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Impact of economic crises, work organization, and vocational rehabilitation on mental health in Italy

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Human resources should be regarded as the main capital of the European economy.

Marco Biagi, 2001

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ABSTRACT

The thesis investigates the relationship between work and mental health in Italy from three perspectives.

In the first paper, the relationship between hospital admissions due to psychiatric disorders and the severe economic downturn caused by the 2008 financial crisis was studied. Also, the buffering mechanism exerted by social protection (SP) was considered. Among women, increased unemployment was associated with increased hospitalizations due to organic and senile mental disorders, while decreased gross domestic product (GDP) was associated with increased hospitalizations due to all psychiatric disorders, mood disorders, alcohol-related disorders, and substance-related disorders. Among men, increased unemployment was associated with increased hospitalizations due to all psychiatric disorders, mood disorders, schizophrenia and other psychotic disorders, and organic and senile mental disorders. Decreased GDP was associated with increased hospitalizations due to all psychiatric disorders and alcohol-related disorders. SP buffered the negative mental health outcomes caused by decreased GDP in both genders, specifically with respect to alcohol-related disorders. Between 2008 and 2014 hospitalization costs exceeded 79,425,797 euros at national level, i.e. 11,346,542 euros per year.

In the second paper, the efficacy and effectiveness of vocational rehabilitation programs (VRPs) carried out at the Modena Mental Health Department (MHD) were retrospectively assessed. All users of the Modena MHD included in VRPs in 2018 were enrolled. A before-after analysis was carried out. Also, exposed users were compared to a non-experimental control group, made up of users not included in VRPs in 2018, homogeneous in terms of socio-demographic characteristics, diagnosis, and severity level. In 2018, 62 users ended the VRP (women 29, 46%; mean age 43 ± 13 years old), thus representing the sample of exposed users. The before-after comparison showed that after the beginning of VRPs, the number and days of hospitalization significantly decreased, and no compulsory hospitalization was needed. Also, the median of urgent health interventions declined. In 2018, VRPs made it possible to reduce costs up to 49,243.50 euros, i.e. 794.25 euros per user. Of the 62 users who ended VRPs, on 31 December 2018 twenty-seven were employed (44% of the sample). Eleven users had an open-end contract while sixteen users had a fixed-term contract.

The third paper investigated the association between work environment factors and risk of depression after retirement. A secondary retrospective analysis was carried out using data from the Survey of Health, Ageing and Retirement in Europe (SHARE), wave 6 and 7. The latter provided retrospective data on the respondents' working conditions before retirement. Binary logistic regressions were used to analyze the association between presence of depression after retirement (detected by the Euro-D scale) and work environment factors in 584 individuals. With respect to work environment factors only fair salary was associated with reduced risk of depression after retirement (OR=0.75, $p=0.047$). Female gender, number of chronic diseases and presence of the partner in the household increased the risk of depression (OR=1.84, $p<0.01$; OR=1.58, $p<0.01$; OR=1.45, $p<0.01$, respectively), while higher education decreased it (OR=0.88, $p=0.048$). With respect to personality, the risk of depression after retirement increased a higher level of neuroticism (OR=1.49, <0.01). Differently, increased conscientiousness was associated with decreased risk of depression (OR=0.73, $p=0.06$).

RIASSUNTO

La tesi indaga la relazione tra lavoro e salute mentale in Italia da tre prospettive. Nel primo paper è stata studiata la relazione tra ricoveri ospedalieri dovuti a disturbi psichiatrici e la grave crisi economica successiva al 2008. Inoltre, si è approfondito il ruolo di moderatore svolto dalla protezione sociale (PS). Nelle donne è emerso che l'aumento della disoccupazione si associa ad aumentate ospedalizzazioni dovute a disturbi mentali organici e senili, mentre la riduzione del Prodotto Interno Loro (PIL) si associa ad aumentate ospedalizzazioni dovute a tutti i disturbi psichiatrici, disturbi dell'umore, disturbi da uso di alcool e disturbi da uso di sostanze. Negli uomini è emerso che l'aumento della disoccupazione si associa ad aumento delle ospedalizzazioni dovute a tutti i disturbi psichiatrici, disturbi dell'umore, schizofrenia e altri disturbi psicotici, e disturbi organici e mentali senili. La riduzione del PIL si associa ad aumentate ospedalizzazioni dovute a tutti i disturbi psichiatrici e ai disturbi da uso di alcool. È emerso che la PS modera gli effetti negativi per la salute mentale causati dalla contrazione del PIL in entrambi i generi, specificamente per quanto riguarda i disturbi da uso di alcool. Infine, si è stimato che tra il 2008 e il 2014 i costi legati alle ospedalizzazioni abbiano superato i 79,425,797 euro a livello nazionale, pari a 11,346,542 di euro all'anno.

