Intention to receive a vaccine against SARS-CoV-2 in Italy and its association with trust, worry and beliefs about the origin of the virus

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Abstract

The aim of the current study was to determine the extent to which Italian people intend to receive a vaccine against SARS-CoV-2 and to investigate its associations with worry, institutional trust and beliefs about the non-natural origin of the virus. A sample of 624 people living in Italy was recruited in April 2020 using an online platform. The survey included questions about intention to receive a vaccine against SARS-CoV-2, trust, worry and beliefs about the origin of the virus. Most respondents (75.8%) intended to receive a vaccine, while 32 (5.1%) and 63 (10.1%) participants responded ‘No’ and ‘I do not know’, respectively. The remaining participants (9.0%) chose not to respond to this question. Controlling for socio-demographic factors, a multinomial logistic regression model revealed that no intention to receive a vaccine was associated with lower levels of worry and institutional trust, while increased odds for responding ‘do not know’ were found among participants holding beliefs about the non-natural origin of the virus. Vaccine acceptance may not be sufficient to establish a high level of herd immunity and a successful implementation of new pandemic vaccination programs should take into account trust, conspiracy beliefs and worry.

Introduction

To respond urgently to COVID-19 pandemic, the scientific community has been asked to rapidly develop a vaccine against SARS-CoV-2. A mass vaccination campaign can boost community (herd) immunity, protecting the population from infections that might result in need for critical care or adverse consequences. The scale and speed of global vaccine research and development efforts in response to the COVID-19 pandemic are unprecedented and three imperatives guided these efforts: speed, manufacture and deployment at scale, and global access [1]. High rates of acceptance and coverage are key factors in the success of an immunization program. Vaccine hesitancy and refusal increase the individual and collective risk of disease [2, 3]. A systematic review of surveys of the general public revealed that the willingness to receive a pandemic vaccine ranged from 8 to 67% [4]. However, to date, no investigations have been made to determine the intention to receive a vaccine against SARS-CoV-2 and the factors associated with vaccine hesitancy and refusal. The investigation of the factors affecting the intention to accept or decline a vaccine against SARS-CoV-2 may inform strategies and interventions to promote public’s compliance and, ultimately, the vaccination program’s efficacy. Indeed, to successfully implement new
pandemic vaccination programs, it is important to consider the perceptions and beliefs of the lay public [4–6].

Acceptance of a pandemic influenza vaccine seems to depend on the public’s evaluation of a new threat and of public authorities who propose new countermeasures [4–6]. Affective reactions to health risks (e.g., worry) play an important role in predicting acceptance of a pandemic influenza vaccine [5, 7–9]. Theories of decision making such as the risk-as-feelings hypothesis [10] and the affect heuristic [11] highlighted the role of emotions experienced at the moment of decision making.

In addition to worry about pandemic flu, several studies have investigated the role of institutional trust in determining vaccination intent with regard to pandemic influenza A/H1N1 2009 [5, 6, 12]. Trust in recommendations from public health authorities and the medical community may enable people to accept the short-term individual costs associated with vaccination (e.g., risk of side effects, time) to address the solution of common problems in the community. Trust in the public authorities who recommended a vaccine ‘is an expression of a special social contract that is one key to the success of immunization programs’ [13].

A systematic review of factors associated with uptake of vaccination against pandemic influenza highlighted the role of information about vaccination from official health sources [9]. The distinction between reliable and unreliable sources and misinformation is especially important in the COVID-19 pandemic: WHO declared that addressing ‘infodemic’ and misinformation represent one of the greatest challenges of this outbreak [14]. Conspiracy theories suggest that SARS-CoV-2 is a laboratory construct or the product of purposeful manipulation [15]. Previous research demonstrated that conspiracy beliefs are a barrier to compliance with health protective behaviors [16–20].

The present study
The aim of the present study was twofold: (i) to determine intention to receive a vaccine against SARS-CoV-2 among people living in Italy and (ii) to investigate the association between intention to receive a vaccine against SARS-CoV-2 and institutional distrust, worry and beliefs about the non-natural origin of the virus. Italy was one of the most affected countries with the highest number of COVID-19 cases [21]. Based on the above discussion, it was expected that intention to receive a vaccine against SARS-CoV-2 among people living in Italy would be related to higher scores on institutional trust and worry and lower beliefs about the non-natural origin of the virus. Given that older age, male gender, being from an ethnic minority and unemployment were associated with uptake of vaccination against pandemic influenza [9], these variables were added as covariates in the analysis.

