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Conspiracy mentality and health-related behaviour during the COVID-19 pandemic: a multiwave survey in Italy

V. Candini a, #, S. Brescianinib, #, F. Chiarottib, C. Zarbo a, M. Zamparina a, M. Caserotti c, T. Gavaruzzi c, d, P. Girardid, e, L. Lotto f, A. Tasso c, f, F. Starace f, g, G. Calamandrei b, G. de Girolamo a,*

a Unit of Epidemiological Psychiatry and Evaluation, IRCCS Istituto Centro San Giovanni di Dio Fatebenefratelli, Brescia, Italy
b Centre for Behavioral Science and Mental Health, Istituto Superiore di Sanità, Roma, Italy
c Department of Developmental Psychology and Socialization, University of Padova, Italy
d Department of Experimental, Diagnostic and Specialty Medicine (DIMES), University of Bologna
e Department of Environmental Sciences, Informatics and Statistics, Ca’ Foscari University of Venice, Venezia, Italy
f Department of Humanities, University of Ferrara, Ferrara, Italy
g Department of Mental Health and Drug Abuse, Azienda Unità Sanitaria Locale (AUSL) Modena, Modena, Italy

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A B S T R A C T

Objectives: This study aimed to (1) explore the changes in conspiracy mentality across the four waves of the COVID-19 pandemic; (2) assess the relationship between conspirative mentality and psychological/behavioural variables; (3) identify the predictors of conspirative mentality; and (4) explore the effect of conspirative mentality on COVID-19 protective behaviour.

Study design: This was a multiwave survey.

Methods: A total of 10,013 Italian individuals, aged 18–70 years, were assessed across the four waves (from January to May 2021) through online survey. We collected information about the sociodemographic characteristics of participants, personal experiences of COVID-19 infection, trust, COVID-19 protective behaviours, COVID-19 risk perception, arousal, auto-efficacy, resilience and well-being. Conspiracy mentality was assessed with the Conspiracy Mentality Questionnaire. The statistical analyses included exploratory factorial analyses, Pearson correlations and multiple linear regressions.

Results: The conspiracy mentality score during the COVID-19 pandemic was medium–high (mean 59.0 on a 0–100 scale) and slightly increased from 58.2 to 59.9 across months, in parallel with a slight decrease in trust in health institutions and scientific informational sources. Individuals aged >35 years, poorly educated and particularly scared about their financial situation were at risk of showing higher levels of conspirative mentality. Higher levels of conspirative mentality were risk factors for low levels of COVID-19 protective behaviours.

Conclusions: Clear and effective communication may improve trust in health institutions and informational sources, decrease conspirative theories and increase compliance with protective behaviour.

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Introduction

The COVID-19 pandemic has caused an enormous number of deaths and human suffering worldwide, posing extraordinary challenges to public health. Italy was the first European country to suffer severe effects of the virus spread,1 with a spiral of infections that placed it at the top of the international rankings. In this context, a range of conspiracy theories emerged in many countries, for example, the virus was purposely created in the laboratory, the virus was a hoax or a bioweapon, secret activities or organisations exist, COVID-19 vaccines had been developed before the pandemic, and the effects of the treatments (including vaccines) have not been disclosed. For example, a survey conducted with adults in the United States found that about 50% reported that they...
believed the virus was either probably or definitely intentionally created or accidentally released by China. The onset and maintenance of conspiracy theories in facing uncertain and complex events such as the COVID-19 pandemic may be explained by the fact that theories and beliefs about such events grant individuals an illusion of control, which acts as palliative compensation for the lack of real control.

Conspiracy beliefs are particularly noteworthy in the current pandemic. They appear to be pervasive across time and tend to undermine any action against the conspiracy theories, in part because they are not easy to rebut. Conspiracy theories play a potentially damaging role in decreasing trust in authorities and institutions and in shaping health-related behaviour, acting as barriers to compliance with health protective behaviour such as poor adherence to medication regimens, resistance to preventive action and unwillingness to vaccinate.

Several studies aimed at clarifying the association between conspiracy theories and health-related behaviour have shown that these theories can have negative impacts. For example, HIV conspiracy theories lead to negative attitudes toward HIV medication, and anti-vaccine conspiracy theories reduce the willingness of parents to vaccinate their children. Similar effects are expected during the COVID-19 pandemic. Studies published in 2020 and 2021 have shown that conspiracy theories and COVID-19 found that conspiracy mentality seems to be inversely related to a variety of factors such as educational level, threat perception of the pandemic, various preventive actions, perceived safety of vaccination, intention to be vaccinated against COVID-19, intention to take diagnostic or antibody tests, trust in different agencies and governments (e.g. media, health care, public health institutions, science) and adherence to public health experts’ warnings or official recommendations.

