

Supplementary Material

Supplementary methods

Composite variables

Variables used in the multivariate analyses were devised from the applied questionnaire in the c1 wave (performed between May and July, 2020). These variables are explained below:

SOCIODEMOGRAPHIC VARIABLES

1. *Older than 60 years-old*
2. *Non-white ethnicity*
3. *College degree*
4. *Female sex*

LONELINESS RELATED VARIABLES

1. Relationship quality:
 - *Worsened relationship quality* (reference for comparison)
 - *Improved relationship quality*
 - *Maintained relationship quality*

For relationship quality, the following variables were assessed:

- How did your relationship with your family change during the pandemic?
- How did your relationship with your friends change during the pandemic?

Each variable ranges from: *Considerably Worsened* (1) to *Considerably Improved* (5). We summed these variables and then dichotomized in tertiles. The upper tertile was *Improved*, the middle tertile was *Maintained*, the lower tertile was *Worsened*.

2. *Living alone*
3. *Married*
4. *Living with people > 60 years-old*
5. *Living with child in school age*

COMORBIDITIES

1. *Alcohol abuse*

Alcohol abuse was defined as >1 dose/day for women and >2 doses/day for men during a given week.

2. *Active smoker*

3. *Presence of chronic diseases*

- *No chronic disease* (reference for comparison)
- *Having 1 chronic disease*
- *Having >1 chronic disease*

For chronic diseases, participants were asked whether they had ever been diagnosed with one of the following:

- Diabetes
- Arterial Hypertension
- Myocardial Infarction
- Stroke
- Asthma
- Chronic Bronchitis
- Autoimmune Disease
- Other chronic diseases
- None

4. *Obesity*

We assessed current participant weight, and used baseline height data. Body Mass Index (BMI) was calculated as weight divided by the square of height. Obesity was defined as $BMI \geq 30$.

5. *Good physical health*

Participants were asked how they considered their physical health compared to people their own age, the answer ranged from *very bad* (1) to *very good* (5) in a likert scale. The score was then binarized in *Good physical health* (5) and *Not very good physical health* (1-4).

6. *Previous mental disorders*

Participants were asked if they have previously received one of the following diagnoses:

- Schizophrenia
- Depression
- Generalized Anxiety Disorder
- Obsessive Compulsive Disorder
- Personality Disorder
- Bipolar Disorder
- Substance Use Disorder
- Eating Disorder
- Other Psychiatric diagnosis
- None

BEHAVIOURS RELATED TO COVID-19

1. *In agreement with federal measures*
2. *In agreement with institutional, municipal and state measures*

Participants were assessed with 4 questions asking if they agree with measures against COVID-19 from the institution they work in, from their municipality, from their state and from the federal government. Variables ranged from *Totally disagree (1)* to *Totally agree (5)*.

We observed positive correlation between the three first aforementioned variables. They were summed up and binarized, the upper part was *In agreement with institutional, municipal and state measures*.

Federal government answers had negative correlation with all the others. This variable was binarized, and the upper part was *In agreement with federal measures*.

3. *Adequately informed about COVID-19*

Three questions were elaborated regarding participants' knowledge about COVID-19. The questions were related to three main aspects:

- Symptomatology
- Transmissibility
- Prevention hygiene

All questions were measured through a scale ranging from 0 to 2 (*'not informed'* to *'well informed'*, respectively). The scores of the three variables were summed up. Finally participants were classified as being *Inadequately informed (0- 5)* or *Adequately informed (6)* about COVID-19.

4. *Adopting adequate preventive measures*

Participants were assessed regarding the frequency they adopted the following recommendations to reduce risk of COVID-19 transmission:

- Washing hands frequently
- Removing shoes before entering home
- Wearing masks
- Covering mouth and nose when sneezing
- Refraining from shaking hands or kissing when greeting somebody
- Washing store bought packages before use
- Using alcohol gel

Answers ranged from never (0) to always (4), they were summed up and dichotomised into *Not adopting adequate preventive measures (0-26)* and *Adopting adequate preventive measures (27-28)*.

