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Vaccine Literacy and Hesitancy on routine and travelers' vaccines: a preliminary online survey

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Key words: Vaccine Literacy; Vaccine Hesitancy; Routine Vaccines; Travelers' Vaccines
Parole chiave: Alfabetizzazione Vaccinale; Esitazione Vaccinale; Vaccini di routine; Vaccini del viaggiatore

Abstract

Background. *The vast amount of conflicting information during the COVID-19 pandemic might have had a detrimental effect on people's opinions about vaccinations, including groups like travelers. This study aimed at assessing Vaccine Literacy in a sample of the general Italian population, together with antecedents of Vaccine Hesitancy, such as confidence, complacency, and convenience, the so-called "3Cs", and their effects on accepting routine and travelers' vaccines.*
Study Design. *A specifically designed anonymous questionnaire was created by using Google forms and validated through a face validity process. Subsequently, it was employed in an online cross-sectional survey.*
Methods. *The assessment Vaccine Literacy scale used in this survey was similar to that employed in earlier surveys. In addition to demographic data and information sources used by participants, the questionnaire was composed, in total, of nine multiple choice questions on Vaccine Literacy, and six questions on the 3Cs. Considered outcomes were self-reported participants' beliefs, attitudes, behaviors and intentions toward recommended routinary adulthoods vaccines and arboviral vaccines for travelers. A section of the questionnaire focused on chikungunya awareness, taken as an example of arboviral disease that has caused outbreaks in Italy, but not yet vaccine-preventable at the time of the investigation.*
Results. *After cleaning the database, 357 responses were suitable for analysis. Vaccine Literacy mean functional score was 2.81 ± 0.74 (lower than in an earlier survey, p = 0.012), while the interactive-critical (score 3.41 ± 0.50) was higher (p<0.001). Vaccine literacy was confirmed to be associated with attitudes and behaviors towards vaccination, with the 3Cs often acting as a mediator. However, interactive Vaccine Literacy was misaligned with respect to functional and critical ones, as if looking for information sources or discussing about vaccination was less relevant than amidst the pandemic. Also, there was an increase in Vaccine Hesitancy, particularly with regard to travel vaccinations, with 10-17% of individuals refusing to be vaccinated if travelling in areas at risk. The main limitation of the study was the unbalance in demographic variables, in particular the education level.*
Conclusions. *The study highlights the risks associated with current travel, including those related to climate change and the spread of vector-borne infections. It underscores the importance of raising awareness about arboviral diseases and the vaccines available to prevent them. As with all online surveys that employ convenience sampling, this study might not have provided a comprehensive representation of the entire population. Nevertheless, a dedicated analysis has been conducted to reduce biases and make data interpretation easier. Despite the need for further research, the findings indicate potential new approaches for assessing Vaccine Literacy and Vaccine Hesitancy, to ease the development of new communication strategies to enhance routine and travel vaccinations.*

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Introduction

Sustaining vaccine acceptance is extremely important for public health, particularly given the impact of the COVID-19 infodemic. The abundance of contradictory information may have negatively influenced people's views on vaccinations, including specific populations such as travelers (1). The field of travel medicine is always developing, and the importance of vaccinations before traveling is becoming more significant. In fact, vaccinations are important not only for protecting travelers from specific diseases but also for preventing the spread of infections (2, 3).

Environmental factors influencing risks while traveling include the destination, the duration and purpose of travel, as well as the regional climate(4). Tropical and subtropical areas present an elevated risk of vector-borne infections, such as those caused by arboviruses. Additionally, shifts in global climate can amplify the danger. Higher temperatures and rainfall are known to boost virus replication and spread rates (4, 5), as happened for the Japanese encephalitis outbreak in Australia (6).

Traveler's health and their actions while overseas play a crucial role in the level of risk they face from diseases linked to travel. To minimize these threats, effective methods include proper self-care and vaccination. While personal safety practices like using bed nets, screens, and insect repellents do offer some protection, immunization is the most reliable form of defense against vaccine-preventable infectious diseases (2).

Despite evidence of effectiveness and safety of modern vaccines, vaccine hesitancy (VH) has increased, leading to delayed vaccination or refusal even when vaccines are readily available. The rise in skepticism and reluctance to vaccinate escalated during the COVID-19 pandemic with the spread of misinformation through different sources, mainly social media platforms (7). VH stems from a complex decision-making process influenced by various often latent factors encompassed in the "3Cs" model (8) including complacency, confidence, and convenience. The 3Cs represent the main psychological antecedents of vaccination, i.e. beliefs and attitudes people have towards vaccines.

On the other hand, Vaccine Literacy (VL) is defined as the sum of knowledge, motivation, and competencies to find, understand, and judge immunization-related information to make appropriate decisions about vaccination (9). VL is linked to Health Literacy (HL), but the two realms only partially overlap. In fact, competencies and knowledge about vaccines are unique: even individuals with higher levels of HL may lack the necessary skills about vaccination. VL is also a process of improving information about vaccination, building communication, and increasing people's engagement on vaccines (community VL). VL is also organizational, including the different degrees of complexity within a health organization focused on communication and immunization practice (9). Different tools (psychometric tests) have been developed to assess individual and population VL (10, 11) as well as VH levels (12, 13). The results of such investigations are useful to health institutions, as they serve as a basis for developing targeted communication strategies and health education campaigns.

Limited VL has been identified as a potential contributing factor to VH and low vaccine uptake in several studies, despite not all of them have confirmed this association(10). VL has received growing attention through research during the pandemic: emerging literature has proposed different online measures to explore population and individual VL skills, in addition to attitudes and behaviors about coronavirus and vaccine acceptance. Based on the existing literature showing that functional and interactive-critical VL are directly and negatively associated with VH, it has been shown that during the COVID-19 pandemic the 3Cs played a significant role in mediating VL with VH (14).

Therefore, this survey was prompted by the resurgence of international travel after the pandemic, the increased research on travelers' related diseases, as well as the development of novel vaccines against arboviruses. At the same time, climate changes make countries with an environmentally temperate climate suitable for the development of endemic outbreaks of arboviruses, as already happened in Southern Europe for dengue (15) and chikungunya (16). Understanding travelers' VL and VH and their role towards vaccination outcomes is important for a better communication, as well as development and implementation of effective strategies to prevent infectious risk.

Study objectives

This online cross-sectional survey aimed to assess the VL levels in a sample of the Italian general population, and to confirm the proportion of individuals with limited VL, in comparison with previous similar studies.

Additional objectives were to assess people's beliefs, attitudes, and behaviors related to routine vaccines and those recommended for international travel, and to confirm the negative association between VL and VH intended as intention (willingness) to get vaccinated, and the actual receipt of vaccines (vaccine uptake).

We aimed also to confirm if the psychological antecedents of vaccination (the 3Cs), could act as a mediator between VL and VH, taking into account the influence of demographic determinants.

Methods

An anonymous online questionnaire was used, with a similar VL scale to that employed in earlier cross-sectional surveys. The questionnaire had been adapted to the scope of the study following changes proposed by an expert panel before it was finalized and distributed. The purpose of this face validation was to evaluate: a) the reliability of the questionnaire (how the questions included in the test appeared to be suitable to measure its theoretical construct, considering the Italian socio-cultural situations), b) its comprehensibility (how the questions seemed understandable to the adult population >18 years of age), c) the sensitivity (how the questions appeared to be able to identify variations in the measures under investigation), d) the efficiency (how efficient the questions appeared in detecting the aspects related to the test construct). The same validation process was performed also for items related to the psychological antecedents of VH. The VL and VH items' definitions are reported in the following sections.

After face validity, the questionnaire was distributed to a broad audience via Google Forms, a platform that specializes in creating and administering web-based surveys. A survey URL was created, to be embedded in email messages and web pages. This allowed respondents to access the survey and submit their responses. For its distribution, a convenient, non-probabilistic sampling method has been adopted, as for many similar published surveys (10). The URL – together with a QR code - was forwarded during the second week of February 2024 (a reminder was sent two weeks later) to about 50 addressees selected from the mailing list of Giovanni Lorenzini Foundation (Milan, Italy). This list included general population, in addition to representatives of citizen, scientific Societies (including the Italian Society of Travel Medicine), patient and healthcare workers associations. Recipients were free to fill in the questionnaire and were asked to forward the link to others, without communicating back their list of addresses. No incentives were offered to respondents, and no targeted replies were purchased. The survey was aimed at Italian adult individuals, aged 18 y and older, interested in looking for information about travelers' vaccines, as well as routine vaccines. No other exclusion criteria were applied. The questionnaire was composed, in total, of nine multiple choice questions on VL, and six questions on the 3Cs.

The questionnaire included main demographic data - age group (four age classes, for consistency with earlier surveys), sex, native language, educational levels (four groups), occupational status, area of residence - together with sources of information, intention / planning to travel during the current year, and possible destinations, according to different climate areas. A small amount of information was asked to respect most respondents' anonymity, focusing on the essential demographic variables relevant to the research questions. The first page of the questionnaire provided participants with information about the rationale and scope of the survey. Participants were asked to give honest answers and were informed that they were not given any incentives, that could reply only once to the survey, and that continuing to the following pages of the survey and forwarding the filled questionnaire constituted consent. Participants were free to send answers via PC, tablet, or smartphone. The study has been performed following the Declaration of Helsinki as revised in 2013, and according to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines (17).

VL measures

The questions assessing VL levels were adapted from a self-reported questionnaire for adulthood vaccination derived from the Ishikawa test for chronic non-communicable diseases (18), which had already been validated for content and construct (19). Nine items of the questionnaire aimed at assessing functional, interactive (also said communicative) and critical VL, according to Nutbeam's definition (20). From the psychometric point of view, functional VL questions are mainly about language, involving the semantic system and referring to 'crystallized' knowledge, while the interactive and critical questions focus on 'procedural' knowledge and 'fluid' cognitive efforts, such as problem-solving and decision-making. Each response is rated with a forced four-point Likert scale (4 – never, 3 – rarely, 2 – sometimes, 1 – often, for the functional questions; 1 – never, 2 – rarely, 3 – sometimes, 4 – often, for the interactive and critical subscale). The score is obtained from the mean value of the answers to each sub-scale (range 1 to 4), with a higher value corresponding to a higher VL level. In this survey, a composite VL score was also adopted, comprehensive of all VL subscales, as well as a mean score of interactive plus critical VL (interactive-critical VL).

Despite rated on an ordinal scale, these variables have been treated as numerical, as in previous studies where similar instruments were employed, showing a high overlap of results both when tested using parametric and non-parametric tests (10). A nominal metric has also been used in this study, dividing the scores in tertiles, and considering as limited VL the scores in the bottom tertile.

3Cs measures

Determinants of VH were elicited using participants' level of agreement to six "negative" statements based on the "the 3Cs" psychological antecedents of vaccination. Specifically, the statements refer to the three dimensions of the 3C model, namely "confidence" (two items), "complacency" (two items) and "convenience" (two items). Answers to each question were evaluated using a four-point Likert scale, for consistency with the VL scale. Higher scores indicate higher levels of confidence, complacency, and convenience toward vaccination (scores: 1= completely agree with the negative statements; 2=partially agree; 3=partially disagree; 4=completely disagree) and evaluated as continuous variable. Each of the 3Cs was evaluated separately, but an average score was also adopted to summarize all the 3Cs subscales. "Vaccine acceptance" was intended as a positive attitude towards vaccination (i.e. the opposite of VH).

Outcomes

Considered outcomes were the self-reported participants' behaviors and intentions (intended as precursor of behaviors) toward recommended routinary adulthoods vaccines and arboviral vaccines for travelers. Vaccine uptake reported by participants was calculated by considering the total number of vaccinations received from that listed in the questionnaire, ("routine vaccine uptake", or "vaccines received"), corresponding to those recommended for adults in the Italian National Vaccination Plan (21): influenza, COVID-19, Herpes Zoster, Pneumo, dTaP (diphteria-tetanus-pertussis) booster.

Additionally, we determined the number of people who reported receiving each specific vaccine through a nominal yes/no scale. Last seasonal flu Vaccine uptake was taken as a main outcome regarding single vaccine immunization status, considering it as a reference for adults' vaccination, while willingness to receive next seasonal flu vaccine was taken to evaluate the intention to be vaccinated. For the travelers' vaccines, the most administered one in the Italian practice (i.e. yellow fever) was used as the reference for the outcome "travelers' vaccine uptake".

Awareness about chikungunya

In line with recent definitions (9), knowledge about vaccines and related diseases has been considered as part of VL, which also includes motivation and skills. Thus, a specific section of the survey was focused on chikungunya to evaluate the respondents' awareness of a travelers' preventable communicable disease, also causing local outbreaks Italy (22).

The reason for this choice was that, unlike other arboviral infections (dengue, yellow fever, tick-borne, and Japanese encephalitis), chikungunya was not vaccine-preventable at the time of the survey, likely making participants less familiar and find it more challenging to respond. Knowledge about chikungunya was assessed through a summative score, namely the sum of correct responses (true/false) to seven questions (score between 0 and 7).

Control questions

Control questions were included to identify inconsistent or unreliable responses, such as being vaccinated with non-existent vaccines at the time of the survey. Also, we examined how information sources used by the participants correlated with responses to the VL questions and 3Cs statements, and how the number of received travelers' vaccines against arboviruses were associated with planning travels to tropical and subtropical areas.

Statistical analysis

Data from a study conducted in 2020 was considered as reference for power calculation (23). Taking as criterion for defining the sample size an expected prevalence of 37% of individuals with limited VL levels (score in the lower tertile of the study population), 359 subjects were to be enrolled, at 95% confidence, and 5% margin of error.

