

# Telework and its effects on mental health during the COVID-19 lockdown

S. DE SIO<sup>1</sup>, F. CEDRONE<sup>2</sup>, H.A. NIETO<sup>3</sup>, E. LAPTEVA<sup>1</sup>, R. PERRI<sup>1</sup>, E. GRECO<sup>4</sup>, N. MUCCI<sup>5</sup>, E. PACELLA<sup>6</sup>, G. BUOMPRISCO<sup>1</sup>

<sup>1</sup>R.U. of Occupational Medicine, "Sapienza" University of Rome, Rome, Italy

<sup>2</sup>Postgraduate School of Hygiene and Preventive Medicine, University "G. d'Annunzio" of Chieti-Pescara, Chieti, Italy

<sup>3</sup>University of Chilechito, Chilechito, Argentina

<sup>4</sup>Research Department Link Campus University, Rome, Italy

<sup>5</sup>Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy

<sup>6</sup>Department of Sense Organs, "Sapienza" University of Rome, Rome, Italy

**Abstract. – OBJECTIVE:** During the Covid-19 pandemic, many governments promoted the adoption and development of telework to reduce some of the consequences of the current health crisis on the economy and favor social distancing. The aim of this web-based cross-sectional study was to assess the consequences of the Covid-19 pandemic on job organization, exploring the effects of lockdown measures on the psychological distress and perceived well-being of workers experiencing telework.

**SUBJECTS AND METHODS:** A web-based cross-sectional survey has been used to collect data. The participants answered the questionnaire from April 1 to April 30, 2020. The questionnaire consisted of three sections, which investigated: 1) demographic and occupational variables, 2) lifestyle and habits variables, 3) psychological distress and perceived well-being. The General Health Questionnaire (GHQ-12) has been used to evaluate psychological distress and the 5-item World Health Organization Well-Being Index (WHO-5) to explore subjective well-being.

**RESULTS:** Psychological distress was associated with educational level, with habits, and with reporting poor well-being. Poor well-being was associated with a higher job demand during pandemic, lifestyle and habits variables, and psychological distress.

**CONCLUSIONS:** This is one of the first studies exploring the consequences of the COVID-19 pandemic and lockdown measures on the perceived well-being and psychological distress of workers experiencing telework. It is mandatory to pay more and more attention to the mental health of teleworkers, considering the increasing diffusion and adoption of this type of work organization.

*Key Words:*

COVID-19 pandemic, Telework, Lockdown, Mental health.

## Introduction

The beginning of 2020 has been characterized by the pandemic outbreak of a novel human Coronavirus, named SARS-Cov-2. This virus is responsible to cause a disease, COVID-19, that often causes only mild illness, but can also make some people very ill. More rarely, the disease can be fatal, especially among older people, and those with pre-existing medical conditions (such as high blood pressure, heart problems or diabetes). At the end of March 2020, Italy was the world's most affected country by the novel coronavirus spread, counting more than 86.000 confirmed cases. The advanced average age of the Italian population, together with a particular social structure, have also contributed to making the death rate of this country among the highest in the world<sup>1</sup>. The most affected regions of the Country were Lombardia, Piemonte, Veneto, and Emilia-Romagna, counting, together, 72.110 cases and the remaining 16 Italian Regions counting 35.559 cases (April 21, 2020)<sup>2</sup>.

The pandemic forced Governments to establish lockdown measures such as the closing of schools, universities, parks, and non-essential businesses, limiting movements and transports, and promoting social distancing, in order to slow down the

spread of the virus (the “lockdown” was introduced in Italy on March 9, 2020).

That allowed to contain the spread of the virus, helping the Italian health system to face the demands of thousands of people needing hospital advanced care but, on the other hand, it resulted in worse health among people not affected by the virus but forced to stay home and not working<sup>3,4</sup>.

As part of the measures established by the Italian Government for the containment and management of the epidemiological emergency from COVID-19, March 1, 2020, a new decree intervened on how to access the so-called “smart working” or “agile working”. That term refers to, according to the Italian Law no. 81/2017, a working relationship that focuses on organizational flexibility, on the voluntariness of the parties that sign the individual agreement and on the use of information and communication technologies (ICTs) that allow remote working (such as portable PCs, tablets, and smartphones).

In the previous years, that kind of work organization was very little used in Italy; it was the European country with the least number of workers experiencing this form of work, defined by The International Labour Organization (ILO) as “Telework/ICT-Mobile work (TICTM)”<sup>5</sup>.