Nel secondo paper, si sono indagate efficacia ed efficienza dei programmi di inserimento lavorativo (PDIL) attivati presso il Dipartimento di Salute Mentale (DSM) di Modena. Tutti gli utenti inclusi nei PDIL nel 2018 sono stati arruolati. Si è ricorso ad una analisi pre-post, e al successivo confronto con un gruppo di controllo non sperimentale, costituito da utenti del DSM di Modena non inclusi nei PDIL nel 2018, omogeneo in termini di caratteristiche sociodemografiche, diagnosi e livello di gravità. Nel 2018, 62 utenti hanno portato a termine i PDIL (donne: 29, 46%; età media 43 ± 13 anni), costituendo così il gruppo degli esposti. L'analisi pre-post ha mostrato che dopo l'inizio dei PDIL il numero e i giorni di ospedalizzazione sono diminuiti significativamente, e non vi è stato bisogno di ricorrere a Trattamenti Sanitari Obbligatorii. Inoltre, la mediana di accessi in urgenza presso i Centri di Salute Mentale si è ridotta. Nel 2018, i PDIL hanno consentito una riduzione dei costi fino a 49,243.50 euro, cioè 794.25 euro per utente. Al 31 dicembre 2018, 27 utenti erano impiegati (44% del campione): 11 con un contratto di lavoro a tempo indeterminato, 16 a tempo determinato.

Il terzo paper ha indagato l'associazione tra fattori ambientali lavorativi e rischio di depressione dopo il pensionamento. È stata condotta un'analisi retrospettiva su dati della "Survey of Health, Ageing and Retirement in Europe" (SHARE), wave 6 e 7, che hanno fornito dati retrospettivi sulle condizioni lavorative prima del pensionamento. Sono state effettuate regressioni logistiche binarie per analizzare l'associazione, in 584 italiani, tra presenza di depressione dopo il pensionamento (individuata dalla scala Euro-D) e fattori ambientali lavorativi. Tra questi, solo l'equità del salario è risultata associata alla riduzione del rischio di depressione ($OR=0.75$, $p=0.047$). Genere femminile, numero di malattie croniche e presenza del/della partner nel nucleo familiare sono risultati associati alla depressione ($OR=1.84$, $p<0.01$; $OR=1.58$, $p<0.01$; $OR=1.45$, $p<0.01$, rispettivamente), mentre un maggiore livello di istruzione è risultato associato a una riduzione del rischio ($OR=0.88$, $p=0.048$). Infine, il rischio di depressione dopo il pensionamento aumenta all'aumentare dei livelli di neuroticismo ($OR=1.49$, $p<0.01$), mentre livelli più alti di coscienza sono associati a riduzione del rischio di depressione ($OR=0.73$, $p=0.06$).

Impact of the late 2000s economic crisis on hospitalizations due to psychiatric disorders and related costs for mental health care in Italy

ABSTRACT

This paper investigates the relationship between hospital admissions due to psychiatric disorders and the severe economic downturn caused by the 2008 global financial crisis in Italy. Also, the buffering mechanism potentially exerted by social protection (SP) was considered. It was found that among women, increased unemployment was associated with increased hospitalizations due to organic and senile mental disorders, while decreased gross domestic product (GDP) was associated with increased hospitalizations due to all psychiatric disorders, mood disorders, alcohol-related disorders, and substance-related disorder. Among men increased unemployment was associated with increased hospitalizations due to all psychiatric disorders, mood disorders, schizophrenia and other psychotic disorders, and organic and senile mental disorders. Decreased GDP was associated with increased hospitalizations due to all psychiatric disorders and alcohol-related disorders. SP buffered the negative mental health outcomes caused by decreased GDP in both genders, specifically with respect to alcohol-related disorders. Finally, a cost analysis suggested that between 2008 and 2014 hospitalizations cost exceeded 79,425,797 euros at national level, 11,346,542 euros per year. The global financial crisis caused increased psychiatric hospitalizations in Italy, with gender specificity, and increased costs for the National Health System budget. Adequate resources should be allocated to mental health care and social protection measures.