Owing to the important impact of conspiracy mentality on several behavioural domains, it is crucial to investigate how it evolved with the progression of the COVID-19 pandemic, its association with other behavioural and psychological variables and its predictors. Therefore, the aims of our study were to (1) explore the changes in conspiracy mentality during four different periods of the COVID-19 pandemic in a large, representative sample of the Italian population; (2) assess the relationship between conspirative mentality and psychological and behavioural variables (e.g. trust, resilience, risk perception, auto-efficacy and arousal); (3) identify the sociodemographic and COVID-19–related experience predictors of conspirative mentality; and (4) explore the effect of conspirative mentality on COVID-19 protective behaviour.

**Methods**

**Participants and procedures**

This study is part of the larger project promoted by the World Health Organisation (WHO), “Monitoring knowledge, risk perceptions, preventive behaviours and trust to inform pandemic outbreak response” and carried out in over 30 countries of the WHO European Region (Registered ISRCTN on 11/05/2021, ID: ISRCTN26200758).

In Italy, the survey was conducted by administering an online questionnaire developed ad hoc by the WHO (January–May 2021) to 10,013 individuals aged 18–70 years across the four waves of the pandemic, with approximately 2500 participants for each wave. The four sample groups were selected using the same stratification method; they were equally representative of the Italian population and were therefore homogeneous and comparable. Therefore, in this manuscript, we henceforth use the term “sample” to refer to the four sample groups interviewed in the four waves.

A detailed sampling plan was developed to obtain a representative sample of the Italian adult population (for details, see https://doi.org/10.1186/ISRCTN26200758). The interviews were conducted using Doxa S.p.a. and carried out with the computer-assisted web interviewing technique on an online panel and on the Confindir software platform used by Doxa S.p.a. The average administration time was approximately 18–20 min.

**Measures**

The WHO questionnaire included 21 thematic areas noteworthy for the investigation of the COVID-19 experience. The questionnaire was translated into the desired country language by the designated recruiting sites following the WHO guidelines for translations of study tools. The process included the following steps: forward translation, panel experts, back-translation, pretest and cognitive interviews and development of the final version.

In this article, we considered the following areas explored in the WHO survey:

- Sociodemographic characteristics (e.g. age, sex, education, rural/urban residence, financial situation, work status); personal experience of COVID-19 infection; trust in information sources (e.g. television, newspapers, health workers, social media, radio, Ministry of Health, Institute of Public Health, hotlines, official websites, celebrities, etc.); attitudes toward COVID-19 protective behaviours (hygiene, social behaviour, mask use, respecting social distancing protocol); COVID-19 risk perception; arousal; and auto-efficacy.
- The three items of the Brief Resilience Scale ranged from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicated higher resilience.
- The Conspiracy Mentality Questionnaire, an instrument composed of five items to assess generic beliefs in conspiracy theories, ranged from 1 (certainly not true) to 7 (certainly true). Higher scores indicated a higher conspiracy mentality.
- The WHO 5-item well-being scale (WHO-5): a measure of well-being composed of five items, ranged from 1 (at no time) to 6 (all of the time). The overall score ranged from 0 to 100. A score ≤50 indicated poor psychological well-being, suggesting further investigation into possible symptoms of depression. A score ≤28 or below was indicative of clinical depression.

**Statistical analyses**

We performed nine different explorative factorial analyses on the respondents’ scores of items that revealed the psychological (cognitive and emotional) and behavioural patterns of the interviewees: conspiracy mentality, risk perception, arousal, auto-efficacy, protective behaviours, trust in media information sources, trust in health information sources, frequency of use of media information sources, frequency of use of health information sources, trust in health institutions and resilience, for each of the four waves, separately. These items are listed in Table 1S. Metric invariance among the waves was computed for each pattern. Because no significant difference was observed among the waves, explorative factorial analyses were performed on the four waves combined, and a single factor was estimated for each pattern. The factorial scores of each pattern were then transformed to assume values from 0 to 100 for better interpretation and were used in all subsequent analyses.

Categorical data were summarised as absolute and percentage frequencies, whereas quantitative data (normalised factorial scores) were presented as means and standard deviations.
Differences among waves in the distribution of categorical variables were assessed using the Chi-squared test, whereas differences in the mean values of quantitative variables were assessed using analysis of variance, followed by multiple comparisons corrected by the Bonferroni’s method.

Pairwise correlations between behavioural and psychological scores were computed using the Pearson correlation coefficient.