Across Europe, about 18% of employees and self-employed are “teleworkers”. Scandinavian countries are those that most implemented that kind of work organization; the Netherlands, Luxembourg, the UK, France, and Estonia had a relatively high number of workers performing TICTM. Spain is the South European country with the highest share of ICT-based mobile workers and home-based teleworkers (16%). Among the 18% TICTM in Europe, 15% are employees and 3% are self-employed; in Italy, 36% of self-employed, but only 7% of employees are TICTM. Those variations can be explained by different factors: the spread of ICTs, internet connectivity, ICT skills, economic structure, and geography and culture of work, including managerial models<sup>6</sup>.

Recently a review investigated the relationships between telework and health. The authors identified both health problems (musculoskeletal problems, psychological problems, overwork, and others) and benefits (stress reduction, greater flexibility, better work-life balance/control, and enhanced job satisfaction)<sup>7</sup>.

Other authors administered a survey to a sample of Belgian workers, founding that most part of them who experienced telework during the Covid-19 pandemic reported increased efficiency

and a lower risk of burnout but, on the other hand, the responders think that working from home diminishes their promotion opportunities and weakens ties with their colleagues and employer<sup>8</sup>.

The aim of this web-based cross-sectional study was to assess the consequences of the Covid-19 pandemic on job organization, exploring the effects of lockdown measures on psychological distress and perceived well-being among workers experiencing telework. The authors have successfully applied the same methodology in two previous studies about healthcare workers<sup>9,10</sup>.

## Subjects and Methods

### *Study Design and Participants*

A web-based cross-sectional survey based on Google® Forms has been used to collect data. The survey was accessible during the lockdown period that started in Italy on March 9, 2020, and the participation was voluntary and anonymous. The link of the survey was published on the personal website of the first author (<https://sites.google.com/a/uniroma1.it/simonedesio>), and it was sent to a mailing list of workers from all Italy, in total 821 people, belonging to an association of Italian professionals. The *Smart Working Observatory of the School of Management* of the Politecnico di Milano in 2018 detected 480,000 Italian teleworkers. During the lockdown period, this number has risen to 570,000<sup>11</sup>. The appropriate sample size for an adequate study power was calculated using the EpiInfo™ software, considering a confidence level of 95%, a margin of error of 5% on about 570,000 teleworkers working in Italy. The analysis computed a representative sample size of 384 teleworkers. The STROBE Statement has been adapted to report the results of the study<sup>12</sup>.

### *Data Collection*

The participants answered the questionnaire from April 1 to April 30, 2020. The questionnaire consisted of three sections, which investigated: 1) demographic and occupational variables, 2) lifestyle and habits variables, 3) psychological distress and perceived well-being.

### *Ethical Statement*

This study was conducted in conformity with the Declaration of Helsinki. An electronic informed consent was obtained from each participant before the start of the investigation.

The research involved the use of completely anonymous surveys and the participants were not considered as “vulnerable”. The participation was voluntary, and it did not induce undue psychological stress or anxiety. For these reasons, no ethical approval has been requested, as required by the Institutional Review Board (IRB) of “Sapienza” University; a self-certification was provided about the respect of ethical principles.

### **Questionnaire Sections**

*Demographic and occupational variables.* The first section of the survey explored demographic and occupational characteristics. The demographic variables included gender (male or female), age, educational level, and family status (single or cohabiting). Occupational variables included: 1) working area, in relation to the Italian regions most affected by COVID-19 (Veneto, Lombardia, Piemonte, and Emilia-Romagna) and those that were less affected; 2) professional field; 3) working shifts; 4) job seniority; 5) job demand during pandemic; 6) participation in videoconferences.

*Lifestyle and habits changes.* The second section of the survey explored lifestyle and habits variables. Lifestyle variables included living alone or cohabiting (with partner, family or friend/roommates), feeling sheltered at home, suffering loneliness, feeling comfortable at home. Habit's variables included smoking, eating habits, and alcohol consumption.

*Psychological distress and perceived well-being.* The third section of the survey consisted of two questionnaires: the 12-item version of the General Health Questionnaire (GHQ-12) to evaluate psychological distress and the 5-item World Health Organization Well-Being Index (WHO-5) to explore subjective well-being.

The 12-item General Health Questionnaire (GHQ-12) is a self-report indicator of psychiatric disorders currently experienced by the responder with respect to the last two weeks<sup>13</sup>. It consisted of 12 questions with four possible answers: 1) less than usual, 2) no more than usual, 3) rather more than usual or 4) much more than usual, according to how much the symptoms indicated were experienced. The dichotomous scoring method (0-0-1-1), suggested by the original authors, has been adopted to ensure less dispersion in the results and consider a score  $\geq 4$  as an indicator of psychological distress.

The WHO-5 items questionnaire is a short and generic rating scale checking subjective well-being<sup>14</sup>, chosen because it is short, simple, and has

been used to study the well-being of workers both in Italy and worldwide<sup>15,16</sup>. It consists of five positively worded questions, rated by the respondent from 0 to 5, with higher scores indicating better conditions; a score below 13 indicates poor well-being.

