Covid-19 Outbreak In Italy: Are we ready for the psychosocial and the economic crisis?

Baseline findings from the PsyCovid Study

AUTHORS

Chiara Cerami, MD[1,2], Gaia C Santi, MSc[1], Caterina Galandra, PhD[3], Alessandra Dodich, PhD[4], Stefano F Cappa, MD[1,2], Tomaso Vecchi, PhD[2,5], Chiara Crespi, PhD[5]*

Affiliations

[1] Scuola Universitaria Superiore IUSS Pavia, 27100, Pavia, Italy

[2] IRCCS Mondino Foundation, 27100, Pavia, Italy

[3] Istituti Clinici Scientifici Maugeri IRCCS, 27100, Pavia, Italy

[4] Center for Neurocognitive Rehabilitation - CIMeC, University of Trento, 38068, Rovereto, Italy

[5] Department of Brain and Behavioral Sciences, University of Pavia, 27100, Pavia, Italy

**Corresponding author:*

Chiara Crespi, PhD

Department of Brain and Behavioral Sciences

University of Pavia

27100, Pavia, Italy

chiara.crespi@unipv.it

ABSTRACT

Covid-19 pandemic is burning all over the world. National healthcare systems are facing the contagion with incredible strength, but concern regarding psychosocial and economic effects is critically growing. The PsyCovid Study assessed the influence of psychosocial variables on individual differences in the perceived impact of Covid-19 outbreak on health and economy in the Italian population. Italian volunteers from different regions completed an online anonymous survey. Main outcomes were the perceived impact of Covid-19 outbreak on health and economy. A two-way MANOVA evaluated differences in main outcomes, with geographical area (northern, central and southern regions) and professional status (healthcare workers or not) as factors. We then tested the relationship linking psychosocial variables (i.e. perceived distress and social isolation, empathy and coping style) to the main outcomes through two different mediation models. 1163 responders completed the survey (835 females; mean age: 42±13.5 y.o.; age range: 18-81 y.o.) between March 14 and 21, 2020. Healthcare workers and people living in northern Italy reported significantly worse outbreak impact on health, but not on economy. In the whole sample, distress and loneliness were key variables influencing perceived impact of Covid-19 outbreak on health, while empathy and coping style affected perceived impact on economy. Covid-19 pandemic is a worldwide emergency in term of psychological, social and economic consequences. Our data suggests that in the Italian population actual differences in individual perception of the Covid-19 outbreak severity for health are dramatically modulated by psychosocial frailty (i.e., distress and loneliness). At the same time, problem-oriented coping strategies and enhanced empathic abilities increase people awareness about the severity of the impact of Covid-19 emergency on economics. There is an immediate need of consensus guidelines and healthcare policies to support interventions aimed to manage psychosocial distress and increase population resilience towards the imminent crisis.

KEYWORDS

Covid-19 outbreak; perceived impact on health; economic crisis; psychosocial frailty; loneliness; empathy; distress; coping abilities.

1. INTRODUCTION

In late 2019, pneumonia cases of unknown etiology, later proven to be caused by a new coronavirus (2019-nCOV or SARS-CoV2) appeared in Wuhan, Hubei Province of China. First clusters of patients were epidemiologically linked to human-animal transmission in the Huanan Seafood Wholesale Market of Wuhan. At the end of December 2019, the World Health Organization (WHO) was alerted on the novel viral illness causing respiratory symptomatology up to the severe acute respiratory syndrome (SARS) [1,2]. This was the third zoonotic coronavirus in 20 years to cross species infecting humans and raising global health concerns, following SARS in 2002–2003 and MERS in 2012. At the end of January 2020, person-to-person infection was proved among health care workers and family clusters in China [3,4]. Researchers showed that sustained human-to-human transmission among close contacts has been occurring since middle December 2019 [3] and multiple countries confirmed travel-associated cases. The rising tide of affected patients and deaths in China and of positive cases outside China draw worldwide attention on the new Covid-19 infection [5]. At the end of the month, the WHO's Emergency Committee agreed to confer the status of a Public Health Emergency of International Concern (PHEIC) to the new Covid-19 outbreak.

The numbers and speed of diffusion of Covid-19 infection pose public health and governance challenges in several countries. The escalation of travel-related cases imposed border screening for travelers, temperature testing and symptom monitoring for people coming from China or having contacts with travelers. Although the lessons coming from previous PHEIC (e.g., H1N1 in 2009 or Ebola in 2014 and in 2019) supported the quick need of coordinated international response to contain novel outbreaks in a globalized society, quarantine and social distance measures were differently adopted by infected countries, sparkling controversy in the civilian population concerning its implementation and effectiveness. Multidisciplinary committee of experts were recruited by governing bodies in

order to better orchestrate global action plans including restriction measures, surveillance, contact investigations, testing, and treatment. However, timing and geographic extension of measures vary according to public trust, cooperation, and stringent measures applied to control the population movements.

