mild and mainly include fever, irritability, local redness and pain at the injection site, allergic reactions (rash and urticaria), headache, nausea, vomiting and gastrointestinal problems. Healthcare professionals consider these side effects to be very mild and insignificant, while opponents of vaccination say more attention should be paid to them. Most of the participants stated that they knew which side effects vaccines cause. The development and approval process of vaccines is time-consuming and complex, and includes the analysis of appropriate vaccine quality, its effectiveness, and safety of application. Vaccine safety is continuously evaluated by monitoring for adverse reactions during the clinical trial, and especially after the start of administration. If clinical trials prove that the risk outweighs the benefits, such a vaccine cannot be marketed. In Croatia, the Agency for Medicinal Products and Medical Devices is responsible for approving and checking the quality of all medicines, including vaccines on our market. During 2018, a total of 212 side effects after vaccination were reported in Croatia (16). Most reports were related to mild side effects, such as fever, redness, and swelling at the site of application (16). Any reaction that occurs after vaccination does not necessarily mean a cause-and-effect relation. For some side effects, such as a local reaction at the site of vaccination, it is easy to determine the cause-and-effect relation. For others, such as fever after vaccination, it is difficult to determine whether the cause is a vaccine or a disease independent of vaccination. Regarding the statement that vaccines cause autism, students stated that they somewhat disagree, although nursing students agree with this statement to a lesser degree than students of non-medical studies (Table 6). Although there is a statistically significant difference in favour of nursing students, these results are very encouraging because non-medical students also showed a high degree of disagreement with this scientifically unproven claim. On the statement that vaccines cause some other diseases, the statistics were similar to the previous statement. There is enough evidence to reject the null hypothesis according to which there is no difference in attitudes between nursing and non-medical students regarding the connection between vaccination-related diseases (Ta-



ble 6). In 2011, the American Institute of Medicine conducted a thorough review of the professional and scientific literature with the aim of determining the association of various vaccines (17). Regardless of the vaccine ingredients and certain side effects, they concluded that no vaccine was associated with autism and that vaccines were generally safe for use in children and adults, as well as that (other) serious side effects are rare (16). Another study by Geber and Offit presented research conducted around the world based on the link between vaccines and autism (18). Theories for this putative association have centred on the measles-mumps-rubella (MMR) vaccine, thimerosal, and the large number of vaccines currently administered. However, both epidemiological and biological studies fail to support these claims (18).

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## Conclusion

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This study showed a statistically significant difference in attitudes and knowledge between nursing students and non-medical students. Although both groups of students showed positive attitudes towards vaccination in most cases, nursing students had statistically significantly more positive attitudes and better knowledge. Such results are not too surprising considering that nursing students undergo additional education during their schooling. Different international studies, including this one, found that students stated that doctors and nurses are the first to be approached for information related to vaccination and its side effects. Additional education and a sense of trust of both students and the general population towards health care staff would significantly change the negative attitude towards vaccination and thus help maintain group immunity and prevent the spread of infectious diseases. Therefore, it is necessary to invest in programs and education about vaccination of both the population and health professionals because they have an important role in forming attitudes as well as presenting accurate, clear, and proven information.

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## STAVOVI STUDENATA SESTRINSTVA I STUDENATA NEZDRAVSTVENIH STUDIJA O CIJEPLJENJU

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### Sažetak

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**Uvod.** Bez obzira na znanstveno dokazani pozitivan učinak na populaciju, cijepljenje i dalje predstavlja veliki javnozdravstveni problem. Najveći je problem što se stavovi baziraju na raznim znanstveno neutemeljenim informacijama.

**Cilj.** Cilj ovog istraživanja bio je ispitati stavove i razinu znanja o cijepljenju studenata sestrinstva i nezdravstvenih studenata u Republici Hrvatskoj te postoji li razlika između njih. Metode. U istraživanju je sudjelovao 961 student sestrinstva i nezdravstvenih studija s područja Republike Hrvatske, u dobi između 18 i 53 godine. Istraživanje je provedeno putem online upitnika sastavljenog u programu Google obrasci koji se sastojao od 33 pitanja te je bio u potpunosti anonimno.

**Rezultati.** Istraživanje je pokazalo kako su studenti sestrinstva bolje upućeni u cjepiva i cijepljenje naspram nezdravstvenih studija. Kada je u pitanju informiranje o cjepivima, u istraživanjima diljem svijeta, pa tako i ovom, studenti su naveli kako su stručne osobe (liječnici i medicinske sestre) oni kojima se prvima obraćaju za informacije povezane s cijepljenjem i nuspojavama cjepiva.

**Zaključak.** Ovo istraživanje pokazalo je bolje znanje studenata sestrinstva o cjepivima. Također je dokazana i statistički značajna razlika u stavovima stude-

nata sestrinstva i studenata nezdravstvenih studija, ali je brojčana razlika vrlo mala, što zapravo iskazuje vrlo malu razliku u stavovima. Vrlo je važno ulagati u programe i edukaciju o cijepljenju, kako studenata tako i cijele populacije. Veliku ulogu u formiranju stavova imaju obrazovne i zdravstvene ustanove, kao i važnost u prezentiranju točnih, jasnih i dokazanih informacija.

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**Ključne riječi:** cijepljenje, obrazovanje, stavovi, medicina, studenti

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