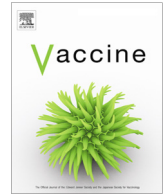




Contents lists available at ScienceDirect

## Vaccine

journal homepage: [www.elsevier.com/locate/vaccine](http://www.elsevier.com/locate/vaccine)

## People's perspectives about COVID-19 vaccination certificate: Findings from a representative Italian sample



Marta Caserotti<sup>a,1</sup>, Teresa Gavaruzzi<sup>a,1</sup>, Paolo Girardi<sup>a,b,\*</sup>, Roberta Sellaro<sup>a</sup>, Enrico Rubaltelli<sup>a</sup>, Alessandra Tasso<sup>c,1</sup>, Lorella Lotto<sup>a,1</sup>

<sup>a</sup> Department of Developmental Psychology and Socialization, University of Padova, Via Venezia 8, 35131 Padova, Italy

<sup>b</sup> Department of Statistical Sciences, University of Padova, Via Cesare Battisti 241, 35121 Padova, Italy

<sup>c</sup> Department of Humanities, University of Ferrara, Via Paradiso 12, 44121 Ferrara, Italy

### ARTICLE INFO

#### Article history:

Available online 15 August 2022

#### Keywords:

COVID-19 public policy  
Vaccine hesitancy  
COVID-19 vaccination certificate  
Medical expenses  
Risk perception  
Judgment and decision-making

### ABSTRACT

In Italy, like in other countries, issues still exist regarding how to reach high vaccine coverage and several countries have considered policies to increase vaccine uptake. In the present study, we focused on people who have a favorable attitude towards vaccination. In March–April 2021, we asked a representative sample of Italian participants (N = 1,530) to assess to what extent they would support the adoption of a COVID-19 vaccination certificate, excluding unvaccinated people from participating in public and cultural events. Furthermore, as the vaccination coverage increases, severe forms of COVID-19 requiring hospitalization more likely involve unvaccinated individuals, who might be perceived as those who don't contribute to ending the pandemic and who constitute a significant health cost for society. We then asked participants to assess to what extent they would favor the idea of requiring people who refuse the vaccine to pay for their own medical expenses in case of hospitalization. We hypothesized that support for the adoption of the vaccination certificate would be predicted by the COVID-19 vaccination status (received, booked, high-, medium-, low-willingness to be vaccinated, or refused) and by the same factors that are known to affect the willingness to get vaccinated. These factors were also tested in a model aimed at investigating if a vaccinated person would favor a measure requiring the unvaccinated individuals to pay for medical expenses. Results confirmed that the support towards the vaccination certificate policy was strongly predicted by the vaccination status and by factors known to affect the willingness to get vaccinated. Interestingly (and surprisingly), a similar pattern was observed for the support of the policy about medical expenses. In conclusion, support for a COVID-19 vaccination certificate was high among the Italian population in the early phases of the vaccination rollout. The findings are discussed considering potential policies to tackle the pandemic.

© 2022 Elsevier Ltd. All rights reserved.

## 1. Introduction

The restrictions on daily activities caused by the SARS-CoV-2 global pandemic had a strong impact on people's health, the soci-

ety, and the economy [14]. After more than a year, and thanks to extraordinary efforts and resources globally implemented [27], the quick development of COVID-19 vaccines provided our best chance to successfully reduce infection, severity, hospitalization and mortality rates [32], allowing the pandemic and restrictions to be overcome [23,30,44,51]. However, despite the availability of effective and safe vaccines, in Italy, like in many other Western countries, issues still exist regarding how to reach high vaccine coverage (respectively: [7,8,35], and [1,33,13]). Studying vaccine hesitancy has become therefore paramount during the pandemic and, as a result, much of the recent literature has focused on undecided people to identify the factors driving COVID-19 vaccine hesitancy [7,24,27,29].

In the present study, we addressed the other side of the coin by investigating to what extent people would support policies aiming

*Abbreviations:* COVID-19, COroNaVirus Disease 2019; CLM, Cumulative Logistic Model; EFA, Exploratory Factorial Analysis; PEC, Profile of Emotional Competence; OROV, Openness to Revising One's Viewpoint; SARS-CoV-2, Severe Acute Respiratory Syndrome COroNaVirus 2; WTV, Willingness To be Vaccinated.

\* Corresponding authors at: Department of Developmental Psychology and Socialization, University of Padova, Via Venezia 8, 35131 Padova, Italy.

*E-mail addresses:* [marta.caserotti@unipd.it](mailto:marta.caserotti@unipd.it) (M. Caserotti), [teresa.gavaruzzi@unipd.it](mailto:teresa.gavaruzzi@unipd.it) (T. Gavaruzzi), [paolo.girardi@unipd.it](mailto:paolo.girardi@unipd.it) (P. Girardi), [roberta.sellaro@unipd.it](mailto:roberta.sellaro@unipd.it) (R. Sellaro), [enrico.rubaltelli@unipd.it](mailto:enrico.rubaltelli@unipd.it) (E. Rubaltelli), [alessandra.tasso@unife.it](mailto:alessandra.tasso@unife.it) (A. Tasso), [lorella.lotto@unipd.it](mailto:lorella.lotto@unipd.it) (L. Lotto).

<sup>1</sup> Equal contribution.

at preserving the health of vaccinated people. Specifically, we investigated people's support of the probable adoption of a COVID-19 vaccination certificate that would exclude unvaccinated people from participating in certain activities to mitigate further outbreaks while reopening various economic and social activities over time. Furthermore, we investigated whether people would favor the idea of requiring individuals who refuse the vaccine to pay for their medical expenses in case of hospitalization. Unquestionably, this is a provocative question in a country like Italy where universal access to a public health care system is guaranteed (art. 32 of the Italian Constitution, [45]). This issue, however, had begun to emerge in the public debate. From our point of view, the rationale driving this question was related to the fact that as the vaccination coverage increases, severe forms of COVID-19 requiring hospitalization and intensive care admission would involve disproportionately unvaccinated individuals as confirmed by first studies [20]. It was therefore plausible to assume that the vaccinated people might think that those refusing the vaccine, in addition to slowing down the effort to end the pandemic, also constitute a significant health cost for the whole society, especially in a public health system, like the Italian one. In other words, vaccinated people might be unwilling to cover expenses that are due to the choice not to vaccinate. While the question of personal responsibility in relation to allocation choices by the welfare state can be examined from a variety of perspectives (e.g., public ethics, political philosophy, and public policy), in the present study we aimed to simply examine the general public support for such a measure.

As for the first issue, it is worth noting that in March 2021 the European Commission proposed to create a COVID-19 health pass, named EU Digital COVID-19 Certificate, with the general aim to resume normal activities and to facilitate travel inside the EU [15]. This certificate was intended as a transitory tool certifying that a person was vaccinated, or was swab negative within the previous 48 h, or recovered from COVID-19 in the last six months. In Italy, while we were collecting the data for this study (March – April 2021), this issue was subject to a limited public debate and mainly during television and radio programs (i.e., talk shows). Afterwards, to ensure the reopening of social and economic activities, the Italian Government pronounced itself in favor of the introduction of a digital COVID-19 certificate, named COVID-19 Green certificate or Green pass, which took place in August 2021 (Decreto-legge 23 luglio 2021 n. 105, see <https://www.dgc.gov.it/web/norme-e-circolari.html>) and remained active until the end of emergency status, which occurred on May 1st, 2022.

The implementation of the Green Pass was aimed at controlling the spread of COVID-19 infection allowing to restart some of the pre-pandemic activities (e.g., access to national/international travel, concerts and shows, as well as sporting events, restaurants, hotels, and gyms). In addition to the economic benefits that result from the resumption of these activities, it has also been suggested that the introduction of the COVID-19 digital pass has allowed people to partially return to the usual habits of travel and human interactions, with a positive impact on their social and psychological well-being [14] and on the vaccination campaign [50]. Already during the H1N1 pandemic, several factors (e.g., trust in authority, perceived severity and susceptibility) have been shown to predict compliance with a variety of protective behaviors, such as adherence to quarantine and respect for behavioral norms like social distancing and mask wearing [2], as well as adherence to vaccination behavior [38].

