Predictors of COVID-19 vaccination intention and behavior among young people in Slovenia: A cross-sectional study

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Table of Contents

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Abstract

Background: Decision-making regarding protective measures against COVID-19 is complex, and it has been suggested that younger populations act differently than older population groups. Young population groups have shown a lower willingness to be vaccinated against COVID-19, also in Slovenia. Although COVID-19 vaccination behavior has been studied extensively, research often does not focus comprehensively on the specific population groups of young people and their vaccination intention and behavior in relation to COVID-19. There is still a gap in research and knowledge about the different factors influencing vaccination behavior and differences between different groups of young people in relation to COVID-19 vaccination.

Objective: This study investigates socio-psychological factors influencing COVID-19 vaccination intention and behavior among Slovenian young people by integrating constructs from two health behavior theories - Health Belief Model (HBM) and Theory of Planned Behavior (TPB). The influence of the main constructs on vaccination behavior (vaccine uptake and vaccine refusal) and intention (delayed vaccination and vaccine hesitancy) is controlled by several cognitive, affective and behavioral contextual factors (e.g. trust in science, health status, previous vaccinations) and demographic characteristics of the studied population.

Methods: An online survey panel was conducted in August 2021 among Slovenian young people aged between 15 and 30 years. A total of 507 respondents completed the survey. Bivariate analyses and multinomial logistic regression analyses were performed to analyze the data.

Results: The results showed that the majority of respondents had been vaccinated against COVID-19 (45.8%), 30% refused vaccination, 12.4% were hesitant and 11.8% reported that they intended to be vaccinated against COVID-19 (i.e. delayers). Multinomial logistic regression revealed that younger adults, those with lower education, and those whose mothers had lower education were more likely to delay or hesitate towards vaccination. Perceived health consequences of COVID-19, negative attitudes towards vaccines, and weaker subjective norms were associated with increased likelihood of delaying vaccination or refusing it altogether.

Conclusions: The study enhances the body of research that explores the decision-making processes within distinct groups of young people. By doing so, the study provides a deeper insight into the various factors that influence the vaccination related behaviors of young individuals regarding COVID-19 vaccination. The study's findings can inform health policy makers and health professionals to optimize the management of vaccine uptake in young people and apply insights into other vaccinations, future outbreaks of infectious diseases and the establishment of necessary preventive measures.

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Keywords: vaccine uptake; young people; COVID-19 vaccine; health belief model; theory of planned behavior

Introduction

The rapid development of COVID-19 vaccines is considered as a pandemic success story, and vaccination against COVID-19 as one of the most effective preventive measures [1,2]. Yet, the success of vaccination against a communicable disease depends on sufficiently high vaccination rate and successful management of vaccine hesitancy in a given population [3]. In the case of COVID-19, it has been suggested that around 75% to 90% of the population needs to be vaccinated against COVID-19 to achieve so-called herd immunity [4]. Slovenia lagged far behind this goal; it is among the countries with the lowest vaccination rate against COVID-19 in the EU since vaccination against COVID-19 became available to citizens [5].

The most hesitant against COVID-19 vaccination in Slovenia were those under 37 years of age [6]. This is consistent with previous studies around the world, showing that among adults, younger age groups are among the populations that have shown lower willingness to be vaccinated against COVID-19 [7-14]. However, vaccination of young adults against COVID-19 had been perceived crucial for establishing herd immunity and safeguarding the elderly and people with weakened immune systems from severe outcomes, hospitalization, and death [15]. This is important also since young people in particular question “the effectiveness of the recommended infection control measures" in general and believe that pandemic outbreaks cannot be controlled [16]. A scoping review study suggests that primary factors in young people’s acceptance of the COVID-19 vaccine are the desire to protect themselves and close family/friends, fear of infection, professional recommendations and employer obligations [17]. Primary hesitancy factors, on the other hand, include concerns about the safety of the vaccine and its side effects, effectiveness and efficacy, as well as lack of trust in the pharmaceutical industry and government, conspiracies and favoring natural immunity [17]. The same study also suggested the need for additional research into COVID-19 vaccine-related decision-making dynamics on specific adolescent and youth population age ranges to better understand how vaccination related behavior is influenced by environmental or social factors as well as personal health and susceptibility [17].

The decision-making dynamics regarding protective measures against COVID-19 are indeed complex [18] and it is suggested that it is different in younger populations than in older population groups. It seems that despite awareness of the need for the recommended protective measures against COVID-19 (cognitive level), young people tend to get more emotionally burdened by them (affective level), which may affect the way they practice the recommended protective measures (behavioral level) [18]. To this end, the main aim of this study is to gain better insight into the cognitive, affective and existing behavioral level determinants affecting vaccine uptake among young people by examining factors related to COVID-19 vaccine uptake, socio-demographic and health-related factors and other factors that have been highlighted in previous studies and theories as important in influencing vaccination related behavior [13,17]. To achieve this aim, we adopted and further developed Shmueli’s [19] model with factors from two behavioral models (Health Belief Model (HBM) and Theory of Planned Behavior (TPB)) and some other social factors (such as trust in science, tendency towards conspiracy theories), which proved to be a very strong predictors of willingness to receive COVID-19 vaccine among the adult population [20]. The HBM, which has generated a great deal of research interest in various health related behaviors to date, is based on a set of core beliefs (cognitive factors) regarding risk susceptibility, risk severity, benefits and barriers [21]. According to a widely tested TPB [22,23], the underlying behavioral intention as a direct antecedent of behavior is determined by attitude towards the behavior, subjective norms and perceived behavioral control. Both models aim to predict behavior, in our case COVID-19 vaccination related behavior. Based on the study by Schmueli [19], we developed an integrated

model that integrates constructs of two prominent health behavior theories (HBM and TPB) and controls for a number of other cognitive, affective and behavioral contextual factors (e.g. trust in science, health status, previous vaccinations etc.) and socio-demographic characteristics of the studied population, to identify socio-psychological factors influencing COVID-19 vaccination intention and behavior among Slovenian young people. In line with the proposed integrated model, we compared vaccinated and unvaccinated young people, which we further divided into those who are hesitant to vaccinate, tend to vaccinate or refuse to vaccinate. Our goal is to enhance the body of research that explores the decision-making processes within distinct groups of young people. By doing so, we strive to gain a deeper insight into the various factors that influence the vaccination related behaviors of young individuals regarding COVID-19 vaccination. This cross-sectional study is based on data collected with an online survey panel on a quasi-representative sample of the young population in Slovenia.