In Italy, the first two cases have been registered in Rome[6]. These are a couple of Chinese tourists, hosted in a city center hotel, who arrived in Milan from Wuhan and then moved to Rome. They were proved to be infected prior to the arrival in Italy [7]. Specific algorithms, detailed protocols, and specialized teams were applied to contain the contagion [8]. A dramatic increase of affected cases and hospitalized patients however quickly followed, inflaming northern Italy regions. After the confirmation of 2019-nCov positivity in the two Chinese tourists admitted at the Spallanzani Hospital in Rome on February 21, 2020, the Italian government declared the state of emergency [9]. Extraordinary public health social distance measures, including sealing off large cities, closing borders and social distancing, were instituted only on March 9, 2020 (DCPM #iorestoacasa – I stay at home) to prevent spread of the virus, but by that time much of the damage had been done, as numbers prove. Measures that are more stringent followed on March 13, 20 and 22, 2020. After these decisions, social distance became extreme and unprecedented (Figure 1). A daily press release system has been established as well as education campaigns launched to promote precautions for contagion. Covid-19 outbreak changed habits, routines and life styles, affecting human relationships and work productivity of an entire country. Roads and streets are now desert and the suspicion of infection is at each one's side. At the time of writing (April 15, 2020) there are in Italy 165.155 confirmed case and 21.645 deaths.

Few days after March 9, 2020, we started the PsyCOVID longitudinal study. We designed this psychosocial research study taking into account of three key requirements to test the impact of infectious diseases [10]: i) a systemic perspective, directed to the general public, more

inclusive as possible; ii) a prospective outlook, including a baseline assessment during the social restrictive measures and two follow-ups (the first a month after the abolition of these measures, and the second six months after the first follow-up); iii) measurable outcomes of psychosocial variables, suitable to detect fragile sub-populations who would benefit from specific interventions at the end of the outbreak.

Indeed, extreme social restrictions like social distancing, as well as emergency situations and settings that healthcare professionals have to face every day, require individuals to allocate enormous resources to the process of psychosocial adjustment to the long lasting and substantial impact on life quality. In such a context, increasing distress and loneliness possibly emerging as a result of social distancing can profoundly affect our perception of events. At the same time, effective coping strategies and empathic abilities can help individuals to enhance people's awareness towards the problem, build resilience and increase social responsibility, and thus facing such a complex situation in a more constructive way.

In this paper, we report findings on the baseline assessment of the PsyCOVID study aiming at evaluating differences in the perceived impact of Covid-19 outbreak for health and economy on the Italian population during the very first days of the extreme social distancing measures, specifically taking into account the impact of demographic variables, regional differences (Northern, Central and Southern regions), and professional status (healthcare workers or not).

PARTICIPANTS AND METHODS

2.1 Participants

Between Mar 14 and 21, 2020, we conducted an anonymous on-line survey among adult Italian residents. Study protocol was approved by the university ethics committee (IUSS –

University of Pavia). We selected convenience sampling, selecting participants based on their accessibility and proximity to the research group. We created the survey using Google Forms and distributed it through a link, accessible to anyone (https://forms.gle/5f3yH3aTNJYEuJ7B9). We distributed the survey link via written invitations through e-mails, whatsapp and social network messaging (Facebook, Instagram and Linkedin). Then, we asked initial participants to diffuse the questionnaire through their social networks. Eligibility criteria were age (18 years of age or older), ability to provide an informed consent and place of residence (Italy). At the beginning of the survey, we presented the study objective and timeline, the commitment required to participants, and information about the research team. We asked potential participants to read and provide their informed consent by clicking a box. After providing informed consent, participants were directed to the survey completion. We first invited all participants to provide a reference in order to be contacted for the following phases. Participants did not receive any incentive to take part in the study. The response rate was 98%. We calculated the rate response as the ratio of the number of complete responders to the total number of potential participants who had the chance to access to the first page of the study. Non-responders were persons who did not provide their informed consent to participate or who declared an age < 18 years old.

A total of 1163 adult Italian residents completed the survey (72% females; mean age: 42±13.5 y.o.; age range: 18-81 y.o.). The majority (65.6%) of participants was resident in Northern Italy, 9.6% in Central Italy and 24.8% in Southern Italy. Of all responders, the 14.3% were healthcare professionals. Table 1 provides details about the socio-demographic characteristics of the sample.

2.2 Measures

The questionnaire collected data on socio-demographic characteristics (Table 1), an assessment about the perceived impact of Covid-19 outbreak on health and economy (main outcome measures), and psychosocial factors.

2.2.1 Outcome measures: assessment of the perceived impact of Covid-19 outbreak

We assessed the perceived impact of Covid-19 outbreak with 4 items for health (*average interitem covariance*=0.34; *Cronbach's alpha or α = 0.74*) and 4 items for economy (*average interitem covariance*=0.31; *α = 0.81*). Items of both health and economy scales required participants to rate the perceived severity of Covid-19 outbreak at the local (item 1: city or town), regional (item 2), and global (item 3: national; item 4: international) levels, on a 5-point Likert scale (0=not serious at all; 4=extremely serious). Finally, for each scale we created an index (range 0-16), obtained by summing up the item ratings within each scale. We used the resulting measures as outcome variables in our subsequent analyses.

2.2.2 Psychosocial predictors

In the PsyCOVID study we decided to evaluate a set of specific psychosocial dimensions crucial in emergency settings and situations, including perceived global distress [11,12], loneliness [12], empathic skills [13,14], and coping strategies [15]. To collect information about these psychosocial dimensions we used a battery of validated questionnaires in Italian language. In particular, we assessed the different facets of global distress with the Italian version of the Depression Anxiety Stress Scales-21 [16], allowing obtaining specific sub-scores of depression, anxiety and stress. We used the Empathic Concern and Perspective Taking sub-scales of the Interpersonal Reactivity Index (IRI [17]) to capture emotional and cognitive facets of empathic

abilities, respectively. Loneliness was assessed with the Italian Loneliness Scale [18], including the three sub-scales (Emotional, Social and General Loneliness). Finally, coping strategies were investigated with the short version of the Italian version of the Coping Orientation to the Problems Experienced (COPE-NVI-25 [19]), measuring different coping behaviors or styles towards problems and stressful events, reflected in 5 scale sub-scores (Positive attitude, Problem orientation, Transcendence orientation, Social support, Avoidance strategies).