5. *Obedience to quarantine*

Obedience to quarantine was considered when participants answered to be following recommendations to stay at home during the quarantine period. This was assessed through a binary variable: *staying at home vs. not staying at home*.

COVID-19 EXPOSURE

1. *Being a healthcare worker*

Participants who reported to be working during the pandemic period answered in which sector they were working in. The participant was allowed to choose one or more options among 9 activities: 1) Medical and hospital area (Direct patient care); 2) Medical and hospital area (Supporting activities); 3) Public security; 4) Cleaning; 5) Supply jobs; 6) Food jobs; 7) Journalism; 8) Research; 9) Other(s).

Options 1 and 2 were considered '*Being a healthcare worker*'.

2. *Being retired*

3. *Working from home*

4. *Working at the office*

Participants who were not retired were assessed concerning where they were working. If they reported working exclusively from home, they were considered *Working from home*, otherwise *Working at the office*.

5. *Presented COVID-19 symptoms*

Participants were asked whether they presented symptoms related to the COVID-19 disease since the beginning of the pandemic crisis in Brazil. Following symptoms were assessed:

- Fever
- Cough
- Shortness of breath
- Sore throat
- Fatigue (Physical)
- Loss of smell
- Decreased sense of smell
- Loss of taste
- Decreased sense of taste

DISTRESS RELATED VARIABLES

1. *Increased domestic chores*

Domestic chores were assessed by the following question: "In the last 30 days, your domestic chores were: More than usual (3); Same as usual (2); Less than usual (1); I don't know or does not apply (0). The score was binarized and participants who answered More than usual (3) were categorized as having *Increased domestic chores*.

2. *Concerns about income*

Concerns on income were assessed by 3 questions:

- Are you concerned about your family's financial situation in the next few months?
- Are you concerned about your family's food security in the next few months?
- Are you concerned about an income decrease in the next few months?.

Participant's answers ranged from Very concerned (3) to Mildly concerned (1).

The variables were summed up and then dichotomized; the higher scores (≥ 8) were defined as having *Concerns about income*.

3. *Stress relieving practices*

- *No Stress relieving practices* (reference for comparison)
- *Sporadic stress relieving practices*
- *Frequent stress relieving practices*

Stress alleviating practices during the quarantine period was assessed through 16 options ranging from 1 to 4 ('I did not practice'; '1/2x per week'; '3/4x per week'; '5/7x per week') and the option 'does not apply'. The following practices were evaluated:

- Meditation/mindfulness
- Deep breathing techniques
- Pray or join prayer groups
- Gardening activities
- Physical activities indoor
- Arts and/or crafts
- Read books/magazines
- Writing texts, poetry, chronicles, on notebooks etc
- Watch movies, TV series, youtube videos
- Play video game
- Play musical instruments or singing
- Listen to music
- Taking care of pets
- Online psychotherapy (Skype or other platforms)

The average of the applicable variables was then calculated and the final score was dichotomized in the following tertiles: *frequent, sporadic or no stress relieving practices*

4. *Self-reported distress*

- *Self-reported distress (1st quartile)* (reference for comparison)
- *Self-reported distress (2nd quartile)*
- *Self-reported distress (3rd quartile)*
- *Self-reported distress (4th quartile)*

Stress under quarantine was assessed through 7 questions with answers ranging from 1 to 5, concerning how stressful it has been to:

- Stay at home
- Avoid contact
- Stop meeting friends
- Stop meeting relatives
- Cancel important events
- Cancel vacations or travel
- Follow news about the pandemic

The sum was then divided in quartiles defined in *first* (7-15), *second* (16-21), *third* (22-26) and *fourth* (27-35).