Methods

Study design and data collection

The data for this cross-sectional study was collected using the JazVem online survey panel among Slovenian young people aged 15-30 years in August 2021. The online survey panel was administered by the online survey panel provider Valicon, whose database provides a quasi-representative sample of the Slovenian population. A quota sampling based on prior stratification by gender, age groups, education and region was used. A total of 507 respondents completed the questionnaire with 79 questions, which took around 15-20 minutes to answer.

Measurement instruments

The dependent variable vaccine uptake was measured with the following three questions: "Please tell us about your decision regarding the COVID-19 vaccination. Have you been vaccinated against COVID-19?", "Do you intend to get vaccinated against COVID -19 in the next 30 days?", and "Do you intend to get vaccinated against COVID-19 in the next 6 months?". Based on the respondents' answers, we computed vaccine uptake variable and divided the respondents into four categories: Respondents who reported being vaccinated were categorized as "vaccinated respondents"; respondents who reported not being vaccinated but intended to get vaccinated in the next 30 days were categorized as "delayers"; respondents who reported not being vaccinated but intended to get vaccinated in the next 6 months were categorized as "hesitant respondents"; and respondents who reported not being vaccinated and do not intend to get vaccinated in the next 30 days or 6 months were categorized as "refusers."

The independent variables, i.e. the predictors of vaccine uptake among young people, were arranged into five groups:

1. Socio-demographic variables included: a) gender, b) age, which was transformed from numeric to categorical variable (15-18, 19-22, 23-26, 27-30) to examine differences between specific age groups, c) education, d) work status, e) partner status, f) material status, g) mother’s education, h) religiousness, and i) settlement type.
2. Health-related variables were: a) perceived health status measured using a 5-point Likert scale, ranging from 1 (very bad) to 5 (excellent), b) having a long term (chronic) condition, c) probability of past COVID-19 infection, d) being health or medical professional or not, and e) having received influenza vaccine in the past year or not.
3. Control variables were: a) life satisfaction, which was measured on the scale from 0

(extremely dissatisfied) to 10 (extremely satisfied), b) trust in health care system was measured on the scale 0 (don't trust at all) to 10 (completely trust), c) trust in science was measured with Trust in Science and Scientists Inventory [24] and since exploratory factor analysis did not demonstrated unidimensionality of the scale, the originally proposed measure had to be slightly adjusted containing nine items that showed very good internal consistency (α=.92), d) trust in vaccine was measured with two items asking respondents to express their agreement using a 5-point Likert scale (1-strongly disagree to 5-strongly agree) with statements related to safety and efficiency of vaccines against COVID-19 (α=.92), e) conspiracy theory tendency was measured with three items adapted from Slovenian public opinion research #Novanormalnost [25] and asked respondents to assess their agreement with statements related to COVID-19 being a part of conspiracy theory (e.g. *"Vaccination against the coronavirus that causes COVID-19 is an attempt to control the population."*) using a 5-point Likert scale (1-strongly disagree to 5-strongly agree) (α=.87), f) following events related to pandemic was measured with a question asking respondent to assess to what extent they follow events related to pandemic using a 5-point Likert scale, ranging from 1 (I don't follow events at all) to 5 (I follow events very often).

4. Health Believe Model (HBM) variables were: a) Perceived health severity, which was measured with an item adapted from Shmueli [19] and asked respondents to assess on 5-point Likert scale (1-insignificant consequences to 5-very serious consequences) possible health consequences in case of COVID-19 infection, b) perceived financial severity was measured by an item that was adapted from Shmueli [19], asking respondents to assess on 5-point Likert scale (1-insignificant consequences to 5-very serious consequences) possible financial consequences in case of COVID-19 infection, c) perceived benefits was measured with Chu and Liu [26] scale with five items (α=.95), d) fear was measured with an item from Chu and Liu [26] and asked respondents to assess on 5-point scale (1-not at all to 5-very much) how afraid they feel when they think about COVID-19, e) health motivation was measured with Chu and Liu [26] scale with two items (α=.77). The HBM also includes susceptibility, perceived barriers, and cues to action, which were measured in our study, but only in the subsample of unvaccinated respondents. Because the purpose of this paper is to compare different groups of young people, including those who accept vaccination, we did not include these variables in the analysis.
5. Theory of Planned Behavior (TPB) variables included: a) Attitudes toward COVID-19 vaccines was measured with Chu and Liu [26] scale with six items (α=.97), b) subjective norms were measured with adapted scale with three items from Chu and Liu (2021) (α=.88), and c) self-efficacy was measured with three items adapted from Schwarzer and Jerusalem's General Self-Efficacy Scale [27] (α=.85).

Statistical analyses

The prevalence of vaccination related behavior was measured as the percentage of vaccinated respondents, delayers, hesitant respondents and refusers in the total study sample. Data were weighted by gender, age group, education, and region before the analyses. Bivariate analyses were performed to compare groups by sociodemographic characteristics, health-related variables, control variables, HBM variables, and TPB variables, using Chi-square for categorical measures and ANOVA along with appropriate post-hoc tests (Games-Howell) for continuous variables. Multinomial logistic regression analysis was used to estimate the selected determinants of vaccine uptake with "vaccinated" as the reference group for comparisons. All predictor variables with $p < 0.05$ in the bivariate analyses were added into the multinomial logistic regression model. Data were analyzed using SPSS IBM, version 27 software. We report adjusted odds ratios (AORs) and 95%

confidence intervals (CI).

Ethical considerations

As data collection was conducted by online survey panel provider, we (the authors) had no access to the respondents' information and were provided with an anonymized dataset that did not contain any identifiable personal information. The study was conducted in accordance with the Code of Ethics for Researchers of the University of Ljubljana [28] and the World Medical Association's Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects [29].

