### INFLUENZA VACCINATION IN THE HEALTH CENTER OF THE SPLIT-DALMATIA COUNTY IN VRGORAC

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#### **ABSTRACT**

Introduction: Adults over 65 years of age have the highest mortality rate from lower respiratory tract infections caused by influenza. People who live with or care for patients in risk groups, such as healthcare workers, should be vaccinated. Low influenza vaccination rates among certain at-risk groups contribute to the burden of disease and remain a major public health challenge. The coronavirus disease 2019 (COVID-19) pandemic has had a significant impact on seasonal influenza.

Aim: Investigate the coverage of influenza vaccination among adults at the Health Center of the Split-Dalmatia County in Vrgorac.

Materials and methods: A retrospective analysis was conducted. Data on influenza vaccinations from January 01, 2019 to December 31, 2024 at the Health Center of the Split-Dalmatia County in Vrgorac were analyzed from the electronic immunization database. The following variables were included in the analysis: vaccination coverage by year, subject category (older than 65, chronically ill, healthcare worker, other), and subject gender.

Results: A total of 2090 doses of influenza vaccine for adults were consumed. The most vaccine doses were consumed in 2020, 512 doses, and the fewest vaccine doses were consumed in the last two years, 257 and 296, respectively (p<0.05). The largest number of patients was over 65 years old, 1214, 833 were chronic patients, while 26 were healthcare workers (p<0.05).

Conclusion: A statistically significantly lower consumption of vaccine doses was found during and after the end of the COVID-19 pandemic compared to the time before the pandemic. Healthcare workers were statistically significantly less vaccinated against influenza compared to other groups.

**Keywords:** Influenza, human flu, vaccination, immunization, vaccines

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#### INTRODUCTION

Seasonal influenza, commonly known as the flu, is an acute and infectious respiratory virus. Millions of people are infected with the flu virus every year, mostly in temperate regions, and sporadic spikes in prevalence in tropical areas. It causes diseases that vary in severity of sometimes symptoms and hospitalization and death. Most people recover from fever and other symptoms within a week without needing medical attention. However, influenza can cause serious illness or death, especially among high-risk groups including the very young, the elderly, pregnant women, healthcare workers and people with serious health problems (1). There are more than 1 billion flu cases each year, of which 3-5 million are severe cases and 290,000-650,000 respiratory deaths related to influenza worldwide (2, 3). Older adults are at higher risk of developing severe influenza, influenza complications, hospitalization, and death than other populations. Adults over 65 years of age have the highest mortality rate from lower respiratory tract infections caused by influenza (4). Vaccination with the trivalent inactivated vaccine is the most effective method of preventing influenza and should be offered to patients in risk groups. People who live with or care for patients in risk groups, such as healthcare workers, should be vaccinated (5). Influenza vaccination rates are low among underserved populations, whose primary healthcare access is through emergency departments (6). Declining vaccination rates among adults against influenza are also being recorded in developed countries around the world, such as the United States, despite the fact that vaccines are key in reducing vaccinepreventable diseases (7). Low influenza vaccination rates among certain at-risk groups contribute to the burden of disease and remain a major public health challenge (8).

The coronavirus disease 2019 (COVID-19) pandemic has had a significant impact on seasonal influenza by changing seasonality of the virus and reducing detection rates (9). In relation to chronic diseases, populations aged 50-64 recommended for vaccination or classified as a risk group in the case of chronic diseases. Some authors point out the low vaccination coverage of people over 60 years of age, although this is the age group that falls into the risk group for chronic diseases. In order to improve influenza vaccination rates in all age groups, it is necessary to conduct research and devise strategies increase vaccination coverage rates (10).

The aim of this study was to investigate the coverage of influenza vaccination among adults at the Health Center of the Split-Dalmatia County in Vrgorac. Additional objectives were to investigate the trend of influenza vaccination after the start of the COVID-19 pandemic in the Republic of Croatia.