2.3 Statistical analysis

We performed statistical analyses using SPSS (https://www.spss.it/) and STATA (https://www.stata.com/). Since less than 2% of cases were missing in any analysis, we dropped cases with missing values via list-wise deletion. We set statistical significance at $p < 0.05$ for all statistical tests we performed. We calculated descriptive statistics including frequencies and percentages for categorical variables, and mean and standard deviation for pseudo-continuous variables. We estimated group differences in the perceived impact of Covid-19 outbreak for health and for economy dimensions with a two-way MANOVA, considering geographical area (northern, central and southern regions) and professional status (healthcare professionals vs. non-healthcare professionals) as factors. We additionally described between group differences on psychosocial variables, with geographical area (one-way ANOVA) and professional status (Student's t-test) as grouping variables in separate analyses. We then explored the correlations (Pearson's r coefficient) between psychosocial variables and main outcomes.

Finally, based on correlation results, we tested two mediation models. The first (*Model 1*) tested the indirect effect of the perceived distress (Stress subscale of the DASS-21) on the relationship between loneliness (General Loneliness subscale of the ILS) and perceived

impact of Covid-19 outbreak on health. The second mediation model (*Model 2*) assessed the indirect effect of coping style (Problem orientation sub-score) on the relationship between empathic skills (Composite score of Empathic Concern and Perspective taking sub-scales of the IRI) and perceived impact of Covid-19 outbreak on economy.

3. RESULTS

Descriptive statistics are illustrated in Tables 1-2 and in Figure 2.

The two-way MANOVA showed a significant multivariate effect of both geographic area (Λ=0.955 F(4, 2308)=13.582, p<0.001) and professional status (Λ=0.991 F(2, 1154)=5.042, p=0.007) on the perceived severity of Covid-19 outbreak. However, the interaction between geographic area and professional status was not significant (Λ=0.996; F(4, 2308)=1.031, p=0.390). Univariate results revealed that both geographic area and professional status had a significant effect on the perceived severity for health (*geographic area:* F(2, 1161)=19.391, p<0.001; *professional status*: F(2,1161)=30.920, p=0.035), but not for economy (*geographic area:* F(2, 1161)=0.231, p=0.794; *professional status*: F(2,1161)=0.874, p=0.350).

Post-hoc tests (Tukey HSD) on geographical area showed the perceived severity for health in northern Italy was significantly different from that of central (p<0.001) and southern regions (p<0.001). Briefly, the perceived outbreak impact on health was significantly higher (i.e., more serious) in healthcare workers and in people living in northern Italy, compared to non-healthcare workers and people living in central-southern Italian regions.

Group comparisons on all psychosocial variables by professional status did not show significant results (Table 2). The same was true for group comparisons based on geographical area, with the exception of coping strategies reflecting transcendence orientation, which

characterize southern regions more than central (Tukey HSD, p=0.001) and northern ones (Tukey HSD, p<0.001).

Correlation analyses assessing the relationship between main outcomes and psychosocial variables are reported in Table 3. Several variables were significantly related to one or both study outcomes. On this basis, we selected a small set of variables to test two mediation models. In *Model 1* (Figure 2A), we tested the mediation effect of perceived distress – positively correlated to the dependent variable and negatively with the independent variable – on the positive relationship linking general loneliness (independent variable) and the perceived impact of Covid-19 outbreak for health (dependent variable) (direct effect: Z=-4.32, p<0.001). Results highlighted a significant indirect effect of perceived distress (Z=4.50 p<0.001), mediating approximately the 48% of the total effect of loneliness on perceived impact of Covid-19 outbreak for health. In *Model* 2 (Figure 2B), we tested the mediation effect of problem-oriented coping strategies – positively correlated with both the dependent and the independent variables – on the positive relationship linking empathic skills (independent variable) and the perceived impact of Covid-19 outbreak for economy (dependent variable) (direct effect: Z=2.37, p=0.02). Results highlighted a significant indirect effect of problem-oriented coping (Z=2.81, p=0.005), mediating approximately the 34% of the total effect of perceived social isolation on perceived impact of Covid-19 outbreak for health.

Characteristics	*No. (and %) of respondents*
Sex	
Male	326 (28.0)
Female	837 (72.0)
Age	
Youth age (18-24 y)	61 (5.2)
Young adults (25-39 y)	528 (45.4)
Adults (40-64 y)	475 (40.9)
Elderly (>65 y)	99 (8.5)
Education	
Secondary school (8 y)	26 (2.2)
High school (13 y)	323 (27.8)
Graduate school (16-18 y)	549 (47.2)
Postgraduate school (>18 y)	265 (22.8)
Occupation	
Student	84 (7.2)
Housewife	31 (2.7)
Unemployed	48 (4.1)
Employee	558 (47.9)
Manager	96 (8.3)
Freelance	211 (18.1)
Professor or Researcher	32 (2.8)
Retired	103 (8.9)
Job field	
Industry	106 (9.1)
Financial and Economy	109 (9.4)
Communication Industry	57 (4.9)
Art and Manufacturing	55 (4.7)
Humanistic	188 (16.2)
Non-profit	90 (7.7)
Construction	22 (1.9)
Trade	58 (5.0)
Healthcare	165 (14.3)
Education and University	56 (4.8)
Public Services	54 (4.6)
Others	203 (17.4)
Geographic Area (place of birth)	
Norther Italy	646 (55.5)
Centre Italy	111 (9.5)
Southern Italy	375 (32.3)
Abroad	31 (2.7)
Geographic Area (place of residence)	
Norther Italy	763 (65.6)
Centre Italy	112 (9.6)
Southern Italy	288 (24.8)
Size of place of residence	
Rural area (<1k people)	11 (0.9)
Small-size town (1-10k people)	202 (17.4)
Medium-size town (10-50k people)	314 (26.9)