Results

Participants characteristics

Sociodemographic and health-related participants characteristics are presented in Table 1. The respondents were on average 23.4 years old (SD=4.43), comprising 51.6% men and 48.4% women. The majority were employed (38.3%) or had a student status (36.2%) and had a partner (50.9%). As shown in Table 1, on average respondents reported average material status (M=2.09, SD=0.64), most of them had a mother or a primary caretaker with finished high school education (49.4%), were religious (62.3%) and lived in an urban area (51.3%). Most respondents reported having a good (29.6%) or a very good (50.2%) health status (M=3.67, SD=0.82) (Table 1). Most of the respondents reported not having a chronic health condition (78.7%), 67.9% reported that they were (probably) not infected by coronavirus in the past, 84.4% did not have a health or medical background and 90.1% respondents were not vaccinated against influenza in the last year (Table 1).

Table 1: Sociodemographic and health-related participants characteristics by COVID-19 vaccination related behaviour groups (n=507).

		Total sample (n=507)	**Vaccinated (n=232, 45.8%)**	**Delayers (n=60, 11.8%)**	**Hesitant respondents (n=63, 12.4%)**	**Refusers (n=152, 30%)**	**Test**
		n (%)	n (%)	n (%)	n (%)	n (%)	
Sociodemographic variables							
Gender	Male	262 (51.6%)	127 (48.5%)	33 (12.6%)	29 (11.1%)	73 (27.9%)	χ^2=2.8 *P*=.431
	Female	245 (48.4%)	105 (42.9%)	27 (11.0%)	34 (13.9%)	79 (32.2%)	
Age groups	15-18 years	102 (20.2%)	28 (27.5%)	18 (17.6%)	17 (16.7%)	39 (38,2 %)	χ^2=39.7 *P*<.001
	19-22 years	123 (24.3%)	66 (53.7%)	18 (14.6%)	14 (11.4%)	25 (20,3 %)	
	23-26 years	133 (26.3%)	81 (60.9%)	6 (4.5%)	11 (8.3%)	35 (26,3 %)	
	27-30 years	148 (29.2%)	57 (38.5%)	17 (11.7%)	20 (13.5%)	54 (36,5 %)	
Education	Elementary school or less	69 (13.6 %)	15 (21.7 %)	12 (17.4 %)	14 (20.3 %)	28 (40.6 %)	χ^2=25.6 *P*<.001
	2, 3, 4, or 5 year high school	290 (57.3 %)	131 (45.2 %)	35 (12.1 %)	34 (11.7 %)	90 (31.0 %)	

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		n (%)	n (%)	n (%)	n (%)	n (%)	
	College, university or higher education	147 (29.1 %)	85 (57.8 %)	12 (8.2 %)	15 (10.2 %)	35 (23.8 %)	
Work status	High school student	106 (20.9%)	31 (29.2%)	18 (17.0%)	14 (13.2%)	43 (40.6%)	χ^2=34.9 *P*<.001
	Student	184 (36.2%)	109 (59.2%)	22 (12.0%)	16 (8.7%)	37 (20.1%)	
	Employed	194 (38.3%)	85 (43.8%)	16 (8.2%)	28 (14.4%)	65 (33.5%)	
	Unemployed	23 (4.5%)	7 (30.4%)	4 (17.4%)	4 (17.4%)	8 (34.8%)	
Partner status	Do not have a partner	249 (49.1%)	109 (43.8%)	39 (15.7%)	32 (12.9%)	69 (27.7%)	χ^2=7.4 *P*=.06
	Have a partner	258 (50.9%)	123 (47.7%)	21 (8.1%)	31 (12.0%)	83 (32.2%)	
Material status (n=494)	Below average	81 (16.4%)	26 (32.1%)	9 (11.1%)	11 (13.6%)	35 (43.2%)	χ^2=24.5 *P*<.001
	Average	288 (58.3%)	123 (42.7%)	37 (12.8%)	36 (12.5%)	92 (31.9%)	
	Above average	125 (25.3%)	78 (62.4%)	8 (6.4%)	15 (12.0%)	24 (19.2%)	
Mother's education (n=488)	Elementary school or less	40 (8.2%)	13 (32.5%)	5 (12.5%)	6 (15.0%)	16 (40.0%)	χ^2=17.4 *P*=.008
	2, 3, 4, or 5 year high school	242 (49.4%)	99 (40.9%)	23 (9.5%)	31 (12.8%)	89 (36.8%)	
	College, university or higher education	206 (42.2%)	112 (54.4%)	26 (12.6%)	24 (11.7%)	44 (21.4%)	
Religiousness	Non religious	191 (37.7%)	100 (52.4%)	15 (7.9%)	22 (11.5%)	54 (28.3%)	χ^2=7.5 *P*=.06
	Religious	316 (62.3%)	132 (41.8%)	45 (14.2%)	41 (13.0%)	98 (31.0%)	
Settlement type	Urban	260 (51.3%)	137 (52.7%)	32 (12.3%)	28 (10.8%)	63 (24.2%)	χ^2=13.1 *P*=.004
	Rural	247 (48.7%)	95 (38.3%)	28 (11.3%)	35 (14.1%)	90 (36.3%)	
<u>Health-related variables</u>							
Perceived health status	Very bad	6 (1.2%)	2 (33.3%)	1 (16.7%)	0 (0%)	3 (50.0%)	χ^2=20.9 *P*=.052
	Bad	32 (6.3%)	18 (56.3%)	5 (15.6%)	4 (12.5%)	5 (15.6%)	
	Good	150 (29.6%)	63 (42.0%)	27 (18.0%)	21 (14.0%)	39 (26.0%)	
	Very Good	254 (50.2%)	118 (46.5%)	20 (7.9%)	34 (13.4%)	82 (32.3%)	
	Excellent	64 (12.6%)	30 (46.9%)	6 (9.4%)	3 (4.7%)	25 (39.1%)	
Long term	NO	399	181	43 (10.8%)	48	128	χ^2=4.3

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		n (%)	n (%)	n (%)	n (%)	n (%)	
(chronic) condition		(78.7%)	(45.3%)		(12.0%)	(32.0%)	p>.05
	YES	108 (21.3%)	51 (47.2%)	17 (15.7%)	15 (13.9%)	25 (23.1%)	
Covid-19 past disease	(Probably) not infected	344 (67.9%)	171 (49.7%)	46 (13.4%)	36 (10.5%)	91 (26.5%)	χ^2=14.4 *P*=.002
	(Probably) infected	163 (32.15)	60 (36.8%)	14 (8.6%)	27 (16.6%)	62 (38.0%)	
Health/ medical professional	NO	428 (84.4%)	192 (44.9%)	46 (10.7%)	55 (12.9%)	135 (31.5%)	χ^2=5.3 *P*>.05
	YES	79 (15.6%)	40 (50.0%)	14 (17.5%)	8 (10.0%)	18 (22.5%)	
Influenza vaccine in the past year	NO	457 (90.1%)	195 (42.7%)	55 (12.0%)	60 (13.1%)	147 (32.2%)	χ^2=19.1 *P*<.001
	YES	50 (9.9%)	37 (74.0%)	5 (10.0%)	3 (6.0%)	5 (10.0%)	