#### **MATERIALS AND METHODS**

A retrospective analysis was conducted between January and April 2025. Vaccination data were collected from the electronic immunization database of the local Health Center, which routinely collects data on all administered vaccines. Data on influenza vaccinations from January 01, 2019 to December 31, 2024 at the Health Center of the Split-Dalmatia County in Vrgorac were analyzed.

The inclusion criteria for the study were adults who were vaccinated at the Split-Dalmatia County Health Center Vrgorac and who were recommended to undergo influenza vaccination, persons over 65 years of age, residents and employees of nursing homes and long-term care institutions, employees of nursing homes, elderly people with chronic diseases (diseases of the heart and circulatory lungs, kidneys, metabolism, system, nervous and immune systems), healthcare workers. Children and adolescents aged 6 months to 18 years, pregnant women and persons under 65 years of age who are not chronically ill were excluded from the study. All patients were vaccinated with a dose of the Vaxigrip Tetra vaccine. The Croatian Institute of Public Health ensures a sufficient number of doses of the Vaxigrip Tetra influenza vaccine for each influenza season. Influenza vaccination is carried out in primary health care offices and in public health institutes. For certain risk groups, the vaccine is recommended and free of charge: including people in close contact with the aforementioned groups (in case the person in the risk group has a contraindication) (11).

Adults receive a single dose of 0.5 ml. The recommended dose of the vaccine is administered as an injection into a muscle or subcutaneously. The vaccine was stored according the manufacturer's to instructions, refrigerated (2°C - 8°C), not frozen. The syringe was kept in the outer carton to protect from light (12). All vaccinated people are informed about the possible side effects of the vaccine. Common side effects include: headache, muscle pain (myalgia), general feeling of weakness, pain at the application site,

fever, chills, application site reactions: erythema, swelling, induration.

The following variables were included in the analysis: vaccination coverage by year, subject category (older than 65 (>65), chronically ill, healthcare worker, other), and subject gender. The "Other" category includes people who pay for the vaccine themselves and who brought the flu vaccine with them for vaccination.

#### Statistical analysis

The statistical software SPSS (Statistical Package for Social Sciences) for Windows, version 26.0 (IBM, Armonk, New York, USA) was used for data analysis. This program is user-oriented. The collected data were processed using the method of descriptive statistics. The results presented descriptively, in tables and graphs, in absolute numbers and percentages. The chi-square test  $(\chi 2)$  was to determine the significant relationship between two nominal (categorical) variables. The probability level of p<0.05 was taken as statistically significant. The dispersion of the data is defined by the 95% confidence interval, 95% CI (Confidence Interval).

#### **Ethical principles**

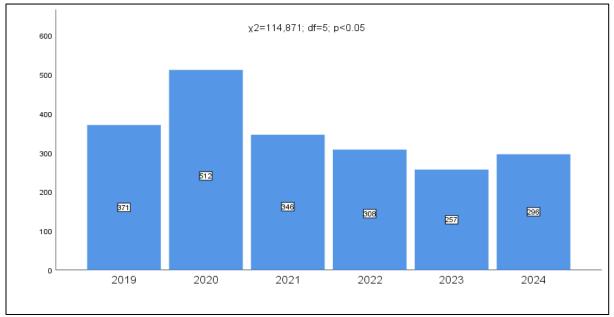
Because this study was a public health surveillance, ethics committee or institutional review board approval was not required. When collecting and analyzing data, we took care of their anonymity. All data is encrypted and stored in a safe place.

#### **RESULTS**

In the observed period, according to available data, a total of 2090 doses of influenza vaccine for adults were consumed. Of the total number of

vaccinated adults, 1055 were men and 1035 were women. The difference in respondents by gender was not statistically significant ( $\chi$ 2=0.191, df=1, p=0.662). The most vaccine doses were consumed in 2020, 512 doses, and the fewest vaccine

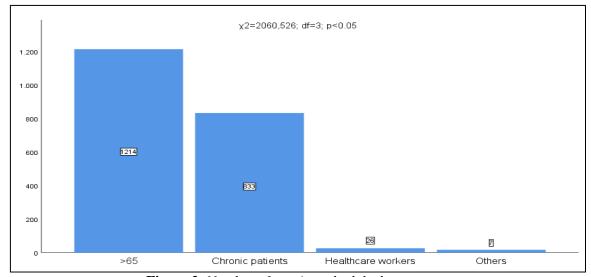
doses were consumed in the last two years, 257 and 296, respectively (p<0.05). The difference in the number of adults vaccinated against influenza by year was statistically significant (p<0.05) (Figure 1).