In the present study, we thus hypothesized that a favorable attitude towards the vaccination certificate (intended only for those who got vaccinated against COVID-19) was predicted by the same factors that the literature on COVID-19 has shown to affect the propensity to vaccinate. Recent studies have been showing that

adherence to protective behaviors such as mask usage and social distancing positively influences the intention to be vaccinated against SARS-CoV-2 [25]. Further, intention to be vaccinated against SARS-CoV-2 is also positively influenced by a variety of different factors including high COVID-19 risk perception [1,7,8], high trust in the institutions [33,36] and science [8], a favorable attitude towards vaccination [1,35] and specifically flu vaccine [7]. In contrast, a high level of conspiracy [13,33], deep doubts about vaccinations [7], high pandemic fatigue [26], and gender (female; [33,48]), strongly decrease the intention to get vaccinated. Although at the time the project was developed there was no evidence to support our assumption, after the introduction of the EU Digital COVID-19 Certificate, some evidence emerged suggesting a strong relationship between vaccine certificate aptitude and vaccination intention [11,18].

In Italy, at the time of our data collection (March – April 2021), the vaccination campaign had started by about 3 months (from December 2020) and 24 % of the Italian population were vaccinated with at least one dose (Our World in Data, 2022 [34]). Participants in our study, through an online questionnaire, were asked to indicate whether they had been offered the opportunity to be vaccinated and, if so, whether they accepted or refused. To those who had not yet received this opportunity, we asked their intention. This allowed us to investigate how the vaccination status (i.e., behavior or intention regarding COVID-19 vaccination) affected people's favor towards the two issues covered by our study (i.e., supporting the vaccination certificate and that unvaccinated people pay for their own medical expenses if hospitalized). We also assessed the influence of COVID-19 related perceived risk, trust in institutions, attitude towards flu vaccination, conspiracy beliefs, doubts about vaccinations, pandemic fatigue, and gender. Specifically, we hypothesized that:

- H1: Those who already received the vaccine or are likely to receive it should be more prone to accept the COVID-19 vaccination certificate;
- H2: High risk perception, trust in institutions, and a favorable attitude towards flu vaccination should increase the willingness to accept the COVID-19 vaccination certificate;
- H3: High level of conspiracy, doubts about vaccinations in general, pandemic fatigue, and female gender should decrease the intention to accept the COVID-19 vaccination certificate.

Additionally, we explored which factors affect the likelihood that a person would support a measure requiring people who refuse the vaccine to pay for their medical expenses if hospitalized, considering the COVID-19 status as a further determinant. While a policy like this is not viable in our public health system, it has been broadly discussed by some scientists and politicians and has been attracting a lot of interest also in the context of social networks. This is still a hot debate even in the face of calculations that have been made to quantify how much a COVID-19 patient costs to the Italian health system, respectively €1.680,59/die and €709,72/die in intensive care or only hospitalized [10].

Furthermore, in our study we intended to better understand the role of some individual differences in the adherence to both measures. Since affect is a key factor in shaping preferences and choices [37] and some recent work has shown that being able to recognize and manage one's emotions is central to parental acceptance of pediatric vaccines [19], we decided to assess people's ability to manage emotions, through the Profile of Emotional Competence (PEC, [4]). In addition, previous studies have shown that people who are more intellectually humble are more likely to get vaccinated [46]. We thus decided to include the Openness to Revising One's Viewpoint (OROV), a subscale of the Comprehensive Intellectual Humility Scale [28].

## 2. Methods

### 2.1. Participants

Data were collected online by a survey company (Demetra [opinioni.net](https://www.opinioni.net)), which selected an Italian representative sample (N = 1,530), weighted by age (18–86), gender, education (Middle school or lower, High school, Degree or higher) and area of residence (North, Center, South and Islands). All participants provided informed consent. The study was approved by the ethical committee of the researchers' University (protocol 3911).

### 2.2. Material and procedure

In the present study we considered a subset of variables selected from a larger research project that aimed to investigate various aspects of vaccination decision, such as the role of public policies, personal reasons and individual differences. In particular, we asked participants if they had already received any of the vaccines offered against COVID-19 (“Yes”, “Not yet vaccinated but already booked”, “Not yet eligible”, and “No I refused the vaccine”). Those who had not yet been offered the vaccine (“Not yet eligible”) were asked how likely they would be to get vaccinated if they were offered a COVID-19 vaccine (from 0 = *Not at all likely* to 100 = *Absolutely likely*). All participants also indicated how favorable they were towards adopting the vaccination certificate and towards the possibility that those who choose not to vaccinate, despite being eligible, would pay medical expenses if they are hospitalized for COVID-19 (from 0 = *Not at all likely* to 100 = *Absolutely likely*). Participants were then asked whether they had been vaccinated against influenza in the 2019/2020 seasons and how doubtful they felt about vaccines in general (from 0 = *Not at all* to 100 = *Extremely*). In addition to the demographics on which the sample was weighted, participants were asked to indicate their employment (“Employed”, “Entrepreneur”, “Healthcare worker”, “Not at work”, and “Other”). The questionnaire also included the 20-item PEC scale [4], the 6-item Pandemic Fatigue scale [26], and the 5-item Openness to Revising One's Viewpoint scale [28], a subscale of the Comprehensive Intellectual Humility Scale. We also included two measures of conspiracy through the last 3-item of the Conspiracy Mentality Questionnaire (CMQ; [5] and an ad-hoc scale of COVID-19 conspiracy. The CMQ measures individual differences in the generic tendency to engage in conspiracy theories, namely, alternative explanations for relevant events that are hidden from the public by sinister and powerful individuals who want to protect their malevolent interests [5]. The ad-hoc scale instead intends to measure participants' predisposition to believe conspiracy theories closely related to the current pandemic by means of 5 items, such as “The COVID-19 virus was created in the laboratory”, for which people were asked to indicate their level of agreement (from 1 = *Not at all agree* to 7 = *Absolutely agree*; more details in [Appendix 1](#)). Besides, we assessed a measure of COVID-19 risk perception by asking participants to indicate how scared they felt of the virus, how severely contagious they considered it to be for them as well as the level of concern about mutations of the virus [7]. Finally, we investigated respondents' trust in institutions, such as the national, local and health institutions (from 1 = *Not at all confident* to 5 = *Absolutely confident*).

### 2.3. Sample characteristics

The age was categorized according to the following categories: young 18–25, young adults 26–45, adults 46–65, elderly  $\geq 66$  years old. The level of doubts about vaccinations and willingness to be vaccinated (WTV) were evaluated on a 1–100 range scale and were

categorized in three categories with an equal subdivision of the scale range (Low:  $<33$ , Medium: 33–67, High:  $\geq 67$ ). We then merged information on WTV and vaccination status (received, booked, and refused) into a single variable called COVID-19 vaccine status formed by six categories (“Refused”, “Low WTV”, “Medium WTV”, “High WTV”, “Booked” and “Received”).

### 2.4. Statistical analysis

#### 2.4.1. Descriptive analysis

All the analyses were performed only on respondents without missing observations on the variables of interest (N = 1,504, 98.3 %). The study variables were summarized in frequency tables and figures (frequency for categorical variables, median and Interquartile Range (IQR) for continuous variables). Kruskal-Wallis tests were computed to compare the distribution of continuous variables across the categories of vaccine status. Categorical variables were compared using chi-squared or Fisher's exact test where expected frequencies in any combination were  $<10$ . Statistical significance was assumed at the 5 % level. Statistical analysis was performed using R [46].