### **Statistical Analysis**

Quantitative variables were expressed as the median and interquartile range (IQR) or as the mean and standard deviation in relation to their distribution; qualitative variables were indicated as frequency and percentage. Univariate analysis, including chi-square for categorical variables, was conducted to assess differences between groups of descriptive variables and the outcome of the questionnaires (dichotomous). The analysis of kurtosis showed that the GHQ-12 questionnaire had a normal distribution in each of the groups formed, according to the answers given. Furthermore, using the *Levene's test*, centered using the 10% trimmed mean, the homogeneity of variances has been demonstrated. Since the statistical assumptions were respected, we proceeded with an analysis of variance (one-way ANOVA) to analyze the differences between the averages of the scores of the GHQ-12 questionnaire between groups identified by the answers given. A post-hoc *Tukey test* was subsequently performed to demonstrate which specific groups were significantly different from each other. As the score of the WHO-5 questionnaire did not satisfy the assumptions for the analysis of variance (one-way ANOVA), it was not carried out and was used to distinguish one group with poor well-being and another with a good level of well-being, useful both for the descriptive univariate and as an independent variable of the one-way ANOVA. Statistical significance was set at  $p < 0.05$ . The data were analyzed using the statistical software *Stata*® version 15.

## **Results**

A total of 575 participants completed the questionnaires (response rate of 70.04%). All the results about prevalence and univariate analysis are shown in Table I.

### **Demographic and Occupational Variables**

Regarding demographic variables, the total sample was made of 348 (60.52%) females and

227 (39.48%) males, with a median age of 40 years (IQR: 33-49). Most of the participants were graduated or post-graduated (73.00%). Most of the responders were employees (65.22%) with a median job seniority of 9 years (IQR: 3-18), 54 (9.39%) were 24h available, while the others had ordinary or flexible shifts. One-third of the sample (30.09%) claimed that they worked more than before the pandemic and two thirds (72.87%) to have participated in video conferencing more often than before.

### ***Lifestyle Habits Changes***

Regarding lifestyle, the total sample was made of 160 workers (27.83%) who were living alone, and 715 who (72.17%) were cohabiting. Just 250 (43.48%) felt “sheltered at home”, 40 (6.96%) suffered from “loneliness”, and 367 (63.83%) felt “comfortable at home”. Among smokers, 44.52% declared to have increased the number of cigarettes. Most of the sample (57.39%) changed eating habits, 256 responders (44.50%) increased food intake, 97 (16.87%) reported having also increased alcohol consumption.

### ***Perceived Well-Being and Psychological Distress***

#### *Univariate analysis*

The evaluation by the GHQ-12 demonstrated the prevalence of psychological distress in females (77.01%), with respect to males (71.37%), even not statistically significant. Workers with higher educational levels reported higher psychological distress ( $p<0.001$ ), as like as those with flexible working shifts ( $p=0.038$ ). It emerged the larger prevalence of psychological distress in workers with a higher job demand during the pandemic ( $p<0.001$ ) and among who did not feel “sheltered in their home” ( $p<0.001$ ), suffered from “loneliness” ( $p<0.001$ ), and who did not feel “comfortable at home” ( $p<0.001$ ). The prevalence of distress was greater in those who changed their eating habits ( $p<0.001$ ).

The evaluation by the WHO-5 demonstrated the prevalence of poor well-being in females (40.52%) with respect to males (27.75%), statistically significant ( $p=0.002$ ). Besides, it was higher in those who reported:

- a higher job demand during the pandemic ( $p=0.004$ );
- not to “feel sheltered at home” ( $p<0.001$ );
- to suffer from “loneliness” ( $p<0.001$ );
- not to feel “comfortable at home” ( $p<0.001$ );

- to have changed their eating habits ( $p<0.001$ );
- to have increased food intake ( $p=0.013$ ).

#### *Multivariate Logistic Analysis*

The results of the multivariate analysis are shown in Table II.

Regarding the results of GHQ-12, psychological distress was associated with post-graduate (OR 2.20; 95% CI 1.20-4.03) and graduate (OR 2.01; 95% CI 1.21-3.34) educational level, with feeling not “sheltered at home” (OR 4.73; 95%CI 1.28-17.48), and with reporting poor well-being (OR 7.39; 95%CI 3.44-15.86).

Regarding the results of WHO-5, poor well-being was associated with having a higher job demand during pandemic (OR 2.61; 95% CI 1.10-6.19), with feeling not “sheltered at home” (OR 8.80; 95%CI 2.60-29.75), with smoking more cigarettes during pandemic (OR 2.47; 95%CI 1.13-5.59), and with experiencing psychological distress (OR 8.01; 95% CI 2.57-24.97).