Method
Participants
Participants in this study were 624 people living in Italy. Women were 337 (54%), while men were 287 (46.0%). Age ranged between 18 years and 72 years ($M = 32.31, SD = 12.69$). Perceived household economic resources in the last 12 months were: excellent (13.8%), adequate (72.0%), scarce (13.7%), or absolutely insufficient (0.5%). More than half of participants reported being employed ($n = 327$, 52.4%). Twenty-five participants (4.0%) belonged to an ethnic minority group.

Measures
Participants completed a questionnaire including socio-demographic questions as well as measures of intention to receive the vaccine, worry, institutional trust and belief about the non-natural origin of the virus. Intention to receive the vaccine was measured using the following question: ‘Assume that your local health authority makes freely available a vaccine against SARS-CoV-2. Do you intend to get the vaccine?’ Possible answers to this question were: yes; no; do not know. A two-item (i.e., ‘To what extent do you currently worry about the epidemic of COVID-19?’ and ‘Do you feel scared about the epidemic of COVID-19?’) index derived from previous
research on the pandemic influenza H1N1 2009 [5, 22] was used to assess worry. Participants responded using a 10-point scale (1 = not at all, 10 = extremely). Participants’ responses were averaged, with higher scores indicating higher levels of worry about the epidemic of COVID-19. The size of the (Pearson) correlation between the two items was very large (0.77). Institutional trust was measured using three items derived from previous research on pandemic influenza vaccination [5, 23]. Specifically, participants were asked to rate the trustworthiness of Italian government, Ministry of Health and physicians using a 10-point scale ranging from 1 = not trustworthy to 10 = very trustworthy. This measure exhibited adequate internal consistency (Cronbach’s alpha of 0.78). Participants’ answers were averaged, with higher scores reflecting higher institutional trust. Belief about the non-natural origin of the virus was measured using the following question: ‘Is SARS-CoV-2 a laboratory construct or the product of purposeful manipulation?’ There are three answers to this question: yes; no; do not know.

Procedure

Ethical approval and permission to undertake the study was granted by the Ethical Committee of the University of (anonymized for blind review). Potential study participants were required to provide informed consent on the introductory web page of the online survey by reading an information screen and agreeing to participate in the research before entering the study. Eligibility criteria were: (i) living in Italy; (ii) having a sufficient level of Italian language proficiency and (iii) being 18 years old or older. Data were collected using a self-administered online anonymous questionnaire. Respondents were recruited via virtual snowball sampling [24]. Specifically, potential participants were recruited through email, websites, blogs and social media. The calculation of the response rate was not possible since an online link was posted on blogs and published on social media. Participation in the study was voluntary and without any compensation to respondents. Data collection occurred in April 2020 during a period of national quarantine in Italy. Only completed questionnaires were included in the study. Completion rate (number of completed surveys/number of respondents who entered the survey) was 67.0%. Using a Bonferroni correction for multiple testing (i.e., critical value of α = 0.05/4 = 0.013), participants who dropped out did not differ from those who completed the survey on the following study variables: belief about the non-natural origin of the virus, $\chi^2(2) = 0.88$, $P = 0.646$; intention to receive a vaccine, $\chi^2(2) = 8.78$, $P = 0.013$; worry, $t(240.83) = -2.48$, $P = 0.014$; institutional trust, $t(247.35) = 0.23$, $P = 0.816$.

Statistical analysis

The analysis was performed using SPSS version 26. Multinomial logistic regression was employed to investigate the determinants of intention to receive a vaccine against SARS-CoV-2. More specifically, a multinomial logistic regression model was used because the outcome variable (i.e., intention to receive the vaccine) had three categories (yes/no/do not know). To evaluate the fit of the model, the McFadden’s, Cox and Snell’s and Nagelkerke’s goodness-of-fit tests (0 = no fit; 1 = perfect fit) were used. To account for missing data, the multiple imputation technique ($n = 10$) was used. To determine effect size, Rosenthal [25] suggested the following qualitative size categories for odds ratios: about 1.5 = small effect, about 2.5 = medium, about 4 = large, about 10 = very large.

Results

Table I displays sample descriptive statistics for study measures. The majority of participants ($n = 473, 75.8\%$) reported that they intend to receive a vaccine against SARS-CoV-2, while 32 (5.1\%) and 63 (10.1\%) participants indicated ‘No’ and ‘I do not know’, respectively. Fifty-six participants (9.0\%) did not respond to this question.