A multiple linear regression was performed using the conspiracy index (normalised to 0–100) as the dependent variable and the following variables as independent variables: sex, age, education, occupation, presence of chronic diseases, area of residence, rural/urban zone, concerns about their own economic situation (due to the pandemic), having had COVID-19 (self) and knowing someone who was infected with COVID-19. Regression unstandardised coefficients (b) with 95% confidence intervals were calculated for each independent variable. All regression models were computed for each wave separately and for all waves combined (adjusting for independent variable. All regression models were computed for every wave, and the results were similar, merging all waves, with only a few exceptions: not knowing about having contracted the disease; having a greater number of worries about economic difficulties. Interestingly, individuals with the highest levels of conspirative mentality were also the least likely to have personally known people who were directly infected by the SARS-CoV-2 virus or who died due to the infection.

Predictors of conspirative mentality

The results of the multiple regression analysis are presented in Table 3. No heterogeneity was found among waves (I² <60% for all predictors). The conspiracy index was higher in older (>35 years) and less-educated people. Being worried about the economic situation due to COVID-19 is associated with higher ratings on the conspiracy index, as well as not knowing about contracting the disease with respect to not having contracted it. Knowing someone who was infected with COVID-19 was associated with a decrease in conspiracy mentality levels. In terms of differences across the four waves, conspiracy mentality ratings increased significantly in the fourth wave compared with the first. We replicated the models for every wave, and the results were similar, merging all waves, with only a few exceptions: not knowing about having contracted the disease with respect to not having contracted it. This factor was not significant in any of the waves, although it was consistent with respect to direction and size across the four waves. In wave 3, people living in rural settings had a higher conspiracy index than those in urban settings, and subjects who did not suffer from any chronic illness had a lower conspiracy mentality index compared with those who reported suffering from at least one. In most other cases, the results for every wave individually do not reach statistical significance, although they are of the same magnitude and direction.

Predictors of protective behaviour

All predictors, apart from age (35–44 years) and occupation (being a health professional), were homogenous among the waves (I² = 78% and 77%, respectively). Women, older subjects (35 years and above), having a greater number of worries about the economic situation, and people who knew someone who died of COVID-19 reported higher levels of protective behaviour. Conversely, people who declared not to know if they had ever been infected or to have had a mild infection did not work in the health sector and did not have or did not know of having any chronic disease reported lower levels of protective behaviours. Finally, a slightly higher conspiracy normalised score was associated with lower levels of protective behaviours across all waves, with the exception of wave 3 (Table 4).

Discussion

Is there any consistent profile of individuals showing a ‘conspirative’ mentality?

We found that higher levels of conspirative mentality were associated with lower trust in scientific information sources and healthcare institutions. Furthermore, in our survey, conspirative mentality was associated with older age, lower education levels and greater number of worries about economic difficulties. Interestingly, individuals with the highest levels of conspirative beliefs were also the least likely to have personally known people who were directly infected by the SARS-CoV-2 virus or who died due to the infection.
Table 1
Sociodemographic characteristics and COVID-19 personal experience of the Italian general population (n = 10,013).

