

Statistics, Technology and Data Science for Economic  
and Social Development

Book of short papers of the ASA Bologna Conference

Supplement to Volume 35/3

Guest Editors:

Luigi Fabbri, Stefania Mignani, Giorgio Tassinari



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Statistica Applicata – Italian Journal of Applied Statistics is associated to the following Italian and international journals:

QTQM – Quality Technology & Quantitative Management (<http://web.it.nctu.edu/~qtqm/>)

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Statistica Applicata – Italian Journal of Applied Statistics (ISSN:1125-1964, E-ISSN:2038-5587) applies the Creative Commons Attribution (CC BY) license to everything we publish.

Published: November 2023

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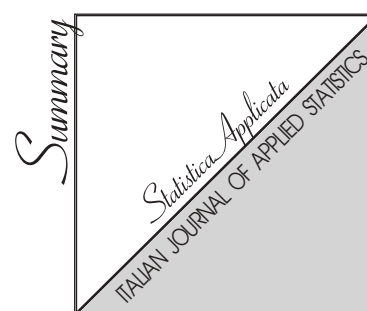
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Statistica Applicata – Italian Journal of Applied Statistics is a four-monthly journal published by the Associazione per la Statistica Applicata (A.S.A.), Largo Gemelli 1 – 20123 Milano, Italy (phone + 39 02 72342904). Advertising: CLEUP SC, via G. Belzoni, 118/3 – 35128 Padova, Italy (phone +39 049 8753496 – Fax +39 049 9865390), email: info@cleup.it. Rules for manuscript submission: <https://www.sa-ijas.org/ojs/index.php/sa-ijas/about/submissions>. Subscription: yearly €103.30; single copy €40.00; A.S.A. associates €60.00; supporting institutions: €350.00. Advertisement lower than 70%. Postal subscription Group IV, Milan. Forum licence n. 782/89. CLEUP SC on behalf of ASA., 7 March 2023.





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## Introduction

This volume includes a selection of the papers presented at the ASA (Association for Applied Statistics) scientific conference held in Bologna from 6 to 8 September 2024. The volume keeps the title of the meeting “Statistics, Technology and Data Science for Economic and Social Development”. The majority of papers are, in fact, devoted to economic statistics, but there are other papers dealing with other applied statistics fields and official statistics methodology.

All papers have been blindly reviewed by at least two independent experts belonging to the conference scientific committee. The published papers are, then, the outcome of a reviewing process, including suggestions, by academic statisticians and of the consequent \adjustment - both formal and substantive – by authors.

At the conference, the presentations were organized in session homogeneous according to content. The self-selection of some contributors and the severe selection from the reviewers drastically reduced the number of possible articles and so the content-based structure of the works went lost. Finally, we decided to publish the articles in alphabetic order according to the family name of the first author.

This volume was annexed as a supplement of a “normal” volume of the scientific journal *Statistica Applicata – Italian Journal of Applied Statistics*. Scholars can freely download the articles in an open access format, with the only obligation to cite the paper, possibly as follows:

Author(s) (Year). Paper title. In L. Fabbris, S. Mignani, G. Tassinari (eds) , *Technology and Data Science for Economic and Social Development. Book of Short Papers of the ASA Bologna Conference*. Padua: Cleup (pages).

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# Coping strategies and perception of the after-pandemic future of Italians

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## 1. Introduction

COVID-19 pandemic affected millions of people worldwide. While the majority of the diseased recovered, a significant proportion continued to suffer from persistent symptoms and functional limitations referred to as long COVID (LC) or post-acute sequelae of SARS-CoV-2 infection (PASC). Among these symptoms, depression and anxiety have emerged as important health problems. Several studies have reported a higher prevalence of depression in individuals with LC compared with those who fully recovered. The chronic nature of LC, sometimes exacerbated by physical limitations and social isolation, contributes to an increased risk for depression. In addition, dysregulation of immune and inflammatory responses during acute infection may have long-lasting effects on the brain that may lead to the development of depression symptoms.

Efforts are underway to establish comprehensive rehabilitation programs tailored to the needs of people with LC, including multidisciplinary care involving mental health professionals and other specialists. Recent studies (Marchetti and Pössel, 2023) have explored the relationship between personal cognitive traits (such as beliefs about the self, the world and the future) and depressive symptoms, while others have focused on the association between an individual's orientation towards the future and his/her depression symptoms (Zheng et al., 2019). Other scholars (Servidio et al., 2022) have focused on the relationships between future orientation, resilience and depression during the pandemic. However, further research is needed to highlight the mechanisms linking depression and perception of the future to develop effective interventions.