Missing data

_____Missing scores for participants were imputed using multiple imputation by chained equations (MICE) (Buuren, 2010), a method which estimates missing values by using a series of regressions of non-missing values. A model is fit for each of the datasets created using MICE, and the final performance is reported as an average of all models. This method is commonly used for longitudinal, outcome variables (Liao *et al.*, 2014). Data from 1943, 1799 and 1571 participants were available at c1 (May-July, 2020), c2 (July-September, 2020) and c3 (October-December, 2020). Missing scores were imputed using the same variables from our questionnaire which were used to create the composite exposure variables. DASS models used to assess longitudinal variation of symptom scores were then evaluated in the data frames created by MICE and reported results are the pooled effects of the models (Figure 3, Table S3).

At c1, data from 2117 participants who had completed CIS-R were available. Out of these, 174 participants (8.2% of sample) did not complete the questionnaire that was sent in parallel with CIS-R to evaluate exposure variables. This data was considered to be missing at random and imputed using MICE. Results from multivariate models were obtained by pooling results from models for each generated data frame, and are reported in Figures 4, S1 and S2, and Table S2.

Supplementary results

Differences between responders and non-responders

Table S1. Comparison of responders and non-responders of Wave-Covid.

	Overall	Non-Responders	Responders	P-Value
N	4297	2180	2117	
Socio-economic				
Age	63.2 ± 8.8	64.1 ± 8.9	62.3 ± 8.4	<0.001
Educational Level				<0.001
Bellow High School	275 (6.4)	252 (11.6)	23 (1.1)	
High School	309 (7.2)	260 (11.9)	49 (2.3)	
Incomplete College	1719 (40.0)	931 (42.7)	788 (37.2)	
University Degree	1994 (46.4)	737 (33.8)	1257 (59.4)	
Gender				<0.001
Male	1914 (44.5)	1030 (47.2)	884 (41.8)	
Female	2383 (55.5)	1150 (52.8)	1233 (58.2)	
Self-reported Ethnicity				<0.001
Black	580 (13.7)	356 (16.6)	224 (10.7)	
Mixed (Brown)	889 (21.0)	528 (24.6)	361 (17.3)	
White	2538 (59.9)	1144 (53.2)	1394 (66.7)	
Yellow	191 (4.5)	89 (4.1)	102 (4.9)	
Indigenous	41 (1.0)	32 (1.5)	9 (0.4)	
CIS-R Diagnoses				
Depressive Disorders				0.093
0	4126 (96.0)	2082 (95.5)	2044 (96.6)	
1	171 (4.0)	98 (4.5)	73 (3.4)	
Anxious Disorders				0.002
0	3637 (84.7)	1809 (83.0)	1828 (86.5)	
1	657 (15.3)	371 (17.0)	286 (13.5)	
Obsessive Compulsive Disorder				0.803
0	4197 (97.7)	2131 (97.8)	2066 (97.6)	
1	100 (2.3)	49 (2.2)	51 (2.4)	
Common Mental Disorder				0.012
0	3262 (75.9)	1619 (74.3)	1643 (77.6)	
1	1035 (24.1)	561 (25.7)	474 (22.4)	

Comparison between responders and non-responders using t-test for continuous variables and χ^2 -tests for categorical variables. Socioeconomic data reported from wave 1 (age based on date of birth), and CIS-R scores from wave 3 (collected between 2016-2018) was used for comparisons.

Table S2. Models for CIS-R symptom and DASS-21 scores over the course of the pandemic

	β	99.5%CI	P
CIS-R Total Symptom			
3rd vs. 1st	-0.62	(-1.34, 0.05)	0.012
c1 vs. 1st	-0.64	(-1.31, 0.08)	0.009
CIS-R Depression			
2nd vs. 1st	0.07	(-0.25, 0.39)	0.513
3rd vs. 1st	-0.07	(-0.39, 0.24)	0.516
c1 vs. 1st	-0.17	(-0.48, 0.15)	0.142
DASS-21 Total Symptom			
c2 vs. c1	-1.08	(-1.44, -0.71)	<0.001
c3 vs. c1	-1.22	(-1.58, -0.86)	<0.001
c3 vs. c2	-0.14	(-0.50, 0.22)	0.275
DASS-21 Stress			
c2 vs. c1	-0.46	(-0.61, -0.30)	<0.001
c3 vs. c1	-0.48	(-0.64, -0.33)	<0.001
c3 vs. c2	-0.03	(-0.18, 0.12)	0.614
DASS-21 Depression			
c2 vs. c1	-0.29	(-0.43, -0.15)	<0.001
c3 vs. c1	-0.37	(-0.50, -0.23)	<0.001
c3 vs. c2	-0.08	(-0.21, 0.06)	0.115
DASS-21 Anxiety			
c2 vs. c1	-0.33	(-0.44, -0.22)	<0.001
c3 vs. c1	-0.37	(-0.48, -0.26)	<0.001
c3 vs. c2	-0.04	(-0.15, 0.07)	0.270