## **Discussion**

The web-based survey has been administered to a sample of Italian workers experiencing “telework” during the COVID-19 pandemic, to measure psychological distress, subjective well-being, self-rated mood, and changes in their lifestyle habits due to the lockdown.

Two validated, short, and worldwide used tools have been chosen to evaluate the psychological distress and perceived well-being of teleworkers: The General Health Questionnaire (12 items version) and the WHO-5 Well-being Index. The GHQ-12, due to its simplicity and brevity, has been widely used among workers and usually provided good validity and reliability. It represents a general indicator of distress and/or potential problems and has been validated in its Italian version (16). The WHO-Five Well-being Index, according to a quite recent review, can be applied both as a screening tool for depression and to compare well-being between groups<sup>18</sup>.

The COVID-19 pandemic has forced most of the Countries to implement social distancing measures, also known as “lockdown”, with the aim of reducing the virus transmission through respiratory droplets and contact routes by increasing physical distance or reducing social aggregations<sup>19</sup>. The adoption and development of telework helped to reduce some of the consequences of the current health crisis on the economy. In fact, it allowed continuing business even if workplaces were inaccessible<sup>20</sup>.



**Table I.** Characteristics of the sample.

	N. (%)	GHQ-12 score <4	GHQ-12 score ≥4	p-value	WHO-5 score <13	WHO-5 score ≥13	p-value
<b>Total</b>	575 (100)	145 (25.22)	430 (74.78)		371 (64.52)	204 (35.48)	
<b>I. Demographic variables</b>							
<b>Gender</b>							
Female	348 (60.52)	80 (22.99)	268 (77.01)	0.128	207 (59.48)	141 (40.52)	0.002
Male	227 (39.48)	65 (28.63)	162 (71.37)		164 (72.25)	63 (27.75)	
Age median (IQR)	40 (33-49)	40 (33-50)	40 (33-49)	0.944	41 (33-50)	40 (32-49)	0.443
<b>Educational level</b>							
High school	156 (27.1)	57 (36.5)	99 (63.4)	0.001	106 (68.0)	50 (32.0)	0.538
Graduation	270 (47.0)	57 (21.1)	213 (78.9)		169 (62.6)	101 (37.4)	
Post-graduation	149 (26.0)	31 (20.8)	118 (79.2)		96 (64.4)	53 (35.6)	
<b>II. Job characteristics</b>							
<b>Working Area</b>							
Most affected Regions	123 (21.39)	24 (19.51)	99 (80.49)	0.125	71 (57.72)	52 (42.28)	0.206
Less affected Regions	440 (76.52)	116 (26.36)	324 (73.64)		292 (66.36)	148 (33.64)	
Abroad	12 (2.09)	5 (41.67)	7 (58.33)		8 (66.67)	4 (33.33)	
<b>Professional field</b>							
Employee	375 (65.22)	103 (27.47)	272 (72.53)	0.069	243 (64.80)	132 (35.20)	0.974
Director	60 (10.43)	17 (28.33)	43 (71.67)		38 (63.33)	22 (36.67)	
Freelancer	140 (24.35)	25 (17.86)	115 (82.14)		90 (64.29)	50 (35.71)	
<b>Working shift</b>							
Flexible	267 (46.43)	55 (20.60)	212 (79.40)	0.038	169 (63.30)	98 (36.70)	0.201
Available h 24	54 (9.39)	13 (24.07)	41 (75.93)		30 (55.56)	24 (44.44)	
Ordinary	254 (44.17)	77 (30.31)	177 (69.69)		172 (67.72)	82 (32.28)	
Job Seniority median (IQR)	9 (3-18)	10 (4-20)	9 (3-17)	0.681	9 (4-20)	9 (3-15)	0.904
<b>Job demand during pandemic</b>							
Higher than before	173 (30.09)	27 (15.61)	146 (84.39)	<0.001	94 (54.34)	79 (45.66)	0.004
Lower than before	144 (25.04)	31 (21.53)	113 (78.47)		100 (69.44)	44 (30.56)	
Unchanged	258 (44.87)	87 (33.72)	171 (66.28)		177 (68.60)	81 (31.40)	
<b>Do you often participate in video conferences than before?</b>							
Yes	419 (72.87)	99 (23.63)	320 (76.37)	0.150	276 (65.87)	143 (34.13)	0.268
No	156 (27.13)	46 (29.49)	110 (70.51)		95 (60.90)	61 (39.10)	
<b>III. Lifestyle habits during lockdown</b>							
<b>Cohabitants during the lockdown</b>							
Alone	87 (15.13)	20 (22.99)	67 (77.01)	0.793	58 (66.67)	29 (33.33)	0.590
Partner	160 (27.83)	39 (24.38)	121 (75.63)		109 (68.13)	51 (31.88)	
Family	300 (52.17)	77 (25.67)	223 (74.33)		186 (62.00)	114 (38.00)	
Friend\Roommates	28 (4.87)	9 (32.14)	19 (67.86)		18 (64.29)	10 (35.71)	
<b>Feeling sheltered at home</b>							
Yes	250 (43.48)	99 (39.60)	151 (60.40)	<0.001	223 (89.20)	27 (10.80)	<0.001
No	83 (14.43)	3 (3.61)	80 (96.39)		19 (22.89)	64 (77.11)	
Sometimes	242 (42.09)	43 (17.77)	199 (82.23)		129 (53.31)	113 (46.69)	
<b>Suffering loneliness</b>							
Yes	40 (6.96)	2 (5.00)	38 (95.00)	<0.001	7 (17.50)	33 (82.50)	<0.001
No	435 (75.65)	128 (29.43)	307 (70.57)		324 (74.48)	111 (25.52)	
Sometimes	100 (17.39)	15 (15.00)	85 (85.00)		40 (40.00)	60 (60.00)	
<b>Feeling comfortable at home</b>							
Yes	367 (63.83)	119 (32.43)	248 (67.57)	<0.001	280 (76.29)	87 (23.71)	<0.001
No	33 (5.74)	1 (3.03)	32 (96.97)		6 (18.18)	27 (81.82)	
Sometimes	175 (30.43)	25 (14.29)	150 (85.71)		85 (48.57)	90 (51.43)	