Bivariate analyses and comparisons among vaccination related behavior groups

The results (Table 1 and Table 2) showed that the majority of respondents had been vaccinated against COVID-19 (45.8%), 30% refused vaccination, 12.4% were hesitant and 11.8% reported that they intended to be vaccinated against COVID-19 (i.e. delayers). The sociodemographic and health-related variables that were found to have a statistically significant effect on young people's vaccine uptake were age, education, work status, material status, mother's education, settlement type, assessed probability of past COVID-19 infection, and vaccination against influenza in the past year (Table 1). Sociodemographic and health-related variables that were not found to have a statistically significant effect on young people's vaccine uptake were gender, partner status, religiousness, perceived health status, and having (or not) a long term (chronic) disease (Table 1).

Table 2: Descriptive statistics of control, HBM, and TPB variables by COVID-19 vaccination related behavior groups (n=507).

	Total sample (n=507)	Vaccinated (n=232, 45.8%)	Delayers (n=60, 11.8%)	Hesitant respondents (n=63, 12.4%)	Refusers (n=152, 30%)	ANOVA: F (*P* value)[e]	Scale
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)		
Control variables							
Life satisfaction	6.61 (2.18)	6.78 (2.02)	6.05 (2.06)	6.77 (1.86)	6.50 (2.53)	F=2.06 (*P*>.05)	0-10
Trust in health care system	5.78 (2.36)	6.49 (2.18)[a]	5.81 (1.62)[a, b]	5.78 (2.40)[c]	4.70 (2.51)[a, b, c]	F=19.82 (*P*<.001)	0-10
Trust in science	3.51 (0.75)	3.85 (0.63)[a,b,c]	3.55 (0.58)[a, b]	3.35 (0.69)[a, c]	3.05 (0.75)[a, b, c]	F=46.12 (*P*<.001)	1-5
Trust in vaccine	2.96 (1.33)	3.94 (0.93)[a, b, c, d]	3.05 (0.80)[a, b, c , d]	2.51 (0.92)[a, b, c, d]	1.61 (0.78)[a, b, c, d]	F=226.56 (*P*<.001)	1-5
Conspiracy	2.65	1.94	2.60	3.08	3.58	F=98.26	1-5

theory tendency	(1.18)	(0.96)[a, b, c , d]	(0.82)[a, b, c , d]	(0.83)[a, b, c , d]	(1.00)[a, b, c , d]	(*P*<.001)	
Following events related to pandemic	2.85 (1.01)	3.10 (1.01)[a, c]	2.94 (0.86)[b]	2.66 (0.96)[a, c]	2.50 (0.98)[a, b]	F=12.61 (*P*<.001)	1-5
HBM variables							
Perceived health severity	2.32 (0.95)	2.41 (0.93)[a]	2.76 (0.92)[a, b]	2.68 (0.89)[c]	1.85 (0.83)[a, b, c]	F=23.33 (*P*<.001)	1-5
Perceived financial severity	2.27 (1.14)	2.35 (1.23)[a]	2.65 (1.10)[b]	2.32 (1.00)	1.98 (1.00)[a, b]	F=6.09 (*P*<.001)	1-5
Perceived benefits	3.04 (1.28)	3.98 (0.86)[a, b, c, d]	3.13 (0.68)[a, b, c, d]	2.54 (0.88)[a, b, c, d]	1.77 (0.84)[a, b, c, d]	F=221.82 (*P*<.001)	1-5
Fear	2.56 (1.15)	2.81 (1.07)[a]	2.96 (1.20)[b]	2.89 (1.01)[c]	1.87 (1.01)[a, b, c]	F=30.95 (*P*<.001)	1-5
Health motivation	3.53 (0.93)	3.50 (0.93)	3.47 (0.87)	3.58 (0.80)	3.56 (1.01)	F=0.242 (*P*>.05)	1-5
TPB variables							
Attitudes	2.96 (1.49)	4.11 (1.05)[a, b, c, d]	3.03 (1.04)[a, b, c, d]	2.38 (0.90)[a, b, c, d]	1.44 (0.67)[a, b, c, d]	F=260.17 (*P*<.001)	1-5
Subjective norms	2.98 (1.14)	3.76 (0.88)[a, b, c, d]	3.11 (0.63)[a, b, c, d]	2.54 (0.85)[a, b, c, d]	1.93 (0.79)[a, b, c, d]	F=159.53 (*P*<.001)	1-5
Self-efficacy	3.71 (0.73)	3.79 (0.71)[a]	3.41 (0.67)[a, b]	3.63 (0.65)	3.74 (0.80)[b]	F=4.82 (*P*<.001)	1-5

[a] Category has statistically different mean value (p<.05) of the corresponding variable in comparison to the mean value of the other category with the same superscript.

[b] Category has statistically different mean value (p<.05) of the corresponding variable in comparison to the mean value of the other category with the same superscript.

[c] Category has statistically different mean value (p<.05) of the corresponding variable in comparison to the mean value of the other category with the same superscript.

[d] Category has statistically different mean value (p<.05) of the corresponding variable in comparison to the mean value of the other category with the same superscript.