Small-size city (50-250k people)	243 (20.9)
Medium-size city (250-500k people)	46 (4.0)
Big-size city (500k-1mln people)	142 (12.2)
Metropolis (> 1 mln people)	205 (17.7)

Table 1. Demographic information. The table reports demographic features of the PsyCOVID study baseline sample (N=1163) collected within the first week after the start of the study (March 14-21, 2020).

	A. Professional status		**B. Geographic area**		
	Healthcare	*Non-healthcare*	*Northern Italy*	*Central Italy*	*Southern Italy*
DASS-21 Depression	3,55 ±3,65	3,52 ±3,87	3,44 ±3,65	3,75 ±4,33	3,64 ±4,11
DASS-21 Anxiety	1,84 ±2,46	2,07 ±2,87	1,94 ±2,64	2,01 ±3,20	2,27 ±3,09
DASS-21 Stress	6,21 ± 4,23	5,32 ±4,31	5,60 ±4,15	5,21 ±4,66	5,09 ±4,55
ILS Emotional	7,66 ±4,38	7,61±4,35	7,54 ±4,31	8,12 ±4,42	7,64 ±4,44
ILS Social	13,55 ±4,22	13,44 ±4,39	13,38 ±4,40	13,67 ±4,08	13,59 ±4,37
ILS General	8,48 ±5,11	8,40 ±5,07	8,31 ±5,07	8,66 ±5,04	8,63 ±5,15
IRI Empathic Concern	20,57 ±3,82	20,39 ±4,10	20,35 ±4,09	20,63 ±3,94	20,47 ±4,06
IRI Perspective Taking	18,80 ±4,31	18,23 ±4,57	18,12 ±4,55	18,54 ±4,33	18,72 ±4,56
COPE-NVI-25 Positive attitude	24,32 ±5,38	23,74 ±5,48	23,79 ±5,31	23,13 ±5,25	24,16 ±5,97
COPE-NVI-25 Social support	20,51 ±5,03	19,10 ±5,33	19,44 ±5,16	18,74 ±5,55	19,09 ±5,59
COPE-NVI-25 Problem orientation	21,72 ±4,42	20,66 ±4,75	20,83 ±4,53	19,96 ±4,20	21,05 ±5,35
COPE-NVI-25 Transcendence orientation§	8,82 ±5,95	9,39 ±6,33	8,56 ±5,93	8,87 ±5,82	11,42 ±6,87
COPE-NVI-25 Avoidance strategies	9,40 ±3,65	10,25 ±3,85	9,96 ±3,61	10,48 ±3,93	10,44 ±4,31

Table 2. Group comparisons on psychosocial variables. The table illustrates group comparisons on psychosocial variables assessed taking into account professional status (A) and geographic area (B). For each group we report mean and standard deviation. Statistical significance at $p<0.05$ is indicated with (*) for group comparisons based on professional status and with (§) for group comparisons based on geographic area.

		Outcomes		*Global distress (DASS-21)*			*Loneliness (ILS)*			*Empathy (IRI)*		*Coping (COPE-NVI-25)*				
		H	*E*	*D*	*A*	*S*	*EL*	*SL*	*GL*	*EC*	*PT*	*PA*	*SS*	*PO*	*TO*	*AS*

Outcomes	*H*	-	0,502***	0,072*	0,154***	0,118***	-0,060*	-0,007	-0,88**	0,180***	0,059*	0,043	0,116***	0,0124***	0,099**	-0,29
	E		-	0,091***	0,068*	0,38	-0,015	0,009	-0,019	0,125***	0,079**	0,08**	0,096***	0,125***	0,093***	0,017
Global distress (DASS-21)	*D*			-	0,606***	0,738***	0,324***	-0,181***	0,352***	-0,025	-0,055	-0,110***	0,001	-0,125***	-0,010	0,261***
	A				-	0,656***	0,232***	-0,132***	0,227***	0,49	-0,005	0,066*	0,069*	-0,035	0,071*	0,219***
	S					-	0,291***	-0,124***	0,274***	0,024	-0,047	-0,085**	0,095***	-0,044	-0,008	0,180***
Loneliness (ILS)	*EL*						-	0,258***	0,837***	-0,27	-0,20	0,001	0,038	-0,061*	-0,063*	0,196***
	SL							-	-0,154***	0,241***	0,246***	0,272***	0,367***	0,293***	0,036	-0,122***
	GL								-	-0,096***	-0,065*	-0,021	-0,068*	-0,099**	-0,057	0,252***
Empathy (IRI)	*EC*									-	0,495***	0,318***	0,333***	0,346***	0,177***	-0,127***
	PT										-	0,424***	0,325***	0,402***	0,064*	-0,105***
Coping (COPE-NVI-25)	*PA*											-	0,440***	0,650***	0,178***	0,071*
	SS												-	0,571***	0,184***	0,049
	PO													-	0,177***	-0,097***
	TO														-	0,153***
	AS															-

Table 3. Correlation analyses. The table reports correlation coefficients (Pearson's r) and statistical significance (*p<0.05; **p<0.0; ***p<0.005). *Variable acronyms: H=Perceived impact of COVID-19 on Health; E= Perceived impact of COVID-19 on Economy; D=Depression; A=Anxiety; S=Stress; EL=Emotional loneliness; SL=Social loneliness; GL=General loneliness; EC=Empathic concern; PT=Perspective taking; PA=Positive attitude; SS=Social support; PO=Problem orientation; TO=Transcendence orientation; AS=Avoidance strategies.*

4. DISCUSSION

Covid-19 pandemic seems at present unstoppably inflaming countries all over the world. Although Italy is facing with all the available weapons and tools the main pressing threat represented by a massive amount of affected patients requiring intensive care with a high risk of healthcare systems overwhelming, severe concern arises regarding the Italian national health system's capacity to take the brunt of subsequent psychosocial and economic implications.