c1 = first assessment of wave-covid, performed between May-July, 2020 . c2 = wave-covid second contact, performed between July-September, 2020. c3 = wave-covid third contact, performed between October-December, 2020. Significant comparisons with $p < 0.005$ are highlighted in bold.

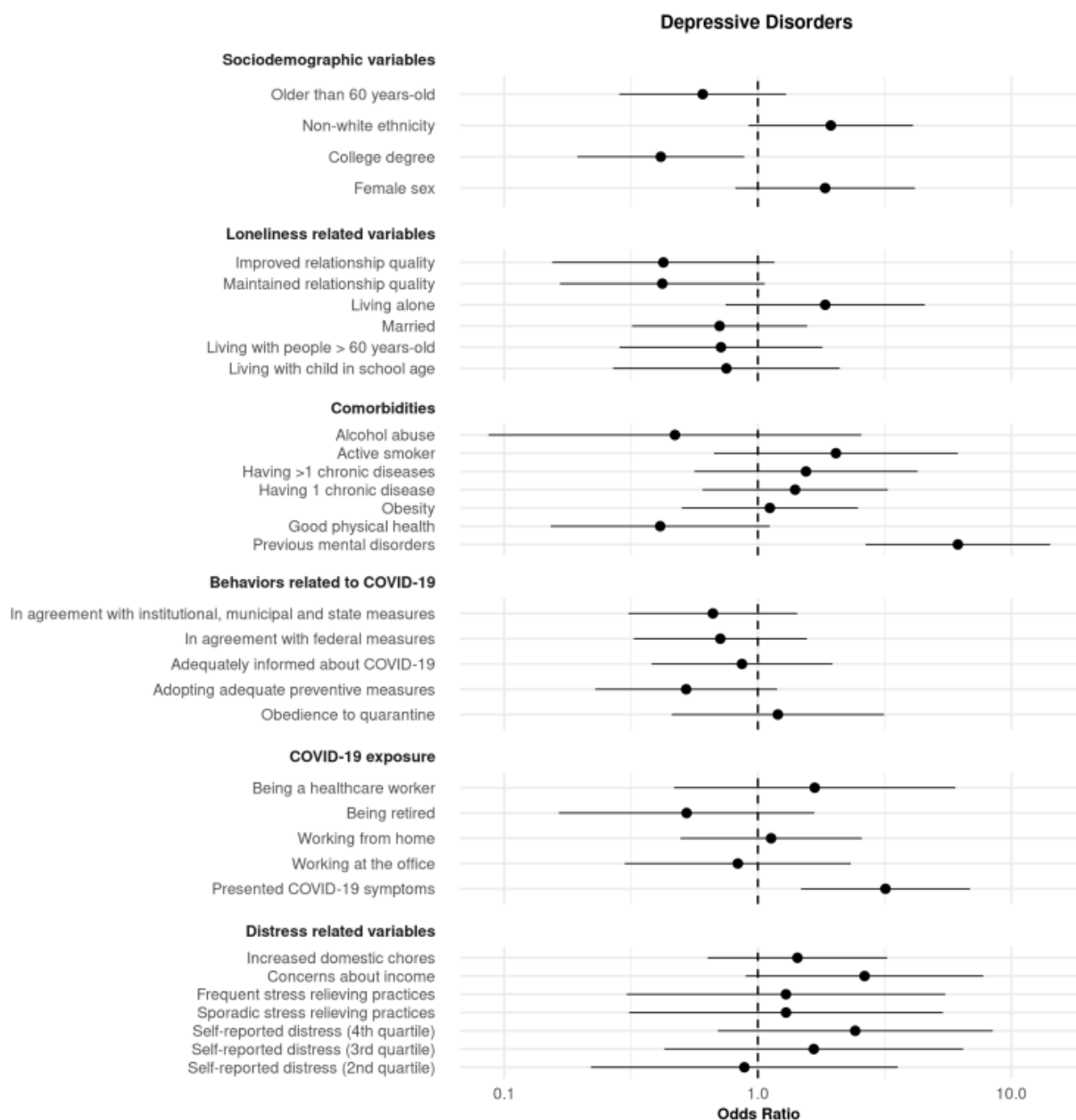
Table S3. Association between exposure variables and diagnoses from CIS-R.