#### 2.4.2. Dimensionality reduction - exploratory factor analyses

Six different Exploratory Factorial Analyses (EFAs) were performed on groups of variables related to specific domains: 1) COVID-19 perceived risk, 2) Pandemic fatigue, 3) COVID-19 conspiracy, 4) Conspiracy mentality, 5) Openness to revising one's viewpoint, 6) Trust in institutions.

Since the scales of all variables reported a different marginal distribution (1–100 scale, 5-point or 7-point Likert scale), each factorial analysis was performed on the hypothesizing normally distributed continuous latent variables using a weighted least square mean and variance adjusted estimator. We extracted from each EFA only the first factor, which explained the highest percentage of variance: the amount of variance explained by the one-factor solution was satisfactory, ranging from 45 % to 67 %. The estimated loadings were then used to calculate the regression factor scores. Regression scores were categorized in tertiles (1<sup>st</sup> tertile = low risk; 2<sup>nd</sup> tertile = medium risk; 3<sup>rd</sup> tertile = high risk) for inclusion in the following regression models. For each EFA, the number and the name of items included, their internal consistency (Cronbach's  $\alpha$ ), the estimated loadings, and the proportion of deviance explained are reported in Table S1.

#### 2.4.3. Regression models

Each participant reported their support towards a COVID-19 vaccination certificate or that unvaccinated people have to pay for the COVID-19 medical expenses on a 7-point Likert scale. To evaluate which factors influenced the respondent's motivation to take this measure related to the COVID-19 contagion, we employed two different Cumulative Logistic Models (CLMs). To include variables, we adopted a backward stepwise regression model that begins with a full model and, at each step, gradually removes variables from the regression model based on the Akaike Information Criterion (AIC). The full model included age, gender, educational level, employment status, a flu shot done in the 2019/2020 season, Doubts about vaccinations in a categorical form (Low:  $\leq 33$ , Medium: 34–66, High:  $\geq 67$ ), PEC score, and the 6 factorial scores estimated by the factorial analyses described above. With the exception of the doubts about vaccinations, other continuous variables were categorized into three classes (low, medium, and high category) according to tertiles of each marginal distribution. CLMs were estimated using a maximum likelihood method. Results were presented using Odds Ratios (ORs) by exponentiating the estimated coefficients from the cumulative logistic regression and producing its relative 95% Confidence Interval (95 % CI).

A further regression analysis was conducted by means of a linear regression model in order to explain which factors influenced the Trust in institutions. The full model included the same variables considered in the CLMs and the variable selection was based on the minimization of the AIC index. Results were reported by means of the estimated coefficients and relative 95 % CIs.

The regression models were estimated through the R 4.0 program [39], and for the CLMs we employed the *ordinal* package [9].

### 2.4.4. Classification tree analysis

A classification tree analysis was carried out in order to characterize profiles with a low or high propensity to support a COVID-19 vaccination certificate or paying COVID-19 medical expenses. Although the dependent variables were distributed on a Likert scale, we considered them continuously distributed adopting a splitting criterion based on the analysis of the variance. We tested the inclusion of the same regressors used in the CLM regression, but keeping the variables in continuous form for obtaining a more discriminating power. Tree pruning strategy was adopted to reduce classification tree overfitting considering the overall R<sup>2</sup> as indicator and fixing that at each classification step in the tree if the R<sup>2</sup> did not increase by 1 % the tree should be stopped. The classification tree analysis was performed by means of the *rpart* package on R environment [49].

## 3. Results

Among respondents, 22 % were offered the vaccination and only 12.7 % of them refused the vaccination (Figure S1). Among those not yet eligible for the vaccination (78 %) the willingness to be vaccinated was high in 62 % of the participants (Figure S1) with a skewed and bimodal distribution (Figure S2, median: 81, IQR: 50–100). The main characteristics of the sample, overall and by vaccination-propensity status were reported in Table 1. Good agreement emerges between the two measures, a vaccination cer-

tificate and policy for unvaccinated people to pay for the COVID-19 medical expenses (Spearman's correlation: 71 %), with the presence of an evident polarization and concordance between these two measures (Figure S3); their marginal distribution showed a median value of 5 on a 7-point Likert scale (Table 1).

A higher proportion of females and younger people refused or have a low WTV with respect to males and older people (gender  $p = 0.002$ , age  $p < 0.001$ ). There was no difference between the area of residence on COVID-19 vaccine status. The educational level pushed up both the WTV and the acceptance of the COVID-19 vaccine ( $p < 0.001$ ) while a significant difference in the distribution of the employment status was observed among the categories of COVID-19 vaccination status ( $p < 0.001$ ). Almost half of the respondents who had a flu shot in the season 2019/2020 had already received their COVID-19 vaccine or had booked (42 % and 39 %, respectively) while the percentage decreased to very low values among those who refused the COVID-19 vaccine or had a low WTV propensity (7.3 % and 7.6 %, respectively). Both the support towards the vaccination certificate and medical expenses showed a strong correlation with the current vaccination status passing from low values for those who refused the COVID-19 vaccine to high values for those who had already done the vaccine.

The pairwise marginal distribution and Spearman's correlations between 6 scores resulting from the EFAs performed on 6 dimensions with also the PEC are shown in Fig. 1. We found positive agreement between COVID-19 conspiracy and Conspiracy mentality (Spearman's  $\rho = 0.589$ ) and the Pandemic fatigue ( $\rho = 0.370$ ). A negative correlation was seen between COVID-19 conspiracy and Trust in institutions ( $\rho = -0.322$ ). The COVID-19 perceived risk score was positively correlated with the subscale of the Openness to revising one's viewpoint ( $\rho = 0.140$ ) and negatively correlated with the Pandemic fatigue ( $\rho = -0.166$ ). The scores produced by the 6 EFAs marked change by vaccination status ( $p < 0.001$ , Table 2).