Our research aims to understand how Italians perceive their future in the aftermath of the Covid 19 pandemic, and whether and how disposition toward their future can be strengthened to make them better prepared to cope with their future. We hypothesize that the situation in recent years, characterized by two global shocks (pandemic and Ukraine war) may have increased the difficulty for young people to look into the future. Table 1 describes the aftermath of the pandemic. The data indicate the proportion of respondents who have difficulty imagining their own future, broken down by personal characteristics and the nature of pandemic concerns.

The rest of the paper is organized as follows: Section 2 describes the sample and presents the methodological approach used in the analysis; Section 3 reports the results of the analysis conducted on young and adult people to shed light on the different coping strategies correlated with their future perception. Section 4 discusses the main outcomes in line with the mainstream literature and concludes.

## 2. Data and methods

### 2.1. The data

The survey was conducted from May 2021 to May 2022, near the end of the pandemic, using computer-assisted web-based interviews (CAWI) and social media participation. Data collection

was conducted by administering the electronic questionnaire via email to a large convenience sample. The questionnaire was accessible via a link provided in a personal email. As some questions related to health could have been perceived as sensitive, the questionnaire was kept strictly anonymous. It was therefore not possible to ask participants from the first wave who had not responded to cooperate. The final coverage rate was around 6%. A total of 1,164 Italian respondents completed the electronic questionnaire. Research groups from several Italian universities were involved in the study: Bari, Padua, Turin, Naples-Federico II and Chieti-Pescara.

To better understand which variables (sociographic characteristics, personality traits, health experiences, hang-over of the pandemic) affected individuals' vision of the future, an overall analysis and a focus on young people (18-39 years old  $n=549$ ; 47.16%) were performed. The set of descriptors is shown in Table 1. Our target variable was based on respondents having a clear or, alternatively, blurred vision of what they expected to do after the pandemic. The question was: *Do you have sufficiently clear ideas about what you will do after the pandemic, or do you find it difficult to imagine if and what your life will be like afterwards? R1. I have sufficiently clear ideas about what I expect to do in the future. R2. I imagine my future with difficulty.* Below, we analyze the responses to this question.

Some of the multi-item variables were reduced to a single index, namely: Attitude, Lifestyle, Depression.

**Attitude** (toward the future) was based on a set of eight items selected from Zimbardo's Time Perspective Inventory (Zimbardo and Boyd, 1999) measured on a dichotomous scale. The factor scores of the responses were used to create the Attitude index allowing us to obtain three groups of respondents scoring about 30% very low and 30% very high. Henceforth, we labeled very low values as "passive" attitude toward the future, medium values as "reactive", and very high values as "proactive".

The second index, **Lifestyle**, was calculated by algebraically summing the reliable raw scores of the 10 items that survived the step-by-step removal process to reach a Cronbach's  $\alpha \geq 0.7$ . Subsequently, a one-dimensional factor analysis was performed to determine the quantile thresholds corresponding to three groups: never practicing, indifferent, still practicing social habits.

The third index, **Depression**, measured full-blown depression with the nine-item PHQ9–Patient Health Questionnaire by Spitzer et al. (1999), translated into Italian by Mazzotti et al. (2003). Based on the response scores, three degrees of depression were identified: full-blown depression, at risk of depression, normal. In what follows, only full-blown depression was used.

## 2.2. Statistical methods

A classification tree, through CART (Breiman et al., 1984), fitting the target variable  $Y$  related to the presence of a blurred vision of the after-pandemic future, allowed us to identify the interactions between the main variables in the classification procedure. The predictors selected by the classification tree are listed in Table 1. The predictors were used as independent variables in the subsequent analysis based on a logistic regression model for a binary response variable.

The multiple logistic regression model is expressed as follows (Hosmer & Lemeshow, 2000):

$$\text{logit}[p(Y = 1)] = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n$$

where  $\text{logit}(p) = \ln[p/(1-p)]$  and  $\beta_i$  measures the relation between  $Y$  and  $X_i$  when all other variables in the model remain fixed. The predictors were divided into two blocks: the control variables that were forced into the model and the set of all other variables that were to be selected according to the backward stepwise criterion. The Nagelkerke pseudo- $R^2$  was used for the variable selection. Classification tree and logistic model were performed using the software IBM SPSS rel.25.