Analysis was carried out using SPSS v27 (24), and NCSS (25) v23.0.2 software, along with the open source software Jamovi v2.4.11 to complement analyses with additional tests like the mediation model using the jAMM module (26). This package allows estimation of the direct and indirect effects of independent variables on the dependent variables, by also examining all paths of the mediation model components, including moderating effects. Mediation and moderation were also explored through the Hayes' process module v4.2 included in SPSS. The use of more software also allowed us to verify the consistency between findings.

Descriptive analysis showed percentages, means, standard deviations, confidence intervals, medians, percentiles. The internal consistency of the psychometric questions (VL and VH scales) was assessed through Cronbach's alpha and MacDonald's omega coefficients. Non-parametric tests were mainly used for describing comparisons, due to the non-normal distribution of data. Kruskal-Wallis, Wilcoxon, Mann–Whitney, ROC curves, and χ^2 tests were employed.

Simple and multiple logistic and linear regression analyses were performed to determine demographic and psychological factors associated with outcomes. The variables significantly associated with the outcomes (i.e., with p-values < 0.05) at the simple regression were identified as candidates for multiple logistic regression models. Mediation analysis was performed to understand the pathway through which VL affected outcomes via the 3Cs (taken as mediators), also considering a possible moderating role of different levels of education, classes of age, gender, and healthcare worker status. Spearman's rho correlation coefficient was calculated to determine the relationships between the VL, the VH scales, and outcomes. Principal Component Analysis (PCA) was conducted to investigate latent factors and how the questions of the VL subscales, and those of the 3Cs scale, were related to one another, as well as the loading of each item on the different components of the model.

Results

Data was gathered beginning in the second week of February through to the first week of April 2024. A total of 367 responses were obtained. However, seven participants were excluded from analysis because of inconsistent responses (claiming to be vaccinated with non-existing vaccines), and the first three, because sent by the investigators for testing the questionnaire. As a result, 357 responses were suitable for analysis.

Demographics

As for gender, 62% of participants were female (Table 1). The most represented age group was between 31 and 50 years of age (41%), while the least represented was between 18 and 30 years (8%). Almost all participants were Italian-speaking, 54% lived in central Italy, 30% in northern Italy, the remaining in the south and islands. Regarding occupation, about 30% of participants were healthcare workers. Most participants (64%) planned to travel during the year in temperate climate areas, while 18% intended to travel in subtropical and tropical zones, and 15% had no travel plans.

Education and age were the main causes of unbalance of the sample, with 71% of participants holding a master's degree, while only 8% were in the younger age class. However, excluding from the analysis healthcare workers, the difference in education level was not significant across age classes ($\chi 2$, p=0.183).

Data reliability

Reliability of the items related to VL together with the psychological antecedents of VH revealed an acceptable internal consistency, as Cronbach's α and McDonald's ω values were 0.720 and 0.768, respectively. In addition, other checks have been

Table 1 – Demographics

Age class (years)	**18 - 30**	**31 - 50**	**50 - 65**	**>65**
	8.2%	41.1%	32.4%	18.3%
Sex	F 62%		M 38%	
Education level	**Primary, other**	**High, vocational school**	**Bachelor's degree**	**Master's degree**
	4.3%	15,3%	9%	71.4%
Area of residence	**Northern Italy**	**Central Italy**	**Southern Italy & Larger Islands**	
	28,6%	53.5%	17,9%	
Occupation (most represented)	**HCW**	**Employee, Officer**	**Self-employed**	**Retired**
	29.7%	33%	13.9%	12.8%

performed to control the consistency of the study sample, such as the correlation of participants declaring to be vaccinated against yellow fever and those planning trips to tropical and subtropical areas (Spearman r= 0.411, P< 0.001), as well as between respondents stating to use more than one information sources and responses to question #3 ("...have consulted more than one source of information...") (r=0.251, P< 0.001), and between those who declared to get information from the doctors and the responses to question #4 ("...you discussed with the doctor or others what you understood about vaccinations...") (r=0.278, P< 0.001).

Six outliers (lowest values) have been identified in the critical VL subscale (Rosner test P<0.05). However, they have been maintained in the analysis, as, considering the limited variability of the dataset (range used: 1 to 4), the exclusion of lower values could have had an impact on the assessment of participants with limited VL. At the end, excluding the outliers didn't change significantly in terms of means and correlation between VL variables.

VL and 3Cs scores

The functional VL score was 2.81 ± 0.74 (median= 3), the interactive score was 3.22 ± 0.71 (median= 3.50), while the critical one was 3.59 ± 0.60 (median= 4) (Table 2). The overall VL score was 3.21 ± 0.42 (Median 3.33), while a mixed interactive-critical one was 3.41 ± 0.50 (median= 3.50). Higher VL subscales were associated with healthcare worker status, except interactive (Kruskal-Wallis P=0.436) and interactive-critical VL (P=0.073) (Table 3). Higher interactive and interactive-critical VL were observed for females (P= 0.007, and P= 0.020, respectively). VL scores in Northern Italy were generally higher compared to other regions.

VL scores have been compared with those reported in an earlier survey, conducted using similar methods and measures during the COVID-19 pandemic (23). In mid-2020 functional VL score was higher with respect to this study (2.92 ± 0.70, p = 0.012, Mann-Whitney test independent samples, two-tailed probability), while an interactive-critical score was lower (3.27 ± 0.54, p<0.001).

We also calculated the proportion of participants with "limited" VL, identified as those in the lower tertile of the study population score. They were 42% for functional VL, 43% for interactive-critical VL, while for total VL was 36.2% (N=357), very similar to the limited total VL proportion observed in 2020 (36.6%, N=885) (23) (Mann-Whitney P= 0.948) which was used for power calculation of this study. Post-hoc margin of error was = 4.99.

Table 4 displays the 3Cs' scores related to people's psychological attitudes towards vaccination. These scores are based on how much participants agreed with statements about vaccines reported in the table. Higher scores indicate more confidence, complacency, and convenience related to vaccination, suggesting less consequent VH. Yet, these values are not as high as those seen in an earlier study (23). For example, when measuring "confidence" with a nearly identical question, in 2020, the score was 3.77 ± 0.55, whereas in current survey it was 3.51 ± 0.75, showing a significant difference (Mann-Whitney P<0.001).

However, positive correlations were observed between outcomes and each of the 3Cs, all of them being significant predictors of seasonal flu vaccination status and intention to receive the forthcoming flu vaccine.

Values of all psychological antecedents observed in HCWs were significantly higher respect to the rest of participants (Kruskal-Wallis P= between < 0.001 and 0.013), except for the convenience statement: 'I do not get vaccinated because going to the vaccination clinic is complicated' (P= 0.692).

Correlation between psychological variables and outcomes

A significant positive correlation between each of the 3Cs and the different VL subscales emerged, except for interactive VL. Routine vaccines uptake and knowledge about chikungunya were always positively correlated with the 3Cs, while having received travel vaccines was correlated only with complacency and convenience (Table 5).

Notably, interactive VL was negatively correlated with functional VL and positively with critical VL (gray boxes in Table 5). On the contrary, analysis of the same items from the 2020 survey showed that interactive VL was always positively correlated with the other VL subscales and the 3Cs.

In addition, applying Kruskal-Wallis test on variables assessed through nominal scales (factor codes: yes/no), a significant association was shown between seasonal flu vaccine uptake and both functional and critical VL (P< 0.001), while the association was not significant for interactive VL (P= 0.564). Also, the association was significant between intention to be vaccinated against next seasonal influenza for functional (P< 0.001) and critical VL (P= 0.002), while it was not for interactive VL (P=0.228).

Table 2 - Descriptive analysis of VL score (mean scores of functional, interactive, critical, interactive-critical subscales, and overall)

	Functional VL	Interactive VL	Critical VL	Interactive-critical VL	Overall VL
Mean	2.81	3.22	3.59	3.41	3.21
SD	0.74	0.71	0.60	0.50	0.42
Median	3.00	3.50	4.00	3.50	3.33
25 - 75 Percentile	2.00 to 3.00	2.88 to 4.00	3.00 to 4.00	3.00 to 3.75	3.00 to 3.50

Table 3 - Descriptive analysis of VL score by job (healthcare workers -HCW- vs. others – non-HCW): mean scores of functional, interactive, critical, interactive critical, and overall VL. Associations tested by Kruskal-Wallis test (K-W)

		Functional VL	K-W P	Interactive VL	K-W P	Critical VL	K-W P	Interactive-critical VL	K-W P	Overall	K-W P
Mean	Non-HCW	2.69	<0.001	3.20	0.436	3.56	0.057	3.38	0.073	3.15	<0.001
	HCW	3.10		3.26		3.67		3.47		3.35	
SD	Non-HCW	0.70		0.71		0.61		0.49		0.41	
	HCW	0.73		0.70		0.57		0.51		0.41	

Table 4 - Descriptives of psychological antecedents of VH (the 3Cs), assessed through agreement to negative statements on vaccines through a four-point scale: 1=completely agree; 2=partially agree; 3=partially disagree; 4=completely disagree). The higher the score, more positive beliefs and attitudes towards vaccination are, and less VH exists

3Cs⇒	Confidence		Complacency		Convenience	
Statements⇒	'I do not trust the quality of vaccines'	'I do not trust doctors'	'I'm fine, so I don't have to get vaccinated'	'Climate change will not increase the risk of infection'	'I do not get vaccinated as going to the vaccination clinic is complicated'	'I won't pay out of my own pocket to be vaccinated'
Mean	3.51	3.52	3.65	3.50	3.62	3.12
SD	0.75	0.70	0.67	0.77	0.69	1.00
Median	4.00	4.00	4.00	4.00	4.00	3.00
25 - 75 Percentile	3.00 to 4.00	3.00 to 4.00	3.00 to 4.00	3.00 to 4.00	3.00 to 4.00	2.00 to 4.00

Table 5 - Correlation table between VL, 3Cs and outcome variables (Spearman's rho = * p < 0.05, ** p < 0.01, *** p < 0.001, °p>=0.05)

Variables		VL			3Cs			Outcomes	
		Functional VL	Interactive VL	Critical VL	Confidence	Complacency	Convenience	Routine vaccines uptake	Travel vaccines uptake
VL	Functional VL	—							
	Interactive VL	-0.187***	—						
	Critical VL	0.331***	0.133**	—					
3Cs	Confidence	0.399***	0.024°	0.384***	—				
	Complacency	0.293***	0.048°	0.259***	0.533***	—			
	Convenience	0.270***	0.028°	0.376***	0.482***	0.466***	—		
Outcomes	Routine vaccines uptake	0.148**	-0.054°	0.149**	0.285***	0.239***	0.279***	—	
	Travel vaccines uptake	0.082°	0.054°	0.049°	0.090°	0.144**	0.124*	0.129*	—
	Knowledge on chikungunya	0.384***	0.000°	0.167**	0.254***	0.236***	0.162**	0.232***	0.060°

Table 6 - Principal Component Analysis: VL and 3Cs items' loading on four components, after Varimax rotation. Values for each variable correspond to the factor for which the squared cosine is the largest. Lower uniqueness values indicate higher correlation with other variables included in the PCA

VL	Items	Components (factors)				
	When you listen, or read about vaccines...	1	2	3	4	Uniqueness
Functional VL	1...find words or expressions you don't know...			0.863		0.195
	2...you find what you hear or read hard to understand...			0.814		0.227
Interactive VL	***When you looked for information about vaccines...***					
	3...you have consulted more than one source of information...				0.802	0.333
	4...you discussed with the doctor or others what you understood about vaccinations...				0.736	0.432
Critical VL	5...you found the information you were looking for…		0.886			0.151
	6...you have found useful information to decide whether to vaccinate you and/or your children...		0.880			0.150
3Cs	***Describe agreement with each of the statements below***					
Confidence	'I do not trust the quality of vaccines'	0.785				0.289
	'I don't trust doctors'	0.774				0.362
Complacency	I'm healthy, so I don't have to vaccinate'	0.772				0.349
	'Climate change will not increase the risk of infection'	0.664				0.420
Convenience	'I do not get vaccinated because going to the vaccination clinic is complicated'	0.630				0.455
	'I won't pay out of my own pocket to be vaccinated'	0.619				0.542

Principal Component Analysis on VL and 3Cs items

PCA was applied on the psychological variables, namely VL questions and 3Cs statements. Based on four components, analysis showed that VL and 3Cs items loaded on separate factors, similarly to what had been observed in the 2020 (23), with 48% of the total variance explained by the first two components (Bartlett's Test of Sphericity P<0.001, KMO = 0.783) (Table 6). After Varimax rotation, visualizing three components, the 2020 survey had shown interactive items - round dots in Figure 1 - situated between the functional and critical items. This implied a consistent

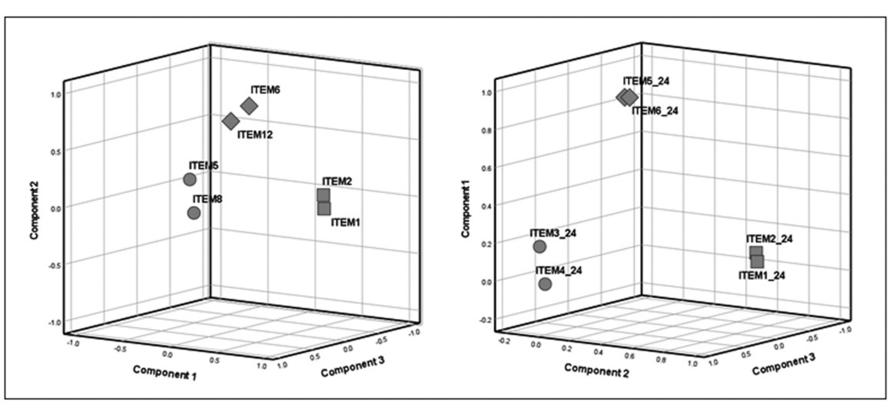

Figure 1 - PCA plots: VL items' loading on three components after Varimax rotation in 2020 (left graph) and current (2024) survey (right graph). Square= functional items – Round= interactive items – Diamond= critical items. Differently than in 2020, In the 2024 survey interactive items appeared misaligned with respect to functional and critical items.

relationship among all the elements of VL, which appeared to move conjointly, a trend not seen in the present study where interactive items were not aligned, particularly with the other VL subscales (ref. to supplementary Material S1 and S2 for more detail).