**Table 1**  
Main characteristics of the sample, overall and by vaccination status or propensity.

Characteristics	Overall, N = 1,504 <sup>1</sup>	COVID-19 vaccine status						P-value <sup>2</sup>
		Refused, N = 41 <sup>1</sup>	Low WTV, N = 225 <sup>1</sup>	Medium WTV, N = 224 <sup>1</sup>	High WTV, N = 731 <sup>1</sup>	Booked, N = 124 <sup>1</sup>	Received, N = 159 <sup>1</sup>	
<b>Gender</b>								0.002
Female	765 (51 %)	23 (56%)	134 (60 %)	131 (58 %)	341 (47 %)	59 (48 %)	77 (48 %)	
Male	739 (49 %)	18 (44 %)	91 (40 %)	93 (42 %)	390 (53 %)	65 (52 %)	82 (52 %)	
<b>Age</b>	47 (35, 57)	44 (34, 56)	44 (33, 55)	46 (34, 55)	47 (34, 57)	57 (44, 67)	50 (39, 60)	<0.001
<b>Area of residence</b>								0.24
Center	392 (26 %)	5 (12 %)	64 (28 %)	59 (26 %)	194 (27 %)	29 (23 %)	41 (26 %)	
North	691 (46 %)	22 (54 %)	102 (45 %)	101 (45 %)	347 (47 %)	48 (39 %)	71 (45 %)	
South and Islands	421 (28 %)	14 (34 %)	59 (26 %)	64 (29 %)	190 (26 %)	47 (38 %)	47 (30 %)	
<b>Educational level</b>								<0.001
Low	607 (40 %)	22 (54 %)	113 (50 %)	111 (50 %)	281 (38 %)	38 (31 %)	42 (26 %)	
Middle	602 (40 %)	14 (34 %)	87 (39 %)	86 (38 %)	298 (41 %)	61 (49 %)	56 (35 %)	
High	295 (20 %)	5 (12 %)	25 (11 %)	27 (12 %)	152 (21 %)	25 (20 %)	61 (38 %)	
<b>Employment status</b>								<0.001
Employed	552 (37 %)	17 (41 %)	75 (33 %)	86 (38 %)	272 (37 %)	38 (31 %)	64 (40 %)	
Entrepreneur	149 (9.9 %)	2 (4.9 %)	21 (9.3 %)	22 (9.8 %)	86 (12 %)	11 (8.9 %)	7 (4.4 %)	
Healthcare worker	87 (5.8 %)	1 (2.4 %)	6 (2.7 %)	4 (1.8 %)	18 (2.5 %)	13 (10 %)	45 (28 %)	
Not at work	588 (39 %)	19 (46 %)	102 (45 %)	83 (37 %)	295 (40 %)	50 (40 %)	39 (25 %)	
Other	128 (8.5 %)	2 (4.9 %)	21 (9.3 %)	29 (13 %)	60 (8.2 %)	12 (9.7 %)	4 (2.5 %)	
<b>Flu shot in 2019/2020 season [Yes]</b>	317 (21 %)	3 (7.3 %)	17 (7.6 %)	31 (14 %)	152 (21 %)	48 (39 %)	66 (42 %)	<0.001
<b>Doubts about vaccinations</b>								<0.001
Low [ $\leq 33$ ]	652 (43 %)	8 (20 %)	15 (6.7 %)	32 (14 %)	434 (59 %)	62 (50 %)	101 (64 %)	
Medium [34–66]	417 (28 %)	5 (12 %)	44 (20 %)	120 (54 %)	177 (24 %)	38 (31 %)	33 (21 %)	
High [ $\geq 67$ ]	435 (29 %)	28 (68 %)	166 (74 %)	72 (32 %)	120 (16 %)	24 (19 %)	25 (16 %)	
<b>Vaccination certificate</b>	5 (3, 7)	1 (1, 3)	1 (1, 4)	4 (2, 5)	6 (4, 7)	5.50 (4, 7)	6 (4, 7)	<0.001
<b>Medical expenses</b>	5 (2, 7)	1 (1, 2)	1 (1, 4)	4 (1, 5)	6 (4, 7)	5 (3, 7)	6 (4, 7)	<0.001

<sup>1</sup>Median (IQR) or Frequency (%).

<sup>2</sup>Pearson's Chi-squared test; Kruskal-Wallis rank sum test.



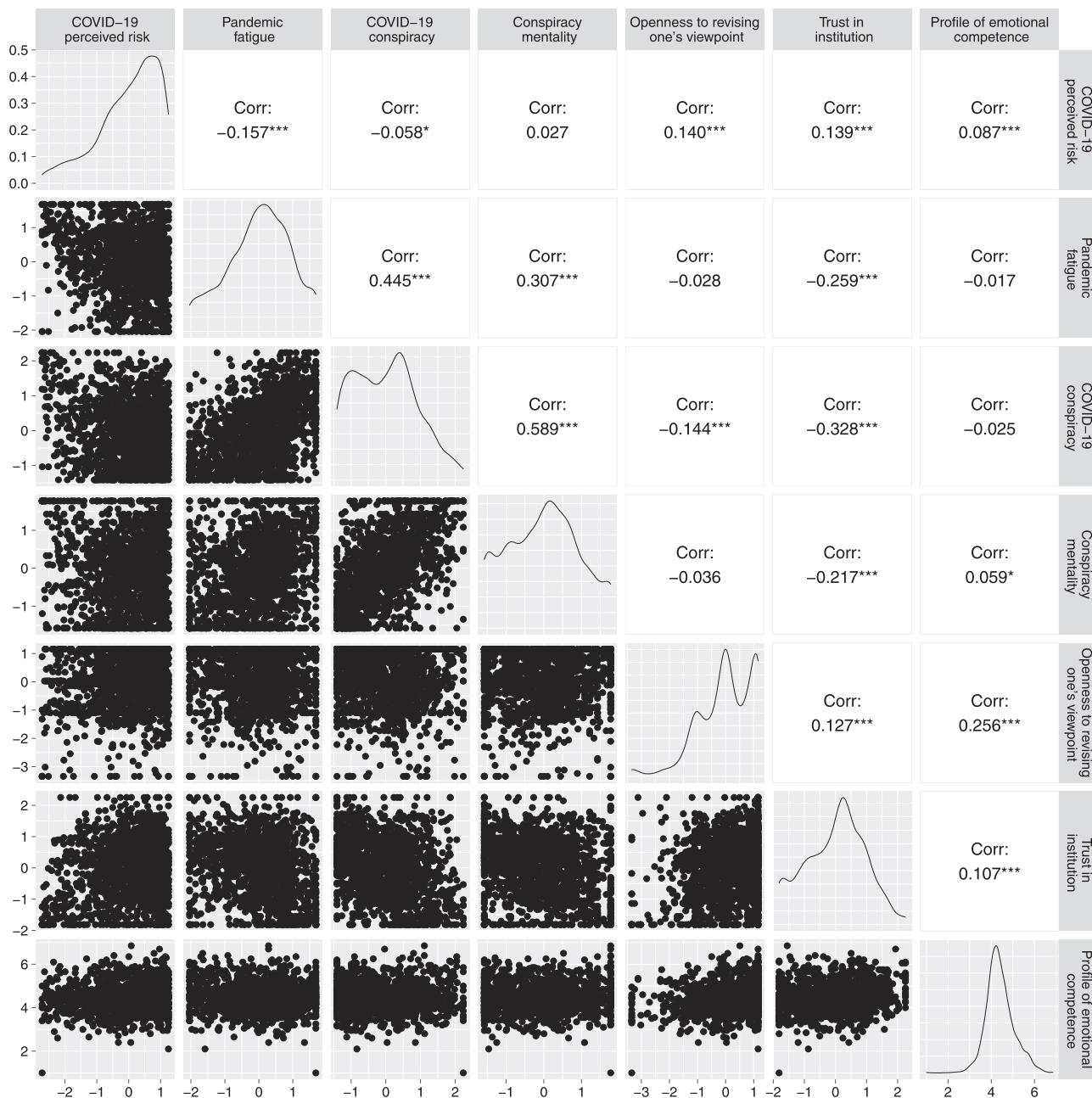


Fig. 1. Pairwise marginal distribution and Spearman's correlation between six regression scores resulted by EFA and by values of Profile of emotional competence.

### 3.1. Regression models

Results of the CLM regressions (Table 3) showed a great impact of COVID-19 vaccine status with a similar OR for both the measures for those who had received or booked the vaccine or with high WTV compared with those who reported a medium WTV (all ORs > 1.5 and with p-values < 0.05). Conversely, low WTV or the refusal of the COVID-19 vaccine reported a high likelihood of low scores for the two dependent variables.

These estimates were adjusted for a series of co-determinants that had a significant effect on the response variable. In particular, the adverse effect of the doubts about vaccinations was similar for both the measures, while only the elderly exhibited stronger support towards the vaccination certificate (OR:1.46, 95%CI: 1.05–2.03). The COVID-19 perceived risk showed a protective effect on

the adoption of these two measures while the opposite effect was observed for the COVID-19 conspiracy. Considering the belief in conspiracy theories as an additional esplicative variable in the regression model following our goodness-of-fit criterion, it reported to have a low marginal adjusted influence on the two considered outcomes. Conversely, high values on Openness to revising one's viewpoint led to higher values on the adoption of these two measures. Only for the medical expenses, we observed a protective influence of those who had a flu shot in the 2019/2020 season and who reported a high PEC.

The second regression model estimated considering the Trust in institutions as the main outcome reported as regressors a series of variables as Doubts about vaccinations, COVID-19 vaccine status, and COVID-19 perceived risk, which was already included in the previous CLMs regression, partially justifying the absence

**Table 2**  
Factorial scores of the 6 dimensional scales and score of Profile of emotional competence, overall and by COVID-19 vaccine status.