| Characteristics                        | Wave 1 | Wave 2 | Wave 3 | Wave 4 | Total |
|----------------------------------------|--------|--------|--------|--------|-------|
|                                        | n      | %      | n      | %      | n     | %     |
| **Sex**                                |        |        |        |        |       |
| Male                                   | 1244   | 49.7%  | 1243   | 49.7%  | 1245  | 49.7% |
| Female                                 | 1260   | 50.3%  | 1259   | 50.3%  | 1262  | 50.3% |
| **Age (years)**                        |        |        |        |        |       |
| 18–34                                  | 652    | 26.0%  | 652    | 26.0%  | 653   | 26.0% |
| 35–44                                  | 481    | 19.2%  | 480    | 19.2%  | 481   | 19.2% |
| 45–54                                  | 594    | 23.7%  | 594    | 23.7%  | 595   | 23.7% |
| 55–70                                  | 777    | 31.0%  | 776    | 31.0%  | 778   | 31.0% |
| **Educational level (years)**          |        |        |        |        |       |
| <8 years                               | 1027   | 41.0%  | 1026   | 41.0%  | 1028  | 41.0% |
| 9–13 years                             | 772    | 30.8%  | 832    | 33.2%  | 891   | 35.5% |
| >13 years                              | 705    | 28.2%  | 645    | 25.8%  | 588   | 23.5% |
| **Occupational status**                |        |        |        |        |       |
| Employed (not health sector)           | 1216   | 48.6%  | 1198   | 47.9%  | 1213  | 48.4% |
| Employed (health sector)               | 93     | 3.7%   | 111    | 4.4%   | 98    | 3.9%  |
| Unemployed                              | 1194   | 47.7%  | 1193   | 47.7%  | 1196  | 47.7% |
| **Chronic illness**                    |        |        |        |        |       |
| None                                   | 1869   | 74.7%  | 1890   | 75.5%  | 1841  | 73.4% |
| Yes                                    | 548    | 21.9%  | 530    | 21.2%  | 544   | 21.7% |
| Do not know                            | 86     | 3.5%   | 83     | 3.3%   | 122   | 4.9%  |
| **Rural/urban area**                   |        |        |        |        |       |
| Rural                                  | 1920   | 76.7%  | 1918   | 76.7%  | 1922  | 76.7% |
| Urban                                  | 584    | 23.3%  | 584    | 23.3%  | 585   | 23.3% |
| **Italian region**                     |        |        |        |        |       |
| North-West                             | 662    | 26.5%  | 662    | 26.5%  | 663   | 26.5% |
| North-East                             | 480    | 19.2%  | 480    | 19.2%  | 481   | 19.2% |
| Centre                                 | 497    | 19.8%  | 496    | 19.8%  | 497   | 19.8% |
| South/Islands                          | 865    | 34.5%  | 864    | 34.5%  | 866   | 34.5% |
| **Concerns about their own economic situation** |        |        |        |        |       |
| Absolutely not                         | 49     | 2.0%   | 60     | 2.4%   | 52    | 2.1%  |
| Not                                    | 93     | 3.7%   | 78     | 3.1%   | 93    | 3.7%  |
| Partially not                          | 145    | 5.8%   | 125    | 5.0%   | 169   | 6.7%  |
| Neither not nor yes                    | 655    | 26.1%  | 647    | 25.9%  | 612   | 24.4% |
| Partially yes                          | 685    | 27.4%  | 711    | 28.4%  | 722   | 28.8% |
| Yes                                    | 346    | 13.8%  | 367    | 14.7%  | 332   | 13.2% |
| Absolutely yes                         | 531    | 21.2%  | 512    | 20.5%  | 527   | 21.0% |
| **COVID-19 (self)**                    |        |        |        |        |       |
| Do not know                            | 233    | 9.3%   | 230    | 9.2%   | 191   | 7.6%  |
| No                                     | 2129   | 85.0%  | 2078   | 83.1%  | 2134  | 85.1% |
| Yes, mild                              | 136    | 5.4%   | 175    | 7.0%   | 158   | 6.3%  |
| Yes, severe                            | 6      | 0.3%   | 19     | 0.8%   | 24    | 0.9%  |
| **COVID-19 (others)**                  |        |        |        |        |       |
| No                                     | 715    | 28.5%  | 687    | 27.5%  | 671   | 26.7% |
| Yes, alive                             | 821    | 32.8%  | 767    | 30.7%  | 774   | 30.9% |
| Yes, deceased                          | 969    | 38.7%  | 1048   | 41.9%  | 1062  | 42.4% |

Note: NS = not significant; <0.05; <0.01; <0.001.
Our results are in line with previous studies that identified how a higher conspirative mentality was associated with low educational levels\textsuperscript{28,29} and low trust in governments and aided institutions (e.g. media, health care, public health institutions) or in science and scientists.\textsuperscript{10–12}

According to the literature, conspiracy theories might be used by more psychologically vulnerable individuals to cope with uncertain and complex events, such as the COVID-19 pandemic, to attain an illusion of control, which may act as palliative compensation for the lack of real control.\textsuperscript{3,4} Moreover, the fact that more individuals with conspirative mentalities were more likely to not know people who were infected by or died because of the SARS-CoV-2 virus may be explained by the fact that the personal experience of this disease may reduce the conspirative belief that the pandemic was either not real or magnified by media or institutions.

\textit{Conspirative mentality increased while trust in Health Institutions and scientific information sources decreased during the progression of the COVID-19 pandemic}

Our findings show that the conspirative mentality in an Italian representative sample was at a medium—high level and increased slightly from January to May 2021. Simultaneously, trust in health institutions and scientific information sources decreased. This maladaptive trend of the conspirative mentality is particularly important if we consider its potentially damaging role in influencing health-related behaviours, acting as barriers to satisfactory compliance with health protective behaviours\textsuperscript{9} and containment-related behaviours.\textsuperscript{3,24} This result is somewhat different from the finding of another study\textsuperscript{6} in which the authors found a stability of conspiracy beliefs during the early phases of the COVID-19 pandemic. In any event, it should be emphasised that the differences found, albeit statistically significant, were small in magnitude, and the implications remain to be ascertained.