Regression and mediation analyses

Relationships between demographic predictors, intermediate variables (VL and the 3Cs), and outcomes were assessed using simple and multiple logistic and linear regression, as well as through a multi-mediation model (26). The latter was performed to evaluate the mediating effect of the 3Cs in the relationship between VL and outcomes and determine whether demographic factors like education and age - which appeared unbalanced - might have affected the results, when entered in the model as moderators.

When examining the factors influencing the uptake of routine vaccines, taking the seasonal flu vaccine as reference, simple logistic regression was shown to be significant (z-test, $p<0.05$) for all variables, except gender ($p=0.636$) which was therefore not included in the multiple regression model. This last indicated that age and healthcare worker status ($p<0.001$), along with the 3Cs ($p=0.010$), were still important factors in predicting flu vaccine uptake. However, education level ($p=0.704$) and VL score ($p=0.503$) did not maintain significance after adjusting for the other variables in the model (overall model test χ^2, $p< 0.001$). Predictive values of these variables are shown in Figure 2).

These patterns held true for overall routine vaccine uptake and intention to receive the next seasonal flu vaccine, with age and healthcare worker status being significant factors in both models ($p< 0.001$). On the other hand, the decision to get travel vaccines appeared to be independent of the factors examined. However, it's important to consider that this finding is based on a small number of participants who actually received vaccinations for their travels. Additionally, it should be noted that the most commonly administered vaccine (yellow fever) is mandatory for travelers entering and/or leaving certain countries. This requirement could potentially influence any correlation between variables.

We applied the same demographic variables to the multiple mediation model to examine their moderating effect on the relationship between VL (taken as a predictor) and the 3Cs (acting as mediator), in relation to the outcomes. Without introducing any moderator into the model, the 3Cs' mediating effect between VL and flu vaccination status explained 42% of the total effect ($p= 0.003$), while VL confirmed a non-significant direct effect ($p=0.056$) (Supplementary Material S4).

Including "education" in the model, it appeared to have no significant direct (Education → flu vaccine uptake, $p= 0.180$) or mediated effect (Education → 3CS → flu vaccine uptake, $p= 0.085$). However, during conditional mediation, taking "education"

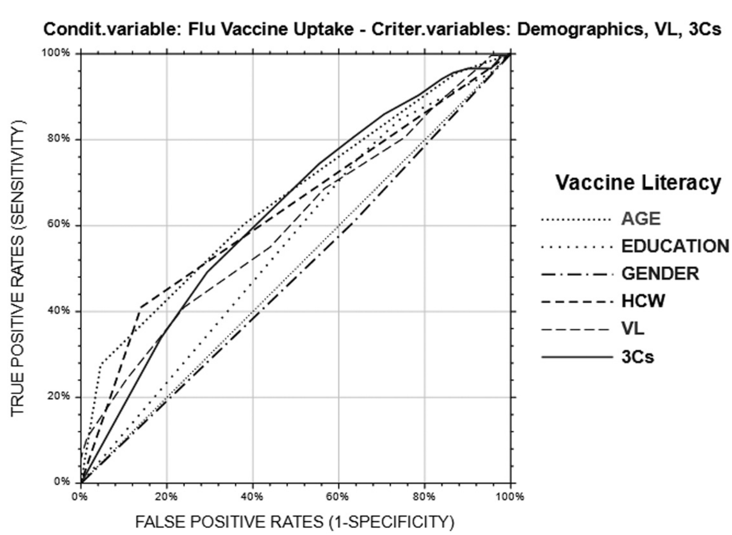

Figure 2 – Receiver Operating Characteristic (ROC) analysis of the demographic variables (predictive value, Area Under the Curve - AUC) of conditioned variable "flu vaccine received". AUC Age= 0.662 (p=0.000), Education=0.558 (p=0.010), Female Gender=0.488 (p=0.682), Healthcare Workers=0.636 (p=0.000), VL=0.602 (p=0.000), 3Cs=0.635 (p=0.000) (Supplementary Material S3)

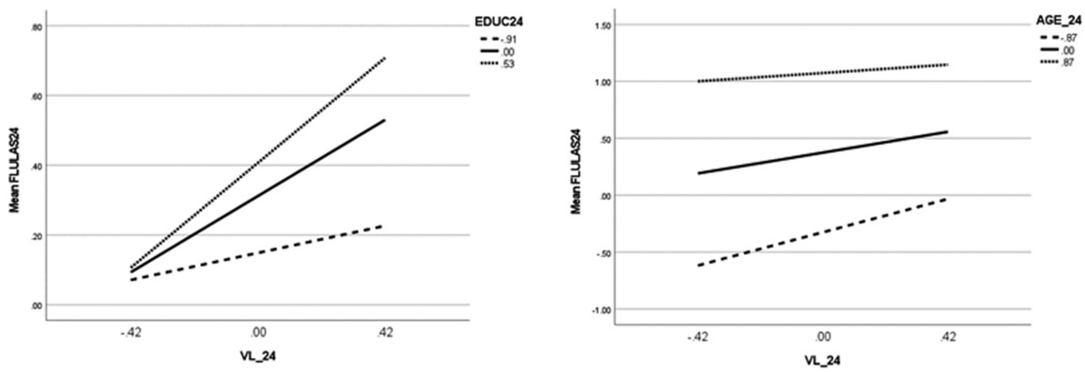

Figure 3 - Moderating effect of education (left) and age (right) on the relationship between VL and last flu vaccine received

as moderator at its low level (-1 SD) the effect on flu vaccine uptake was 56%, while it was 43% at the average level, and 33% at its high level (+1 SD). It implies that the impact of education acting as moderator on flu vaccination was partial, and more influential for individuals with lower education, although values observed at its various levels were quite close each other and all significant ($p < 0.05$) (Figure 3).

When “age” was included in the mediation model, it showed a significant direct effect on flu vaccine received ($p < 0.001$), whereas the indirect effect was not. In the conditional mediation analysis with “age” acting as the moderator, the effect on flu vaccine uptake was 47% at the low level (-1 SD), 51% at the average level, and 48% at the high level (+1 SD) of age. These percentages are close to each other, indicating that the variable “age” played a partial and similar moderating role on flu vaccine uptake at all age classes (Figure 3). As a moderator, healthcare worker status had a significant effect on flu vaccine uptake (93% at -1 SD). This effect lessened to 31% at the average level and further dropped to 9% at +1 SD, proving the direct influence that healthcare worker status has on vaccine acceptance. Similar results to those seen with the outcome “flu vaccine received” were seen when the outcomes “routine vaccines uptake”, or “intention to receive the next seasonal flu vaccine”, were included in the model.

Routine vaccines intention and behaviors

Correlation of routine vaccine uptake – i.e. the total number (sum) of routine vaccines received with VL - and psychological antecedents of vaccination are reported in Table 5. Fifty-eight percent of people reported they had received flu vaccine, 98% COVID-19 vaccine,15% shingles, 37% pneumococcal vaccine, and 80% dTaP booster. This latter percentage appears to be excessively high in comparison to the actual number of booster vaccinations in the adult Italian population. It is possible that some respondents misunderstood the question and thought it referred to the dose administered during adolescence, not to the 10-year dTaP booster. In support, the coverage for this vaccine to Italian adolescents in 2022 was 71% (27). Due to this inconsistency, dTaP was not included in the outcome “routine vaccines uptake”.

Travelers’ vaccines intention and behaviors

As mentioned, the questionnaire was intended for the general population but was also distributed to travelers. Of all participants, 15% did not plan to travel during the year, while 18% planned to visit tropical or subtropical areas.

Regarding arboviral vaccines, coverage rate was 3% for dengue and tick-borne disease, 1% for Japanese encephalitis, and 18% for yellow fever. The correlation between planning trips to endemic areas and vaccines received was significant only for yellow fever (χ^2 Tests 57.3, $p < 0.001$). Intention to be vaccinated was similar for all arboviral diseases, with about 50% of responses, while willing to be vaccinated against dengue was higher (66%) (Friedman test, $p < 0.001$). Refusal to be vaccinated accounted between 11% and 17% for the different diseases. As expected, sum of refused vaccinations were negatively correlated with each of the 3Cs (Spearman’s rho between 0.192 and 0.224, $p < 0.001$).

Awareness about chikungunya

Participants’ average knowledge score about chikungunya was 5.4 on a scale of 1 to 7. Healthcare workers scored higher with an average of 6 compared to 5.1. The knowledge score had a positive correlation with functional and critical VL skills, as well as with the 3Cs, as shown in Table 5. However, these relatively high scores were mainly linked to the knowledge of disease's characteristics (causes, symptoms), while only 66% of participants correctly identified that there are no effective treatments for chikungunya, and only 60% knew that there wasn't a preventive vaccine available in Italy at the time of the survey.

As expected, healthcare workers had a significantly higher percentage of correct responses for both knowledge of treatments against chikungunya (Kruskal-Wallis: $p= 0.035$) and about vaccine's availability ($p= 0.003$). Also, there were significant correlations with higher vaccine literacy ($p= 0.027$ and $p= 0.026$, respectively), education level ($p= 0.005$ and $p= 0.030$, respectively), and having experience of vaccinations against arboviral diseases (yellow fever) ($p= 0.009$).

Discussion

VL is defined as the sum of knowledge, motivation and competencies to find, understand and judge immunization-related information to make appropriate decisions about vaccination. It is also a process of improving vaccine communication and increasing people's engagement about vaccines (9). VL assessment is critical to public health strategies aimed at increasing vaccine coverage, countering VH, and ensuring that communities are informed, prepared, and protected against vaccine-preventable illnesses. Assessing VL helps public health and healthcare providers identify gaps in public knowledge and misunderstandings about vaccines, also revealing disparities across different groups of the population. All this is crucial for developing communication strategies that address specific concerns and provide clear and accessible information.

Different tools (psychometric tests) have been developed to assess individual and population VL skills (10), in addition to VH levels (12, 13). To the best of our knowledge, this survey is the first to focus on travelers' VL using a dedicated assessment tool. We think this study is important because it evaluates the VL levels in a sample of the Italian general population shortly after the pandemic. It also examines psychological factors linked to VH, like beliefs and attitudes regarding confidence, complacency, and convenience about vaccinations, known as the 3Cs. We also studied how the 3Cs relate to VL, and their impact on the uptake of routine and travel vaccines, along with the intent to get vaccinated, giving a detailed evaluation of all the factors affecting outcomes.

Study population

The survey was conducted among the general population in Italy to gather – among others - initial insights about travelers' vaccination. This was done before conducting more extensive surveys focusing on selected groups of travelers. Therefore, we consider this survey representing a first step toward the evaluation of VL in specific areas of medicine. Unlike HL – for which there is a huge proliferation of measures (28) - the number of tools to assess VL is relatively limited. Therefore, as for HL tools developed for several specific contexts and populations outside of pandemic emergencies, we started adopting a similar approach for VL in the specific area of travel and migration medicine.

The number of participants in our sample was lower than initially expected, although we do not consider it a limitation as the intended target sample size was achieved. Still, it is important to highlight the reasons behind this lower number, as they may provide insights into people's attitudes and behaviors toward vaccinations in the post-pandemic period. During the early stage of the COVID-19 outbreak, we carried out a similar online survey, using similar tools, methods, and distribution channels. That survey had a significantly higher level of participation, with 885 people enrolled within a shorter timeframe (23).

We think this happened because more people became interested in vaccines during that period. There was also a feeling of hope and confidence that a SARS-CoV-2 vaccine would be available soon since many were still being developed in the middle of 2020. Additionally, during that survey, there were isolation measures in place, making people more available for web consultations, also taking part in the many online surveys performed amidst the pandemic (29). Interest in vaccines seems now to have decreased (30), probably due to a decline in confidence, and an increase in complacency, as also shown in this study. We think these are the reasons why fewer people have participated in this survey. Additionally, the topic of travel vaccines may not be as attractive as the COVID-19 vaccine, unless respondents had plans for international travel, which represents a limitation (self-selection bias) as it will be detailed later.

VL framework and assessment tool used

To accomplish the objectives of the study, we made reference to the Health Literacy Skills Framework by Squiers et al(31), which we adapted to VL (10) (Figure 4).

Looking at this framework, we used an assessment VL scale which was similar to the one used in previous surveys, although with a reduced number of items. For the mediators, we utilized a scale assessing the 3Cs derived from that used by Lu et al (14). We found it interesting to combine these two assessment tools since their construct follows a similar and complementary conceptual approach. Consequently, the methods employed in this study represent an effort to advance in the development of tools for assessing VL and its associated variables.

Using the above tool, we evaluated how the factors mentioned influence the outcomes of two categories of vaccines: routine adult vaccines and those specifically recommended for travelers visiting high-risk areas where vector-borne diseases are present. This is relevant, as today it also entails the additional challenge of a local risk associated with climate change, which could pose a significant threat to public health.

VL and 3Cs roles

Findings from this survey align with results of previous studies and reviews, which mostly indicate that VL skills can predict health outcomes, like intention to be vaccinated, or vaccines received(10, 11, 36). However, not all studies have confirmed these findings, A recent meta-analysis regarding the association between VL and vaccine intention and uptake (37), has indicated that VL significantly influenced vaccination intentions, although its correlation with vaccination status was weaker in comparison.