Characteristics	Overall, N = 1,504 <sup>1</sup>	COVID-19 vaccine status						P-value <sup>2</sup>
		Refused, N = 41 <sup>1</sup>	Low WTV, N = 225 <sup>1</sup>	Medium WTV, N = 224 <sup>1</sup>	High WTV, N = 731 <sup>1</sup>	Booked, N = 124 <sup>1</sup>	Received, N = 159 <sup>1</sup>	
<b>COVID-19 perceived risk</b>	0.19 (-0.54, 0.75)	-0.50 (-1.65, 0.40)	-0.46 (-1.64, 0.48)	0.20 (-0.55, 0.65)	0.33 (-0.33, 0.80)	0.25 (-0.38, 0.86)	0.24 (-0.33, 0.74)	<0.001
<b>Pandemic fatigue</b>	0.07 (-0.63, 0.68)	0.30 (-0.62, 1.00)	0.51 (-0.12, 1.01)	0.23 (-0.38, 0.69)	-0.03 (-0.76, 0.57)	-0.09 (-0.71, 0.59)	-0.11 (-0.68, 0.35)	<0.001
<b>COVID-19 conspiracy</b>	-0.01 (-0.78, 0.63)	0.57 (0.06, 1.31)	0.85 (0.39, 1.38)	0.40 (-0.06, 0.78)	-0.44 (-0.96, 0.33)	-0.17 (-0.91, 0.41)	-0.58 (-1.08, 0.27)	<0.001
<b>Conspiracy mentality</b>	0.08 (-0.79, 0.66)	0.33 (-0.46, 0.77)	0.41 (-0.19, 1.20)	0.17 (-0.46, 0.69)	0.17 (-0.92, 0.54)	0.10 (-0.64, 0.70)	-0.25 (-0.92, 0.49)	<0.001
<b>Openness to revising one's viewpoint</b>	0.03 (-0.61, 0.83)	-0.17 (-1.18, 0.75)	-0.07 (-0.80, 0.77)	-0.07 (-0.95, 0.50)	0.03 (-0.40, 0.89)	0.10 (-0.28, 0.95)	0.19 (-0.61, 0.91)	<0.001
<b>Trust in institutions</b>	0.13 (-0.71, 0.68)	-0.34 (-1.07, 0.22)	-0.90 (-1.55, 0.02)	-0.03 (-0.75, 0.31)	0.26 (-0.44, 0.85)	0.25 (-0.40, 0.71)	0.35 (-0.19, 0.90)	<0.001
<b>Profile of emotional competence</b>	4.35 (4.00, 4.75)	4.20 (4.00, 4.60)	4.35 (4.00, 4.75)	4.30 (4.00, 4.75)	4.35 (4.00, 4.72)	4.35 (4.05, 4.71)	4.35 (4.00, 4.80)	0.83

<sup>1</sup>Median (IQR) or Frequency (%).

<sup>2</sup>Kruskal-Wallis rank sum test.

**Table 3**  
Odds Ratios (ORs) estimated by a CLM regression models on willingness to adopt a Vaccination certificate or unvaccinated people have to pay for the COVID-19 medical expenses respect to the reference category\*.

Predictors	Vaccination certificate			Medical expenses		
	OR	95 %CI	P-value	OR	95 %CI	P-value
Doubts about vaccinations [Medium]	0.61	0.47 – 0.79	<0.001	0.62	0.48 – 0.81	<0.001
Doubts about vaccinations [High]	0.35	0.26 – 0.47	<0.001	0.36	0.27 – 0.49	<0.001
Age-class [18–25]	0.78	0.56 – 1.07	0.125	0.80	0.58 – 1.10	0.166
Age-class [26–45]	0.93	0.75 – 1.15	0.504	1.19	0.96 – 1.48	0.107
Age-class [66–90]	1.49	1.07 – 2.06	0.017	1.30	0.94 – 1.80	0.119
COVID-19 perceived risk [Medium]	1.65	1.30 – 2.08	<0.001	1.56	1.24 – 1.98	<0.001
COVID-19 perceived risk [High]	3.07	2.40 – 3.92	<0.001	1.96	1.53 – 2.50	<0.001
COVID-19 conspiracy [Medium]	0.65	0.49 – 0.85	0.002	0.76	0.58 – 1.01	0.056
COVID-19 conspiracy [High]	0.48	0.35 – 0.67	<0.001	0.56	0.40 – 0.77	<0.001
Conspiracy mentality [Medium]	0.94	0.73 – 1.21	0.615	0.84	0.66 – 1.08	0.182
Conspiracy mentality [High]	1.29	0.98 – 1.70	0.074	1.22	0.93 – 1.61	0.159
Openness to revising one's viewpoint [Medium]	1.53	1.22 – 1.92	<0.001	1.45	1.15 – 1.82	0.001
Openness to revising one's viewpoint [High]	1.58	1.24 – 2.02	<0.001	1.44	1.12 – 1.84	0.004
COVID-19 vaccine status [Received]	2.39	1.62 – 3.53	<0.001	2.53	1.72 – 3.75	<0.001
COVID-19 vaccine status [Booked]	1.67	1.11 – 2.51	0.014	1.75	1.15 – 2.68	0.009
COVID-19 vaccine status [Refused]	0.24	0.12 – 0.48	<0.001	0.27	0.13 – 0.55	<0.001
COVID-19 vaccine status [Low WTV]	0.44	0.30 – 0.63	<0.001	0.60	0.41 – 0.86	0.005
COVID-19 vaccine status [High WTV]	2.32	1.73 – 3.10	<0.001	2.37	1.77 – 3.17	<0.001
Flu shot in 2019/2020 season [No]				0.77	0.60 – 0.98	0.034
Profile of emotional competence [Medium]				0.93	0.74 – 1.16	0.524
Profile of emotional competence [High]				0.75	0.59 – 0.96	0.023
Observations	1504			1504		
R <sup>2</sup> Nagelkerke	0.363			0.301		

\*reference category: Doubts about vaccinations [Low], Age-class [46–65], COVID-19 perceived risk [Low], COVID-19 conspiracy [Low], Conspiracy mentality [Low], Openness to revising one's viewpoint [Low], COVID-19 vaccine status [medium WTV], Flu shot in 2019/2020 season [Yes], Profile of emotional competence [Low].

of the Trust in institutions in the previously estimated models (Table S2).