The result that higher conspirative mentality across time was accompanied by a decline in trust in healthcare institutions is in line with previous studies.\textsuperscript{7,8} However, due to the cross-sectional nature of our survey, we were unable to investigate any causal associations between conspirative mentality and trust. We may hypothesise that some public health decisions (e.g. lockdown and restriction measures, vaccination campaigns, promotion of social distancing) taken during the COVID-19 pandemic may have progressively impaired trust in official institutions and related information sources and may have amplified the conspirative mentality. In particular, the decisions that may have triggered this change may have included containment measures to reduce the spread of the contagion, the perceived lack of economic and social support to families and the perceived absence of strong and transparent communicative messages about vaccines (in particular with reference to the AstraZeneca vaccine). In fact, in Italy, from January to May 2021, there was a massive spread of information (including fake information) about vaccines, and this included numerous controversial issues regarding the AstraZeneca vaccine. This situation may have fuelled the conspirative mentality that affected trust in institutions.

\textit{Conspirative mentality affects COVID-19 protective behaviour}

We found that lower levels of conspirative mentality, together with sociodemographic and clinical variables such as being women, being older than 35 years, being unemployed, having a chronic illness, being worried about the economic situation, not having had the COVID-19 infection and knowing someone...
Table 3
Multiple regression analyses on conspiracy normalised score.

| Independent variables | Waves 1 + 2 + 3 + 4 | Wave 1 | Wave 2 | Wave 3 | Wave 4 |
|-----------------------|-----------------------|--------|--------|--------|--------|
|                       | N                      | 10,013 | 25,040 | 7,670  | 6,040  | 10,430 |
|                       | P(28,9984)             |        |        |        |        |        |
| Sex                   |                       |        |        |        |        |        |
| Females vs males      | -0.017                | -0.797 | 0.764  | 0.230  | -1.413 | 1.873  |
|                       |                         |        |        |        |        |        |
| Age (years)           |                       |        |        |        |        |        |
| 35–44 vs 18–34 years | 2.954                 | 1.772  | 4.135  | 3.042  | 0.578  | 5.506  |
|                       |                         |        |        |        |        |        |
| 45–54 vs 18–34 years | 2.475                 | 1.321  | 6.269  | 2.181  | -0.157 | 4.519  |
|                       |                         |        |        |        |        |        |
| 55–70 vs 18–34 years | 3.048                 | 1.973  | 4.123  | 2.920  | 0.707  | 5.133  |
| Educational level (years) |                     |        |        |        |        |        |
| 9–13 vs 0–8 years    | -0.578                | -1.474 | 0.318  | -1.386 | -3.301 | 0.529  |
|                       |                         |        |        |        |        |        |
| >13 vs 0–8 years     | -4.343                | -5.395 | -3.292 | -4.147 | -6.270 | -2.025 |
| Occupational status  |                       |        |        |        |        |        |
| Yes (not health sector) vs No | 0.144  |        |        |        |        |        |
|                       |                         |        |        |        |        |        |
| Yes (health sector) vs No | -1.515           |        |        |        |        |        |
| Chronic illness       |                       |        |        |        |        |        |
| No vs Yes             | -0.866                | -1.839 | 0.107  | 0.116  | -1.869 | 2.100  |
|                       |                         |        |        |        |        |        |
| Do not know vs Yes    | 0.131                 | -1.815 | 2.077  | 2.501  | -2.145 | 7.148  |
|                         |                         |        |        |        |        |        |
| Geographical area     |                       |        |        |        |        |        |
| North-West vs Centre  | -1.012                | -2.206 | 0.182  | -0.217 | -2.701 | 2.266  |
|                       |                         |        |        |        |        |        |
| North-East vs Centre  | 0.982                 | -0.162 | 2.126  | 2.727  | 0.464  | 4.990  |
|                       |                         |        |        |        |        |        |
| South/Islands vs Centre | 0.298            | -0.712 | 1.307  | 0.794  | -1.203 | 2.851  |
| Rural/urban area      |                       |        |        |        |        |        |
| Rural vs urban        | 0.652                 | -0.264 | 1.569  | 0.159  | -1.740 | 2.057  |
|                       |                         |        |        |        |        |        |
| Concerns about their own economic situation |             |        |        |        |        |        |
| Absolutely not vs neither nor not nor yes | -2.586             | -6.224 | 1.052  | -0.559 | -8.939 | 7.821  |
|                       |                         |        |        |        |        |        |
| Not vs neither not nor nor yes | -1.192             | -3.657 | 1.272  | -1.586 | -6.468 | 3.295  |
|                       |                         |        |        |        |        |        |
| Partially not vs neither nor not nor yes | -1.441             | -3.027 | 0.144  | 1.211  | -2.218 | 4.640  |
|                       |                         |        |        |        |        |        |
| Partially yes vs neither nor not nor yes | 2.915             | 1.944  | 3.886  | 3.478  | 1.473 | 5.484  |
|                       |                         |        |        |        |        |        |
| Yes vs neither nor nor nor nor nor nor nor nor yes | 5.995             | 4.729  | 7.260  | 8.110  | 5.562 | 10.659 |
|                       |                         |        |        |        |        |        |
| Absolutely yes vs neither nor nor nor nor nor nor nor nor yes | 11.295             | 10.090 | 12.499 | 11.804 | 9.399 | 14.209 |
|                       |                         |        |        |        |        |        |
| Having had COVID-19   |                       |        |        |        |        |        |
| Do not vs No          | 1.622                 | 0.289  | 2.956  | 1.269  | -1.411 | 3.949  |
|                       |                         |        |        |        |        |        |
| Yes, mild vs No       | 0.288                 | -1.302 | 1.877  | 1.504  | -1.816 | 4.823  |
|                       |                         |        |        |        |        |        |
| Yes, severe vs No     | 3.383                 | -1.460 | 8.227  | 6.287  | -0.297 | 17.521 |
|                       |                         |        |        |        |        |        |
| Knowing people who had COVID-19 |             |        |        |        |        |        |
| Yes, alive vs No      | -2.856                | -3.849 | -1.863 | -3.168 | -5.217 | -1.118 |
|                       |                         |        |        |        |        |        |
| Yes, deceased vs No   | -2.374                | -3.333 | -1.416 | -1.985 | -3.962 | -0.009 |
| Wave                  |                       |        |        |        |        |        |
| Wave 2 vs Wave 1      | 0.371                 | -0.738 | 1.480  |        |        |        |
|                       |                         |        |        |        |        |        |
| Wave 3 vs Wave 1      | 1.023                 | -0.066 | 2.111  |        |        |        |
|                       |                         |        |        |        |        |        |
| Wave 4 vs Wave 1      | 1.994                 | 0.920  | 3.068  |        |        |        |
| Constant              | 55.388                | 53.390 | 57.385 | 53.388 | 49.650 | 57.125 |