[e] Games Howell Post Hoc test

Participant characteristics based on control, HBM and TPB variables, bivariate analyses and comparisons among vaccination related behavior groups are presented in Table 2. According to the control variables, those who are vaccinated against COVID-19 have, on average, higher trust in the health care system (M=6.49, SD =2.18), higher trust in science (M=3.85, SD =0.63), and higher trust in the vaccine against COVID-19 (M=3.94, SD =0.93) than vaccination refusers (Table 2). Among all four vaccination related behavior groups there is a statistically significant difference in the tendency to believe in conspiracy theories, which is highest on average among refusers (M=3.58, SD =1.0) and gradually decreases to be lowest on average among vaccinated young people (M=1.94, SD =0.96). Similarly, vaccinated (M=3.1, SD =1.01) and delayers (M=2.94, SD =0.86) have higher average levels of following events related to pandemic compared to hesitant young people (M=2.66, SD =0.96) and refusers (M=2.5, SD =0.98). The results in Table 2 also show that, according to HBM, those who delayed their vaccination against COVID-19, on average, perceived COVID-19 to might have greater health (M=2.76, SD =0.92) and financial (M=2.65, SD =1.10) consequences for them than did refusers. On average, vaccinated young people perceived the greatest benefit from vaccination (M=3.98, SD =0.86), which gradually decreases among other groups and is lowest on average among refusers (M=1.77, SD =0.84). Fear of coronavirus disease is lowest on average

among refusers (M=1.87, SD =1.01) and highest among delayers (M=2.96, SD =1.20). The results also show that there are no statistically significant differences in health motivation between the different vaccination related behavior groups (Table 2). According to the TPB model, the vaccinated had the highest average scores in positive attitudes toward COVID-19 vaccines (M=4.11, SD =1.05) and subjective norms (M=3.76, SD =0.88), which gradually decreased in the other groups and were lowest on average in the vaccination refusers (Table 2). The highest self-efficacy in coping with health problems was reported on average by vaccinated young people (M=3.79, SD =0.71) and vaccination refusers (M=3.74, SD =0.80), and the lowest by vaccination delayers (M=3.41, SD =0.67).

Predictors of vaccine uptake

Results of multinomial logistic regression models with predictors of vaccine uptake, using "vaccinated respondents" as the reference group for comparisons, are shown in Table 3. Gender, partner status, religiousness, health status, long term (chronic) condition, health/medical professional background, life satisfaction, and health motivation had no significant bivariate associations with vaccine related behavior and were not included in the multinomial regression analysis (see also Tables 1 and 2). Multinomial regression analysis (Table 3) showed that young adults aged 23 to 26 years (compared with 27 to 30-year-olds) were less likely to delay vaccination compared with vaccinated respondents (AOR =0.12, 95% CI=0.03-0.45). Young adults who had completed elementary school or less (compared to respondents with higher levels of education) were more likely to delay vaccination (AOR =9.75, 95% CI=1.55-61.14) or were hesitant toward vaccination (AOR =11.65, 95% CI=1.51-89.65) compared to the vaccinated group of respondents. Results also showed that young people who were high school students (compared to unemployed) were less likely to be hesitant (AOR =0.01, 95% CI=0.0-0.37) compared to vaccinated respondents (Table 3). Similarly, respondents who were students (AOR =0.09, 95% CI=0.01-0.93) or employed (AOR =0.06, 95% CI=0.01-0.59) (compared with unemployed respondents) were also less likely to refuse vaccination compared with vaccinated respondents. Participants whose mothers had completed elementary school or less were significantly more likely to refuse vaccination (AOR =6.59, 95% CI=1.26-34.42) compared to those with university-educated mothers. Similarly, those whose mothers finished high school were also more likely to decline vaccination (AOR =2.84, 95% CI=1.01-8.01) when compared to the same university-educated group. Results also showed that respondents who felt that COVID-19 could have greater health consequences for them were more likely to delay vaccination (AOR =2.01, 95% CI=1.23-3.28) or be hesitant toward it (AOR =1.91, 95% CI=1.13-3.23) compared with vaccinated respondents. In addition, more negative attitudes toward COVID-19 vaccines were more likely among delayers, hesitant, and refusing respondents than among the vaccinated respondents (Table 3). Compared with vaccinated young people, subjective norms were significantly less likely to be present among hesitant respondents (AOR =0.38, 95% CI=0.20-0.71) and vaccination refusers (AOR =0.34, 95% CI=0.17-0.66). Self-efficacy to cope with health problems was less present among respondents who delayed vaccination (AOR =0.46, 95% CI=0.25-0.86) than among vaccinated respondents (Table 3).

Table 3: Predictors of vaccine uptake by multinomial logistic regression (vaccinated respondents as reference group).

Predictor variable (reference)	Delayers AOR (95% CI)	Hesitant respondents AOR (95% CI)	Refusers AOR (95% CI)
Sociodemographic variables			
Age groups (27-30 years)			
15-18 years	2.93 (0.22-39.41)	22.23 (0.82-60.21)	3.13 (0.08-124-94)
19-22 years	0.62 (0.15-2.63)	0.76 (0.16-3.55)	0.21 (0.04-1.22)
23-26 years	0.12** (0.03-0.45)	0.33 (0.10-1.14)	0.39 (0.10-1.46)
Education (College, university or higher education)			
Elementary school or less	9.75* (1.55-61.14)	11.65** (1.51-89.65)	6.82 (0.71-65.30)
2, 3, 4, or 5 year high school	1.90 (0.66-5.51)	2.53 (0.87-7.37)	4.02* (1.28-12.61)
Work status (Unemployed)			
High school student	0.17 (0.01-4.14)	0.01** (0.0-0.37)	0.05 (0.0-2.98)
Student	0.68 (0.08-5.97)	0.13 (0.02-1.15)	0.09* (0.01-0.93)
Employed	0.37 (0.05-3.06)	0.18 (0.02-1.39)	0.06* (0.01-0.59)
Material status (Above average)			
Below average	1.79 (0.43-7.48)	1.29 (0.30-5.60)	3.34 (0.65-17.29)
Average	1.89 (0.65-5.49)	0.63 (0.22-1.86)	1.29 (0.38-4.39)
Mother's education (College, university or higher education)			
Elementary school or less	2.21 (0.50-9.76)	4.23 (0.91-19.71)	6.59* (1.26-34.42)
2, 3, 4, or 5 year high school	0.85 (0.37-1.96)	1.36 (0.53-3.45)	2.84* (1.01-8.01)
Settlement type (rural)			
Urban	0.94 (0.44-2.04)	0.92 (0.41-2.10)	0.85 (0.34-2.11)
Health-related variables			
Covid-19 past disease ((Probably) infected)			
(Probably) not infected	1.20 (0.50-2.87)	0.58 (0.24-1.41)	0.93 (0.34-2.57)
Influenza vaccine in the past year (YES)			
NO	1.39 (0.39-4.97)	1.94 (0.37-10.28)	1.47 (0.17-13.03)
Control variables			
Trust in health care system	1.11 (0.89-1.40)	1.21 (0.96-1.53)	1.04 (0.81-1.33)
Trust in science	2.15 (0.94-4.91)	1.16 (0.51-2.63)	2.10 (0.88-5.04)
Trust in vaccine	0.67 (0.34-1.31)	0.73 (0.36-1.46)	0.51 (0.24-1.08)
Conspiracy theory tendency	0.91 (0.53-1.57)	1.46 (0.83-2.60)	1.26 (0.69-2.27)