3.2. Regression tree analysis

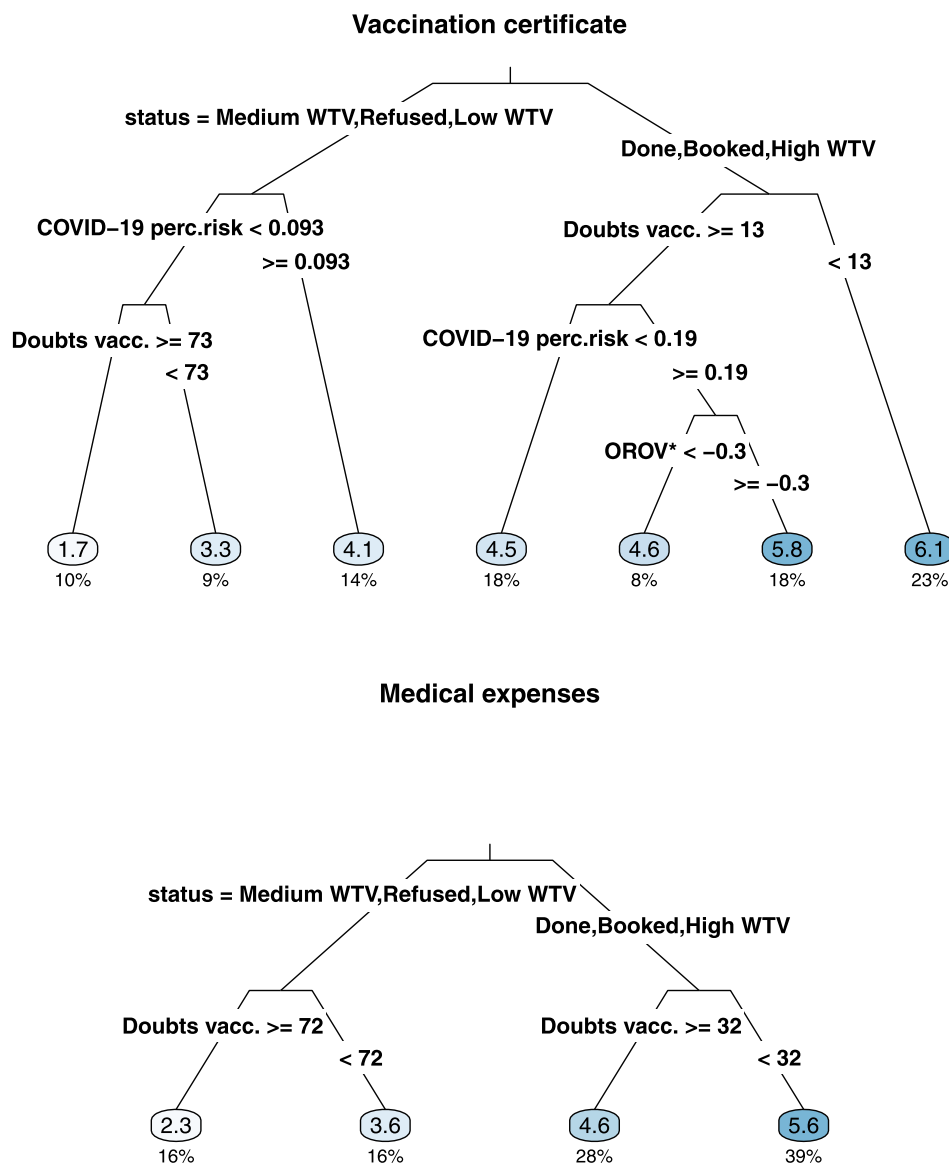
The results of the regression tree performed separately on the support towards the vaccination certificate and charging medical expenses are reported in Fig. 2. Considering vaccination certificate, having already received or booked the COVID-19 vaccine or having a high WTV was the most discriminant variable; this latter in conjunction with very low doubts about vaccinations showed the highest propensity towards this measure (average value = 6.1), reached by 23 % of the sample. On the other side, having refused the COVID-19 vaccine or having a low-to-medium WTV reported the lowest willingness to support the vaccination certificate, and people who had a low COVID-19 perceived risk and high doubts

about vaccinations probably did not accept the use of a vaccination certificate (average value = 1.7, 10 %).

Doubts about vaccinations and COVID-19 vaccine status influenced the belief that unvaccinated people have to pay for their medical expenses if they get infected. In particular, those people who already had done or booked the COVID-19 vaccine or with a high WTV, low doubts about vaccinations (<32 points) reported high support towards this measure (average value = 5.6, 39 %).

4. General discussion

In the present work, we asked an Italian representative sample to what extent they were favorable towards the likely introduction of a COVID-19 vaccination certificate, that some people would eventually welcome as a way to end the pandemic, while others could judge as a way to discriminate against unvaccinated individ-



**Fig. 2.** Results of the classification tree estimated for the willingness to adopt a vaccination certificate or that unvaccinated people have to pay for the COVID-19 medical expenses. \*OROV: Openness to revising one’s viewpoint.

uals. Furthermore, we investigated to what extent respondents were favorable to requiring people who refuse the vaccine to pay for their own medical expenses in case of hospitalization due to COVID-19, despite Italy having a public healthcare service.

In the regression models, we found that high (vs. low) levels of COVID-19 perceived risk positively predicted the support for both the vaccination certificate and the medical expenses. Similarly, having a high (vs. low) level of COVID-19 conspiracy and high (vs. low) doubts about vaccinations in general strongly decrease the support for both the measures. A similar trend was also found when considering the COVID-19 vaccine status. Specifically, those who already received the vaccine or are highly willing to receive it are more favorable towards both measures, whereas those who have refused the vaccine or are not willing to receive it strongly oppose them. The results of the regression tree analysis further support the contribution of doubts about vaccinations and COVID-19 vaccine status. Additionally, we found that intellectual humility positively predicts the adherence to both measures, and that older people are more willing to adopt the vaccination certificate, but no effect of age was found on medical expenses. Besides,

having employed a backward stepwise regression model methodology based on the AIC, flu vaccination and PEC were included only in the medical expenses model and suggested that those who did not receive the flu vaccine in 2019/2020 and those who are more able to manage emotions are also less willing to accept the idea of charging medical expenses to the unvaccinated people in case of COVID-19 hospitalization. Consistent with the literature, we found that high risk perception associated with COVID-19 positively influences adherence to protective behaviors, such as compliance with social distancing and mask wearing [25] and immunizations [7]. These findings are also supported by several theories including the Health Belief Model [42], the Protection Motivation Theory [40], and the Affect Heuristic [47] which show that risk perception is a predictor of behavior. Moreover, our results are also supported by previous works suggesting that low adherence to flu vaccination [7], high doubts about vaccinations in general [13,35,36], and high level of conspiracy [13,33] are strongly associated with a decrease in the acceptance of preventive behaviors. Contrary to our hypotheses, female gender and trust in institutions were not significant predictors in either model. How-

ever, this is likely due to the fact that the variability is already explained by other variables included in the models, as confirmed by the additional regression analysis on trust in institutions.

To the best of our knowledge, these are among the first findings to investigate the effect of emotional competence and intellectual humility concerning the COVID-19 context [43]. Regarding the latter, the results are in line with recent works showing that more intellectually humble people, those who change their views in the face of alternative evidence, are more likely to support preventive behaviors, including vaccine adherence [46,22].

To sum up, we found that the factors predicting compliance towards the COVID-19 vaccination certificate are the same as those predicting propensity towards vaccination. This is an important finding, consistent with our hypotheses, but not yet demonstrated empirically. While the two measures can be seen as tools aimed at protecting against infection, the results are not trivial given that some people, even people with a favorable attitude towards vaccination, may perceive the vaccination certificate as limiting individuals' rights. It was, therefore, important to test this hypothesis, since Italy was among the first countries to introduce the EU COVID-19 digital pass, which was then implemented in other countries. The results involving out-of-pocket medical costs for the unvaccinated people are more surprising. Indeed, we observe almost a complete overlap with the predictors driving vaccination certificate adherence. This is interesting as charging the medical costs to those who refused vaccination cannot be considered as a direct tool to protect against infection, and it is not even conceivable in the Italian context. We can speculate that compliance with this measure might be seen as an emotional response of anger or worry, or even understood as a kind of punishment inflicted on the unvaccinated people. In other words, people who agreed to get vaccinated and who would be using the vaccination certificate might blame the unvaccinated who are not contributing to the fight against the pandemic, are not honoring a civil duty and represent a threat of new infections. Similar reactions have been reported in other countries, albeit anecdotally [41,3]. Indirect support for our speculation comes from the results involving the emotional competence scale, showing that people who better manage and regulate their emotions are less likely to support charging healthcare costs to hospitalized unvaccinated individuals. A discussion about the ethical aspects related to this issue is beyond the scope of this study, but this finding, which is part of a larger debate about personal responsibility associated to life-style related diseases, suggests that in this specific situation most people believe that individuals have to bear the consequences of their choices (for some arguments against the idea that holding individuals responsible for their health should motivate them to change their behaviors, see, for example, [17,6]).