However, most studies have overlooked the indirect role that VL may play, as well as the mediating impact of beliefs and attitudes towards behaviors. Some researchers have examined the mediating role of VL and of the psychological factors influencing VH (14, 38, 39), although these aspects remain largely unexplored. We have tried to reduce this gap, by performing mediation and moderation analyses, which confirmed that VL can have direct effects on outcomes, but its effects can be also mediated by the psychological antecedents of vaccination. The mediated effects we have observed were partial, similar to Shon's et al (38) who, using a VL single-item nominal tool demonstrated the mediating effects of health beliefs between flu VL and flu vaccine acceptance in students, although the literacy of influenza vaccines improved the vaccination behavior also directly. Conversely, Lu et al showed a completely mediated effect by the 3Cs, between VL and outcomes (14). Also Collini et al (39) found that vaccine confidence completely mediated the relationship between interactive-critical VL (assessed through the HLVa tool)l (19) and the intention of nursing home personnel to get vaccinated

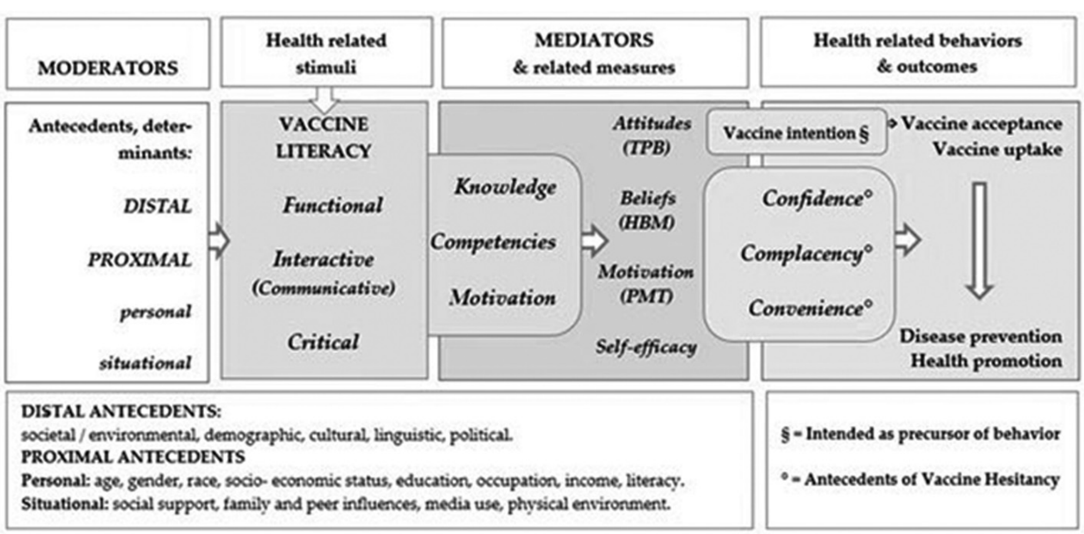

Figure 4 - VL theoretical framework(10): VL is placed between background (moderators) and mediators and partially overlaps these last, explaining its mediating and mediated role toward attitudes, behaviors and health outcomes. Adapted from Squiers' Health Literacy Skills Framework) (31) and Paasche-Orlow (32). HBM = Health Belief Model (33), TPB = Theory of Planned Behavior (34), PMT = Protection Motivation Theory (35).

against influenza. These differences may be linked to methods and tools used, cultural differences between populations, and in mediation tests employed. In fact, mediation models vary significantly from one another, making it challenging to interpret the results. Nevertheless, current literature – despite limited so far – shows that the 3Cs play a mediating role, either partially or fully, between VL and outcomes. Our findings confirm that VL showed a non-significant direct effect on flu vaccination status and intention to be vaccinated on regression and multi mediation models, while the effect mediated by the 3Cs was significant, this confirming the validity of the framework.

Interactive vs functional and critical VL

COVID-related infodemic had a negative impact on individuals because of the abundance of contradictory information (7). However, it also provided opportunities to improve people's discernment of vaccine information. Research has shown that higher VL was associated with higher COVID-19 vaccine acceptance (40). The VL levels were similar in most of the populations studied, with the VL functional score often lower than the interactive-critical one, as if the latter was stimulated by the infodemic to search and try to understand more information, while the functional VL was challenged by the technicality of the information(40). This has been confirmed in the current survey, where functional VL was even lower than in an earlier survey conducted on the same population (23), while interactive and critical VL were higher, as reported in Results.

Despite the high interactive score value, at the PCA, the interactive items were placed in a misaligned position with respect to the other VL items, as if finding information (interactive), understanding (functional), interpreting and using it (critical VL), were no longer actions integrated in a continuous process, but disconnected from each other. Furthermore, while functional and critical VL showed a significant predictive role toward seasonal flu vaccine uptake, interactive VL was not predictive. These findings were also supported by the mediation analysis. This showed that the interactive VL had no significant direct effect on receiving the flu vaccine, nor indirect effects through the 3Cs. Similar findings have been seen for the other outcomes, namely intention to receive the forthcoming flu vaccine, and sum of routine vaccines received. Notably, these observations apply to the entire study population, as well as to selected groups, such as healthcare workers, female and male genders. Moreover, as mentioned, we assessed the impact of consulting multiple information sources by comparing this approach with interactive VL and finding a significant positive correlation. However, this correlation did not extend to the other VL subscales. This finding points again to the limited role of communicative VL. Consulting more information sources seemed to have little influence on the decision on vaccination, as evidenced by the non-significant correlation with critical VL.

The findings support the idea of persisting effects of the pandemic on people's attitudes and behaviors. It seems that searching for information about vaccines and discussing it doesn't catch people's interest as much as it did before, causing their acquired opinions and attitudes to solidify further, leading to decisions being made based on set beliefs and crystallized knowledge. Ongoing discourse about COVID-19 informed, but also induced fatigue (41), causing individuals to avoid new information and further entrench their existing opinions (42). This risk to lead away people from empowerment rather than bringing them closer. Therefore, understanding these dynamics is crucial for crafting strategies that effectively engage individuals in consulting more information sources and having meaningful conversations about vaccination.

As for the VL scores, the analysis showed that they were quite similar to those of previous datasets (40), and the proportion of participants with limited VL was very similar (about 37%). Findings about VL skills were also consistent with factors analyses performed earlier (40). Although a reduced number of items was included, the scale we used can be considered a composite tool, as it contains elements related to the psychological factors influencing VL, as well as knowledge questions about mosquito borne disease (chikungunya being taken as an example). At the same time, the instrument encompasses questions about the psychological antecedents of vaccination, also exploring the behavior of individuals on routine and travelers' vaccines.

Using such tools in the future will help in the standardization of results and enable easier comparison across settings. If composite instruments become widely used, it would likely be feasible to calculate a "composite score". In our context, this could consist of an average of scores for VL, education, and knowledge, according to most recent definition of VL (9). It is important to point out that in this survey knowledge about chikungunya was significantly correlated with education (Spearman's rho P<0.01). This also supports the inclusion of education as part of the composite score as an indicator of competencies(10).

Outcomes: intention to be vaccinated and vaccine uptake

Some Authors reported that acceptance of routine vaccines like flu seems to be higher after the pandemic (43). However, this is not in agreement with other studies. For example, in a survey conducted in Poland more than half of moderate vaccine supporters declared that their vaccine confidence was weakened during the COVID-19 pandemic (44). Notably, in our study the intention to be vaccinated against flu was similar (68%) to that reported in the 2020 survey (66%) (23). In fact, although we found an increase in negative beliefs and attitudes towards vaccination for all the 3Cs, these variables remained correlated with routine vaccine uptake.

In the 2020 survey only 41% of respondents reported receiving the previous seasonal flu shot (23), whereas this was 58% in the current survey. The lower vaccination rate in that period might be attributed to the younger proportion of survey participants, also considering that flu vaccination rates in the general adult population in Italy were notably low just before the Covid-19 outbreak (45). As reported by some Authors, one potentially positive effect during the pandemic was the increase in flu vaccine uptake (46).

Regarding travelers' vaccinations, these can be categorized as routinary, recommended, and required, according to the destination region. Vaccine acceptance and uptake by travelers is influenced by a variety of factors, such as the accessibility to vaccination clinics, individuals' information sources and knowledge about the risks related to the trip, as well as their antecedents, knowledge, attitudes and behaviors toward vaccination in general. Travelers', and also healthcare professionals' knowledge and perception of trips' infectious risk are important factors, as some diseases may be considered irrelevant due to the low incidence reported, but may be important to be prevented due to their potential severity (47).

The number of respondents declaring to be vaccinated against arboviral diseases was limited: as this survey was dedicated to the general population, only few planning to travel to at risk areas. In addition, not all arboviral infections are preventable by immunization. Also, travelers' vaccines are not reimbursed in Italy, which may contribute to a scarce behavior. In addition, a low perception of the risk among travelers may exists due to VH and other reasons (48). Three percent of the participants declared to be vaccinated against dengue and tick-borne disease, and < 1% against Japanese encephalitis. The seven participants who declared to be vaccinated against Zika and chikungunya were excluded from the analysis, as vaccines were not available (chikungunya vaccine was only licensed in the USA for a few months, at the time of this survey). In fact, these questions were included to check data quality.

As mentioned, the relative high percentage of participants vaccinated against yellow fever (18.5%) may be explained by the fact that vaccination against this disease is mandatory when traveling to several countries, together with the fact that the survey questionnaire was also disseminated through newsletters of public health and travel medicine scientific societies. The low percentage of participants vaccinated against dengue can be explained by the fact that approval and availability of the vaccine was very recent at the time of this survey. Many participants intended to get vaccinated against arboviruses before traveling to tropical and subtropical regions. However, a percentage up to 17%, expressed refusal to get vaccinated. As predicted, the rate of vaccination refusal was inversely related to VL and the 3Cs (Spearman's p<0.05 and p< 0.001, respectively). This aligns with other findings, highlighting VH's considerable influence in the field of travel medicine (48).

Awareness about travelers' infectious risk: the example of chikungunya

Among Italian travelers a low attitude to get vaccinated before a trip seems to exist whether for business or pleasure, unlike other European populations, despite the similar proportion of journeys each year (49). Limited medical communication, challenging access to travel clinics, and vaccine costs may also contribute to this issue, aligning with the convenience aspect of the 3Cs model. Unlike most routine vaccinations in Italy, travelers' vaccines are not reimbursed, even though the spread of infections by travelers has the potential to cause serious problems among residents and significantly affect public health.

Chikungunya virus, spread by vectors such as mosquitoes, poses a threat to travelers and carries the potential for wider spread due to climate change, similar to other arboviruses. Participants' knowledge on it was chosen to be assessed in this study because, unlike other tropical diseases preventable by vaccines and used in Italy, no vaccine for chikungunya existed at the time of the survey. Thus, it was hypothesized that the general public might be less familiar with chikungunya than with other vaccine-preventable diseases, making it a more discriminating measure of their knowledge on traveler's vaccination.

An average knowledge score about chikungunya of 5.4 was obtained from the participants, from a range between 1 and 7. The score was higher in healthcare workers and was positively correlated with VL skills and with the 3Cs antecedents of vaccination. However, despite a quite high average score, only 66% of participants responded correctly to the question related to the availability of effective treatments against chikungunya, and 60% responded correctly regarding that of the existence of a preventive vaccine in Italy. Here also, the percentage of participants who responded correctly was higher among healthcare workers.

We think the high rate of mistakes concerning the availability of effective treatments and vaccines for chikungunya stems from the public's limited awareness of arboviral infections. This is especially true for non-traveling people who may mix up the "exotic" names of different diseases. This is confirmed by the significant correlation of correct responses with yellow fever vaccine received ($p<0.01$), and the non-significant correlation with routine vaccine uptake. This remains a hypothesis, though, that suggests a potential reason for the mistakes. Regardless of the cause, this unawareness must be considered in communication to the public about chikungunya, and in continuing medical education. These factors are important given the growing risk of arboviral diseases, which regards not only travelers but local populations in Italy as well, as evidenced by the recent chikungunya (22) and dengue outbreaks (50).

Study limitations

We addressed the known restraints of cross-sectional studies, such as limitation in demonstrating causality, using statistical techniques like regression and mediation models to mitigate this problem to some extent. However, while these statistical measures can help strengthen the evidence for causal relationships, they cannot completely overcome the limitations of cross-sectional design.

In particular, a specific limitation was the unbalance in demographic variables, which was more pronounced compared to a similar earlier survey (23), despite the same methods were followed, including sampling. Convenience sampling can offer benefits. It is a quick and cost-effective method. Additionally, it can sometimes provide insights into specific population segments - like international travelers - that may be harder to reach through probabilistic sampling methods. However, convenience sampling has several limitations. Since participation is based on accessibility, the resulting sample may not accurately represent the broader population, allowing individuals with strong opinions on the topic to be more likely to take part (self-selection bias). Furthermore, despite participants are invited to provide honest answers, the risk of a social desirability bias exists.

Despite the unbalanced educational backgrounds, with most respondents holding higher education degrees, excluding healthcare workers dropped the average education level significantly (Mann-Whitney $p=0.003$). In online surveys education unbalance is a common limitation. Indeed, individuals with low level of education are less likely to participate than individuals with high level (51). For example, while only 21% of respondents by mail to a survey completed college, 57% of the web respondents were graduated (52). In our study, statistical analysis has shown that education did not have a significant effect at the multiple regression model, and it only showed a limited moderating effect between VL and outcomes at its lower level. Regarding unbalance in age, regression analysis showed a significant effect on outcomes, but the moderation model demonstrated the effect was equally balanced between the different age classes. Regarding gender unbalance, females tended to respond more than males like in other online surveys (53, 54), and the higher interactive-critical VL skills we observed in female population was similar to what was already observed for HL (55, 56).