Baseline findings of PsyCOVID study suggest that Covid-19 will represent a psychosocial catastrophe. On the one side, healthcare workers strenuously face the emergency not only at the physical level, as they are continuously exposed to the contagion and engaged in patient assistance and care, but they have to cope with a huge psychosocial burden. This requires healthcare professionals to put into play enormous resources to adapt themselves to the new dystopic situation, managing the increasing distress and, contemporary, trying to bring out the most effective coping strategy. On the other side, quarantine and other social distancing measures imposed by Italian authorities to the majority of the population can exacerbate feelings of loneliness and lack of connectedness in socially fragile individuals.

As for SARS outbreak [20,21], persistent psychological symptoms will affect healthcare personnel and outbreak survivors, families of affected patients, quarantined fragile individuals and socially disadvantaged sub-populations (i.e., subjects affected by chronic disease, elderly population with mild cognitive impairments, aged people without close relatives). However, literature reports only a few studies investigating psychological variables related to Covid-19 spread. Wang and co-workers [22] provided evidence of moderate to severe psychological impact of the outbreak in more than half of Chinese respondents, with 16.5% of interviewed individuals having moderate to severe depressive symptoms, 28.8% moderate to severe anxiety symptoms and 8.1% moderate to severe stress levels. Li et al. [23] reported self-

control as resilience factor potentially attenuating perceived severity of the Covid-19 and mental health problems.

Here we provide a first outlook of the psychosocial effects that Covid-19 outbreak is bringing in Italy, in the very first days after the Italian Government Decree #iorestoacasa of March 9, 2020. Our results about the perceived impact of the Covid-19 outbreak suggest that while the economy emergency is viewed as equally serious in all Italian regions and in both healthcare and non-healthcare workers, the health emergency is tightly linked to the professional status and the geographical spread of Covid-19 outbreak. As expected, healthcare workers who have to deal with suffering and deaths day by day judge the health emergency as more serious than people not involved in Covid-19 patients assistance and care. At the same time, individuals living in northern Italy who are dramatically facing illness and sufferance of close relatives and friends feel the health emergency as more urgent than what individuals living in central and southern regions do.

Notably, we provide evidence that the severity of perception of the Covid-19 emergency is related to individual psychosocial vulnerability. First, increased perceived social support (i.e., a low degree of lonelness) was significantly correlated to the increased perception of Covid-19 impact on health. This suggests that the greater an individual's support network is the worse (i.e., more serious) will be his/her judgment about the Covid-19 consequences for health. In other terms, having more people in our own social network increases the probability to have examples of positive or probable cases in mind (feeding the so-called representativeness heuristic [24]) and, thus, to consider the current emergency as more serious. This is particularly true for healthcare professionals who are continuously and physically in touch with patients and colleagues. However, such a relationship is mediated by the perceived distress, contributing to nearly the half of the total effect of loneliness on the perception of Covid-19 impact on health.

Model 2 highlighted that better empathic skills (i.e., how much better I can understand the others' emotions and point of view) are related to a more serious perception of Covid-19 impact on economy. Such a result indicates that a profound understanding of what the restrictive measures imply for Italian entrepreneurs and organizations generates a more serious judgment of the impact of Covid-19 on the Italian economy. Interestingly, we observed that a third of the effect is mediated by problem-oriented coping strategies. This indicates that a way of facing problems based on active strategies, planning, and focused efforts towards the problem resolution makes people more aware about the imminent crisis and get them prepared to face the economic disaster (e.g. industrial conversion of activities to produce goods currently in high demand).

Crucially, psychosocial variables here investigated represent modifiable factors. The scientific literature provides a large range of intervention strategies and programs for each single domain[25-30]. Of course, the day-by-day accurate reporting of the status of the epidemic and experts opinion guidance on prevention and infection control play important roles in stabilizing people and overcoming the epidemic related crisis. Actively mobilizing the population to participate in epidemic prevention and control can help to alleviate social anxiety and the feeling of helplessness, and strengthen the sense of membership to a large community despite the physical distance and isolation due to restrictive measures. Though, real-time updating the information of outbreak effects without hope beyond the darkness could be detrimental in the long time. This is the reason why, into such a catastrophic context, there is the urgent need to develop evidence-driven and multi-faceted intervention strategies to reduce adverse psychological impacts and psychosocial distress during, and especially after, Covid-19 outbreak. Comparably, consensus guidelines to orient physicians, psychologists and other mental care professionals toward an effective unified approach are urgent. The present work provides important suggestions that may help in defining new

intervention programs. Our data, indeed, might help government and health authorities to evaluate how and where to allocate resources in the next future, including personnel, services, care facilities and interventions, to manage the situation in the next months and years.