Keywords: *economic crisis; mental health; psychiatric hospital admissions; social protection; Italy; fixed effect panel regression*

INTRODUCTION

Economic crises may influence hospital admissions (Brenner, 1967; Kammerling & O'Connor, 1993; Silva et al., 2018) and readmissions (Ahr et al., 1981; Callaly et al., 2010; Schmutte et al., 2009) due to psychiatric disorders. Yet, a few studies analyzed this relationship in the late 2000s and early 2010s, when a severe economic downturn occurred, following the 2008 global financial crisis (Cheung & Marriott, 2015). Silva et al. (2018) reviewed the literature on this topic, and found that periods of economic hardship may increase hospital admissions for mental disorders. Yet, according to the authors, several methodological issues and mixed results limit the generalization of findings, hence the need of further research.

Economic downturns may even decrease hospital admissions, as reported in the United States (Burgard & Hawkins, 2014), potentially due to a lack of health insurance coverage. Moreover, gender differences may be attributed to males having less coverage than females (2-8% less) (Chen & Dagher, 2016). Therefore, recessions may determine different health outcomes according to the type of health service available in a Country.

Social protection (SP) moderates the relationship between mental health and economic crises (Stuckler et al., 2009a; Stuckler & Basu, 2013). Hence, the governments' choice to implement austerity policies may have negative effects on mental health (Stuckler & Basu, 2013). This may explain the mental health outcomes reported following the global financial crises (Frasquilho et al., 2016; Margerison-Zilko, et al., 2016; Martin-Carrasco et al., 2016), when austerity policies were implemented in several European countries. It was the case of Italy, as well, where counter-cyclical measures were not implemented due to the high level of the national debt (de Belvis et al., 2012).

In the light of the above, the aim of the present study was to investigate the relationship between psychiatric hospitalizations and economic downturns in Italy, and the role played by SP as potential buffering mechanism against the mental health outcomes of the economic downturns. The hypothesis was that the global financial crisis and the following years of economic hardship may have determined increased hospitalizations due to mental disorders in Italy. With respect to the role played by SP, the latter was expected to be able to reduce the negative mental health outcomes of the crisis. A cost analysis was also carried out to estimate how hospitalizations due to psychiatric disorders may impact the budget of the Italian NHS, which is universal, public, and funded mainly by taxation (with a small degree of co-payment by users).

To the author's knowledge, only the paper by Wang & Fattore (2020) addressed a similar topic in Italy. This paper contributes to the debate in several ways. First, more psychiatric disorders were included in this study. Second, SP was included in the analysis. Third, since increased hospitalizations due to mental health problems cause increased public expenditure, a cost analysis was carried out. During economic crises, the drop of GDP may reduce the resources available for the NHS, while increased hospitalizations may cause increased costs. The situation may become worse when SP is cut due to austerity measures. This paper focuses on all these aspects.

METHODS

Study design and data collection

Health and economic indicators were collected from the website www.dati.istat.it and from “Health for All Italy” database, that can be freely downloaded from <http://www.istat.it/it/archivio/14562>. Both are powered by the Italian National Institute of Statistics (ISTAT). Five types of indicators were collected:

- 1) Regional rates of hospital discharge for the following clinical classifications software (CCS), disaggregated by gender: all psychiatric disorders, mood disorders, alcohol-related disorders, substance-related disorders, schizophrenia and other psychotic disorders, anxiety disorders, other psychoses, mental retardation, organic and senile mental disorders, disorders usually diagnosed in infancy, childhood, or adolescence, other mental disorders, screening and history of mental health and substance abuse codes, men. CCS were defined by the Agency for healthcare research and quality (www.ahrq.gov), building on the Diagnosis Related Groups (DRGs) system; they are expressed as rate of discharge (with respect to the local population) per 100,000 inhabitants.
- 2) Macroeconomic indicators: male and female unemployment rates (UR), based on the standard International Labour Organization (ILO) definition of people unemployed who are seeking jobs as a proportion of the total labor force. The regional real Gross Domestic Product (GDP) per capita (in euros) was also collected, considering 2010 as reference year, since poverty and socio-economic inequalities affect the epidemiology of psychiatric disorders (Ribeiro et al., 2017).
- 3) Regional aging index, i.e. the ratio between the population aged 65 or more years old and the population aged 0-14 years old. Since data concerning hospital admissions were disaggregated only by gender, the aging index was used to adjust the regression analysis.
- 4) Rates of curative care beds in hospital (per 100,000 inhabitants): this indicator was included since in the last decades the absolute numbers and rates of hospital beds decreased in Italy and in the rest of Europe (Eurostat, 2017).
- 5) Social protection (SP) was retrieved from the ISTAT SocialCohesion.Stat database (<http://dati.coesione-sociale.it/?lang=it>); it refers to regional per capita expenditure on social services and benefits delivered by single and associated municipalities, and was chosen for availability of data and consistency with a previous Italian study carried out on the topic (De Vogli, 2013).

Since complete data were available for years 2005-2014, the latter was considered the observation period of this study. In addition, given that in 2008 began the global financial crisis, whose economic consequences last in Italy up to the end of 2014, while the Country was not in economic crisis between 2005 and 2008, this study focuses specifically on the effects of economic downturns on hospital admissions.

The level of analysis was regional since according to the Italian Constitution the NHS is organized at regional level. Specifically, the twenty Italian regions autonomously decide how to implement the Essential Levels of Care fixed at central level (Italian Ministry of Health, 2017).

Data management and econometric framework

To test the hypothesis that the economic crisis may have determined increased hospitalizations, and that SP may have played a role as buffering mechanism, a panel regression with fixed effects by OLS was estimated. The specification is:

$$Y_{i,t} = \beta_1 U_{i,t} + \beta_2 GDP_{i,t} + \beta_3 Hospital\ beds_{i,t} + \beta_4 Age_{i,t} + \beta_5 Trend + \alpha_i + u_{i,t} \quad (1)$$

In Eq. (1), $i = 1, \dots, 20$ represents the cross-sectional dimension, in other words the 20 Italian regions; $t = 1, \dots, 10$ represents the time dimension (from 2005 to 2014). $Y_{i,t}$ is the regional rate of discharge, for specific psychiatric disorders, disaggregated by gender. $U_{i,t}$ is the regional UR; $GDP_{i,t}$ is the regional GDP per capita; $\beta_3 Hospital\ beds_{i,t}$ is the regional rate of curative hospital beds; $\beta_4 Age_{i,t}$ is the regional aging index (disaggregated by gender); $\beta_5 Trend$ is a set of temporal dummies. $\alpha_{i,t} = \alpha_1, \dots, \alpha_n$ are the *fixed effects* capturing unobservable regional heterogeneity, i.e. variables not included that differ across regions, but are constant over time (e.g. different levels of social capital, different number of hospital beds, etc.). $u_{i,t}$ are the residuals.

Since a specific SP measure was considered, potentially able to affect some psychiatric groups but not all, first a panel regression without including SP was run, as shown in Eq. (1); then, the analysis was repeated including SP, as shown in Eq.(2). Finally, two interaction variables were included, to test the potential moderating effect of SP, as displayed in Eq. (3) and (4).

In Eqs. (2)-(4), $\beta_6 SP_{i,t}$ is the annual per capita expenditure on SP, at regional level. $\beta_7(SP_{i,t} * U_{i,t})$ is an interaction term defined to capture the potential buffering effect of SP. It is obtained by multiplying regional expenditure on social services and benefits (in euros) per UR, and captures how the effects of UR on the outcome vary at different levels of SP. Differently, in Eq. (4) $\beta_7(SP_{i,t} * GDP_{i,t})$ is an interaction term obtained by multiplying regional expenditure on SP per regional GDP (both in euros). It captures how the effects of GDP on the outcome vary at different levels of SP.