Notably, in addition to the reliability tests and controls executed on collected data, VL skills were consistent with earlier datasets (40) although there were expectable score variations due to differences in demographic variables and historic periods. However, the proportion of participants with limited VL skills was very similar, around 37%, which we believe confirm the validity of the assessment tool used and reliability of results.

Conclusions

The ongoing presence of VH after the pandemic, combined with the resumption of international travel and climate changes, raises concerns on the potential for spreading vector-borne diseases. This aroused our interest in conducting this preliminary research which aimed to assess VL by using a composite scale for both routine and travel vaccinations. The results revealed VL levels among the Italian population that partially varied from previous findings, with lower functional, and higher interactive-critical skills, while positive beliefs toward vaccination were reduced, despite the association between higher VL and vaccine acceptance was maintained, as well as the proportion of individuals with limited VL. The study also found a mismatch in the relationship between interactive (communicative) VL and other VL subscales, which should be further investigated. It has been confirmed that psychological factors—known as the 3Cs—affect vaccination decisions, frequently acting as mediators between VL and outcomes, influencing both the intention to get vaccinated and the actual uptake of vaccines, whether for routine or travel purposes. Public health efforts need to continuously find effective ways to combat VH and promote vaccine acceptance within communities and in the context of international travel. Despite its limitations, this survey provides a basis for further research aimed at better understanding the interaction between VL and VH among travelers. A deeper insight into this complex relationship can lead to improved communication and innovative strategies for prevention of community and travelers' infectious diseases.

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Riassunto

Alfabetizzazione ed esitazione vaccinale riguardo i vaccini di routine e dei viaggiatori: indagine online preliminare

Background. L'enorme quantità di informazioni contrastanti circolate durante la pandemia COVID-19 potrebbe aver avuto un effetto negativo sulle opinioni della popolazione riguardo le vaccinazioni, comprese categorie come quella dei viaggiatori. Questa indagine aveva l'obiettivo di valutare i livelli di alfabetizzazione vaccinale nella popolazione italiana, e degli antecedenti dell'esitazione vaccinale, quali fiducia (confidenza), compiacimento e convenienza (le cosiddette "3C"), e i loro effetti sull'accettazione dei vaccini di routine e dei viaggiatori.

Disegno dello Studio. Uno specifico questionario anonimo è stato sviluppato su Google forms, validato attraverso un processo di "face validity" ed impiegato in uno studio cross-sectional online.

Metodi. La scala di valutazione dell'alfabetizzazione vaccinale utilizzata in questa indagine era simile a quella usata in precedenti indagini. Oltre ai dati demografici ed alle fonti di informazione utilizzate dai partecipanti, il questionario era composto, in totale, da nove domande a risposta multipla sull'alfabetizzazione vaccinale e da sei domande sulle 3C. I risultati (outcomes) considerati erano le convinzioni, i comportamenti e le intenzioni dichiarate dai partecipanti nei confronti delle vaccinazioni di routine raccomandate per gli adulti e quelle contro gli arbovirus per i viaggiatori. Una parte del questionario era dedicata al livello di conoscenza della chikungunya, presa quale esempio di malattia da arbovirus che ha già causato focolai autoctoni in Italia, ma non ancora vaccino-prevenibile al momento dell'indagine.

Risultati. Dopo aver ripulito il database, 357 risposte sono risultate utili per l'analisi statistica. Il punteggio medio dell'alfabetizzazione vaccinale funzionale era 2.81 ± 0.74, inferiore rispetto a studi precedenti, mentre quello dell'interattivo-critica (punteggio 3.41 ± 0.50) era più elevato ($p<0.001$). È stata confermata l'associazione dell'alfabetizzazione vaccinale con gli atteggiamenti e comportamenti vaccinali, e con le 3Cs che spesso agivano quali mediatori tra l'alfabetizzazione vaccinale e gli outcomes. L'alfabetizzazione vaccinale interattiva appariva disallineata rispetto a quella funzionale e critica, come se la ricerca di più fonti di informazione o le continue discussioni sulle vaccinazioni fossero meno rilevanti rispetto al periodo pandemico. Inoltre, è stato riscontrato un aumento dell'esitazione vaccinale, in particolare per quanto riguarda le vaccinazioni dei viaggiatori, con il 10-17% di individui che rifiutavano di essere vaccinati prima di viaggi verso aree a rischio. Il principale limite dello studio era lo squilibrio nelle variabili demografiche, in particolare l'istruzione.

Conclusioni. Lo studio evidenzia il rischio di viaggiare verso aree a rischio, anche con riferimento ai cambiamenti climatici e alla diffusione di infezioni trasmesse da vettori. Indica altresì la necessità di aumentare la consapevolezza sulle malattie da arbovirus ed i relativi vaccini. Come per tutti i sondaggi condotti con campionamento di convenienza, questo studio potrebbe non rappresentare completamente la popolazione. L'analisi statistica ha però permesso di minimizzare questi limiti, facilitando l'interpretazione dei dati. Nonostante la necessità di ulteriori ricerche, i risultati dell'indagine suggeriscono nuovi approcci per la valutazione dell'alfabetizzazione ed esitazione vaccinale per facilitare lo sviluppo di nuove strategie si comunicazione per sostenere le vaccinazioni di routine e per i viaggiatori.

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SUPPLEMENTARY MATERIAL

SUPPLEMENTARY MATERIAL S1 - SPSS Principal Component Analysis

Variables Created	FAC1_1	Component score 1
	FAC2_1	Component score 2
	FAC3_1	Component score 3

```
[DataSet1]
```

Descriptive Statistics

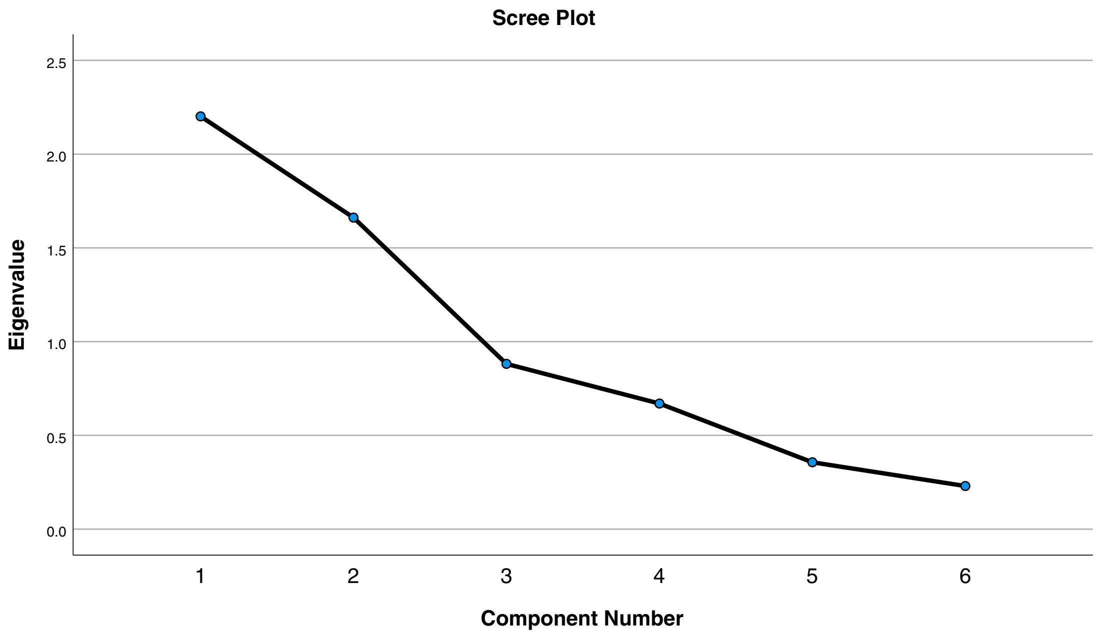
	Mean	Std. Deviation[a]	Analysis N[a]	
ITEM1_24	2.74	.833	357	0
ITEM2_24	2.88	.786	357	0
ITEM3_24	3.47	.744	357	0
ITEM4_24	2.97	.991	357	0
ITEM5_24	3.59	.620	357	0
ITEM6_24	3.60	.661	357	0

a. For each variable, missing values are replaced with the variable mean.

Correlation Matrix[a]

		ITEM1_24	ITEM2_24	ITEM3_24	ITEM4_24	ITEM5_24	ITEM6_24
Correlation	ITEM1_24	1.000	.646	-.153	-.155	.229	.231
	ITEM2_24	.646	1.000	-.143	-.170	.278	.237
	ITEM3_24	-.153	-.143	1.000	.323	.150	.162
	ITEM4_24	-.155	-.170	.323	1.000	.068	.090
	ITEM5_24	.229	.278	.150	.068	1.000	.766
	ITEM6_24	.231	.237	.162	.090	.766	1.000
Sig. (1-tailed)	ITEM1_24		.000	.002	.002	.000	.000
	ITEM2_24	.000		.003	.001	.000	.000
	ITEM3_24	.002	.003		.000	.002	.001
	ITEM4_24	.002	.001	.000		.100	.045
	ITEM5_24	.000	.000	.002	.100		.000
	ITEM6_24	.000	.000	.001	.045	.000	

a. Determinant = .177



Component Matrix[a]

	Component		
	1	2	3
ITEM1_24	.693	-.433	.400
ITEM2_24	.717	-.418	.358
ITEM3_24	.004	.712	.341
ITEM4_24	-.088	.658	.527
ITEM5_24	.782	.410	-.317
ITEM6_24	.767	.437	-.314

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
ITEM1_24	.116	.897	-.096
ITEM2_24	.161	.882	-.113
ITEM3_24	.166	-.129	.761
ITEM4_24	-.017	-.059	.846
ITEM5_24	.923	.153	.069
ITEM6_24	.923	.132	.092

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.739	.672	-.043
2	.464	-.462	.756
3	-.488	.578	.654

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Notes

Variables Created	FAC1_2	Component score 1
	FAC2_2	Component score 2
	FAC3_2	Component score 3

Descriptive Statistics

	Mean	Std. Deviation[a]	Analysis N[a]	Missing N
ITEM1	2.75	.829	885	0
ITEM2	2.92	.787	885	0
ITEM5	3.38	.855	885	0
ITEM12	3.27	.954	885	0
ITEM6	3.22	.750	885	0
ITEM8	2.87	1.064	885	0

a. For each variable, missing values are replaced with the variable mean.

Correlation Matrix[a]

		ITEM1	ITEM2	ITEM5	ITEM12	ITEM6	ITEM8
Correlation	ITEM1	1.000	.591	.025	.124	.136	.065
	ITEM2	.591	1.000	.030	.175	.212	.090
	ITEM5	.025	.030	1.000	.310	.243	.303
	ITEM12	.124	.175	.310	1.000	.429	.276
	ITEM6	.136	.212	.243	.429	1.000	.195
	ITEM8	.065	.090	.303	.276	.195	1.000
Sig. (1-tailed)	ITEM1		.000	.233	.000	.000	.026
	ITEM2	.000		.184	.000	.000	.004
	ITEM5	.233	.184		.000	.000	.000
	ITEM12	.000	.000	.000		.000	.000
	ITEM6	.000	.000	.000	.000		.000
	ITEM8	.026	.004	.000	.000	.000	

a. Determinant = .386

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.626
Bartlett's Test of Sphericity	Approx. Chi-Square	838.047
	df	15
	Sig.	.000

Communalities

	Initial	Extraction
ITEM1	1.000	.799
ITEM2	1.000	.791
ITEM5	1.000	.579
ITEM12	1.000	.667
ITEM6	1.000	.763
ITEM8	1.000	.755

Extraction Method: Principal Component Analysis.