In conclusion, only time will say us while Italian quarantine measures have prevented a historical disaster. However, the costs of the outbreak are not limited to medical aspects, as the virus has led to significant social, psychological and economic effects globally. Our data teaches us the need to invest in preparedness to prevent, rapidly identify, and contain mid- and long-term consequences of global health emergency outbreaks as Covid-19. Although overreacting with travel bans and quarantines costs efforts and economic resource and impacts in the well-being of millions of individuals cordoned off in a zone of contagion, it is reasonably necessary to contain further disasters. The psychological weight of thousands of suspected and confirmed Covid-19 cases and of huge numbers of deaths is difficult to bear without a known successful scenario. People are suffering from the weight of having a limited access to social or psychological support, as well as from not seeing a future constructive outlook.

In this view, big data analyses should analyze public health risks in the next future in order to adjust health care strategies that can be implemented to achieve further crisis. We all need to move in this direction in order to understand and control the disease now and its effects later. Memory of numbers of affected and diseased people will probably wane but psychosocial consequences will last long. This modern war has just begun.

ACKNOWLEGMENT

We would like to thank all the subjects who contributed to the study. We thank Pigmento-LAB ETS members for their help in survey sharing. We thank William Dello Russo, Valentina Grillo, Carla Cerami and Maria Rosaria Gorgone for their suggestions for the implementation of the on-line questionnaire. We would like to thank Luca Casucci for his support on epidemiologic data. We are grateful to Simona Albertini, Barbara Bianco, Maria Capovilla, Tommaso Ebhardt and Tania Scarpellini for city photographs.

Author Contributions

CCe, GS, CG, CCr: conception and design of the work; CCe, GS, CG, AD, CCr: acquisition, analysis of data; CCe, AD, SF, TV, CCr: interpretation of data. CCe, CCr: drafting the work; CCe, GS, CG, AD, SF, TV CCr: revising and providing the final approval of the work.

Declaration of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding information

N/A

REFERENCES

1. Zhu N, Zhang D, Wang W, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N Engl J Med* 2020; **382**(8): 727-33.

2. Ammad Ud Din M, Boppana LKT. An update on the 2019-nCoV outbreak. *Am J Infect Control* 2020.

3. Li Q, Guan X, Wu P, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *N Engl J Med* 2020; **382**(13): 1199-207.

4. Chan JF, Yuan S, Kok KH, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *Lancet* 2020; **395**(10223): 514-23.

5. Hui DS, E IA, Madani TA, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - The latest 2019 novel coronavirus outbreak in Wuhan, China. *Int J Infect Dis* 2020; **91**: 264-6.

6. Albarello F, Pianura E, Di Stefano F, et al. 2019-novel Coronavirus severe adult respiratory distress syndrome in two cases in Italy: An uncommon radiological presentation. *Int J Infect Dis* 2020; **93**: 192-7.

7. Giovanetti M, Benvenuto D, Angeletti S, Ciccozzi M. The first two cases of 2019-nCoV in Italy: Where they come from? *J Med Virol* 2020; **92**(5): 518-21.

8. Spina S, Marrazzo F, Migliari M, Stucchi R, Sforza A, Fumagalli R. The response of Milan's Emergency Medical System to the COVID-19 outbreak in Italy. *Lancet* 2020; **395**(10227): e49-e50.

9. Remuzzi A, Remuzzi G. COVID-19 and Italy: what next? *Lancet* 2020.

10. Sim K, Chua HC. The psychological impact of SARS: a matter of heart and mind. *CMAJ* 2004; **170**(5): 811-2.

11. Brooks SK, Dunn R, Amlot R, Greenberg N, Rubin GJ. Social and occupational factors associated with psychological distress and disorder among disaster responders: a systematic review. *BMC Psychol* 2016; **4**: 18.

12. Brooks SK, Dunn R, Amlot R, Rubin GJ, Greenberg N. A Systematic, Thematic Review of Social and Occupational Factors Associated With Psychological Outcomes in Healthcare Employees During an Infectious Disease Outbreak. *J Occup Environ Med* 2018; **60**(3): 248-57.

13. Welch SJ. Twenty years of patient satisfaction research applied to the emergency department: a qualitative review. *Am J Med Qual* 2010; **25**(1): 64-72.

14. Wang H, Kline JA, Jackson BE, et al. Association between emergency physician self-reported empathy and patient satisfaction. *PLoS One* 2018; **13**(9): e0204113.

15. Khalid I, Khalid TJ, Qabajah MR, Barnard AG, Qushmaq IA. Healthcare Workers Emotions, Perceived Stressors and Coping Strategies During a MERS-CoV Outbreak. *Clin Med Res* 2016; **14**(1): 7-14.

16. Bottesi G, Ghisi M, Altoe G, Conforti E, Melli G, Sica C. The Italian version of the Depression Anxiety Stress Scales-21: Factor structure and psychometric properties on community and clinical samples. *Compr Psychiatry* 2015; **60**: 170-81.

17. Davis MHJJop, psychology s. Measuring individual differences in empathy: Evidence for a multidimensional approach. 1983; **44**(1): 113.

18. Zammuner VLJIJoSS. Italians' social and emotional loneliness: The results of five studies. 2008; **3**(2): 108-20.

19. Foà C, Tonarelli A, Caricati L, Fruggeri LJPdS. COPE-NVI-25: validazione italiana della versione ridotta della Coping Orientation to the Problems Experienced (COPE-NVI). 2015.

20. Maunder RG. Was SARS a mental health catastrophe? 2009.

21. Mak IWC, Chu CM, Pan PC, Yiu MGC, Chan VLJGhp. Long-term psychiatric morbidities among SARS survivors. 2009; **31**(4): 318-26.