P-values in bold are significant at 0.05 level.

* Unstandardised coefficients.
| Independent variables | Waves 1 + 2 + 3 + 4 | Wave 1 | Wave 2 | Wave 3 | Wave 4 |
|-----------------------|---------------------|--------|--------|--------|--------|
|                       | N                   | 10,013 | 2504   | 2502   | 2507   |
|                       | f(29,9983)          | 25.280 | 8.910  | 8.210  | 8.150  |
|                       | P(F)                | <0.001 | <0.001 | <0.001 | <0.001 |
|                       | R-squared           | 0.072  | 0.087  | 0.083  | 0.080  |

**Sex**

- Females vs males
  - Coef**
  - R-squared

**Age (years)**

- 35–44 vs 18–34 years
  - Coef**
  - R-squared

**Geographical area**

- North-West vs Centre
  - Coef**
  - R-squared
- North-East vs Centre
  - Coef**
  - R-squared
- South/Islands vs centre
  - Coef**
  - R-squared

**Rural/urban area**

- Rural vs urban
  - Coef**
  - R-squared

**Concerns about their own economic situation**

- Absolutely not vs neither not nor yes
  - Coef**
  - R-squared
- Not vs neither not nor yes
  - Coef**
  - R-squared
- Partially vs neither not nor yes
  - Coef**
  - R-squared
- Partially yes vs neither not nor yes
  - Coef**
  - R-squared
- Yes vs not vs neither not nor yes
  - Coef**
  - R-squared

**Having had COVID-19**

- Do not know vs No
  - Coef**
  - R-squared
- Yes, mild vs No
  - Coef**
  - R-squared
- Yes, severe vs No
  - Coef**
  - R-squared

**Knowing people who had COVID-19**

- Yes, alive vs No
  - Coef**
  - R-squared
- Yes, deceased vs No
  - Coef**
  - R-squared

**Wave**

- Wave 2 vs Wave 1
  - Coef**
  - R-squared
- Wave 3 vs Wave 1
  - Coef**
  - R-squared
- Wave 4 vs Wave 1
  - Coef**
  - R-squared

**Constant**

- Coef**

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*a* Unstandardised coefficients.
deceased from the infection were associated with higher levels of COVID-19 protective behaviour. This result confirms previous reports showing that conspiracy mentality is inversely associated with adherence to medication regimens, preventive action and willingness to vaccinate.10–14 This association may be because individuals with generic conspirative mentality (i.e. not strictly related to the pandemic) were probably more likely to adhere to conspirative theories about the real existence and extension of the COVID-19 pandemic (e.g. believing that the pandemic was exacerbated by media or institutions). This may explain why they were more likely to not comply with protective behaviours.