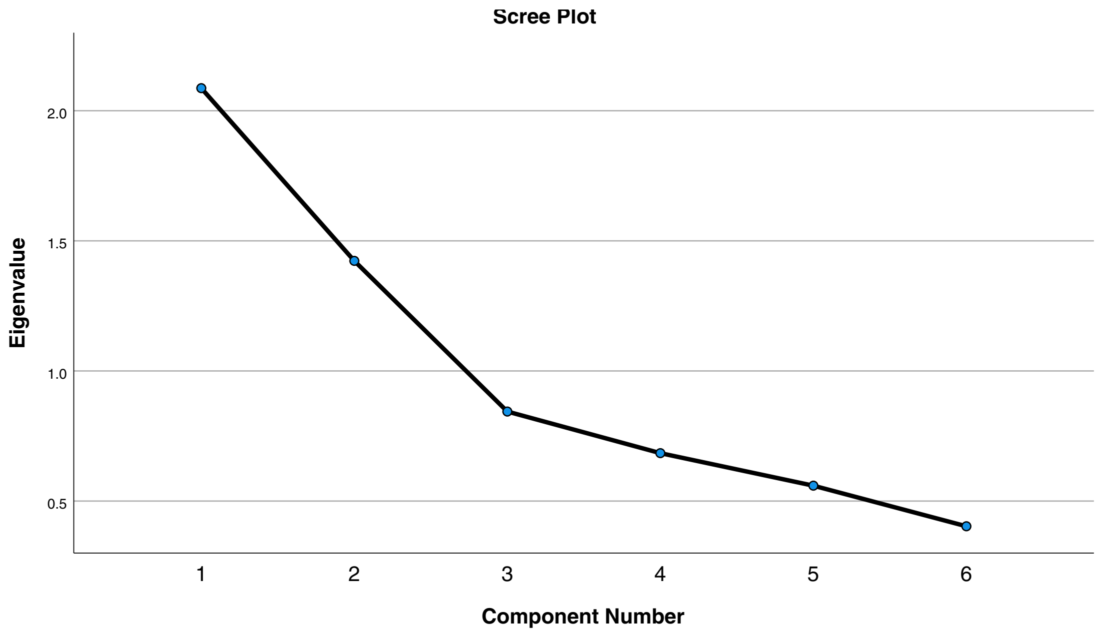
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.087	34.780	34.780	2.087	34.780	34.780
2	1.423	23.717	58.497	1.423	23.717	58.497
3	.844	14.066	72.563	.844	14.066	72.563
4	.684	11.401	83.964			
5	.559	9.319	93.283			
6	.403	6.717	100.000			

Total Variance Explained

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	1.597	26.621	26.621
2	1.439	23.988	50.610
3	1.317	21.954	72.563
4			
5			
6			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component		
	1	2	3
ITEM1	.524	.706	.164
ITEM2	.585	.666	.070
ITEM5	.521	-.484	.271
ITEM12	.697	-.288	-.313
ITEM6	.665	-.175	-.540
ITEM8	.522	-.365	.591

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
ITEM1	.893	.037	.029
ITEM2	.876	.154	.015
ITEM5	-.062	.294	.699
ITEM12	.083	.761	.284
ITEM6	.115	.864	.053
ITEM8	.096	.040	.863

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.542	.665	.514
2	.819	-.280	-.501
3	.190	-.692	.696

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

SUPPLEMENTARY MATERIAL S2 - jamovi Principal Component Analysis

	Component Loadings				
	1	2	3	4	Uniqueness
ITEM1_24			0.863		0.195
ITEM2_24			0.814		0.227
ITEM3_24				0.802	0.333
ITEM4_24				0.736	0.432
ITEM5_24		0.886			0.151
ITEM6_24		0.880			0.150
CONF1_24	0.785				0.289
CONF2_24	0.774				0.362
COMPL1_24	0.772				0.349
COMPL2_24	0.664				0.420
CONV1_24	0.630				0.455
CONV2_24	0.619				0.542

Note. 'varimax' rotation was used

Bartlett's Test of Sphericity

χ^2	df	p
1511	66	< .001

KMO Measure of Sampling Adequacy

	MSA
Overall	0.786
ITEM1_24	0.726
ITEM2_24	0.747
ITEM3_24	0.601
ITEM4_24	0.606
ITEM5_24	0.675
ITEM6_24	0.685
CONF1_24	0.809
CONF2_24	0.807
COMPL1_24	0.884
COMPL2_24	0.882
CONV1_24	0.880
CONV2_24	0.920

Component Statistics

Summary

Component	SS Loadings	% of Variance	Cumulative %
1	3.19	26.6	26.6
2	1.84	15.4	42.0
3	1.68	14.0	56.0
4	1.38	11.5	67.5

Eigenvalues

Initial Eigenvalues

Component	Eigenvalue	% of Variance	Cumulative %
1	4.099	34.16	34.2
2	1.670	13.92	48.1
3	1.386	11.55	59.6
4	0.940	7.84	67.5
5	0.757	6.31	73.8
6	0.707	5.89	79.7
7	0.648	5.40	85.1
8	0.556	4.64	89.7
9	0.433	3.61	93.3
10	0.337	2.81	96.1
11	0.251	2.09	98.2
12	0.214	1.79	100.0

Supplementary Material S3 - NCSS ROC

Dataset C:\Users\lrbia\Desktop\Databases survey FGL travelers\DATABASE SURVEYs 2020_2021_2024.NCSS
Condition Variable FLULAST_24

Area Under Curve Analysis (Empirical Estimation)

Estimated Prevalence = 207 / 357 = 0.5798
Estimated Prevalence is the proportion of the sample with a positive condition of 1. The estimated prevalence should only be used as a valid estimate of the population prevalence when the entire sample is a random sample of the population.

Criterion	Count	AUC	Standard Error	Z-Value to Test AUC ≠ 0.5	2-Sided P-Value	95% Confidence Limits Lower	Upper
AGE_24	357	0.6618	0.0265	6.099	0.0000	0.6066	0.7106
EDUCAT_24	357	0.5579	0.0250	2.314	0.0207	0.5069	0.6051
F1M0_24	357	0.4877	0.0261	-0.473	0.6363	0.4350	0.5371
HCW_24	357	0.6353	0.0223	6.078	0.0000	0.5896	0.6769
VL_24	357	0.6019	0.0295	3.449	0.0006	0.5408	0.6566
X3CS_24	357	0.6345	0.0294	4.572	0.0000	0.5733	0.6887

Definitions:

Criterion	The Criterion Variable containing the scores of the individuals.
Count	The number of the individuals used in the analysis.
AUC	The area under the ROC curve using the empirical (trapezoidal) approach.
Standard Error	The standard error of the AUC estimate.
Z-Value	The Z-score for testing the designated hypothesis test.
P-Value	The probability level associated with the Z-Value.
Lower and Upper Confidence Limits	Form the confidence interval for AUC.

Dataset C:\Users\lrbia\Desktop\Databases survey FGL travelers\DATABASE SURVEYs 2020_2021_2024.NCSS
Condition Variable FLULAST_24

Area Under Curve Analysis (Binormal Estimation)

Estimated Prevalence = 207 / 357 = 0.5798
Estimated Prevalence is the proportion of the sample with a positive condition of 1. The estimated prevalence should only be used as a valid estimate of the population prevalence when the entire sample is a random sample of the population.

Criterion	Count	AUC	Standard Error	Z-Value to Test AUC ≠ 0.5	2-Sided P-Value	95% Confidence Limits Lower	Upper
AGE_24	357	0.6783	0.0275	6.476	0.0000	0.6206	0.7287
EDUCAT_24	357	0.5677	0.0302	2.241	0.0250	0.5056	0.6240
F1M0_24	357	0.4857	0.0302	-0.473	0.6362	0.4243	0.5427
HCW_24	357	0.6730	0.0273	6.334	0.0000	0.6159	0.7231
VL_24	357	0.6065	0.0294	3.624	0.0003	0.5457	0.6609
X3CS_24	357	0.6280	0.0296	4.331	0.0000	0.5666	0.6825

Definitions:

Criterion	The Criterion Variable containing the scores of the individuals.
Count	The number of the individuals used in the analysis.
AUC	The area under the ROC curve using the Binormal estimation approach.
Standard Error	The standard error of the AUC estimate.
Z-Value	The Z-score for testing the designated hypothesis test.
P-Value	The probability level associated with the Z-Value.
Lower and Upper Confidence Limits	Form the confidence interval for AUC.

Dataset	C:\Users\lrbia\Desktop\Databases survey FGL travelers\ DATABASE SURVEYs 2020_2021_2024.NCSS
Condition Variable	FLULAST_24

Area Under Curve Analysis (Empirical Estimation)

Estimated Prevalence = 207 / 357 = 0.5798
Estimated Prevalence is the proportion of the sample with a positive condition of 1. The estimated prevalence should only be used as a valid estimate of the population prevalence when the entire sample is a random sample of the population.

Criterion	Count	AUC	Standard Error	Z-Value to Test AUC ≠ 0.5	2-Sided P-Value	95% Confidence Limits Lower	95% Confidence Limits Upper
FUNCTIONAL_VL	357	0.6427	0.0282	5.059	0.0000	0.5841	0.6947
INTERACTIVE_VL	357	0.4617	0.0301	-1.273	0.2031	0.4006	0.5186
CRITICAL_VL	357	0.5857	0.0272	3.157	0.0016	0.5300	0.6364

Definitions:

Criterion	The Criterion Variable containing the scores of the individuals.
Count	The number of the individuals used in the analysis.
AUC	The area under the ROC curve using the empirical (trapezoidal) approach.
Standard Error	The standard error of the AUC estimate.
Z-Value	The Z-score for testing the designated hypothesis test.
P-Value	The probability level associated with the Z-Value.
Lower and Upper Confidence Limits	Form the confidence interval for AUC.

Area Under Curve Analysis (Binormal Estimation)

Estimated Prevalence = 207 / 357 = 0.5798
Estimated Prevalence is the proportion of the sample with a positive condition of 1. The estimated prevalence should only be used as a valid estimate of the population prevalence when the entire sample is a random sample of the population.

Criterion	Count	AUC	Standard Error	Z-Value to Test AUC ≠ 0.5	2-Sided P-Value	95% Confidence Limits Lower	95% Confidence Limits Upper
FUNCTIONAL_VL	357	0.6429	0.0284	5.031	0.0000	0.5838	0.6952
INTERACTIVE_VL	357	0.4620	0.0301	-1.264	0.2061	0.4010	0.5189
CRITICAL_VL	357	0.5921	0.0302	3.052	0.0023	0.5298	0.6481

Definitions:

Criterion	The Criterion Variable containing the scores of the individuals.
Count	The number of the individuals used in the analysis.
AUC	The area under the ROC curve using the Binormal estimation approach.
Standard Error	The standard error of the AUC estimate.
Z-Value	The Z-score for testing the designated hypothesis test.
P-Value	The probability level associated with the Z-Value.
Lower and Upper Confidence Limits	Form the confidence interval for AUC.

Supplementary Material S4
jamovi MEDIATION AND MODERATION

LAST FLU VACCINE UPTAKE Indirect and Total Effects

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	FUVL_24 ⇒ CONFID_24 ⇒ FLULAST_24	0.03218	0.01599	8.39E-04	0.06353	0.04783	2.0124	0.044
	FUVL_24 ⇒ COMPLAC_24 ⇒ FLULAST_24	-0.00123	0.01355	-0.02779	0.02533	-0.00183	-0.0907	0.928
	FUVL_24 ⇒ CONVEN_24 ⇒ FLULAST_24	0.00345	0.00867	-0.01354	0.02043	0.00512	0.3976	0.691
	INTVL_24 ⇒ CONFID_24 ⇒ FLULAST_24	0.00411	0.00544	-0.00656	0.01478	0.0059	0.7555	0.45
	INTVL_24 ⇒ COMPLAC_24 ⇒ FLULAST_24	-4.02e−4	0.00443	-0.00909	0.00829	-5.76e−4	-0.0906	0.928
	INTVL_24 ⇒ CONVEN_24 ⇒ FLULAST_24	3.04E-04	0.00117	-0.002	0.0026	4.36E-04	0.2592	0.795
	CRVL_24 ⇒ CONFID_24 ⇒ FLULAST_24	0.02854	0.01477	-4.19e−4	0.05749	0.03475	1.9316	0.053
	CRVL_24 ⇒ COMPLAC_24 ⇒ FLULAST_24	-7.78e−4	0.00857	-0.01758	0.01603	-9.47e−4	-0.0907	0.928
	CRVL_24 ⇒ CONVEN_24 ⇒ FLULAST_24	0.00594	0.0149	-0.02326	0.03515	0.00723	0.3987	0.69
Component	FUVL_24 ⇒ CONFID_24	0.29778	0.0469	0.20587	0.3897	0.32461	6.3498	< .001
	CONFID_24 ⇒ FLULAST_24	0.10808	0.05094	0.00824	0.20791	0.14735	2.1218	0.034
	FUVL_24 ⇒ COMPLAC_24	0.24986	0.0447	0.16225	0.33747	0.29704	5.5895	< .001
	COMPLAC_24 ⇒ FLULAST_24	-0.00492	0.05422	-0.11119	0.10135	-0.00615	-0.0907	0.928
	FUVL_24 ⇒ CONVEN_24	0.19358	0.05	0.09557	0.29158	0.20351	3.8711	< .001
	CONVEN_24 ⇒ FLULAST_24	0.0178	0.04453	-0.06948	0.10508	0.02516	0.3998	0.689
	INTVL_24 ⇒ CONFID_24	0.03806	0.04707	-0.0542	0.13032	0.04005	0.8085	0.419
	INTVL_24 ⇒ COMPLAC_24	0.08165	0.04487	-0.0063	0.16959	0.0937	1.8197	0.069
	INTVL_24 ⇒ CONVEN_24	0.01709	0.05019	-0.08129	0.11547	0.01734	0.3405	0.733
	CRVL_24 ⇒ CONFID_24	0.26403	0.05656	0.15317	0.37489	0.23581	4.6681	< .001
	CRVL_24 ⇒ COMPLAC_24	0.15804	0.05391	0.05237	0.26371	0.15393	2.9313	0.003
	CRVL_24 ⇒ CONVEN_24	0.33375	0.06031	0.21554	0.45195	0.28747	5.5339	< .001
Direct	FUVL_24 ⇒ FLULAST_24	0.10378	0.0391	0.02714	0.18042	0.15423	2.6539	0.008
	INTVL_24 ⇒ FLULAST_24	-0.03157	0.03708	-0.10424	0.04109	-0.0453	-0.8516	0.394
	CRVL_24 ⇒ FLULAST_24	0.05767	0.04662	-0.0337	0.14905	0.07023	1.2371	0.216
Total	FUVL_24 ⇒ FLULAST_24	0.13818	0.03719	0.06528	0.21108	0.20536	3.715	< .001
	INTVL_24 ⇒ FLULAST_24	-0.02756	0.03733	-0.10073	0.04562	-0.03954	-0.7381	0.46
	CRVL_24 ⇒ FLULAST_24	0.09137	0.04486	0.00345	0.1793	0.11126	2.0369	0.042