Table continued

**Table 1. (Continued).** Characteristics of the sample.

	N. (%)	GHQ-12 score <4	GHQ-12 score ≥4	p-value	WHO-5 score <13	WHO-5 score ≥13	p-value
<b>Smoking habits</b>							
Smokers	155 (26.96)	45 (29.03)	110 (70.97)	0.201	96 (61.94)	59 (38.06)	0.431
Smoking more during lockdown	69 (44.52)	17 (24.64)	52 (75.36)	0.731	32 (46.38)	37 (53.62)	0.001
<b>Change in eating habits</b>							
Yes	330 (57.39)	65 (19.70)	265 (80.30)	<0.001	190 (57.58)	140 (42.42)	<0.001
No	245 (42.61)	80 (32.65)	165 (67.35)		181 (73.88)	64 (26.12)	
Increasing in food consumption	256 (44.5)	51 (19.92)	205 (80.08)	0.544	138 (53.91)	118 (46.09)	0.013
Decreasing in food consumption	74 (12.8)	14 (18.92)	60 (81.08)		52 (70.27)	22 (29.73)	
Increase in alcohol consumption							
Yes	97 (16.87)	20 (20.62)	77 (79.38)	0.253	54 (55.67)	43 (44.33)	0.046
No	478 (83.13)	125 (26.15)	353 (73.85)		317 (66.32)	161 (33.68)	
GHQ (Psychological distressed)	430 (74.8)	-	-	-	235 (54.7)	195 (45.3)	<0.001
WHO (poor wellbeing)	204 (35.5)	9 (4.41)	195 (95.6)	<0.001	-	-	-

IQR=Interquartile range

Mann et al<sup>21,22</sup> in the early 2000s reported that teleworking has a significant emotional impact on employees, with the appearance of negative emotions such as loneliness, irritation, worry, and guilt. Teleworkers overall were also found to experience more mental ill health than office-workers. The results of our study about that correlation may have been influenced by the current pandemic situation, which can induce to feel that staying at home can be much safer than moving to workplaces and/or taking public transports. These considerations match what other authors have recently observed<sup>23</sup>.

Our results indicate that people with lower educational levels had a lower risk of psychological distress than those with higher educational levels. That assumption contrasts with strong evidence that low socioeconomic position is often associated with severe mental health disorders, such as depression<sup>24,25</sup>.

What emerged about lifestyle habits is the rise of unhealthy behaviors among the responders who reported higher levels of psychological distress and lower ones of perceived well-being. We found that half of the responders that reported to be smokers have increased the number of daily cigarettes during the lockdown. Tobacco smoking, in fact, is a well-known coping strategy against psychological stress<sup>26</sup>. Many

studies<sup>27,29</sup> have also reported that those who smoke or drink alcohol usually increase their consumption, in stressful conditions. Eating habits changed for almost half of the participants, and most of them increased food consumption. It is known that psychological stress can alter both the quantity (there is usually an increased food intake) and quality (typically with high sugar or carbohydrate content) of food. Besides, stress-induced alterations in food intake can, in turn, influence mood<sup>30,31</sup>. That concern of food (often unhealthy) intake as a mechanism to cope with stress has also been demonstrated in the literature and can be considered as valid also in the context of this research.