Limitations

This study has several limitations. Because we used an online survey, it is likely that the findings of the study underrepresented the responses of those with certain demographic characteristics (e.g. less educated and less affluent people and older respondents). Not everybody has access to the Internet; the online survey methodology is relatively uncontrolled, and the results are less generalisable. Furthermore, the Conspiracy Mentality Questionnaire assesses generic beliefs in conspiracy theories and is not specifically related to the COVID-19 pandemic. Finally, R2 for all models are quite low, and this implies that factors other than sociodemographics, not included in the models, might help explain the variability of conspiracy and protective behaviours.

Conclusions

This study highlights that individuals aged >35 years, poorly educated and particularly worried about their financial situations are at a particular risk of reporting higher levels of conspiracy mentality. Conspiracy mentality in Italy during the COVID-19 pandemic was medium—high and increased slightly over time, in parallel with a decrease in trust in health institutions and scientific/formal informational sources. Furthermore, conspirative mentality was a risk factor for low levels of COVID-19 protective behaviours.

Our findings highlight that during a pandemic, there is an urgent need for clear, effective and earnest communication tailored to specific population subgroups that for their sociodemographic characteristics might be more vulnerable to conspirative mentality. This may improve trust in health institutions and official information sources and, in turn, increase compliance with protective behaviour recommended by public health authorities.

Author statements

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Ethical approval

The studies involving human participants were reviewed and approved by IRCCS San John of God Fatebenefratelli of Brescia (protocol 286/2020). The patients/participants provided their written informed consent to participate in this study.

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Competing interests

None declared.

Data availability

The data sets presented in this study can be found in online repositories. Data sets and codes are available here: http://doi.org/10.5281/zenodo.5040719.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2022.11.005.

References

1. Remuzzi A, Remuzzi G. COVID-19 and Italy: what next? Lancet 2020;395:1225–8.
2. Miller J. Do COVID-19 conspiracy theory beliefs form a monolithic belief system? Can J Polit Sci 2020;53:319–28.
3. Douglas KM, Sutton RM, Cichocka A. The psychology of conspiracy theories. Curr Dir Psychol Sci 2017;26:538–42.
4. Imhoff R, Lamberty P. A bioweapon or a hoax? The link between distinct conspiracy beliefs about the coronavirus disease (COVID-19) outbreak and pandemic behavior. Soc Psychol Personal Sci 2020;11:1110–8.
5. Romer D, Jamieson KH. Conspiracy theories as barriers to controlling the spread of COVID-19 in the U.S. Soc Sci Med 2020;263:113356.
6. Lewandowsky S, Ecker UK, Seifert CM, Schwarz N, Cook J. Misinformation and its correction: continued influence and successful debunking. Psychol Sci Publ Interest 2012;13:106–31.
7. Jolley D, Douglas KM. The social consequences of conspiracism: exposure to conspiracy theories decreases intentions to engage in politics and to reduce one’s carbon footprint. Br J Psychol 2014;105:35–56.
8. Wahl I, Kastlunger B, Kirchler E. Trust in authorities and power to enforce tax compliance: an empirical analysis of the “slippery slope framework”. Law Pol 2010;32:383–406.
9. Jolley D, Douglas KM. The effects of anti-vaccine conspiracy theories on vaccination intentions. PLoS One 2014;9:e98177.
10. Kata A. A postmodern Pandora’s box: anti-vaccination misinformation on the Internet. Vaccine 2010;28:1709–16.
11. Bogart LM, Wagner G, Galvan FH, Banks D. Conspiracy beliefs about HIV are related to antiretroviral treatment nonadherence among African American men with HIV. J Acquir Immune Defic Syndr 2010;53:648–55.
12. Hornsey MJ, Finlayson M, Chatwood G, Begeny CT, Donald Trump and vaccine beliefs, vaccine knowledge, and trust: anti-vaccine behavior of Serbian adults. Br J Psychol 2010;53:648–55.
13. Milošević Bordević J, Mari S, Ydović M, Milošević A. Links between conspiracy beliefs, vaccine knowledge, and trust: anti-vaccine behavior of Serbian adults. Soc Sci Med 2021;277:113936.
14. Bird ST, Bogart LM. Conspiracy beliefs about HIV/AIDS and birth control among African Americans: implications for the prevention of HIV, other STIs, and unintended pregnancy. J Soc Issues 2005;61:109–26.
15. Gillman J, Davila J, Sangsryi G, Parkinson-Windross D, Miertschin N, Mitts B, et al. The effect of conspiracy beliefs and trust on HIV diagnosis, linkage, and retention in young MSM with HIV. Health Care Poor Underserved 2013;24:36–45.
16. Motta M, Stecula D, Farbacht C. How right-leaning media coverage of COVID-19 facilitated the spread of misinformation in the early stages of the pandemic in the U.S. Can J Poli Sci 2020;53:335–42.
17. Bruder M, Kunert L. The conspiracy hoax? Testing key hypotheses about the correlates of generic beliefs in conspiracy theories during the COVID-19 pandemic. PsychArchives 2020;57:1(1):43–8.
18. Freeman D, Waite F, Rosebrock L, Petit A, Causier C, East A, et al. Coronavirus conspiracy beliefs, mistrust, and compliance with government guidelines in England. Psychol Med 2020;1:1–13.
19. Earnshaw VA, Eaton LA, Kalichman SC, Brousseau NM, Hill EC, Fox AB. COVID-19 conspiracy beliefs, health behaviors, and policy support. Trans Behav Med 2020;10:850–6.
20. Sallam M, Dababseh D, Eid H, Al-Mahzoum K, Al-Haidar A, Taim D, et al. High rates of COVID-19 vaccine hesitancy and its association with conspiracy beliefs: a study in Jordan and Kuwait among other Arab countries. *Vaccines (Basel)* 2021; 9.