### 3. Results

Overall, 26.9% of respondents have a blurred idea of their post-pandemic role, with a significant difference between respondents aged 18-34 (35.2%) and 35 and over (18.3%). Although we hypothesize that young people are less likely to imagine their future than adults (Bollani, Di Zio and Fabbris, 2023), it is interesting to understand to what extent this might depend on individual pandemic experience, mental health status, and character traits.

**Table 1. Percentage of Italians having difficulty imagining their own future, by age group, gender, higher education degree, family type, health problems and type of after pandemic worry.**

|                       | Particularly worried for the future of: |                  |        |       | Sample size |       |
|-----------------------|-----------------------------------------|------------------|--------|-------|-------------|-------|
|                       | Italian economy                         | Same or no worry | Health | Total | %           | N     |
| 18-34 years old       | 31.8                                    | 36.6             | 46.7   | 35.2  | 47.2        | 549   |
| 35 and more           | 17.6                                    | 20.4             | 29.4   | 19.3  | 52.8        | 615   |
| Male                  | 18.7                                    | 22.1             | 25.7   | 20.3  | 40.7        | 474   |
| Female                | 29.0                                    | 30.6             | 49.2   | 31.3  | 52.3        | 690   |
| Couple                | 18.7                                    | 23.0             | 27.3   | 20.9  | 58.2        | 678   |
| Higher education      | 20.5                                    | 23.5             | 38.8   | 23.1  | 57.4        | 668   |
| Covid infected        | 18.6                                    | 23.4             | 13.2   | 20.1  | 17.0        | 198   |
| Had physical damages  | 30.4                                    | 46.7             | 41.7   | 38.1  | 9.9         | 115   |
| Full-blown depression | 48.5                                    | 55.8             | 68.4   | 54.3  | 28.0        | 326   |
| No chronic disease    | 25.4                                    | 27.8             | 30.8   | 27.0  | 50.3        | 585   |
| One chronic disease   | 18.6                                    | 18.2             | 52.6   | 22.0  | 15.4        | 179   |
| 2 or more diseases    | 24.5                                    | 32.9             | 52.2   | 29.6  | 34.3        | 400   |
| Total                 | 24.2                                    | 27.8             | 40.4   | 26.8  | 100,0       | 1,164 |

The question was: *When you think about Italy, are you more worried about the future of the economy or the risk to your health? R1. More about the future of the economy R2. Both equally or no worry; R3. More about the risk of contagion.*

When the group of young respondents is further subdivided, there is an astonishing 38.1% among 18-24 year olds who have no clear idea of their future. The complementary group of 25-34 year olds, of course, accounts for a smaller but still relevant 28.6%.

Regarding gender, and in line with other studies (Greene and DeBacker, 2004), men have a significantly better idea of the future than women: the difference in our data is 11 percentage points. In our sample, the proportion of Italians unable to imagining their future, being depressed, is 54.3%. At the same time, people with a blurred vision of the future are more likely to be severely depressed. This highlights a very strong relationship between the difficulty of imagining the future and the dark side of people's minds. Among depressed respondents, most are young people (41.7%), and the correlation with lack of future imagination is striking ( $r=0.385$ ;  $p<0.001$ ). This means that young people have been exposed to a psychological stress more than adults and the aftermath should be given special attention in the LC of young people.

Couples generally worry less than average (20.9% *versus* 26.8%). This may be because people feel strong in a partnership when it comes to coping with economic and social difficulties, while health remains a higher-order concern. College graduates also feel stronger than the average (23.1%), but they are also more aware of their powerlessness in the face of the agents of disease. So the virus is a scary factor in that it makes it difficult for individuals to organize their lives in the face of something completely unexpected. Indeed, in the first phase of the pandemic, the apocalyptic news and the astonishing mortality rate of the virus triggered a sense of helplessness that 21<sup>st</sup> century man would never have expected. Suddenly, daily life was turned upside down, with no idea if or when that worst nightmare would end.

Over time, better knowledge of the epidemic, more efficient organization of the hospital system and vaccines probably enabled most people to revise their fears. Thus, not entirely unexpectedly, Covid 19 infection seems to have little effect on perceptions of health future

(13.2%), but if the respondent is chronically ill, the greater the perceived frailty, the worse the future is viewed.