Table II displays the results of the multinomial logistic regression model. Compared to the group of participants who reported intention to receive a
vaccine (reference category), participants who had no intention to receive reported lower levels of worry and institutional trust. Belief about the non-natural origin of the virus was not associated with no intention to receive a vaccine. Compared to the reference category (having intention to receive a vaccine), participants responding ‘do not know’ were older and responded ‘yes’ or ‘I do not know’ when asked about the non-natural origin of the virus. Worry and institutional trust were not correlated with responding ‘do not know’ compared with intention to receive a vaccine. Except for the significant effect of age on ‘do not know’ responses, the covariates (i.e., age, gender, minority and employment status) did not have an influence on intention to receive the vaccine.

### Discussion

The aim of the current study was to investigate the extent to which Italian people intend to receive a vaccine against SARS-CoV-2 and to determine the associations between vaccine acceptance and worry, institutional trust and beliefs about the non-natural origin of the virus. About 76% of participants intend to receive a vaccine against SARS-CoV-2. Although the level of vaccine acceptance was clearly higher than that of previous pandemic influenza [4], it may not be sufficient to establish a high level of community (herd) immunity.

Higher levels of worry predicted intention to receive the vaccine. Therefore, this research provides further evidence for the role of affective reaction in the response to a pandemic influenza [5, 7–9]. Public information campaigns designed to increase vaccine acceptance should consider risk communication strategies that explicitly appeal to affect and emotions, but in a careful way without exaggerating the risk [5]. Thus, there is a need to maintain a

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**Table I. Sample descriptive statistics for study measures**

|                          | M (SD)  | n (%) |
|--------------------------|---------|-------|
| Intention to receive a vaccine against SARS-CoV-2 |         |       |
| Yes                      | 473 (75.8%) |       |
| I do not know            | 63 (10.1%)  |       |
| No                       | 32 (5.1%)   |       |
| Belief about the non-natural origin of the virus |         |       |
| Yes                      | 343 (55.0%) |       |
| I do not know            | 195 (31.3%) |       |
| No                       | 85 (13.6%)  |       |
| Worry                    | 7.28 (1.94) |       |
| Institutional trust      | 6.90 (1.82) |       |

Note. May not add up to the total number of respondents or to 100% due to missing data.

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**Table II. Results from multivariate multinomial logistic regression predicting intention to receive a vaccine against SARS-CoV-2**

|                          | Odds ratio (95% CI) | Odds ratio 95% CI |
|--------------------------|---------------------|-------------------|
| Age                      | 1.02(0.99–1.06)     | 1.04(1.02–1.06)   |
| Gender (woman)           | 1.04(0.51–2.13)     | 1.15(0.65–2.03)   |
| Occupational status (working) | 0.96(0.46–2.00) | 1.04(0.56–1.93)   |
| Majority status          | 1.57(0.19–12.69)    | 1.22(0.26–5.59)   |
| Economic status          | 1.41(0.98–1.05)     | 1.38(0.82–2.31)   |
| Belief about the non-natural origin of the virus |          |                  |
| Yes                      | 0.88(0.22–3.55)     | 2.96(1.39–6.30)   |
| I do not know            | 1.42(0.64–3.16)     | 1.91(1.01–3.60)   |
| No                       | Reference           | Reference         |
| Worry                    | 0.83(0.70–0.99)     | 0.96(0.83–1.11)   |
| Institutional trust      | 0.92(0.85–0.99)     | 0.97(0.92–1.02)   |

Note. Odds ratios are adjusted for the other predictors in the model. CI = confidence interval. Cox e Snell $R^2 = 0.11$; Nagelkerke $R^2 = 0.16$; McFadden $R^2 = 0.11$. 

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delicate balance between the promotion of an affective response to SARS-CoV-2 and, at the same time, the reduction of the likelihood that people would avoid sources of information [26]. The use of narratives to present health information may have the potential to elicit effective responses and is less subject to defensive responding [23, 27].

The findings of the present research confirm the role of institutional trust in determining vaccination intent [5, 6, 12, 26]. Effective communication from authorities will be essential to ensure trust in institutions and, ultimately, facilitate the widespread deployment of the vaccine. Trusted institutions are those who are perceived as knowledgeable and expert, concerned and caring, and open and honest [28]. Moreover, the quality of communication and the use of role models were associated with higher trust in institutions during the 2009 H1N1 pandemic [29]. Finally, trust ‘is not merely a means, but ideally the result of good, ethically justified, public health activities’ [30]. To this end, ethical aspects of risk communication (especially that referring to the risks and benefits of vaccination) as well as a respectful discussion involving relevant stakeholders are key factors.