Following events related to pandemic	0.92 (0.60-1.42)	0.77 (0.48-1.24)	0.78 (0.47-1.29)
HBM variables			
Perceived health severity	2.01** (1.23-3.28)	1.91** (1.13-3.23)	0.77 (0.41-1.44)
Perceived financial severity	1.27 (0.87-1.84)	0.80 (0.52-1.23)	0.81 (0.50-1.33)
Perceived benefits	0.67 (0.34-1.33)	0.51 (0.24-1.05)	0.64 (0.29-1.38)
Fear	0.90 (0.61-1.34)	1.20 (0.80-1.80)	0.72 (0.46-1.13)
TPB variables			
Attitudes	0.53* (0.30-0.93)	0.51** (0.28-0.94)	0.17*** (0.08-0.35)
Subjective norms	0.72 (0.40-1.31)	0.38** (0.20-0.71)	0.34*** (0.17-0.66)
Self-efficacy	0.46* (0.25-0.86)	0.86 (0.45-1.65)	0.99 (0.48-2.04)

Note: R^2 = .72 (Cox & Snell), .78 (Negelkerke); Model (χ^2) = 610.22, *P* < .001; ***P* < .001, *P* < .01**, *P* < .05*

Discussion

Principal Results

In more recent theoretical and empirical work, vaccination behavior is viewed in an increasingly complex way, especially when it comes to the younger population. Chaufan [30], for example, questions the prevailing risk-benefit analysis when it comes to younger people. If vaccine uptake significantly reduces health risks in the general population, the younger population has a much lower risk of COVID-19-related complications. Given their lower risk of COVID-19-related health complications, the reluctance to vaccinate in this population group – which is often seen as unreasonable – may seem understandable [31]. This makes their COVID-19-related risk-benefit perception more complex in terms of cognition and affect, as the perceived benefits of vaccination seem to be more collectively beneficial, while the risks associated with vaccination are only perceived individually. In addition to vaccination reluctance, previous research also shows that the younger population experiences greater affective distress than the adult population when following other COVID-19-related protective measures (isolation, social distancing) [18]. Despite their complex positioning in relation to COVID-19 related protective measures, the young population has rarely been the subject of research into this complex relationship with vaccination against COVID-19. Furthermore, youth related research tends to rely on opportunistic samples, often based on the student population [32-35], resulting in a rather narrow, unrepresentative sample for the entire category of young people.

In this study, we used a quasi-representative sample, we investigated the socio-psychological factors influencing COVID-19 vaccination intention and vaccination behavior of young people in Slovenia by integrating constructs from two theories of health behavior - HBM and TPB. We controlled the influence of the main constructs on vaccination behavior (vaccination uptake and vaccination refusal) and vaccination intention (delayed vaccination and vaccination hesitancy) by various cognitive, affective and behavioral contextual factors (e.g. trust in science, health status, previous vaccinations) and demographic characteristics of the studied population.

The results of our study show that at the time of the study, many of the respondents were already (self-reported) vaccinated against COVID-19 (45.8%), which was only slightly higher than the vaccination rate of the general population (18 years and older) in Slovenia, which was around 43% for the first vaccination at the end of August 2021 [5]. Since previous studies show that among adults, younger age groups are among the population groups that have shown a lower willingness to

be vaccinated against COVID-19 [7-14], we wanted to analyze the group of young people who were still unvaccinated at the time of the study in more detail. We found that not all those who had not yet been vaccinated refused to be vaccinated against COVID-19. A third (30%) of young people refused vaccination, while the rest of the respondents had already considered vaccination: 12.4% of respondents were hesitant to get vaccinated and 11.8% stated that they wanted to get vaccinated against COVID-19 but had postponed it for certain reasons. According to the Stages of change theory [36], this means that these two groups were somewhat willing to act and get vaccinated, but need to be supported with strategies tailored to the reasons that prevent youth from taking further steps towards vaccination. Using multinomial logistic regression, we found that younger adults, those with less education and those whose mothers were less educated were more likely to delay vaccination. Perceived health consequences of COVID-19, negative attitudes towards vaccines and weaker subjective norms were associated with a higher likelihood of delaying or refusing vaccination.

The factors that significantly differentiate the vaccinated from all other groups of our respondents were a greater trust in science, trust in vaccines and in the healthcare system, and a positive attitude towards vaccination against COVID-19, which indicates other factors, as studies suggest [37,38], such as higher education. The delayers have the lowest self-efficacy in coping with health problems compared to all other groups and are likely to be in an affective and cognitive conflict resulting from the fact that they simultaneously have a negative attitude towards vaccination against COVID-19, but also perceive more health and financial consequences of COVID-19 than others. Hesitant respondents are similar in many ways to the delayers, with the same identified conflict, but show higher self-efficacy in coping with health problems and less developed social norms. The vaccination refusers have less developed social norms, are more likely to have less educated mothers (having completed elementary school or less), a negative attitude towards vaccination against COVID-19 and a dangerous combination of increased self-efficacy in coping with health problems and highest scores for conspiracy theory tendencies. They thus belong to a group that has been described in previous studies as dysfunctionally empowered [39].

Strengths and limitations

The strength of this study lies in its comprehensive approach to understanding the factors influencing COVID-19 vaccine uptake among young people in Slovenia. The study also fills a significant research gap by focusing on a specific population group – young people – who have often shown a hesitant attitude towards vaccination [12]. Comparing vaccinated and unvaccinated individuals and categorizing them according to their willingness to be vaccinated allowed us to analyze in detail the reasons for vaccination intention and hesitancy. This could potentially lead to more targeted and effective public health interventions and strategies to deal with vaccination hesitancy and improve vaccination rates among youth.