Besides these considerations, EU COVID-19 Digital pass and vaccine mandates as a way to increase vaccination uptake rates, thus reducing the transmission of SARS-CoV-2, are being discussed in many countries. In Italy, COVID-19 vaccination has become mandatory for healthcare workers since April 1, 2021. The COVID-19 Green pass was first introduced for access to public or cultural events, long distance travels, and non-essential indoor seating areas of bars and restaurants (6 August 2021); it was then extended to all people employed in the educational sector (anyone working in nurseries, schools, and universities, 1 September 2021), and later to all workers in any setting (15 October 2021) (see [31] for a list of governmental regulations), yielding to one of the highest uptake rate of vaccination in Europe (as of July 2022, cumulative uptake of at least one dose in EU: 75.3 %; in Italy 85.1 %, see [16]).

Some studies and reviews about what the public think of COVID-19 mandates and certificates are being published, and the results are mixed, showing that people are generally favorable

(as for other vaccines [21]), but with some exceptions [14,11]. Our study makes an important contribution to this literature, showing that the Italian public favors the possibility that the unvaccinated should not have access to certain activities.

Future research could develop longitudinal studies to evaluate the adherence over time to different measures of virus containment as well as the role emotion regulation competences may play over the long term in health emergency management. In addition, it would be interesting to investigate explicitly whether vaccinated individuals hold the unvaccinated responsible for the pandemic's protraction.

This study has limitations: first, data were collected before the COVID-19 digital certificate was discussed and introduced, thus respondents' answers might have not been fully (in)formed. Conversely, this could be an advantage as opinions were collected before the issue was politicized and drove polarization and protests. Second, we assessed support only for a "soft" application of the vaccination certificate (to access public events, indoor seating at bars and restaurants), whereas the effective Green pass was later gradually hardened (for any worker). However, having found similar results concerning the even stricter policy about medical expenses, we do not expect this pattern of results to be different for stricter vaccination certificate policies. Further, in line with our data, recent data showed that in November 2021, 78 % of the Italian population consider the vaccination certificate as a valuable tool to protect citizens [12].

## 5. Conclusion

Recently, several countries both in Europe and abroad, are taking some economic action against those who did not get a vaccine. In Germany several Länder have decided to suspend the salary of unvaccinated in quarantine, while Austria introduced a lockdown only for unvaccinated, and Singapore demanded payment for medical care from COVID-19-infected patients who are unvaccinated. A drastic measure that is often advocated is mandatory vaccination. Although this may seem the easiest solution, this is associated with strong criticalities. On one side the popular discontent may become even more fierce, on the other side the difficulties to implement the mandate are not easy to overcome. In this world wide dynamic context, our results are paradigmatic of a situation in which people no longer intend to pay the price (not just metaphorically speaking) for choices made by those who do not intend to immunize themselves.

## Funding

This work was supported by institutional personal funding to TG (University of Padova) and AT (University of Ferrara).

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.vaccine.2022.08.016>.

## References

- [1] Attwell K, Lake J, Sneddon J, Gerrans P, Blyth C, Lee J. Converting the maybes: Crucial for a successful COVID-19 vaccination strategy. *PLoS ONE*, 2021;16(1): e0245907. doi: 10.1371/journal.pone.0245907.