Table 2 shows the strong relationship between individual optimistic views and perceptions of the future: those who are unable to imagine their future account for 51.3% of those with passive attitudes while the corresponding percentage for those with proactive attitudes is 5.0. When focusing on youth, the two opposite percentages are 59.9 and 5.6, respectively, confirming that the threefold relationship between depression, passive attitude and difficulty in imagining the future is even stronger among youth.

Another important concern related to the future is the belief that a healthy lifestyle (with physical activity) is more conservative than vaccines and that a poorer society is unavoidable after a social shock such as a pandemic. In addition, younger people believe that intensive livestock farming should be closed because it can easily transmit diseases to humans.

**Table 2. Percentage of Italians having difficulty imagining their future, by psychological disposition and age.**

| Psychological disposition        | Age   |             |       | Sample size |       |
|----------------------------------|-------|-------------|-------|-------------|-------|
|                                  | 18-34 | 35 and more | Total | (%)         | N     |
| Passive attitude                 | 59.9  | 40.5        | 51.3  | 30.1        | 350   |
| Reactive attitude                | 31.8  | 18.7        | 25.2  | 39.8        | 463   |
| Proactive attitude               | 5.6   | 4.6         | 5.0   | 29.5        | 343   |
| Poorer in the future (a)         | 42.3  | 30.8        | 35.1  | 17.5        | 204   |
| Stop to progress (b)             | 29.5  | 23.3        | 25.9  | 10.1        | 117   |
| Epidemics inevitable (c)         | 41.8  | 22.0        | 30.1  | 23.5        | 274   |
| Closure of livestock (d)         | 43.1  | 22.6        | 31.9  | 27.6        | 321   |
| Lazy public servants (e)         | 35.7  | 21.0        | 28.2  | 22.9        | 267   |
| Annoyed by migrant landings (f)  | 41.0  | 26.4        | 32.9  | 12.7        | 148   |
| No travelling abroad (g)         | 41.1  | 23.7        | 30.9  | 27.4        | 319   |
| Mask in case of cold (h)         | 38.6  | 19.3        | 27.9  | 50.3        | 585   |
| Only electric or hybrid cars (i) | 30.4  | 20.7        | 25.3  | 24.5        | 285   |
| Physical activity immunizes (j)  | 47.4  | 29.6        | 37.0  | 7.9         | 92    |
| Total                            | 35.3  | 19.3        | 26.9  | 26.9        | 1,164 |

(a) We will become and stay poorer in the long run; (b) It would not be bad if progress stopped, even if we take a step backward; (c) Epidemics are inevitable, the next one is coming; (d) Intensive livestock farming must be closed, no matter what the cost, because it transmits diseases; (e) Public servants took advantage of working remotely to work even less than usual; (f) Annoyed by migrant landings during the pandemic; (g) I will give up travelling abroad for long time; (h) In case of cold, I will put on the mask; (i) I will only buy electric or hybrid cars; (j) Physical activity makes a person more immune than vaccines.

**Table 3. Classification tree in tabular form (Y=unable to imagine future).**

| Node | Blurred vision (%) | N   | Variable/Category   | Node | Blurred vision (%) | N   | Variable/Category          |
|------|--------------------|-----|---------------------|------|--------------------|-----|----------------------------|
| 1    | 16.2               | 838 | Not Depr            | 14   | 22.8               | 136 | Couple=Else                |
| 2    | 54.3               | 326 | Depr=Yes            | 15   | 20.7               | 92  | Couple=Yes                 |
| 4    | 35.3               | 187 | PassiveAttitude=1   | 17   | 64.0               | 114 | Closing livestock=NotAgree |
| 5    | 12.2               | 41  | ProactiveAttitude=1 | 18   | 80.0               | 50  | Closing livestock=Agree    |
| 8    | 17.0               | 342 | ReactiveAttitude=1  | 21   | 14.9               | 181 | Stop to progress= NotAgree |
| 9    | 27.7               | 148 | Psy_Damages=No      | 22   | 0.0                | 25  | Stop to progress=Agree     |
| 10   | 64.1               | 39  | Psy_Damages=Yes     | 23   | 29.0               | 69  | Higher education=Yes       |
| 11   | 68.9               | 164 | ReactiveAttitude=0  | 24   | 16.4               | 67  | Higher education=Lower     |
| 12   | 48.8               | 121 | ReactiveAttitude=1  | 25   | 8.3                | 24  | Age=<= 18-34 y.o.          |
| 13   | 13.1               | 206 | Couple=Yes          | 26   | 25.0               | 68  | Age=> 18-34 y.o.           |