This study also has some limitations. Firstly, data collection via an online survey panel may have led to an over-representation of certain demographic groups among young adults who have internet access and are more digitally literate, which may exclude certain groups and affect the representativeness of the results. Secondly, the online survey asked respondents to self-report their actual behavior, which can lead to bias. Third, the study used a cross-sectional design, which precludes the identification of cause-and-effect relationships. Fourth, the data is limited to the social, cultural, and political context of Slovenia, where there were specific COVID-19 related protective measures and crisis communication that could had significantly influenced the vaccination behavior of youth [18].

Implications

The results of our study suggest that young people have different attitudes towards vaccination against COVID-19. Therefore, public health authorities should consider different strategies to address them based on individual needs and circumstances regarding their attitudes towards vaccination and the factors that influence these attitudes. This recommendation goes beyond the COVID-19 context and should also be considered for other vaccinations, especially those with lower immunization coverage and vaccination rates [40].

The stages of change model [36], provides insight into how people progress through different stages on the way to a desired behavioral change, in our case vaccination against COVID-19. In our study with young people in Slovenia, we could consider the refusers as those who are in the first stage of behavior change, the so-called pre-contemplation. People in this stage actively think about change or even deny the existence of the problem, are not aware of the problem and/or are not motivated to deal with the problem. Appropriate strategies for this group of young people include raising awareness of the issue, providing information about the benefits of vaccination and addressing misconceptions with tailored communication that addresses specific concerns about the health risks and safety of the vaccines. The group of delayers and hesitants appear to be either in the consideration or preparation stage. In the contemplation stage are those who are thinking about vaccination but have not yet made the decision. Strategies need to help them weigh up the benefits, such as protection against COVID-19, against the disadvantages, such as the perceived risks. The group of delayers seem to be more in the preparation stage. They are actively planning to act but are the most uncertain of all groups when it comes to making health-related decisions. They would therefore need encouragement to make their decisions more easily: Encourage them to make a vaccination appointment, share reliable sources about the effectiveness, safety and availability of vaccines.

Conclusions

The results of our study show that young people in Slovenia have different behavioral and volitional positions on vaccination against COVID-19. From a normative perspective, these positions should be considered when designing and implementing measures to promote the vaccination of young people against COVID-19 and beyond. The results of the study can inform health policy makers and health professionals to optimize young people's willingness to be vaccinated and provide insights for other vaccinations, future infectious disease outbreaks and the selection of the necessary and most effective preventive measures.

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Conflicts of Interest

None declared.

Abbreviations

HBM: Health Belief Model
TPB: Theory of Planned Behavior
AOR: Adjusted odds ratio
CI: Confidence intervals

References

1. Kokić Z, Kon P, Djurković-Djaković O. Effectiveness of Vaccination in Preventing COVID-19: A Community Study Comparing Four Vaccines. Vaccines 2023;11(3):544. doi: 10.3390/vaccines11030544.
2. Rahmani K, Shavaleh R, Forouhi M, Disfani HF, Kamandi M, Oskooi RK, et al. The effectiveness of COVID-19 vaccines in reducing the incidence, hospitalization, and mortality from COVID-19: A systematic review and meta-analysis. Front Public Health 2022;10:873596. doi: 10.3389/fpubh.2022.873596.
3. MacDonald NE. Vaccine hesitancy: definition, scope and determinants. Vaccine 2015;33(34):4161–4. doi: 10.1016/j.vaccine.2015.04.036.
4. Anderson RM, Vegvari C, Truscott J, Collyer BS. Challenges in creating herd immunity to SARS-CoV-2 infection by mass vaccination. Lancet 2020;396(10263):1614-6. doi: 10.1016/S0140-6736(20)32318-7.
5. European Center for Disease Control and Prevention. COVID-19 Vaccine Tracker. ECDC; 2023 Oct [cited 2024 Jun 20]. Available from: https://vaccinetracker.ecdc.europa.eu/public/extensions/COVID-19/vaccine-tracker.html#uptake-tab
6. Valicon. Namera cepljenja stagnira in ne preseže 60 %. Prebivalstvo je razdeljeno po starosti, oceni lastne rizičnosti ter odnosu do virusa in cepljenja nasploh. Valicon; 2021 May [cited 2024 May 25]. Available from: https://www.valicon.net/sl/2021/05/namera-cepljenja-stagnira-in-ne-preseze-60-prebivalstvo-je-razdeljeno-po-starosti-oceni-lastne-rizicnosti-ter-odnosu-do-virusa-in-cepljenja-nasploh/
7. Aw J, Seng JJB, Seah SSY, Low LL. COVID-19 vaccine hesitancy—A scoping review of literature in high-income countries. Vaccines 2021;9(8):900. doi: 10.3390/vaccines9080900.
8. Freeman D, Loe BS, Yu LM, et al. Effects of different types of written vaccination information on COVID-19 vaccine hesitancy in the UK (OCEANS-III): A single-blind, parallel-group, randomized controlled trial. Lancet Public Health 2021;6(6):e416–e427. doi: 10.1016/S2468-2667(21)00096-7.
9. Kelly BJ, Southwell BG, McCormack LA, et al. Predictors of willingness to get a COVID-19 vaccine in the U.S. BMC Infect Dis 2021;21:338. doi: 10.1186/s12879-021-06023-9.
10. Latkin CA, Dayton L, Yi G, Colon B, Kong X. Mask usage, social distancing, racial, and gender correlates of COVID-19 vaccine intentions among adults in the US. PLoS ONE 2021;16(2):e0246970. doi: 10.1371/journal.pone.0246970
11. Prickett KC, Habibi H, Carr PA. COVID-19 Vaccine Hesitancy and Acceptance in a Cohort of Diverse New Zealanders. Lancet Reg Health West Pac 2021;14:100241. doi: 10.1016/j.lanwpc.2021.100241.
12. Schwarzinger M, Watson V, Arwidson P, Alla F, Luchini S. COVID-19 vaccine hesitancy in a representative working-age population in France: A survey experiment based on vaccine characteristics. Lancet Public Health 2021;6:e210–e221. doi: 10.1016/S2468-2667(21)00012-8.
13. Vollmann M, Salewski C. To get vaccinated, or not to get vaccinated, that is the question:

illness representations about COVID-19 and perceptions about COVID-19 vaccination as predictors of COVID-19 vaccination willingness among young adults in The Netherlands. Vaccines 2021;9(9):941. doi: 10.3390/vaccines9090941.
14. Carter J, Rutherford S, Borkoles E. COVID-19 Vaccine Uptake among Younger Women in Rural Australia. Vaccines 2022;10(1):26. doi: 10.3390/vaccines10010026.
15. Ford C, MacKay M, Thaivalappil A, McWhirter J, Papadopoulos A. COVID-19 Vaccine Communications on Instagram and Vaccine Uptake in Young Adults: A Content Assessment and Public Engagement Analysis. Emerging Adulthood 2024 Apr;12(2):224-35. Doi: 10.1177/21676968231222439.
16. Morrison LG, Yardley L. What infection control measures will people carry out to reduce transmission of pandemic influenza? A focus group study. BMC Public Health 2009 Dec;9:1-1. doi: 10.1186/1471-2458-9-258.
17. Blahut R, Flint A, Orlando E, DesChatelets J, Khowaja A. A scoping review on the decision-making dynamics for accepting or refusing the COVID-19 vaccination among adolescent and youth populations. BMC Public Health 2023;23(1):784. doi: 10.1186/s12889-023-15717-5.
18. Kamin T, Perger N, Debevec L, Tivadar B. Alone in a Time of Pandemic: Solo-Living Women Coping With Physical Isolation. Qual Health Res 2021 Jan;31(2):203-217. doi: 10.1177/1049732320971603.
19. Shmueli, L. Predicting intention to receive COVID-19 vaccine among the general population using the health belief model and the theory of planned behavior model. BMC Public Health 2021;21**:**804. doi: 10.1186/s12889-021-10816-7.
20. Đorđević JM, Mari S, Vdović M, Milošević A. Links between conspiracy beliefs, vaccine knowledge, and trust: Anti-vaccine behavior of Serbian adults. Soc Sci Med 2021;277:113930. doi: 10.1016/j.socscimed.2021.113930.
21. Prestwich A, Kenworthy J, Conner M. Health behavior change: Theories, methods and interventions. Routledge; 2024. ISBN: 1138694827
22. McEachan RRC, Conner M, Taylor NJ, Lawton RJ. Prospective prediction of health-related behaviours with the theory of planned behaviour: A meta-analysis. Health Psychol Rev 2011;5(2):97-144. doi: 10.1080/17437199.2010.521684.
23. McEachan R, Taylor N, Harrison R, Lawton R, Gardner P, Conner M. Meta-analysis of the reasoned action approach (RAA) to understanding health behaviors. Ann Behav Med 2016;50(4):592-612. doi: 10.1007/s12160-016-9798-4.
24. Nedelson L, Jorcyk C, Yang D, Jarratt Smith M et al. I Just Don't Trust Them: The Development and Validation of an Assessment Instrument to Measure Trust in Science and Scientists. Sch Sci Math 2014;114:76-86. doi: 10.1111/ssm.12051.
25. Raziskava #Novanormalnost, 13.–15. November 2020, n=527; Valicon.
26. Chu H, Liu S. Integrating health behavior theories to predict American’s intention to receive a COVID-19 vaccine. Patient education and counseling 2021;104(8):1878-86. doi: 10.1016/j.pec.2021.02.031
27. Schwarzer R, Jerusalem M. Generalized self-efficacy scale. In: Weinman J, Wright S, Johnston M, editors. Measures in health psychology: A user's portfolio. Causal and control beliefs. Windsor, UK: NFER-NELSON, 1995:35-7.
28. University of Ljubljana. Code of ethics for researchers at the University of Ljubljana. Ljubljana: University of Ljubljana; 2014.
29. World Medical Association. World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. Bull World Health Organ 2001;79(4):373. doi: 10.1001/jama.2013.281053.
30. Chaufan C. Is Covid-19 “vaccine uptake” in postsecondary education a “problem”? A critical policy inquiry. Health 2023 Nov 15:13634593231204169. doi: 10.1177/13634593231204169.
31. Kelsall J, Sorell T. Two Kinds of Vaccine Hesitancy. Social Epistemology 2024 Apr 15:1-6.

doi: 10.1080/02691728.2024.2330466.
32. Crescenzi-Lanna L, Valente R, Cataldi S, Martire F. Predictors of young people's anti-vaccine attitudes in the context of the COVID-19 pandemic. Public Understanding of Science 2024 Jan;33(1):73-87. doi: 10.1177/09636625231179830.
33. Zhou Y, Li R, Shen L. Targeting COVID-19 vaccine-hesitancy in college students: An audience-centered approach. Journal of American College Health 2023 Feb 14:1-0. doi: 10.1080/07448481.2023.2180988.
34. Huang HY, Gerend MA. The role of trust, vaccine information exposure, and Health Belief Model variables in COVID-19 vaccination intentions: Evidence from an HBCU sample. J Health Psychol 2024;13591053241227388. doi: 10.1177/13591053241227388.
35. Small ML, Lennon RP, Dziak JJ, Smith RA, Sommerville G, Bharti N. College students' COVID-19 vaccine beliefs and intentions: Implications for interventions. J Am Coll Health 2024 May 3;72(4):989-94. doi: 10.1080/07448481.2022.2065205.
36. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. J Consult Clin Psychol 1983 Jun;51(3):390. doi: 10.1037//0022-006x.51.3.390.
37. Stead M, Jessop C, Angus K, Bedford H, Ussher M, Ford A, Eadie D, MacGregor A, Hunt K, MacKintosh AM. National survey of attitudes towards and intentions to vaccinate against COVID-19: implications for communications. BMJ Open 2021 Oct 1;11(10):e055085. doi: 10.1136/bmjopen-2021-055085.
38. Miller JD, Ackerman MS, Laspra B, Polino C, Huffaker JS. Public attitude toward Covid-19 vaccination: The influence of education, partisanship, biological literacy, and coronavirus understanding. FASEB J 2022;36(7). doi: 10.1096/fj.202200730.
39. Petrič G, Atanasova S, Kamin T. Impact of social processes in online health communities on patient empowerment in relationship with the physician: emergence of functional and dysfunctional empowerment. J Med Internet Res 2017;19(3):e74. doi: 10.2196/jmir.7002.
40. World Health Organization. Immunization coverage [Internet]. WHO; 2023 Jul [cited 2024 May 25]. Available from: https://www.who.int/news-room/fact-sheets/detail/immunization-coverage