The issue of trust in institutions is connected to the spread of conspiracy theories. Indeed, exposure to government conspiracy theory content can lead to higher levels of distrust in institutions [31]. Conspiracy theories contend that SARS-CoV-2 is the product of purposeful manipulation or a laboratory construct [15]. The findings of the present study revealed that people holding such beliefs are more likely to respond with ‘do not know’ when asked about their intention to receive the vaccine. It seems likely that people who responded with ‘do not know’ need to be engaged in a responsible and respectful discussion that takes into account their concerns and perceptions. The beliefs (including conspiracy beliefs) of lay people should not be regarded as an ignorant or irrational response, but as a starting point for a responsible and respectful dialogue [30]. There are different ways of stimulating a dialogue. For instance, health authorities can use social media to build a dialogue [32]. Another example is a mass media campaign that encourages people to talk with their doctors about the vaccine [33, 34]. Finally, participatory action research can be linked to a media messaging campaign to engage in conversations about the campaign within the community [35].

The findings of this study suggest that there is a seemingly contradictory effect: Participants who responded ‘yes’ or ‘I do not know’ when asked about the non-natural origin of the virus were more likely to report that they ‘don’t know’ whether they would get the vaccine, whereas participants who responded ‘yes’ or ‘I do not know’ when asked about the non-natural origin of the virus were not more likely to report that they had no intention of getting the vaccine. One might assume that people holding beliefs about the non-natural origin of the virus would be more certain about not getting the vaccine. However, beliefs about the non-natural origin of the virus are not necessarily linked to beliefs about the usefulness or dangerousness of the vaccine. For instance, people may desire to protect themselves with the vaccine even if they believe that the virus has a non-natural origin. Indeed, the findings of this study revealed that people holding beliefs about the non-natural origin of the virus are more likely to adopt a wait-and-see stance toward a vaccine. The results of the present study revealed that being more certain about whether or not getting the vaccine is more a matter of institutional trust [5, 6, 12, 26] and worry [5, 7–9] than beliefs in non-natural origin of the virus.

The findings of the present study may be affected by social desirability and selection bias because participants needed an Internet connection to participate. In addition, in the present sample, 4% of participants belonged to an ethnic minority group while the 72% of participants were from households where economic resources were adequate. External validity of the sample obtained can be assessed by comparison between participants’ characteristics and the expected characteristics from surveys of the Italian National Statistics Institute. In the Multiscopo survey of the Italian National Statistics Institute [36], the percentage of people living in Italy and belonging to an ethnic minority group was 5.94%, while the percentage of Italian people from
households where economic resources were adequate was 56% (the same question along with the same response options were used to determine the economic status). Therefore, the sample of the present study does not differ markedly from that of the Italian National Statistics Institute. It should be noted that economic status and ethnic minority were controlled for in the analysis and did not have an effect on intention to receive the vaccine. The findings of this study are in line with those of two previous reviews of socio-demographic determinants of protective behaviors (including vaccination) during a pandemic [9, 37]. Indeed, there is insufficient evidence to draw any firm conclusions about associations between ethnicity or socioeconomic status and uptake of vaccination during a pandemic. As the sample was self-selected and not randomly generated, it cannot be considered representative of the Italian population. The fact that our study population is diverse may in part be a protection against selection bias. In addition, the completion rate was quite high, and participants who dropped out did not differ from those who completed the survey on study variables. In addition to the completion rate, timeliness was another strength of the present research. Moreover, the present study is one of the first to empirically examine intention to receive a vaccine against SARS-CoV-2.

The epidemic of COVID-19 has prompted unprecedented efforts by the research community to rapidly develop a vaccine that may be available for emergency use in early 2021 [1]. While the development of an effective vaccine against SARS-CoV-2 might be the best solution for ending the COVID-19 pandemic, the response to this pandemic does not end at this stage. Widespread deployment of an effective vaccine through a vaccine program will be necessary. The findings of the present study suggest that vaccine hesitancy or avoidance can undermine widespread deployment and, ultimately, the establishment of high levels of community immunity. Institutional trust, worry and beliefs about the origin of the virus were found as the determinants of intention to receive the vaccine and these findings can help government agencies and health care authorities to plan and implement public health campaigns.

Conflict of interest statement

None declared.

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