Another important information that can be taken from our research is that the workers who reported not to “feel sheltered at home” felt more psychological distress and poorer well-being. This is consistent with the evidence about the health’s benefits of cohabiting and the negative effects of isolation (i.e., the quarantine)<sup>32,33</sup>.

The results of this paper must be interpreted in light of some limitations: the study is based on a convenient sampling of teleworkers, on the spontaneous participation of the interviewees, and the results’ raw materials may lack generalization; moreover, although we have reached a response rate of 70.04%, that is quite high.

**Table II.** Results of multivariable logistic regression models.

	<b>GHQ-12</b>	<b>p-value</b>	<b>GHQ-12</b>	<b>WHO-5</b>	<b>p-value</b>	<b>WHO-5</b>
	OR (95%CI)		AdjOR (95%CI)	OR (95%CI)	AdjOR (95%CI)	
Male vs. Female	0.74 (0.50-1.08)	0.128	-	0.56 (0.39-0.80)	0.002	0.78 (0.41-1.49)
<b>Age (year)</b>	1.00 (0.98-1.01)	0.864	-	0.99 (0.97-1.00)	0.419	
<b>Educational level</b>		0.001	-		0.535	
High school	Ref.		Ref.	Ref.		
Graduation	2.15 (1.38-3.33)	0.001	2.01 (1.21-3.34)	1.26 (0.83-1.92)	0.266	
Post-graduation	2.19 (1.31-3.65)	0.003	2.20 (1.20-4.03)	1.17 (0.72-1.88)	0.516	
Less vs. Most affected Regions	1.50 (0.92-2.46)	0.102	-	1.44 (0.96-2.17)	0.076	
<b>Professional field</b>		0.060			0.974	
Employee	Ref.		Ref.	Ref.		
Director	0.95 (0.52-1.75)	0.889	0.62 (0.29-1.28)	1.06 (0.60-1.87)	0.825	
Freelancer	1.74 (1.06-2.83)	0.026	1.50 (0.85-2.65)	1.02 (0.68-1.53)	0.914	
Working shift		0.038			0.208	
Flexible	1.67 (1.12-2.50)	0.011	1.20 (0.75-1.92)	1.21 (0.84-1.74)	0.289	
Available h 24	1.37 (0.69-2.70)	0.361	0.87 (0.38-1.97)	1.67 (0.92-3.05)	0.090	
Ordinary	Ref.		Ref.	Ref.		
Job seniority (years)	0.99 (0.97-1.00)			0.98 (0.97-1.00)	0.165	
<b>Job demand during pandemic</b>		<0.001			0.004	
Higher than before	1.48 (0.83-2.62)	0.176	1.33 (0.70-2.54)	1.91 (1.20-3.03)	0.006	2.01 (0.85-4.75)
Lower than before	Ref.		Ref.	Ref.		Ref.
Unchanged	0.53 (0.33-0.86)	0.011	0.69 (0.40-1.20)	1.04 (0.66-1.61)	0.862	2.61 (1.10-6.19)
<b>Do you often participate in video conferences than before?</b>						
Yes vs. No	1.35 (0.89-2.03)	0.151		0.80 (0.55-1.17)	0.268	
<b>Cohabitants during the lockdown</b>		0.800			0.588	
Alone	Ref.					
Partner	0.86 (0.49-1.51)	0.612		1.22 (0.74-2.02)	0.428	
Family	0.92 (0.50-1.71)	0.807		0.93 (0.53-1.63)	0.815	
Friend\Roommates	0.63 (0.24-1.60)	0.334		1.11 (0.45-2.71)	0.817	
<b>Feeling sheltered at home</b>		<0.001			<0.001	
Yes	Ref.		Ref.			
Ref.		Ref.				
No	17.48 (5.37-56.90)	<0.001	4.73 (1.28-17.48)	27.82 (14.53-53.25)	<0.001	8.80 (2.60-29.75)
Sometimes	3.03 (2.00-4.59)	<0.001	1.39 (0.83-2.31)	7.34 (4.51-11.60)	<0.001	2.02 (0.90-4.51)
<b>Suffering loneliness</b>		<0.001			<0.001	
Yes	Ref.		Ref.	Ref.		Ref.
No	0.12 (0.03-0.53)	0.005	0.49 (0.09-2.55)	0.07 (0.03-0.16)	<0.001	0.23 (0.04-1.30)
Sometimes	0.29 (0.06-1.36)	0.120	0.45 (0.08-2.52)	0.31 (0.12-0.78)	0.013	0.29 (0.05-1.76)
<b>Feeling comfortable at home</b>		<0.001			<0.001	
Yes	Ref.		Ref.	Ref.		Ref.
No	15.35 (2.07-113.71)	0.008	1.86 (0.20-16.71)	14.48 (5.79-36.22)	<0.001	0.82 (0.18-3.70)
Sometimes	2.87 (1.78-4.63)	<0.001	1.46 (0.82-2.58)	3.40 (2.32-4.99)	<0.001	1.01 (0.48-2.15)
<b>Smoking habits during lockdown</b>						
Smokers	0.76 (0.5-1.15)	0.201		1.16 (0.79-1.70)	0.431	
Smoking more during lockdown	1.11 (0.60-2.04)	0.731		2.42 (1.41-4.13)	0.001	2.47 (1.13-5.59)