**Figure 1.** Number of vaccinated adults at the Health Center of the Split-Dalmatia County, Vrgorac Branch from January 01, 2019 to December 31, 2024.

The largest number of vaccinated adults belonged to the category "over 65 years of age", 1214 of them. Of the total number of vaccinated, 833 were chronic patients, while 26 were healthcare workers. The

difference in the number of vaccinated people compared to the category of respondents was statistically significant (p<0.05) (Figure 2).



**Figure 2.** Number of vaccinated adults by category

The largest number of respondents belonging to the categories "Over 65" and "Chronic patients" were vaccinated in 2020, 289 and 210 respectively. The largest number of healthcare workers were

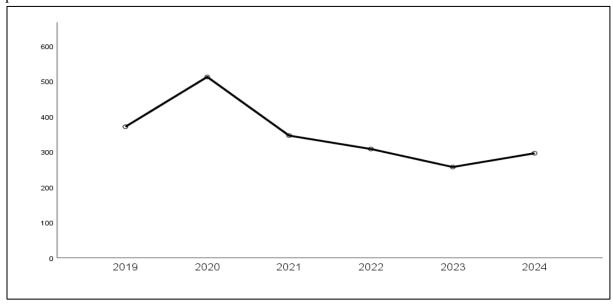
vaccinated in 2021, 10. The difference in the number of respondents by group in relation to the year of vaccination was statistically significant (p<0.05) (Table 1).

**Table 1.** *Difference in the number of vaccinated people by year and category* 

Category							
		>65	Chronic patients	Healthcare workers	Others <sup>a/b</sup>	Total	P
Year	2019	205	154	8	4	371	
	2020	289	210	4	9	512	
	2021	232	104	10	0	346	
	2022	200	107	0	1	308	p <0.05
	2023	124	132	1	0	257	
	2024	164	126	3	3	296	
Total		1214	833	26	17	2090	

<sup>&</sup>lt;sup>a</sup>The patient pays for the vaccine themselves; <sup>b</sup>The patient brought the vaccine with him/her

Figure 3 shows that the flu vaccination trend is lower during and after the COVID-19 pandemic.



**Figure 3.** Vaccination trend at the Health Center of the Spit-Dalmatia County, Vrgorac Branch from January 01, 2019 to December 31, 2024.

#### DISCUSSION

In relation to the main aim of our study, our results showed that in 2020, the vaccination rate was 8.98%, compared to the total population. According to the 2021 census, the town of Vrgorac and its surroundings had 5,698 residents, of which 2,132 in the city of Vrgorac (13). In the period from 2020 to 2025, the vaccination

rate of adults against influenza in Vrgorac decreased significantly, with the lowest vaccination rate recorded in 2023, at 4.51%. This result may be a consequence of the COVID-19 pandemic, which officially appeared in the Republic of Croatia on February 25, 2020. (14). In accordance with our results, many studies indicate a reduced vaccination coverage of