In all analyses, an alpha level below $p < 0.05$ was considered significant.

$$Y_{i,t} = \beta_1 U_{i,t} + \beta_2 GDP_{i,t} + \beta_3 Hospital\ beds_{i,t} + \beta_4 Age_{i,t} + \beta_5 Trend + \beta_6 SP_{i,t} + \alpha_i + u_{i,t} \quad (2)$$

$$Y_{i,t} = \beta_1 U_{i,t} + \beta_2 GDP_{i,t} + \beta_3 Hospital\ beds_{i,t} + \beta_4 Age_{i,t} + \beta_5 Trend + \beta_6 SP_{i,t} + \beta_7(SP_{i,t} * U_{i,t}) + \alpha_i + u_{i,t} \quad (3)$$

$$Y_{i,t} = \beta_1 U_{i,t} + \beta_2 GDP_{i,t} + \beta_3 Hospital\ beds_{i,t} + \beta_4 Age_{i,t} + \beta_5 Trend + \beta_6 SP_{i,t} + \beta_7(SP_{i,t} * GDP_{i,t}) + \alpha_i + u_{i,t} \quad (4)$$

Cost analysis

The cost analysis was carried out as follows. A mean length of stay in acute psychiatric inpatient units of 12 days was considered (Abbate Daga et al., 2011; Ministry of Health, 2017; Wang & Fattore 2020), and multiplied for the cost of one day of hospital stay in acute psychiatric inpatient units: 306.75 euros (Rampazzo, 2014). This product was further multiplied for the coefficient of UR of all psychiatric disorders obtained at the panel regression, thus obtaining the effect of a marginal increment (+1%) of unemployment on hospitalizations due to all psychiatric disorders (per 100,000 people). From 2008 to 2014 UR increased steadily. Therefore, the annual increase in UR per year was calculated, i.e. $\Delta U\%_t$ in Eq (5). Using this percentage, the annual increase in hospital admission (β_{year}) was obtained using Eq. (5):

$$+1\% \Delta U : \beta_I = \Delta U\%_{year} : \beta_{year} \quad (5)$$

By multiplying $\beta_I * \Delta\%$, β_{year} was obtained, i.e. the number of hospital admission per 100,000 people in a given year (from 2008 to 2014). β_{year} was calculated from 2008 to 2014, so to obtain the overall increase in the number of hospital admission during the economic crisis. Also, by multiplying this sum per the average cost of admission to acute psychiatric inpatient units, the cost of psychiatric hospital admissions during the economic crisis per 100,000 was obtained. This result was further adjusted for national and regional population, on annual basis. Please note that this is a conservative approach focused only on direct costs.

Ethics

All data were anonymous and aggregated at the origin, therefore Ethics Committee approval was not necessary. The guidelines governing research from the Declaration of Helsinki were followed.

RESULTS

All variables used in this study are detailed in the Appendix.

Impact of economic crises on hospitalizations

As Table 1 shows, a 1% increase in female UR was associated with 1.67 hospitalizations due to organic and senile mental disorders per 100,000 people (5% significance level). A 1 euro decrease in per capita GDP was associated with: 0.02 admissions due all psychiatric disorders, 0.01 admissions due to mood disorders, 0.03 admissions due to alcohol-related disorders, and 0.001 admission due to substance-related disorder (all at 5% significance level), per 100,000 people. A 1% increase in the aging index was associated with 1.26 admissions due to mood disorders.

Among men, a 1% increase in UR was associated with 10.03 hospitalizations due to all psychiatric disorders (1% significance level), 2.87 hospitalizations due to mood disorders (1% significance level), 1.24 hospitalizations due to schizophrenia and other psychotic disorders (5% significance level), 1.24 hospitalizations due to organic and senile mental disorders (5% significance level), all per 100,000 people (Table 2). With respect to GDP, a 1 euro decrease was associated with 0.01 admissions due to all psychiatric disorders (5% significance level) and 0.01 admissions due alcohol-related disorders (1% significance level), per 100,000 people.