21. Douglas KM. COVID-19 conspiracy theories. *Group Process Intergr Relat* 2021; 24:270–5.

22. Caserotti M, Gavaruzzi T, Tasso A, Buizza C, Candini V, et al. Who is likely to vacillate in their COVID-19 vaccination decision? Free-riding intention and post-positive reluctance. *Prev Med* 2021; 154:106885.

23. Zarbo C, Candini V, Ferrari C, d’Addazio M, Calamandrei G, Starace F, et al. COVID-19 vaccine hesitancy in Italy: predictors of acceptance, fence sitting and refusal of the COVID-19 vaccination. *Front Public Health* 2021; 10.

24. Bikbov B, Tettamanti M, Bikbov A, D’Avanzo B, Galbussera AA, Nobili A, et al. Willingness to share contacts in case of COVID-19 positivity—predictors of collaboration resistance in a nation-wide Italian survey. *PLoS One* 2022; 17:e0274902.

25. Smith BW, Dalen J, Wiggins K, Tooley E, Christopher P, Bernard J. The brief resilience scale: assessing the ability to bounce back. *Int J Behav Med* 2008; 15:194–200.

26. Bruder M, Hafke P, Neave N, Nouripanah N, Imhoff R. Measuring individual differences in generic beliefs in conspiracy theories across cultures: conspiracy mentality questionnaire. *Front Psychol* 2013; 4:225.

27. Bech P, Gudex C, Johansen KS. The WHO (ten) well-being index: validation in diabetes. *Psychother Psychosom* 1996; 65:183–90.

28. Duplaga M. The determinants of conspiracy beliefs related to the COVID-19 pandemic in a nationally representative sample of internet users. *Int J Environ Res Publ Health* 2020; 17:7818.

29. Georgiou N, Delfabbro P, Balzan R. COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs. *Pers Indiv Differ* 2020; 166:110201.

30. Tonković M, Dumančić F, Jelić M, Biruški DC. Who believes in COVID-19 conspiracy theories in Croatia? Prevalence and predictors of conspiracy beliefs. *Front Psychol* 2021; 12.

31. Bărgăoanu A, Corbu N, Buturoiu R, Durach F. Managing the COVID-19 pandemic: predictors of trust in institutions in Romania. *Kybernetes* 2021; 21(9):940–58.

32. Dyrendal A, Hestad K. Trust in crisis: conspiracy mentality, lack of trust and religiosity predicted conspiracy beliefs about COVID-19 in a Norwegian sample. *Approaching Religions* 2021; 11:98–114.

33. Karić T, Mešedović J. COVID-19 conspiracy beliefs and containment-related behaviour: the role of political trust. *Pers Indiv Differ* 2021; 175:110697.