A CART analysis with CRT growth method was performed, the difficulty of imagining the future being the response variable. The results of the analysis are summarized in Table 3: the interaction between depression and attitudes is highlighted by the fact that 80.0% of the depressed and passive respondents being unable to see their future believe that intensive livestock farming should be closed because it is one of the greatest threats to human health. On the other hand, all

non-depressed respondents who are a couple can see their future perfectly and believe that it would not be a bad thing even if progress stopped and the society took a step back.

The logistic model (Table 4) proved that people tend to perceive their future better as they shift from a passive to a reactive attitude toward life. Depression also confirms its strong role (Servidio et al., 2022). An important finding is that confidence in the future is enhanced when people can share their future plans with a partner and when they are employed. The role of gender as a predictor is meaningful in itself and is made even more interesting by its relationship to depression, which suggests a gender difference (Greene and DeBacker, 2004). Age and college degree have no effect on respondents' views, as their effects are substituted by the other variables included in the model.

**Table 4. Beta estimates of the regression model with blurred vision of future as the criterion variable (stepwise backward selection of regressors, n=549; Nagelkerke pseudo-R<sup>2</sup>=35.8%).**

| <i>Regressor</i>   | $\beta$ | S.E.  | p     | Exp( $\beta$ ) | <i>Regressor</i>  | $\beta$ | S.E.  | P     | Exp( $\beta$ ) |
|--------------------|---------|-------|-------|----------------|-------------------|---------|-------|-------|----------------|
| Sex(baseline=Male) | 0.352   | 0.164 | 0.032 | 1.421          | Couple            | -0.346  | 0.170 | 0.042 | 0.708          |
| Age                | -0.013  | 0.213 | 0.951 | 0.987          | Reactive Attitude | -1.645  | 0.272 | 0.000 | 0.193          |
| Employed           | -0.439  | 0.205 | 0.033 | 0.645          | Passive Attitude  | 2.634   | 0.275 | 0.000 | 13.933         |
| Higher Education   | 0.168   | 0.174 | 0.336 | 1.183          | Depressed         | 1.265   | 0.164 | 0.000 | 3.542          |
| Constant           | -1.430  | 0.205 | 0.000 | 0.239          |                   |         |       |       |                |

#### 4. Discussion and conclusion

The results of our analysis show that the ability to see into the future belongs to states of mind, but also to social conditions. Variables that may explain the ability to see the future include gender (Greene and DeBacker, 2004), being in a partnership (Padawer et al., 2007), being employed, and, most importantly, depression and a passive or reactive attitude toward life. Indeed, the relationship between a person's future orientation and depression symptoms is well established in the mainstreaming literature (Servidio et al., 2022; Schubert et al., 2020; Zheng et al., 2019): being oriented toward the future protects against both the life stress and the risk of depression especially to adolescents and younger adults (Zheng et al., 2019).

Instead, a possible Covid-19 infection did not affect future prospects. Much of the research highlights that the pandemic has significantly worsened future prospects, particularly for young people (Hytman et al., 2023; Singh et al., 2022; Padawer et al., 2007). The prevalence of depression and anxiety symptoms increased among youth during the pandemic (Kleine et al., 2023) and had a strong impact on people's difficulty of projecting themselves into the possible futures. Given the strong association between mental disorders and negative views of the future, it is reasonable to conclude that the pandemic *as a social shock* has worsened attitudes toward a positive future, especially among young people. Depression makes people more vulnerable and therefore exposes them to the most unconscious and ancient fears, sometimes fueled by false information from dubious sources. This could explain our findings that intensive livestock farming may cause health problems to humans and contribute to amplify the greenhouse effect by producing CO<sub>2</sub> in the atmosphere.

However, whether a positive attitude toward the future would moderate the relationship between COVID-19 impact and psychological well-being (Hytman et al., 2023) is a hypothesis that should be further explored in future studies, especially as a moderator to LC.

We can conclude that the examined data revealed clear signals for effective interventions, suggesting the implementation of policies to reinforce positive images of the future (Singh et al., 2022) so to improve the mental health of young people in the post-pandemic society and prepare them for life.

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