Role of social protection

Among women, SP buffered the impact of reduced GDP on alcohol-related disorders (Table 3). A 1 euro decrease in per capita GDP was associated with 0.002 hospitalizations due to this specific problem; yet, when a 1 euro decrease in per capita GDP and a 1 euro increase in SP occurred at the same time, 0.000002 hospitalizations due to alcohol-related disorders occurred. Also, when a 1 euro decrease in per capita GDP and a 1 euro increase in SP occurred at the same time, 0.00001 admissions due to organic and senile mental disorders per 100,000 people occurred.

Among men, expenditure on SP was negatively associated with alcohol-related disorders and mental retardation (Table 4): a 1 euro increase in expenditure on SP was associated with 0.12 and 0.03 less hospitalizations per 100,000, respectively (5% significance level). Also, SP was able to moderate the association between alcohol-related disorders and GDP. A 1 euro decrease in the latter was associated with 0.01 hospitalizations due to alcohol-related disorders per 100,000. Yet, when a 1 euro decrease in per capita GDP and a 1 euro increase in SP occurred at the same time, 0.00000438 hospitalizations per 100,000 people due to alcohol-related disorders occurred. Also, when a 1 euro decrease in per capita GDP and a 1 euro increase in SP occurred at the same time, 0.0000113 admissions due to mental retardation per 100,000 people occurred.

Table 1 – Economic crises and hospitalizations due to psychiatric disorders among women. OLS panel regressions with fixed effects (years 2005-2014). Dependent variable: rate of hospitalization due to psychiatric disorders, specified in columns (1)-(12).

	(1) All psychiatric disorders	(2) Mood disorders	(3) Alcohol- related disorders	(4) Substance- related disorders	(5) Schizophre- nia and other psychotic disorders	(6) Anxiety disorders	(7) Other psychoses	(8) Mental retardation	(9) Organic and senile mental disorders	(10) Disorders usually diagnosed in infancy, childhood, or adolescenc e	(11) Other mental disorders	(12) Screening and history of mental health and substance abuse codes
UR women	2.89 (3.54)	0.98 (1.33)	0.29 (0.25)	0.13 (0.18)	0.06 (0.52)	1.18 (1.06)	0.11 (0.20)	-0.30 (0.23)	1.67* (0.74)	0.70 (0.53)	0.56 (0.61)	0.23 (0.24)
GDP	-0.020* (0.009)	-0.007* (0.003)	-0.003* (0.001)	-0.001* (0.001)	-0.0003 (0.0010)	-0.001 (0.002)	0.0003 (0.0007)	0.00001 (0.001)	-0.003 (0.003)	0.001 (0.001)	-0.00272 (0.00217)	0.0000117 (0.000301)
Curative care beds in hospitals	6.78 (5.21)	4.02* (1.66)	0.002 (0.26)	0.322** (0.11)	1.241* (0.53)	1.33 (0.71)	0.47* (0.210)	0.09 (0.13)	1.72* (0.68)	1.12 (0.62)	0.424 (0.618)	0.259 (0.244)
Aging index, women	1.52 (1.34)	1.26* (0.45)	0.08 (0.09)	-0.03 (0.05)	0.24 (0.17)	-0.62 (0.39)	-0.04 (0.07)	-0.02 (0.09)	0.51 (0.40)	-0.02 (0.08)	0.191 (0.243)	-0.0219 (0.0311)
Constant	504.60 (406.80)	-33.57 (87.23)	81.89* (31.00)	29.70 (16.12)	-17.48 (46.42)	171.2 (87.90)	9.09 (20.07)	12.02 (19.71)	15.06 (99.01)	-68.40 (41.86)	73.40 (74.26)	-5.078 (19.96)

Note: Observations: 200. Robust standard errors in parentheses. Year dummies included. Significant results in bold: * $p < .05$, ** $p < .01$.

Table 2 – Economic crises and hospitalizations due to psychiatric disorders among men. OLS panel regressions with fixed effects (years 2005-2014). Dependent variable: rate of hospitalization due to psychiatric disorders, specified in columns (1)-(12).