the population in the time period from the onset of the COVID-19 pandemic to today. Sun et al. report that the overall influenza vaccination coverage rate in Shanghai since the onset of the COVID-19 pandemic, especially among the elderly, is lower compared to before the pandemic (15). In a study using influenza vaccination rate data submitted by the US using the electronic Joint Immunization Reporting Form (eJRF) for the time period 2019-2021, a 21.0% decrease in influenza vaccination rate among adults observed (16). Macdonald points out that factors such as complacency, trust, and comfort play an important role in preventing adults from hesitating to get the flu vaccine, and that experts and health care professionals should work to study these variables as hindering factors in getting the flu vaccine (17). Adults who refuse vaccination due to complacency view influenza as a non-serious illness, believe they are at minimal risk, and view the influenza vaccine as less important. A meta-analysis by Brewer et al. identified perceived low personal risk of disease as a significant factor contributing to adults' hesitation to get vaccinated against influenza (18). Other factors that may lead to differences in influenza vaccination rates following the COVID-19 pandemic include the presence of different COVID-19 variants and the availability of mRNA vaccines. González-Block et al. state that strategies tailored to the specific context and needs of target groups need to be developed to increase trust and reduce disinterest in influenza vaccines (19). Puri and Coomes emphasize in their study that health campaigns and healthcare professionals must remain relentless in highlighting the fact that influenza

vaccination is an immunization tool that significantly contributes to protecting individuals and communities. At the same time, these same experts should strongly social media narratives promote anti-vaccination activities (20). Some authors point to the importance of targeted communications to address false myths surrounding specific vaccinations as more successful methods than broad vaccination promotion initiatives, which require strategic methods that emphasize sustainable regular and seasonal vaccination initiatives while increasing availability (21). The rise in vaccine misinformation and hesitation during the COVID-19 pandemic may have led to a decline in vaccination rates and needs to be further investigated and addressed to reverse the decline in vaccination rates (22, 23). The COVID-19 pandemic impacting health behaviors and vaccination patterns. Findings from some studies highlight the transient impact of the pandemic on influenza vaccine uptake in Canada. The increasing use of pharmacies vaccination sites highlights importance of accessible and convenient vaccination sites in increasing adult vaccination coverage (24). Recent research indicates that vaccination is often agerelated, so there is a need for tailored information about the effects of influenza on cardiovascular disease for adults. especially peripheral arterial disease (25).

Our results showed a low vaccination rate among healthcare workers. Concerns about the hesitancy to vaccinate healthcare workers have become particularly prevalent during and after the COVID-19 pandemic (26). Prior studies suggest that healthcare workers are at significant risk of exposure to the influenza virus during their

daily patient care duties, which places them in a group that is particularly susceptible to influenza infections (27). Some authors bring some information about another important finding that points to the importance of flu vaccination for healthcare workers. Healthcare workers can transmit the flu to susceptible patients, which instantly increases the risk of getting the flu for the patients themselves (28). The World Health Organization recommends that influenza vaccination of healthcare workers should be carried out once a year (1). A study by Alkathlan et al. shows that the Saudi Ministry of Health has advised that all healthcare workers receive mandatory annual influenza vaccination. In addition, influenza vaccine is provided free of charge in hospital settings for all healthcare workers (29). Such an initiative allows for increased vaccination rates among healthcare workers and creates a positive environment that prevents the spread of infectious diseases among healthcare workers and their patients. However, consistent with our study, several studies have reported reduced influenza vaccination rates among healthcare workers despite vaccination promotion campaigns and conditions for vaccination influenza (30,31). important factor in influenza vaccination refusal is the education of health professionals or the promotion of such vaccines by professional initiatives (32). Adults refuse to get vaccinated against influenza for various reasons: their good health, then concerns about side effects, they are well enough not to be infected with influenza, and ignorance about the availability of influenza vaccines (33). Previous studies have shown that selected factors such as high education and living in a city are associated with a positive attitude towards vaccination and greater concern about its side effects (34). Some authors have also suggested that the most common source of information about vaccination is cited as healthcare professionals, but also internet and friends. Healthcare workers should be a source of reliable information about the benefits and possible side effects of vaccination (35). Our study used the VaxiGrip vaccine. When a person receives Vaxigrip Tetra, the immune system (the body's natural defence system) will produce its own protection against the disease (antibodies). Some authors confirms that a quadrivalent inactivated split-virion influenza vaccine Vaxigrip Tetra is well tolerated and has acceptable safety profile in routine practice in South Korea. Authors stated that no unexpected safety concerns were identified (12).