22. Wang C, Pan R, Wan X, et al. Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. *Int J Environ Res Public Health* 2020; **17**(5).

23. Li J-B, Yang A, Dou K, Cheung RY. Self-control moderates the association between perceived severity of the coronavirus disease 2019 (COVID-19) and mental health problems among the Chinese public. 2020.

24. Tversky A, Kahneman D. Judgment under Uncertainty: Heuristics and Biases. *Science* 1974; **185**(4157): 1124-31.

25. Gardiner C, Geldenhuys G, Gott M. Interventions to reduce social isolation and loneliness among older people: an integrative review. *Health Soc Care Community* 2018; **26**(2): 147-57.

26. Falkenberg I, Buchkremer G, Bartels M, Wild B. Implementation of a manual-based training of humor abilities in patients with depression: a pilot study. *Psychiatry Res* 2011; **186**(2-3): 454-7.

27. Masi CM, Chen HY, Hawkley LC, Cacioppo JT. A meta-analysis of interventions to reduce loneliness. *Pers Soc Psychol Rev* 2011; **15**(3): 219-66.

28. Regehr C, Glancy D, Pitts A, LeBlanc VR. Interventions to reduce the consequences of stress in physicians: a review and meta-analysis. *J Nerv Ment Dis* 2014; **202**(5): 353-9.

29. Sharma M, Rush SE. Mindfulness-based stress reduction as a stress management intervention for healthy individuals: a systematic review. *J Evid Based Complementary Altern Med* 2014; **19**(4): 271-86.

30. Weisz E, Zaki JJTohocs. Empathy building interventions: A review of existing work and suggestions for future directions. 2017: 205-17.

FIGURE LEGENDS

Figure 1. Italian ghost towns. The figure illustrates the effect of social distance measures in Italian cities of Milan, Pavia, Venice, Rome and Palermo.

Figure 2. Mediation analyses. The figure illustrates the two mediation models tested for the main outcomes related to perceived impact of COVID-19 outbreak for Health (*Model 1*, Panel A) and for Economy (*Model 2*, Panel B). *Model 1* assessed the mediation effect of perceived distress (DASS-21 Stess sub-scale) on the relationship between perceived loneliness (ILS General Loneliness sub-scale) and perceived impact of COVID-19 outbreak on health. *Model 2* assessed the mediation effect of problem-oriented coping strategies (COPE-NVI-25 Problem orientation sub-scale) on the relationship between empathy (IRI Empathic concern and Perspective Taking sub-scales) and perceived impact of COVID-19 outbreak on economy. *Figure acronyms: IV=Independent variable; DV: Dependent variable; M: mediator.*