Table continued

**Table II. (Continued).** Results of multivariable logistic regression models.

	GHO-12	p-value	GHO-12	WHO-5	p-value	WHO-5
<b>Change in eating habits</b>						
Yes vs. No	1.97 (1.35-2.89)	<0.001	1.43 (0.92-2.21)	2.08 (1.45-2.98)	<0.001	1.08 (0.39-2.94)
Increasing vs decreasing	1.18 (0.67-2.07)	0.544		1.89 (1.14-3.15)	0.014	1.55 (0.67-3.55)
<b>Increase in alcohol consumption</b>						
Yes vs. No	1.36 (0.80-2.32)	0.254		1.56 (1.00-2.44)	0.047	1.83 (0.83-4.01)
GHQ (Psychological distressed)	-	-		12.53 (6.22-25.27)	<0.001	8.01 (2.57-24.97)
WHO (poor wellbeing)	12.53(6.22-25.27)	<0.001	7.39 (3.44-15.86)	-	-	-

### Conclusions

This is one of the first studies exploring the consequences of the Covid-19 pandemic and lockdown measures on workers' perceived well-being and psychological distress experiencing telework. The relatively small number of reports about the health effects of telework suggest that this kind of work arrangement can expose to many psychosocial risks: isolation, lack of support, stress, and overwork. Actually, there are no generally accepted preventive protocols to assess the mental health of teleworkers, but we demonstrated that those workers are at risk of unhealthy eating behaviors and increased cigarette smoking, especially among those with higher education levels, who live alone, and who are exposed to workloads.

Our research invites paying more and more attention to the mental health of teleworkers, considering the increasing diffusion and adoption of this type of work organization. Occupational physicians may play a central role in that process even by health promotion campaigns (healthy diets, tobacco smoking cessation) and supporting employers in the risk assessment.

### Funding

The Authors declare that they received no funding for this study.

### Conflict of Interest

The Authors declare that they have no conflict of interests.

### References

- 1) The Italian Statistical Institute. [https://www.istat.it/it/files/2020/05/Istat-ISS\\_-eng.pdf](https://www.istat.it/it/files/2020/05/Istat-ISS_-eng.pdf). Accessed: 01/02/21.
- 2) The Italian Ministry of Health. [http://www.salute.gov.it/imgs/C\\_17\\_notizie\\_4558\\_0\\_file.pdf](http://www.salute.gov.it/imgs/C_17_notizie_4558_0_file.pdf). Accessed: 01/02/21.
- 3) Gerli AG, Centanni S, Miozzo MR, Virchow JC, Sotgiu G, Canonica GW, Soriano JB. COVID-19 mortality rates in the European Union, Switzerland, and the UK: effect of timeliness, lockdown rigidity, and population density. *Minerva Med* 2020; 111: 308-314.
- 4) Zhang SX, Wang Y, Rauch A, Wei F. Unprecedented disruption of lives and work: Health, distress and life satisfaction of working adults in China one month into the COVID-19 outbreak. *Psychiatry Res* 2020; 288: 112958.
- 5) The European Foundation for the Improvement of Living and Working Conditions. <https://www.eurofound.europa.eu/sites/default/files/wpef18007.pdf>. Accessed: 08/01/21.
- 6) The European Foundation for the Improvement of Living and Working Conditions. [https://www.eurofound.europa.eu/sites/default/files/ef\\_publication/field\\_ef\\_document/ef1634en.pdf](https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef1634en.pdf). Accessed: 08/01/21.
- 7) Buomprisco G, Ricci S, Perri R, De Sio S. Health and telework: new challenges after COVID-19 pandemic. *European J Env Publi* 2021; 5: em0073.
- 8) Baert S, Lippens L, Moens E, Sterkens P, Weytjens J. The COVID-19 crisis and telework: a research survey on experiences, expectations and hopes. GLO Discussion Paper, No. 532, Global Labor Organization (GLO), Essen, 2020.
- 9) De Sio S, Buomprisco G, La Torre G, et al. The impact of COVID-19 on doctors' well-being: results of a web survey during the lockdown in Italy. *Eur Rev Med Pharmacol Sci* 2020; 24: 7869-7879.
- 10) De Sio S, La Torre G, Buomprisco G, Lapteva E, Perri R, Corbosiero P, Ferraro P, Giovannetti A, Greco E, Cedrone F. Consequences of COVID-19-pandemic lockdown on Italian occupational physicians' psychosocial health. *PLoS One* 2021; 16: e0243194. doi: 10.1371/journal.pone.0243194.
- 11) The Smart Working Observatory of the School of Management. <https://www.osservatori.net/it/ricerche/infografiche/smart-working-diffusione-flessibilita-infografica>. Accessed: 09/01/2021.