Indirect and Total Effects

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	FUVL_24 ⇒ 3CS_24 ⇒ FLULAST_24	0.03018	0.01354	0.00365	0.0567	0.04486	2.229	0.026
	INTVL_24 ⇒ 3CS_24 ⇒ FLULAST_24	0.00557	0.0052	-0.00463	0.0158	0.00799	1.07	**0.284**
	CRVL_24 ⇒ 3CS_24 ⇒ FLULAST_24	0.03078	0.01412	0.00309	0.0585	0.03748	2.179	0.029
Component	FUVL_24 ⇒ 3CS_24	0.24707	0.03787	0.17285	0.3213	0.32729	6.524	< .001
	3CS_24 ⇒ FLULAST_24	0.12216	0.0515	0.02122	0.2231	0.13706	2.372	0.018
	INTVL_24 ⇒ 3CS_24	0.0456	0.03801	-0.02891	0.1201	0.05831	1.2	0.23
	CRVL_24 ⇒ 3CS_24	0.25194	0.04568	0.16241	0.3415	0.27343	5.516	< .001
Direct	FUVL_24 ⇒ FLULAST_24	0.10799	0.03899	0.03158	0.1844	0.1605	2.77	0.006
	INTVL_24 ⇒ FLULAST_24	-0.03313	0.03707	-0.10578	0.0395	-0.04753	-0.894	**0.371**
	CRVL_24 ⇒ FLULAST_24	0.0606	0.0463	-0.03016	0.1513	0.07378	1.309	0.191
Total	FUVL_24 ⇒ FLULAST_24	0.13818	0.03719	0.06528	0.2111	0.20536	3.715	< .001
	INTVL_24 ⇒ FLULAST_24	-0.02756	0.03733	-0.10073	0.0456	-0.03954	-0.738	**0.46**
	CRVL_24 ⇒ FLULAST_24	0.09137	0.04486	0.00345	0.1793	0.11126	2.037	0.042

Indirect and Total Effects

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	**VL_24 ⇒ 3CS_24 ⇒ FLULAST_24**	0.0915	0.0306	0.0315	0.151	0.0771	2.99	**0.003**
Component	VL_24 ⇒ 3CS_24	0.5701	0.0637	0.44531	0.695	0.4282	8.95	< .001
	3CS_24 ⇒ FLULAST_24	0.1604	0.0506	0.06129	0.26	0.18	3.17	0.002
Direct	VL_24 ⇒ FLULAST_24	0.1286	0.0673	-0.00343	0.261	0.1084	1.91	0.056
Total	VL_24 ⇒ FLULAST_24	0.22	0.0618	0.09892	0.341	0.1854	3.56	< .001

FORTHCOMING FLU VACCINE INTENTION Indirect and Total Effects

				95% C.I.				
Type	**Effect**	**(a) Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	FUVL_24 ⇒ CONFID_24 ⇒ FLUNEXT_24	0.03557	0.01507	0.00603	0.0651	0.05596	2.36	0.018
	FUVL_24 ⇒ COMPLAC_24 ⇒ FLUNEXT_24	0.01276	0.0127	-0.01214	0.03765	0.02007	1.004	0.315
	FUVL_24 ⇒ CONVEN_24 ⇒ FLUNEXT_24	0.00749	0.00818	-0.00854	0.02353	0.01179	0.916	0.36
	INTVL_24 ⇒ CONFID_24 ⇒ FLUNEXT_24	0.00455	0.0059	-0.00702	0.01611	0.0069	0.77	0.441
	INTVL_24 ⇒ COMPLAC_24 ⇒ FLUNEXT_24	0.00417	0.00468	-0.00501	0.01334	0.00633	0.89	0.373
	INTVL_24 ⇒ CONVEN_24 ⇒ FLUNEXT_24	6.62E-04	0.00207	-0.00339	0.00471	0.001	0.32	0.749
	CRVL_24 ⇒ CONFID_24 ⇒ FLUNEXT_24	0.03154	0.01412	0.00385	0.05922	0.04065	2.233	0.026
	CRVL_24 ⇒ COMPLAC_24 ⇒ FLUNEXT_24	0.00807	0.00837	-0.00834	0.02447	0.0104	0.964	0.335
	CRVL_24 ⇒ CONVEN_24 ⇒ FLUNEXT_24	0.01292	0.0139	-0.01433	0.04017	0.01665	0.929	0.353
Component	FUVL_24 ⇒ CONFID_24	0.29778	0.0469	0.20587	0.3897	0.32461	6.35	< .001
	CONFID_24 ⇒ FLUNEXT_24	0.11944	0.04698	0.02736	0.21152	0.1724	2.542	0.011
	FUVL_24 ⇒ COMPLAC_24	0.24986	0.0447	0.16225	0.33747	0.29704	5.589	< .001
	COMPLAC_24 ⇒ FLUNEXT_24	0.05105	0.05001	-0.04697	0.14907	0.06757	1.021	0.307
	FUVL_24 ⇒ CONVEN_24	0.19358	0.05	0.09557	0.29158	0.20351	3.871	< .001
	CONVEN_24 ⇒ FLUNEXT_24	0.03871	0.04107	-0.04179	0.11921	0.05794	0.943	0.346
	INTVL_24 ⇒ CONFID_24	0.03806	0.04707	-0.0542	0.13032	0.04005	0.808	0.419
	INTVL_24 ⇒ COMPLAC_24	0.08165	0.04487	-0.0063	0.16959	0.0937	1.82	0.069
	INTVL_24 ⇒ CONVEN_24	0.01709	0.05019	-0.08129	0.11547	0.01734	0.34	0.733
	CRVL_24 ⇒ CONFID_24	0.26403	0.05656	0.15317	0.37489	0.23581	4.668	< .001
	CRVL_24 ⇒ COMPLAC_24	0.15804	0.05391	0.05237	0.26371	0.15393	2.931	0.003
	CRVL_24 ⇒ CONVEN_24	0.33375	0.06031	0.21554	0.45195	0.28747	5.534	< .001
Direct	FUVL_24 ⇒ FLUNEXT_24	0.09996	0.03607	0.02928	0.17065	0.15729	2.772	0.006
	INTVL_24 ⇒ FLUNEXT_24	0.02202	0.0342	-0.045	0.08904	0.03344	0.644	0.52
	CRVL_24 ⇒ FLUNEXT_24	0.02392	0.043	-0.06036	0.1082	0.03083	0.556	0.578
Total	FUVL_24 ⇒ FLUNEXT_24	0.15578	0.03492	0.08733	0.22423	0.24511	4.461	< .001
	INTVL_24 ⇒ FLUNEXT_24	0.03139	0.03505	-0.03731	0.1001	0.04768	0.896	0.371
	CRVL_24 ⇒ FLUNEXT_24	0.07644	0.04212	-0.00611	0.159	0.09854	1.815	0.07

Indirect and Total Effects

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	FUVL_24 ⇒ 3CS_24 ⇒ FLUNEXT_24	0.05164	0.01415	0.02391	0.0794	0.0812	3.65	< .001
	INTVL_24 ⇒ 3CS_24 ⇒ FLUNEXT_24	0.00953	0.00823	-0.00661	0.0257	0.0145	1.157	0.247
	CRVL_24 ⇒ 3CS_24 ⇒ FLUNEXT_24	0.05265	0.0153	0.02266	0.0826	0.0679	3.441	< .001
Component	FUVL_24 ⇒ 3CS_24	0.24707	0.03787	0.17285	0.3213	0.3273	6.524	< .001
	3CS_24 ⇒ FLUNEXT_24	0.209	0.04746	0.11597	0.302	0.2482	4.403	< .001
	INTVL_24 ⇒ 3CS_24	0.0456	0.03801	-0.02891	0.1201	0.0583	1.2	0.23
	CRVL_24 ⇒ 3CS_24	0.25194	0.04568	0.16241	0.3415	0.2734	5.516	< .001
Direct	FUVL_24 ⇒ FLUNEXT_24	0.10414	0.03593	0.03372	0.1746	0.1639	2.898	0.004
	INTVL_24 ⇒ FLUNEXT_24	0.02186	0.03416	-0.04509	0.0888	0.0332	0.64	0.522
	CRVL_24 ⇒ FLUNEXT_24	0.02379	0.04267	-0.05985	0.1074	0.0307	0.557	0.577
Total	FUVL_24 ⇒ FLUNEXT_24	0.15578	0.03492	0.08733	0.2242	0.2451	4.461	< .001
	INTVL_24 ⇒ FLUNEXT_24	0.03139	0.03505	-0.03731	0.1001	0.0477	0.896	0.371
	CRVL_24 ⇒ FLUNEXT_24	0.07644	0.04212	-0.00611	0.159	0.0985	1.815	0.07

Indirect and Total Effects

				95% C.I. (a)				
Type	**Effect**	**Estimate**	**SE**	**Lower**	**Upper**	**β**	**z**	**p**
Indirect	VL_24 ⇒ 3CS_24 ⇒ FLUNEXT_24	0.129	0.0301	0.0705	0.188	0.115	4.3	< .001
Component	VL_24 ⇒ 3CS_24	0.57	0.0637	0.4453	0.695	0.428	8.95	< .001
	3CS_24 ⇒ FLUNEXT_24	0.227	0.0463	0.1363	0.318	0.27	4.91	< .001
Direct	VL_24 ⇒ FLUNEXT_24	0.145	0.0616	0.0245	0.266	0.13	2.36	0.018
Total	VL_24 ⇒ FLUNEXT_24	0.275	0.0576	0.1617	0.387	0.245	4.77	< .001

ROUTINE VACCINES UPTAKE Indirect and Total Effects

Type	Effect	Estimate	SE	95% C.I. (a) Lower	95% C.I. (a) Upper	β	z	p
Indirect	FUVL_24 ⇒ CONFID_24 ⇒ ROUVUPTK_24	0.09922	0.03651	0.02766	0.1708	0.067	2.717	0.007
	FUVL_24 ⇒ COMPLAC_24 ⇒ ROUVUPTK_24	0.0096	0.02952	-0.04826	0.0675	0.00648	0.325	0.745
	FUVL_24 ⇒ CONVEN_24 ⇒ ROUVUPTK_24	0.03855	0.02123	-0.00307	0.0802	0.02603	1.815	0.069
	INTVL_24 ⇒ CONFID_24 ⇒ ROUVUPTK_24	0.01268	0.01624	-0.01915	0.0445	0.00827	0.781	0.435
	INTVL_24 ⇒ COMPLAC_24 ⇒ ROUVUPTK_24	0.00314	0.00978	-0.01604	0.0223	0.00205	0.321	0.748
	INTVL_24 ⇒ CONVEN_24 ⇒ ROUVUPTK_24	0.0034	0.01013	-0.01645	0.0233	0.00222	0.336	0.737
	CRVL_24 ⇒ CONFID_24 ⇒ ROUVUPTK_24	0.08797	0.0348	0.01976	0.1562	0.04867	2.528	0.011
	CRVL_24 ⇒ COMPLAC_24 ⇒ ROUVUPTK_24	0.00607	0.01876	-0.03069	0.0428	0.00336	0.324	0.746
	CRVL_24 ⇒ CONVEN_24 ⇒ ROUVUPTK_24	0.06646	0.03449	-0.00115	0.1341	0.03677	1.927	0.054
Component	FUVL_24 ⇒ CONFID_24	0.29778	0.0469	0.20587	0.3897	0.32461	6.35	< .001
	CONFID_24 ⇒ ROUVUPTK_24	0.3332	0.11082	0.116	0.5504	0.2064	3.007	0.003
	FUVL_24 ⇒ COMPLAC_24	0.24986	0.0447	0.16225	0.3375	0.29704	5.589	< .001
	COMPLAC_24 ⇒ ROUVUPTK_24	0.03844	0.11797	-0.19277	0.2696	0.02183	0.326	0.745
	FUVL_24 ⇒ CONVEN_24	0.19358	0.05	0.09557	0.2916	0.20351	3.871	< .001
	CONVEN_24 ⇒ ROUVUPTK_24	0.19912	0.09688	0.00924	0.389	0.12789	2.055	0.04
	INTVL_24 ⇒ CONFID_24	0.03806	0.04707	-0.0542	0.1303	0.04005	0.808	0.419
	INTVL_24 ⇒ COMPLAC_24	0.08165	0.04487	-0.0063	0.1696	0.0937	1.82	0.069
	INTVL_24 ⇒ CONVEN_24	0.01709	0.05019	-0.08129	0.1155	0.01734	0.34	0.733
	CRVL_24 ⇒ CONFID_24	0.26403	0.05656	0.15317	0.3749	0.23581	4.668	< .001
	CRVL_24 ⇒ COMPLAC_24	0.15804	0.05391	0.05237	0.2637	0.15393	2.931	0.003
	CRVL_24 ⇒ CONVEN_24	0.33375	0.06031	0.21554	0.452	0.28747	5.534	< .001
Direct	FUVL_24 ⇒ ROUVUPTK_24	-0.02302	0.08507	-0.18976	0.1437	-0.01554	-0.271	0.787
	INTVL_24 ⇒ ROUVUPTK_24	-0.10413	0.08066	-0.26223	0.054	-0.06788	-1.291	0.197
	CRVL_24 ⇒ ROUVUPTK_24	0.11068	0.10143	-0.08812	0.3095	0.06123	1.091	0.275
Total	FUVL_24 ⇒ ROUVUPTK_24	0.12435	0.08326	-0.03884	0.2875	0.08397	1.494	0.135
	INTVL_24 ⇒ ROUVUPTK_24	-0.08491	0.08357	-0.24871	0.0789	-0.05535	-1.016	0.31
	CRVL_24 ⇒ ROUVUPTK_24	0.27119	0.10042	0.07437	0.468	0.15003	2.701	0.007