Exposure Variables	Common Mental Disorder			Anxiety Disorders			Depressive Disorders		
	OR	99.5% CI	P	OR	99.5% CI	P	OR	99.5% CI	P
Sociodemographic variables									
Female sex	1.95	(1.42-2.7)	<0.001	1.41	(0.88-2.26)	0.042	1.84	(0.82-4.16)	0.035
College degree	0.58	(0.43-0.78)	<0.001	0.52	(0.33-0.81)	<0.001	0.41	(0.19-0.88)	0.001
Non-white ethnicity	1.61	(1.18-2.19)	<0.001	1.28	(0.8-2.04)	0.135	1.94	(0.92-4.09)	0.013

Older than 60 years-old	0.52	(0.38-0.7)	<0.001	0.48	(0.3-0.76)	<0.001	0.61	(0.28-1.29)	0.064
Distress related variables									
Self-reported distress (1st quartile)	ref								
Self-reported distress (2nd quartile)	1.62	(0.96-2.75)	0.01	1.5	(0.66-3.41)	0.168	0.89	(0.22-3.56)	0.803
Self-reported distress (3rd quartile)	2.11	(1.26-3.54)	<0.001	2.61	(1.23-5.52)	<0.001	1.66	(0.43-6.45)	0.284
Self-reported distress (4th quartile)	3.95	(2.44-6.4)	<0.001	2.93	(1.36-6.27)	<0.001	2.42	(0.7-8.43)	0.044
No stress relieving practices	ref								
Sporadic stress relieving practices	0.99	(0.55-1.79)	0.969	1.05	(0.44-2.54)	0.873	1.29	(0.31-5.36)	0.613
Frequent stress relieving practices	0.91	(0.5-1.66)	0.668	1.1	(0.45-2.68)	0.768	1.29	(0.3-5.48)	0.62
Concerns about income	2.16	(1.48-3.17)	<0.001	2.03	(1.11-3.72)	0.001	2.64	(0.9-7.76)	0.012
Loneliness related variables									
Increased domestic chores	1.05	(0.75-1.48)	0.667	1.03	(0.62-1.72)	0.858	1.43	(0.63-3.23)	0.214
Living with child in school age	1.03	(0.7-1.54)	0.809	0.96	(0.49-1.88)	0.855	0.75	(0.27-2.1)	0.434
Living with people > 60 years-old	1.1	(0.78-1.57)	0.425	0.99	(0.58-1.69)	0.967	0.72	(0.29-1.8)	0.308
Married	0.79	(0.57-1.11)	0.054	1.34	(0.79-2.25)	0.118	0.71	(0.32-1.56)	0.22
Worsened relationship quality	ref								
Maintained relationship quality	0.49	(0.32-0.76)	<0.001	0.59	(0.33-1.04)	0.009	0.42	(0.17-1.06)	0.009
Improved relationship quality	0.52	(0.34-0.79)	<0.001	0.62	(0.33-1.15)	0.03	0.42	(0.15-1.16)	0.017
Living alone	1.03	(0.67-1.59)	0.85	0.66	(0.31-1.39)	0.11	1.84	(0.75-4.55)	0.057
Comorbidities									
Previous mental disorders	3.39	(2.44-4.71)	<0.001	3.93	(2.44-6.33)	<0.001	6.15	(2.66-14.2)	<0.001
Good physical health	0.38	(0.25-0.58)	<0.001	0.43	(0.23-0.8)	<0.001	0.41	(0.15-1.11)	0.012
Obesity	1.25	(0.9-1.75)	0.06	1.21	(0.75-1.98)	0.262	1.12	(0.5-2.48)	0.701
Not having any chronic disease	ref								
Having 1 chronic disease	1.38	(0.97-1.96)	0.011	1.34	(0.79-2.3)	0.12	1.4	(0.61-3.25)	0.258
Having >1 chronic diseases	1.95	(1.27-3)	<0.001	2.36	(1.31-4.28)	<0.001	1.55	(0.56-4.27)	0.225
Active smoker	1.43	(0.86-2.4)	0.048	1.82	(0.96-3.43)	0.008	2.03	(0.67-6.15)	0.067
Alcohol abuse	0.94	(0.56-1.56)	0.725	0.83	(0.37-1.85)	0.516	0.47	(0.09-2.56)	0.212
Behaviors related to COVID-19									
Obedience to quarantine	1.16	(0.8-1.7)	0.261	1.04	(0.6-1.81)	0.845	1.2	(0.46-3.14)	0.594
Adopting adequate preventive measures	0.93	(0.68-1.29)	0.557	1	(0.63-1.6)	0.993	0.52	(0.23-1.19)	0.027
Adequately informed about COVID-19	0.84	(0.61-1.16)	0.121	0.84	(0.52-1.35)	0.295	0.87	(0.38-1.97)	0.62
In agreement with federal measures	0.73	(0.51-1.04)	0.012	0.9	(0.55-1.47)	0.547	0.71	(0.32-1.56)	0.224