- [2] Bish A, Michie S. Demographic and attitudinal determinants of protective behaviours during a pandemic: A review. *Br J Health Psychol* 2010;15(4):797–824. <https://doi.org/10.1348/135910710X485826>.
- [3] Bouie J. If You Skip the Vaccine, It Is My 'Damn Business'. *The New York Times*; 2021, August 13. <https://www.nytimes.com/2021/08/13/opinion/covid-vaccine-freedom.html>.
- [4] Brasseur S, Grégoire J, Bourdu R, Mikolajczak M. The profile of emotional competence (PEC): Development and validation of a self-reported measure that fits dimensions of emotional competence theory. *PLoS ONE*, 2013;8:e62635. doi: 10.1371/journal.pone.0062635.
- [5] Bruder M, Haffke P, Neave N, Nouripannah N, Imhoff R. Measuring individual differences in generic beliefs in conspiracy theories across cultures: Conspiracy Mentality Questionnaire. *Front Psychol* 2013;4:225. <https://doi.org/10.3389/fpsyg.2013.00225>.
- [6] Cappelen AW, Fest S, Sørensen EØ, Tungodden B.. Choice and personal responsibility: What is a morally relevant choice?. *The Review of Economics and Statistics*, 2020;1-35. doi: 10.1162/rest\_a\_01010.
- [7] Caserotti M, Girardi P, Rubaltelli E, Tasso A, Lotto L, Gavaruzzi T. Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. *Soc Sci Med* 2021;272:113688. <https://doi.org/10.1016/j.socscimed.2021.113688>.
- [8] Caserotti M, Gavaruzzi T, Girardi P, Tasso A, Buizza C, Candini V, et al. Who is likely to vacillate in their COVID-19 vaccination decision?. *Prev Med* 2022;154:106885. <https://doi.org/10.1016/j.ypres.2021.113688>.
- [9] Christensen RHB. Regression Models for Ordinal Data; 2019 [R package ordinal version 2019.12-10]. <https://CRAN.R-project.org/package=ordinal>.
- [10] Cicchetti A, Damiani G, Specchia ML, Anessi Pessina E, Cifalino A, Scaratti G, et al. Analisi dei modelli organizzativi di risposta al Covid-19. *Alta scuola di Economia e Management dei Sistemi Sanitari*. <https://altems.unicatt.it/altems-InstantReport70.pdf>.
- [11] de Figueiredo A, Larson HJ, Reicher SD. The potential impact of vaccine passports on inclination to accept COVID-19 vaccinations in the United Kingdom: Evidence from a large cross-sectional survey and modeling study. *Eclinical Med* 2021;40:101109. <https://doi.org/10.1016/j.eclinm.2021.101109>.
- [12] Demos & Pl. (November, 2021). COVID e GREEN PASS - ATLANTE POLITICO N. 97 - NOVEMBRE 2021. Retrieved at <http://www.demos.it/a01911.php>.
- [13] Đorđević JM, Mari S, Vdović M, Milošević A. Links between conspiracy beliefs, vaccine knowledge, and trust: Anti-vaccine behavior of Serbian adults. *Soc Sci Med* 2021;277:113930. <https://doi.org/10.1016/j.socscimed.2021.113930>.
- [14] Drury J, Mao G, John A, Kamal A, Rubin GJ, Stott C, et al. Behavioural responses to Covid-19 health certification: a rapid review. *BMC Public Health* 2021;21(1). <https://doi.org/10.1186/s12889-021-11166-0>.
- [15] European Commission (2021, March 17). *Coronavirus: Commission proposes a Digital Green Certificate*. [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_21\\_1181](https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1181)
- [16] ECDC tracker. European Centre for Disease Prevention and Control. COVID-19 Vaccine Tracker; 2022. <https://vaccinetracker.ecdc.europa.eu/public/extensions/COVID-19/vaccine-tracker.html#uptake-tab>.
- [17] Friesen P. Personal responsibility within health policy: unethical and ineffective. *J Med Ethics* 2018;44(1):53–8. <https://doi.org/10.1136/medethics-2016-103478>.
- [18] Garrett P, White J, Dennis S, Lewandowsky S, Yang C, Okan Y, et al. Papers Please: Predictive Factors for the Uptake of National and International COVID-19 Immunity and Vaccination Passports, 2021. *psyarxiv2021*. Available online: <https://psyarxiv.com/fixmq/download/?format=pdf>.
- [19] Gavaruzzi T, Caserotti M, Leo I, Tasso A, Speri L, Ferro A, et al. The Role of Emotional Competences in Parents' Vaccine Hesitancy. *Vaccines* 2021;9(3):298. <https://doi.org/10.3390/vaccines9030298>.
- [20] Griffin JB, Haddix M, Danza P, Fisher R, Koo TH, Traub E, et al. SARS-CoV-2 infections and hospitalizations among persons aged ≥ 16 years, by vaccination status—Los Angeles County, California, May 1–July 25, 2021. *Morb Mortal Wkly Rep* 2021;70(34):1170. <https://doi.org/10.15585/mmwr.mm7034e5>.
- [21] Gualano MR, Olivero E, Vogliano G, Corezzi M, Rossello P, Vicentini C, et al. Knowledge, attitudes and beliefs towards compulsory vaccination: a systematic review. *Human Vaccines Immunotherap* 2019;15(4):918–31. <https://doi.org/10.1080/21645515.2018.1564437>.
- [22] Huynh HP, Senger AR. A little shot of humility: Intellectual humility predicts vaccination attitudes and intention to vaccinate against COVID-19. *J Appl Soc Psychol* 2021;51(4):449–60. <https://doi.org/10.1111/jasp.12747>.
- [23] Israel A, Merzon E, Schaffer AA, Shenhar Y, Green I, Golan-Cohen A, et al. Elapsed time since BNT162b2 vaccine and risk of SARS-CoV-2 infection in a large cohort; 2021. *medRxiv*. doi:10.1101/2021.08.03.21261496.
- [24] Joshi A, Kaur M, Kaur R, Grover A, Nash D, El-Mohandes A. Predictors of COVID-19 Vaccine Acceptance, Intention, and Hesitancy: A Scoping Review. *Front Public Health* 2021;9. <https://doi.org/10.3389/fpubh.2021.698111>.
- [25] Latkin CA, Dayton L, Yi G, Colon B, Kong X. Mask usage, social distancing, racial, and gender correlates of COVID-19 vaccine intentions among adults in the US. *PLoS One* 2021;16(2):e0246970. doi: 10.1371/journal.pone.0246970.
- [26] Lilleholt, L, Zettler I, Betsch C, Böhm R. Pandemic Fatigue: Measurement, Correlates, and Consequences; 2020. *PsyArxiv*. doi: 10.31234/osf.io/2xvbr.
- [27] Lindholt MF, Jørgensen F, Bor A, Petersen MB. Public acceptance of COVID-19 vaccines: cross-national evidence on levels and individual-level predictors using observational data. *BMJ Open* 2021;11(6):e048172. <https://doi.org/10.1136/bmjopen-2020-048172>.
- [28] Krumrei-Mancuso EJ, Rouse SV. The development and validation of the comprehensive intellectual humility scale. *J Pers Assess* 2016;98(2):209–21. <https://doi.org/10.1080/00223891.2015.1068174>.
- [29] Machingaidze S, Wiysonge CS. Understanding COVID-19 vaccine hesitancy. *Nat Med* 2021;27(8):1338–9. <https://doi.org/10.1038/s41591-021-01459-7>.
- [30] Milman O, Yelin I, Aharony N, Katz R, Herzal E, Ben-Tov A, et al. SARS-CoV-2 infection risk among unvaccinated is negatively associated with community-level vaccination rates; 2021. *MedRxiv*. doi: 10.1101/2021.03.26.21254394
- [31] Ministero della Salute. *EU Digital certificate*; 2021. <https://www.dgc.gov.it/web/norme-e-circolari.html>.
- [32] Mohammed I, Nauman A, Paul P, Ganesan S, Chen K-H, Jilil SMS, et al. The efficacy and effectiveness of the COVID-19 vaccines in reducing infection, severity, hospitalization, and mortality: a systematic review. *Human Vacc Immunotherap* 2022;18(1). <https://doi.org/10.1080/21645515.2022.2027160>.
- [33] Murphy J, Vallières F, Bentall RP, Shevlin M, McBride O, Hartman TK, et al. Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nat Commun* 2021;12(1):1–15. <https://doi.org/10.1038/s41467-020-20226-9>.
- [34] Our World in data. *Coronavirus (COVID-19) Vaccinations*. <https://ourworldindata.org/covid-vaccinations>.
- [35] Palamenghi L, Barello S, Boccia S, Graffigna G. Mistrust in biomedical research and vaccine hesitancy: the forefront challenge in the battle against COVID-19 in Italy. *Eur J Epidemiol* 2020;35(8):785–8. <https://doi.org/10.1007/s10654-020-00675-8>.
- [36] Paul KT, Zimmermann BM, Corsico P, Fiske A, Geiger S, Johnson S, et al. Anticipating hopes, fears and expectations towards COVID-19 vaccines: A qualitative interview study in seven European countries. *SSM-Qual Res Health* 2022;2022:100035. <https://doi.org/10.1016/j.ssmqr.2021.100035>.
- [37] Peters E, Slovic P, Hibbard J. Evaluability manipulations influence the construction of choices among health plans. *Decision Research*, 2004 ;(24).
- [38] Poland GA. The 2009–2010 influenza pandemic: effects on pandemic and seasonal vaccine uptake and lessons learned for seasonal vaccination campaigns. *Vaccine* 2010;28:D3–D13. <https://doi.org/10.1016/j.vaccine.2010.08.024>.
- [39] R Core Team. *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing; 2021. <https://www.R-project.org/>.
- [40] Rogers RW. A protection motivation theory of fear appeals and attitude change. *J Psychol* 1975;91(1):93–114. <https://doi.org/10.1080/00223980.1975.9915803>.
- [41] Rabin RC. As virus cases rise, another contagion spreads among the vaccinated. *anger*. *The New York Times*; 2021.
- [42] Rosenstock IM. Why people use health services. *Milbank Memorial Fund Quart* 1966;44(3):94–127. <https://doi.org/10.2307/3348967>.
- [43] Rubaltelli E, Tedaldi E, Orabona N, Scrimin S. Environmental and psychological variables influencing reactions to the COVID-19 outbreak. *Br J Health Psychol* 2020;25(4):1020–38. <https://doi.org/10.1111/bjhp.12473>.
- [44] Sanderson K. COVID vaccines protect against Delta, but their effectiveness wanes. *Nature* 2021. . <https://www.nature.com/articles/d41586-021-02261-8>.
- [45] Senato della Repubblica. *Constitution of the Italian Republic*; 1947. [https://www.senato.it/documenti/repositorio/istituzione/costituzione\\_inglese.pdf](https://www.senato.it/documenti/repositorio/istituzione/costituzione_inglese.pdf).
- [46] Senger AR, Huynh HP. Intellectual humility's association with vaccine attitudes and intentions. *Psychol, Health & Med* 2021;26(9):1053–62. <https://doi.org/10.1080/13548506.2020.1778753>.
- [47] Slovic P, Finucane ML, Peters E, MacGregor DG. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Anal* 2004;24:311–22. <https://doi.org/10.1111/j.0272-4332.2004.00433.x>.
- [48] Soares P, Rocha JV, Moniz M, Gama A, Laires PA, Pedro AR, et al. Factors associated with COVID-19 vaccine hesitancy. *Vaccines* 2021;9(3):300. <https://doi.org/10.3390/vaccines9030300>.
- [49] Therneau T, Atkinson B, Ripley B. Rpart: Recursive Partitioning. *R Package Version 4.1-3*; 2013. <http://CRAN.R-project.org/package=rpart>.
- [50] Wilf-Miron R, Myers V, Saban M. Incentivizing vaccination uptake: the “green pass” proposal in Israel. *JAMA* 2021;15(15):1503–4. <https://doi.org/10.1001/jama.2021.4300>.
- [51] Zhang S. The Coronavirus Is Here Forever. This Is How We Live with It. *The Atlantic*; 2021, August 17. <https://www.theatlantic.com/science/archive/2021/08/how-we-live-coronavirus-forever/619783/>.