	(1) All psychiatric disorders	(2) Mood disorders	(3) Alcohol- related disorders	(4) Substance- related disorders	(5) Schizophre- nia and other psychotic disorders	(6) Anxiety disorders	(7) Other psychoses	(8) Mental retardation	(9) Organic and senile mental disorders	(10) Disorders usually diagnosed in infancy, childhood, or adolescenc e	(11) Other mental disorders	(12) Screening and history of mental health and substance abuse codes
UR men	10.03** (3.13)	2.87** (0.87)	1.55 (1.05)	0.110 (0.210)	1.24* (0.56)	0.36 (0.39)	0.314 (0.395)	0.27 (0.38)	1.24* (0.59)	-0.36 (0.33)	2.324 (1.779)	0.126 (0.277)
GDP	-0.014* (0.006)	0.002 (0.002)	-0.008** (0.003)	-0.0003 (0.0004)	-0.0004 (0.0019)	0.00048 (0.0019)	-0.0003 (0.0011)	0.0004 (0.00054)	-0.0016 (0.0012)	-0.0002 (0.0008)	-0.00539 (0.00308)	-0.0000929 (0.000343)
Curative care beds in hospitals	2.002 (1.86)	1.25 (0.66)	0.61 (1.28)	0.56** (0.19)	0.15 (0.86)	-0.14 (0.41)	0.13 (0.24)	0.15 (0.12)	0.70* (0.29)	0.37 (0.23)	-2.009 (1.197)	0.230 (0.203)
Aging index, men	5.47** (1.03)	1.04* (0.37)	0.33 (0.48)	0.04 (0.08)	1.01** (0.22)	0.99** (0.17)	0.18* (0.08)	0.08 (0.08)	0.36 (0.18)	0.15 (0.09)	1.228* (0.500)	0.0508 (0.0287)
Constant	338.60 (183.90)	-99.66 (78.09)	239.70* (92.61)	-4.55 (11.91)	22.42 (62.72)	-19.78 (56.55)	17.28 (32.02)	-8.89 (14.68)	41.91 (32.32)	-6.35 (20.22)	165.6 (89.71)	-9.049 (18.86)

Note: Observations: 200. Robust standard errors in parentheses. Year dummies included. Significant results in bold: * $p < .05$, ** $p < .01$.

Table 3 – Economic crises, hospitalizations due to psychiatric disorders, and buffering role exerted by social protection among women. OLS panel regressions with fixed effects (years 2005-2014). Dependent variable: rate of hospitalization due to psychiatric disorders, specified in columns (1)-(12).

	(1) All psychiatric disorders	(2) Mood disorders	(3) Alcohol- related disorders	(4) Substance- related disorders	(5) Schizophre- nia and other psychotic disorders	(6) Anxiety disorders	(7) Other psychoses	(8) Mental retardation	(9) Organic and senile mental disorders	(10) Disorders usually diagnosed in infancy, childhood, or adolescenc e	(11) Other mental disorders	(12) Screening and history of mental health and substance abuse codes
UR women	2.56 (3.80)	1.05 (1.43)	0.17 (0.21)	0.12 (0.17)	0.16 (0.55)	1.27 (1.03)	0.15 (0.22)	-0.31 (0.23)	1.35 (0.77)	0.78 (0.56)	0.59 (0.64)	0.27 (0.26)
GDP	-0.0187 (0.0105)	-0.00748 (0.00394)	-0.00234** (0.000735)	-0.00106* (0.000465)	-0.000681 (0.00101)	-0.00146 (0.00212)	0.000129 (0.000753)	0.000112 (0.000571)	-0.00211 (0.00216)	0.000811 (0.000702)	-0.00283 (0.00195)	-0.000156 (0.000282)
Curative care beds in hospitals	6.53 (5.49)	4.07* (1.76)	-0.09 (0.28)	0.32* (0.11)	1.31* (0.54)	1.40 (0.71)	0.49* (0.22)	0.09 (0.13)	1.48 (0.81)	1.18 (0.64)	0.44 (0.62)	0.29 (0.24)
Aging index, men	1.55 (1.35)	1.25* (0.44)	0.09 (0.09)	-0.03 (0.05)	0.24 (0.17)	-0.63 (0.38)	-0.04 (0.07)	-0.024 (0.09)	0.53 (0.39)	-0.02 (0.07)	0.19 (0.24)	-0.03 (0.03)
SP * GDP	- 0.0000063 3 (0.0000105)	0.0000012 7 (0.0000029 8)	- 0.0000024 2* (0.0000009 96)	- 0.0000000 7 (0.0000004 32)	0.0000016 4 (0.0000011 0)	0.0000017 3 (0.0000035 3)	0.0000007 18 (0.0000005 91)	0.0000001 16 (0.0000004 35)	- 0.0000060 3* (0.0000024 1)	0.0000015 5 (0.0000010 8)	0.0000004 96 (0.0000026 2)	0.0000007 79 (0.0000005 00)
Constant	496.10 (400.30)	-31.86 (87.23)	78.65* (30.16)	29.60 (16.00)	-15.27 (46.03)	173.50 (88.79)	10.06 (20.17)	11.86 (20.03)	6.96 (97.53)	-66.31 (37.86)	74.06 (73.41)	-4.032 (18.77)