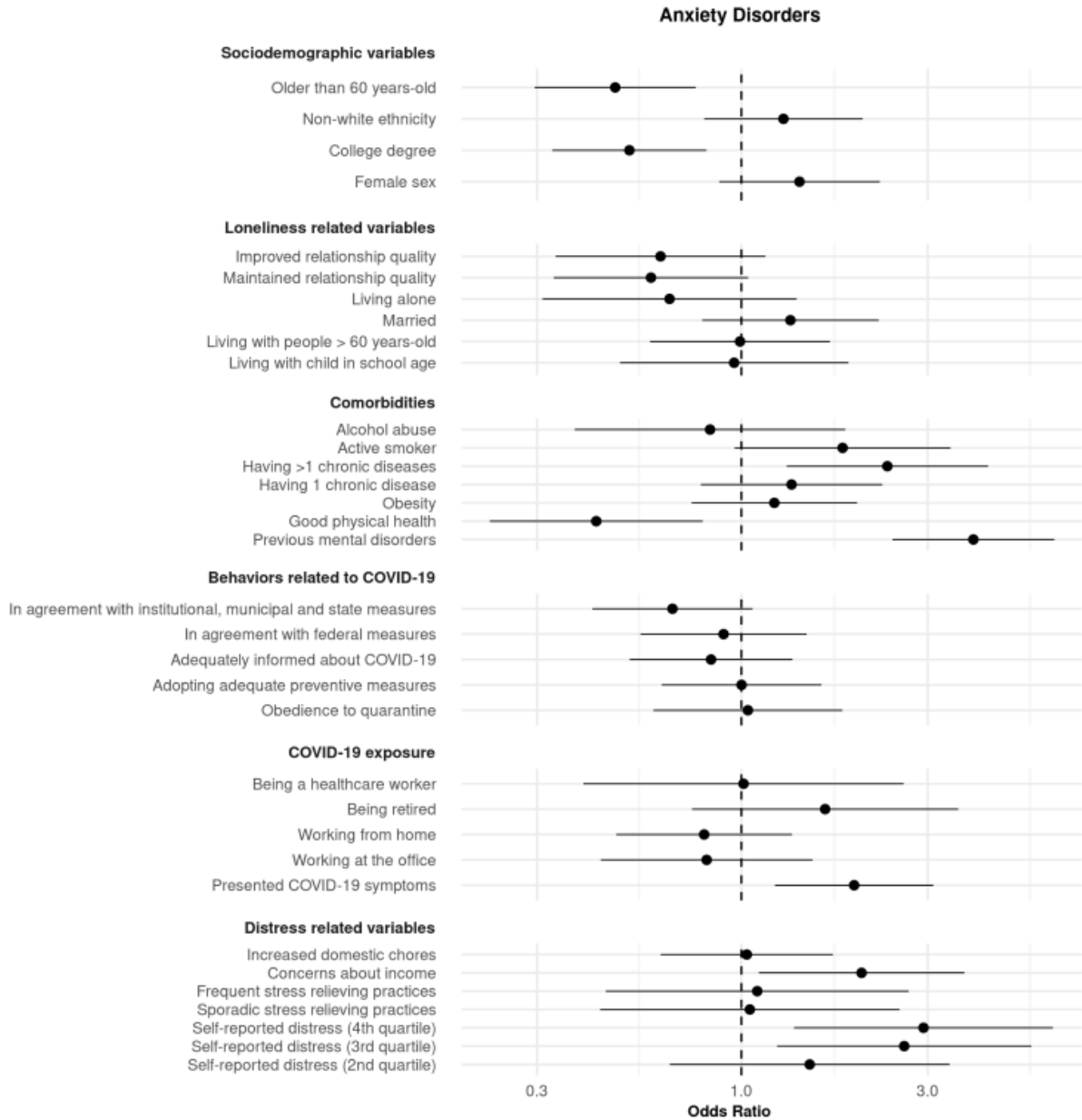
In agreement with institutional, municipal and state measures	0.73	(0.53-1)	0.005	0.67	(0.42-1.07)	0.016	0.67	(0.31-1.43)	0.135
COVID-19 exposure									
Presented COVID-19 symptoms	2.8	(2.03-3.86)	<0.001	1.94	(1.22-3.1)	<0.001	3.19	(1.48-6.86)	<0.001
Working at the office	0.74	(0.48-1.14)	0.048	0.82	(0.44-1.52)	0.358	0.83	(0.3-2.33)	0.62
Working from home	1.19	(0.85-1.67)	0.15	0.8	(0.48-1.35)	0.234	1.13	(0.5-2.57)	0.68
Being retired	0.95	(0.57-1.59)	0.767	1.64	(0.75-3.59)	0.06	0.52	(0.16-1.67)	0.101
Being a healthcare worker	0.88	(0.45-1.72)	0.605	1.01	(0.39-2.6)	0.969	1.68	(0.47-6.01)	0.255

Figure S1. Association of several exposure variables with depressive disorders.



Association was measured using Odds Ratios (ORs) and 99.5% Confidence Intervals. ORs > 1 and < 1 indicate variables associated with increased and decreased risk, respectively. Models were adjusted by age, sex, ethnicity and educational level.

Figure S2. Association of several exposure variables with anxiety disorders.



Association was measured using Odds Ratios (ORs) and 99.5% Confidence Intervals. ORs > 1 and <1 indicate variables associated with increased and decreased risk, respectively. Models were adjusted by age, sex, ethnicity and educational level.

References

- Buuren S** (2010) mice: Multivariate imputation by chained equations in R. *dspace.library.uu.nl Journal of statistical.*
- Liao SG, Lin Y, Kang DD, Chandra D, Bon J, Kaminski N, Scirba FC, Tseng GC** (2014) Missing value imputation in high-dimensional phenomic data: imputable or not, and how? *BMC bioinformatics* **15**, 346.