Milan

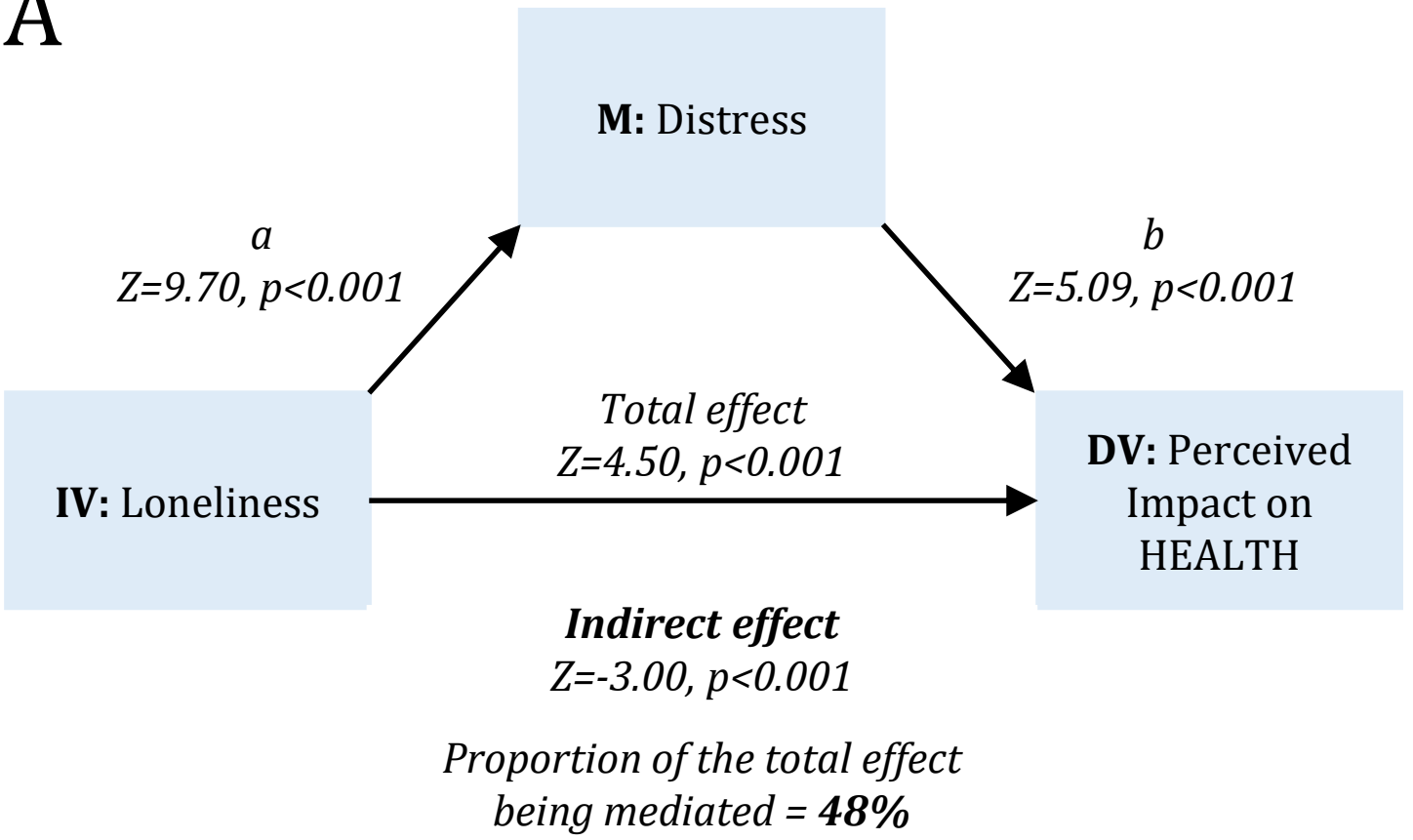
Pavia

Palermo

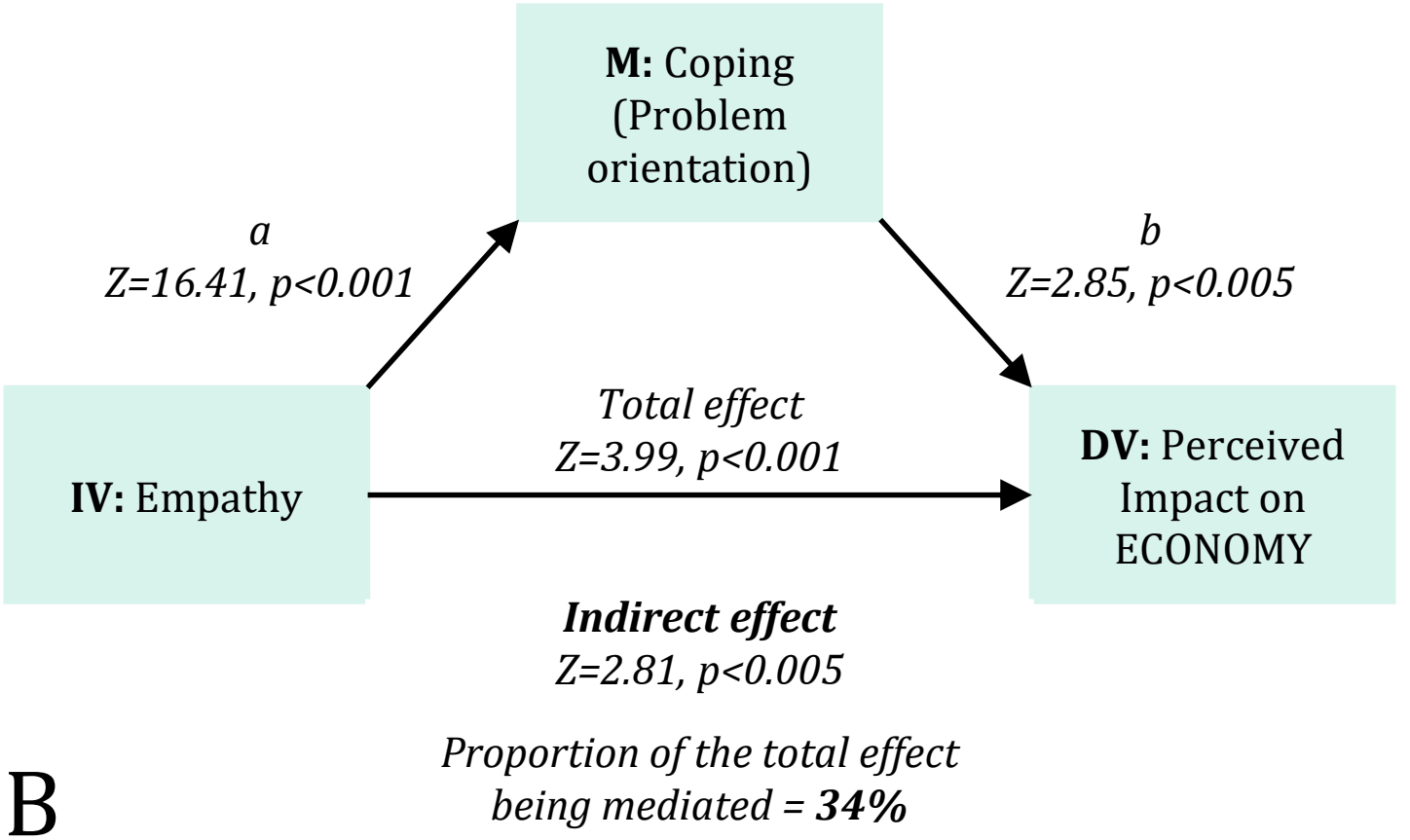
Venice

Rome

A


M: Distress
a
Z=9.70, p<0.001
b
Z=5.09, p<0.001
IV: Loneliness
Total effect
Z=4.50, p<0.001
DV: Perceived Impact on HEALTH
Indirect effect
Z=-3.00, p<0.001
Proportion of the total effect being mediated = 48%

B


M: Coping (Problem orientation)
a
Z=16.41, p<0.001
b
Z=2.85, p<0.005
IV: Empathy
Total effect
Z=3.99, p<0.001
DV: Perceived Impact on ECONOMY
Indirect effect
Z=2.81, p<0.005
Proportion of the total effect being mediated = 34%