There are several limitations of this study. The limitations of the present studies naturally include the availability of only those data that were entered into the institution's electronic database. There is a possibility that some data on the category of respondents were entered incorrectly. A study of this design does not make it possible to determine the reasons and attitudes of the respondents in relation to the refusal of vaccination. We recommend that in future research, the authors additionally apply the focus group method, which will obtain more subjective explanations of the respondents' attitudes about the reasons for refusing vaccination. In this study, due to the availability of data, only data from the Vrgorac Branch were analyzed. In future research, the research population should be expanded to other health centers in the Split-Dalmatia County in order to increase the reliability of drawing conclusions about the trend of influenza vaccination. Although our results clearly showed that the rate of influenza vaccination has been declining since the beginning of the COVID-19 pandemic, additional research is needed to further determine the vaccination trend and investigate the connection between the rate of influenza vaccination and the occurrence of the COVID-19 pandemic.

#### **CONCLUSIONS**

In the observed period, a statistically significant difference was recorded in the number of adults vaccinated against influenza. A statistically significantly lower consumption of vaccine doses was found during and after the end of the COVID-19 pandemic compared to the time before the pandemic. The largest number respondents were statistically significantly older than 65 years of age. Healthcare workers were statistically less vaccinated significantly against influenza compared to other groups. It is necessary to implement appropriate strategies and programs aimed at different populations in order to increase the coverage of influenza vaccination of adults, which is declining, especially healthcare workers.

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### CIJEPLJENJE PROTIV GRIPE U DOMU ZDRAVLJA SPLITSKO-DALMATINSKE ŽUPANIJE, ISPOSTAVA VRGORAC

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#### **SAŽETAK**

Uvod: Osobe starije od 65 godina imaju najveću stopu smrtnosti od infekcija donjih dišnih putova uzrokovanih gripom. Osobe koje žive s pacijentima iz rizičnih skupina ili se o njima brinu, poput zdravstvenih djelatnika, trebaju se cijepiti. Niske stope cijepljenja protiv gripe među određenim rizičnim skupinama pridonose teretu bolesti i ostaju veliki javnozdravstveni izazov. Pandemija koronavirusne bolesti 2019 (COVID-19) značajno je utjecala na sezonsku gripu.

Cilj: Istražiti cjepni obuhvat protiv gripe odraslih osoba u Domu zdravlja Splitsko-dalmatinske županije, Ispostava Vrgorac.

Materijali i metode: Provedena je retrospektivna analiza. Podaci o cijepljenju prikupljeni su iz elektronske baze podataka o cijepljenju. Analizirani su podaci o procijepljenosti odraslih osoba protiv gripe od 01. siječnja 2019. do 31. prosinca 2024. godine u Domu zdravlja Splitsko-dalmatinske županije, Ispostava Vrgorac. U analizu su uključene sljedeće varijable: cjepni obuhvat po godinama, kategorija ispitanika (stariji od 65, kronični bolesnik, zdravstveni djelatnik, ostalo) i spol ispitanika.

Rezultati: Potrošeno je ukupno 2090 doza cjepiva protiv gripe za odrasle osobe. Najviše doza cjepiva potrošeno je 2020. godine, 512 doza, a najmanje doza cjepiva potrošeno je u zadnje dvije godine, 257 odnosno 296 (p<0,05). Najveći broj oboljelih bio je stariji od 65 godina, njih 1214, 833 su kronični bolesnici, dok je 26 zdravstvenih djelatnika (p<0,05).

Zaključak: Utvrđena je statistički značajno manja potrošnja doza cjepiva tijekom i nakon završetka pandemije COVID-19 u odnosu na vrijeme prije pandemije. Zdravstveni djelatnici su statistički značajno manje cijepljeni protiv gripe u odnosu na ostale skupine.

**Ključne riječi:** Gripa, influenca, cijepljenje, imunizacija, cjepivo Autor za korespondenciju: doc. dr. sc. Darjan Franjić; <u>darjan.franjic@fzs3.sum.ba</u>