Indirect and Total Effects

Type	Effect	Estimate	SE	95% C.I. (a) Lower	95% C.I. (a) Upper	β	z	p
Indirect	FUVL_24 ⇒ 3CS_24 ⇒ ROUVUPTK_24	0.1427	0.0353	0.0735	0.2119	0.0964	4.043	< .001
	INTVL_24 ⇒ 3CS_24 ⇒ ROUVUPTK_24	0.0263	0.0225	-0.0178	0.0705	0.0172	1.168	0.243
	CRVL_24 ⇒ 3CS_24 ⇒ ROUVUPTK_24	0.1455	0.0386	0.0698	0.2212	0.0805	3.765	< .001
Component	FUVL_24 ⇒ 3CS_24	0.2471	0.0379	0.1728	0.3213	0.3273	6.524	< .001
	3CS_24 ⇒ ROUVUPTK_24	0.5775	0.1121	0.3578	0.7972	0.2944	5.152	< .001
	INTVL_24 ⇒ 3CS_24	0.0456	0.038	-0.0289	0.1201	0.0583	1.2	0.23
	CRVL_24 ⇒ 3CS_24	0.2519	0.0457	0.1624	0.3415	0.2734	5.516	< .001
Direct	FUVL_24 ⇒ ROUVUPTK_24	-0.0183	0.0849	-0.1847	0.148	-0.0124	-0.216	0.829
	INTVL_24 ⇒ ROUVUPTK_24	-0.1112	0.0807	-0.2694	0.0469	-0.0725	-1.379	0.168
	CRVL_24 ⇒ ROUVUPTK_24	0.1257	0.1008	-0.0718	0.3232	0.0695	1.247	0.212
Total	FUVL_24 ⇒ ROUVUPTK_24	0.1243	0.0833	-0.0388	0.2875	0.084	1.494	0.135
	INTVL_24 ⇒ ROUVUPTK_24	-0.0849	0.0836	-0.2487	0.0789	-0.0553	-1.016	0.31
	CRVL_24 ⇒ ROUVUPTK_24	0.2712	0.1004	0.0744	0.468	0.15	2.701	0.007

Type	Effect	Estimate	SE	Lower	Upper	β	z	p
Indirect	VL_24 ⇒ 3CS_24 ⇒ ROUVUPTK_24	0.35182	0.0736	0.2076	0.496	0.13471	4.7819	< .001
Component	VL_24 ⇒ 3CS_24	0.5701	0.0637	0.4453	0.695	0.42824	8.9541	< .001
	3CS_24 ⇒ ROUVUPTK_24	0.61711	0.1091	0.4033	0.831	0.31457	5.6561	< .001
Direct	VL_24 ⇒ ROUVUPTK_24	-0.00655	0.1452	-0.2912	0.278	-0.00251	-0.0451	0.964
Total	VL_24 ⇒ ROUVUPTK_24	0.34526	0.1372	0.0764	0.614	0.1322	2.5165	0.012

Indirect and Total Effects

Type	Effect	Estimate	SE	95% C.I. (a) Lower	95% C.I. (a) Upper	β	z	p
Indirect	VL_24 ⇒ 3CS_24 ⇒ FLULAST_24	0.09475	0.02948	0.037	0.15253	0.07985	3.214	0.001
	AGE_24 ⇒ 3CS_24 ⇒ FLULAST_24	-0.00176	0.00509	-0.0117	0.00823	-0.00309	-0.345	**0.73**
Component	VL_24 ⇒ 3CS_24	0.57139	0.06377	0.4464	0.69637	0.42921	8.961	< .001
	3CS_24 ⇒ FLULAST_24	0.16583	0.04816	0.0714	0.26021	0.18605	3.444	< .001
	AGE_24 ⇒ 3CS_24	-0.0106	0.03056	-0.0705	0.04931	-0.01661	-0.347	0.729
Direct	VL_24 ⇒ FLULAST_24	0.10498	0.06421	-0.0209	0.23084	0.08847	1.635	0.102
	AGE_24 ⇒ FLULAST_24	0.1695	0.02781	0.115	0.22402	0.29803	6.094	< .001
Total	VL_24 ⇒ FLULAST_24	0.19973	0.05906	0.084	0.31548	0.16832	3.382	< .001
	AGE_24 ⇒ FLULAST_24	0.16774	0.02831	0.1123	0.22323	0.29494	5.926	< .001

Conditional Mediation

Moderator levels AGE	Type	Effect	Estimate	SE	95% C.I. (a) Lower	95% C.I. (a) Upper	β	z	p
Mean-1·SD	Indirect	VL ⇒ 3Cs ⇒ FLULAST	0.113	0.0307	0.05274	0.173	0.0939	3.676	< .001
Mean-1·SD	Component	VL ⇒ 3Cs	0.4909	0.0855	0.32342	0.658	0.3688	5.744	< .001
Mean-1·SD		3Cs ⇒ FLULAST	0.2301	0.0481	0.13583	0.324	0.2545	4.783	< .001
Mean-1·SD	Direct	VL ⇒ FLULAST	0.1294	0.0812	-0.02972	0.289	0.1076	1.594	0.111
Mean-1·SD	Total	VL ⇒ FLULAST	0.2406	0.0793	0.08524	0.396	0.2028	3.035	0.002
Mean	Indirect	VL ⇒ 3Cs ⇒ FLULAST	0.0993	0.0299	0.04071	0.158	0.0836	3.323	< .001
Mean	Component	VL ⇒ 3Cs	0.5776	0.0639	0.4524	0.703	0.4339	9.045	< .001
Mean		3Cs ⇒ FLULAST	0.1719	0.0481	0.07758	0.266	0.1927	3.572	< .001
Mean	Direct	VL ⇒ FLULAST	0.1012	0.0645	-0.02516	0.228	0.0852	1.57	0.116
Mean	Total	VL ⇒ FLULAST	0.196	0.0592	0.07993	0.312	0.1652	3.309	< .001
Mean+1·SD	Indirect	VL ⇒ 3Cs ⇒ FLULAST	0.0755	0.0337	0.0095	0.141	0.064	2.242	0.025
Mean+1·SD	Component	VL ⇒ 3Cs	0.6642	0.0931	0.48171	0.847	0.499	7.134	< .001
Mean+1·SD		3Cs ⇒ FLULAST	0.1136	0.0481	0.01933	0.208	0.1283	2.362	0.018
Mean+1·SD	Direct	VL ⇒ FLULAST	0.073	0.0905	-0.10436	0.25	0.0619	0.807	0.42
Mean+1·SD	Total	VL ⇒ FLULAST	0.1514	0.0864	-0.01784	0.321	0.1276	1.753	0.08

Indirect and Total Effects

Type	Effect	Estimate	SE	95% C.I. (a) Lower	95% C.I. (a) Upper	β	z	p
Indirect	VL_24 ⇒ 3CS_24 ⇒ FLULAST_24	0.08327	0.02935	0.02574	0.1408	0.0702	2.84	0.005
	EDUCAT_24 ⇒ 3CS_24 ⇒ FLULAST_24	0.00946	0.0055	-0.00131	0.0202	0.0174	1.72	**0.085**
Component	VL_24 ⇒ 3CS_24	0.54451	0.06445	0.41819	0.6708	0.409	8.45	< .001
	3CS_24 ⇒ FLULAST_24	0.15293	0.05077	0.05341	0.2524	0.1716	3.01	0.003
	EDUCAT_24 ⇒ 3CS_24	0.06189	0.0295	0.00407	0.1197	0.1016	2.1	0.036
Direct	VL_24 ⇒ FLULAST_24	0.11706	0.06773	-0.01568	0.2498	0.0987	1.73	0.084
	EDUCAT_24 ⇒ FLULAST_24	0.03818	0.02847	-0.01762	0.094	0.0703	1.34	0.18
Total	VL_24 ⇒ FLULAST_24	0.20033	0.06269	0.07746	0.3232	0.1688	3.2	0.001
	EDUCAT_24 ⇒ FLULAST_24	0.04764	0.02869	-0.0086	0.1039	0.0877	1.66	0.097

Conditional Mediation

Moderator levels EDUCAT	Type	Effect	Estimate	SE	95% C.I. (a) Lower	95% C.I. (a) Upper	β	z	p
Mean-1·SD	Indirect	VL ⇒ 3Cs ⇒ FLULAST	0.0799	0.0339	0.01358	0.146	0.0676	2.361	0.018
Mean-1·SD	Component	VL ⇒ 3Cs	0.6292	0.0883	0.45617	0.802	0.4727	7.127	< .001
Mean-1·SD		3Cs ⇒ FLULAST	0.127	0.0508	0.02753	0.227	0.143	2.502	0.012
Mean-1·SD	Direct	VL ⇒ FLULAST	0.0664	0.0906	-0.11118	0.244	0.0561	0.733	0.464
Mean-1·SD	Total	VL ⇒ FLULAST	0.1428	0.086	-0.02574	0.311	0.1203	1.661	0.097
Mean	Indirect	VL ⇒ 3Cs ⇒ FLULAST	0.0866	0.0292	0.02939	0.144	0.0729	2.967	0.003
Mean	Component	VL ⇒ 3Cs	0.5376	0.0644	0.41141	0.664	0.4039	8.348	< .001
Mean		3Cs ⇒ FLULAST	0.1611	0.0508	0.06162	0.261	0.1806	3.174	0.002
Mean	Direct	VL ⇒ FLULAST	0.1203	0.0676	-0.01225	0.253	0.1013	1.779	0.075
Mean	Total	VL ⇒ FLULAST	0.2043	0.0627	0.08138	0.327	0.1722	3.257	0.001
Mean+1·SD	Indirect	VL ⇒ 3Cs ⇒ FLULAST	0.0871	0.0291	0.03	0.144	0.0728	2.99	0.003
Mean+1·SD	Component	VL ⇒ 3Cs	0.4461	0.0938	0.26222	0.63	0.3351	4.756	< .001
Mean+1·SD		3Cs ⇒ FLULAST	0.1952	0.0508	0.0957	0.295	0.2173	3.845	< .001
Mean+1·SD	Direct	VL ⇒ FLULAST	0.1743	0.0929	-0.00774	0.356	0.1458	1.877	0.061
Mean+1·SD	Total	VL ⇒ FLULAST	0.2659	0.0914	0.08682	0.445	0.224	2.91	0.004

Note. Confidence intervals computed with method: Standard (Delta method)

Note. Betas are completely standardized effect sizes *jamovi linear regression*

Model Coefficients - ROUVUPTK_24

Predictor	Estimate	SE	t	p
Intercept [a]	1.4161	0.4764	2.972	0.003
VL_24	-0.1111	0.1211	-0.917	0.360
3CS_24	0.3730	0.0912	4.089	< .001
AGE_24:				
2 – 1	-0.1615	0.1753	-0.921	0.357
3 – 1	-0.0705	0.1785	-0.395	0.693
4 – 1	0.7233	0.1933	3.742	< .001
EDUCAT_24:				
2 – 1	-0.3638	0.2388	-1.524	0.129
3 – 1	-0.5297	0.2573	-2.058	0.040
4 – 1	-0.3722	0.2154	-1.728	0.085
F1M0_24:				
1 – 0	-0.1364	0.0926	-1.473	0.142
HCW_24:				
1 – 0	0.4241	0.1033	4.106	< .001

[a] Represents reference level

jamovi logistic regression

Model Coefficients - FLULAST_24

Predictor	Estimate	SE	Z	p
Intercept	-3.698	1.365	-2.709	0.007
AGE_24:				
2 – 1	0.820	0.494	1.659	0.097
3 – 1	1.260	0.504	2.502	0.012
4 – 1	3.354	0.629	5.332	< .001
EDUCAT_24:				
2 – 1	-0.623	0.654	-0.952	0.341
3 – 1	-0.146	0.696	-0.210	0.833
4 – 1	-0.255	0.583	-0.438	0.662
F1M0_24:				
1 – 0	-0.189	0.262	-0.718	0.473
HCW_24:				
1 – 0	1.594	0.309	5.157	< .001
VL_24	0.263	0.338	0.779	0.436
3CS_24	0.549	0.258	2.123	0.034

Note. Estimates represent the log odds of "FLULAST_24 = 1" vs. "FLULAST_24 = 0"

Model Coefficients - FLUNEXT_24

Predictor	Estimate	SE	Z	p
Intercept	-6.7677	1.488	-4.5489	< .001
AGE_24:				
2 – 1	1.0127	0.482	2.1013	0.036
3 – 1	1.8972	0.507	3.7409	< .001
4 – 1	3.5633	0.681	5.2336	< .001
EDUCAT_24:				
2 – 1	-0.0422	0.690	-0.0612	0.951
3 – 1	0.2965	0.742	0.3996	0.689
4 – 1	0.1295	0.622	0.2081	0.835
F1M0_24:				
1 – 0	0.2634	0.279	0.9452	0.345
HCW_24:				
1 – 0	1.2695	0.349	3.6337	< .001
VL_24	0.4322	0.358	1.2083	0.227
3CS_24	1.1801	0.279	4.2279	< .001

Note. Estimates represent the log odds of "FLUNEXT_24 = 1" vs. "FLUNEXT_24 = 0"

Model Coefficients - YFVAC_24

Predictor	Estimate	SE	Z	p
Intercept	-5.781	1.951	-2.963	0.003
AGE_24:				
2 – 1	2.199	1.058	2.080	0.038
3 – 1	1.753	1.064	1.647	0.100
4 – 1	1.268	1.102	1.151	0.250
EDUCAT_24:				
2 – 1	-1.493	0.712	-2.098	0.036
3 – 1	-2.060	0.929	-2.217	0.027
4 – 1	-1.059	0.578	-1.834	0.067
F1M0_24:				
1 – 0	-0.640	0.297	-2.154	0.031
HCW_24:				
1 – 0	-0.205	0.332	-0.617	0.537
VL_24	0.316	0.413	0.765	0.444
3CS_24	0.843	0.374	2.254	0.024

Note. Estimates represent the log odds of "YFVAC_24 = 1" vs. "YFVAC_24 = 0"

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