- 12) Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ* 2007; 335: 806-808.
- 13) Goldberg DP, Gater R, Sartorius N, Ustun TB, Piccinelli M, Gureje O, Rutter C. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med* 1997; 27: 191-197.
- 14) WHO. Well-being measures in primary health care/The Depcare project. WHO Regional Office for Europe: Copenhagen, 1998.
- 15) Schütte S, Chastang JF, Malard L, Parent-Thirion A, Vermeylen G, Niedhammer I. Psychosocial working conditions and psychological well-being among employees in 34 European countries. *Int Arch Occup Environ Health* 2014; 87: 897-907.
- 16) Nena E, Katsaouni M, Steiropoulos P, Theodorou E, Constantinidis TC, Tripsianis G. Effect of Shift Work on Sleep, Health, and Quality of Life of Health-care Workers. *Indian J Occup Environ Med* 2018; 22: 29-34.
- 17) Piccinelli M, Bisoffi G, Bon MG, Cunico L, Tansella M. Validity and test-retest reliability of the Italian version of the 12-item General Health Questionnaire in general practice: a comparison between three scoring methods. *Compr Psychiatry* 1993; 34: 198-205.
- 18) Topp CW, Østergaard SD, Søndergaard S, Bech P. The WHO-5 well-being index: a systematic review of the literature. *Psychother Psychosom* 2015; 84: 167-176.
- 19) WHO. Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations: scientific brief, 27 March 2020. World Health Organization, 2020.
- 20) Guitton MJ. Cyberpsychology research and COVID-19. *Comput Human Behav.* 2020; 111: 106357.
- 21) Mann S, Varey R, Button W. An exploration of the emotional impact of tele-working via computer-mediated communication. *J Manag Psychol* 2000; 15: 668-686.
- 22) Mann S, Holdsworth L. The psychological impact of teleworking: stress, emotions and health. *New Technol Work Employ* 2003; 18: 196-211.
- 23) Golden TD, Veiga JF, Dino RN. The impact of professional isolation on teleworker job performance and turnover intentions: does time spent teleworking, interacting face-to-face, or having access to communication-enhancing technology matter? *J Appl Psychol* 2008; 93: 1412-1421.
- 24) Lorant V, Deliège D, Eaton W, Robert A, Philippot P, Anseau M. Socioeconomic inequalities in depression: a meta-analysis. *Am J Epidemiol* 2003; 157: 98-112.
- 25) Wang JL, Schmitz N, Dewa CS. Socioeconomic status and the risk of major depression: the Canadian National Population Health Survey. *J Epidemiol Community Health* 2010; 64: 447-452.
- 26) Piazza PV, Le Moal M. The role of stress in drug self-administration. *Trends Pharmacol Sci* 1998; 19: 67-74.
- 27) Newbury-Birch D, Walshaw D, Kamali F. Drink and drugs: from medical students to doctors. *Drug Alcohol Depend* 2001; 64: 265-270.
- 28) Pomerleau OF, Pomerleau CS. Behavioural studies in humans: anxiety, stress and smoking. *Ciba Found Symp* 1990; 152: 225-239.
- 29) De Sio S, Tittarelli R, Di Martino G, Buomprisco G, Perri R, Bruno G, Pantano F, Mannocchi G, Marinelli E, Cedrone F. Alcohol consumption and employment: a cross-sectional study of office workers and unemployed people. *PeerJ* 2020; 8: e8774.
- 30) Epel E, Lapidus R, McEwen B, Brownell K. Stress may add bite to appetite in women: a laboratory study of stress-induced cortisol and eating behavior. *Psychoneuroendocrinology* 2001; 26: 37-49.
- 31) Oliver G, Wardle J, Gibson EL. Stress and food choice: a laboratory study. *Psychosom Med* 2000; 62: 853-865.
- 32) Amato PR. Marriage, cohabitation and mental health. *Family Matters* 2015; 96: 5-13.
- 33) Hossain MM, Sultana A, Purohit N. Mental health outcomes of quarantine and isolation for infection prevention: a systematic umbrella review of the global evidence. *Epidemiol Health* 2020; 42: e2020038.