Note: Observations: 200. Robust standard errors in parentheses. Year dummies included. Significant results in bold: * $p < .05$, ** $p < .01$.

Table 4 – Economic crises, hospitalizations due to psychiatric disorders, and buffering role exerted by social protection among men. OLS panel regressions with fixed effects (years 2005-2014). Dependent variable: rate of hospitalization due to psychiatric disorders, specified in columns (1)-(12).

	(1) All psychiatric disorders	(2) Mood disorders	(3) Alcohol- related disorders	(4) Substance- related disorders	(5) Schizophre- nia and and other psychotic disorders	(6) Anxiety disorders	(7) Other psychoses	(8) Mental retardation	(9) Organic and senile mental disorders	(10) Disorders usually diagnosed in infancy, childhood, or adolescenc e	(11) Other mental disorders	(12) Screening and history of mental health and substance abuse codes
UR men	9.94** (3.18)	2.95** (0.89)	1.40 (0.82)	0.09 (0.21)	1.24 (0.62)	0.35 (0.38)	0.25 (0.41)	0.23 (0.37)	1.19 (0.58)	-0.42 (0.34)	2.52 (1.834)	0.15 (0.27)
GDP	-0.0132* (0.00618)	0.00108 (0.00185)	-0.00720** (0.00237)	-0.000132 (0.000350)	-0.000445 (0.00193)	0.000611 (0.00198)	0.000208 (0.00116)	0.000669 (0.000549)	-0.00107 (0.000915)	0.000314 (0.000822)	-0.00701 (0.00358)	-0.000250 (0.000409)
Curative care beds in hospitals	1.81 (1.89)	1.44 (0.83)	0.30 (1.29)	0.53* (0.20)	0.15 (1.04)	-0.168 (0.41)	0.00611 (0.22)	0.07 (0.13)	0.57* (0.27)	0.24 (0.25)	-1.6 (1.04)	0.27 (0.21)
Aging index, men	5.55** (1.08)	0.97* (0.40)	0.45 (0.44)	0.06 (0.08)	1.01** (0.28)	1.00** (0.17)	0.23** (0.07)	0.11 (0.09)	0.41* (0.17)	0.200 (0.13)	1.071* (0.47)	0.04 (0.03)
SP* GDP	- 0.0000027 1 (0.0000064 4)	0.0000026 1 (0.0000035 8)	0.0000043 8* (0.0000015 4)	- 0.0000004 44 (0.0000003 36)	0.0000001 07 (0.0000042 6)	- 0.0000004 62 (0.0000010 4)	- 0.0000018 0 (0.0000011 3)	- 0.0000011 3* (0.0000004 36)	- 0.0000017 5 (0.0000015 6)	- 0.0000017 8 (0.0000020 6)	0.0000057 6 (0.0000032 8)	0.0000005 56 (0.0000005 14)
Constant	328.50 (179.40)	-89.85 (72.03)	223.30* (85.11)	-6.22 (10.89)	22.82 (58.87)	-21.52 (57.44)	10.53 (32.48)	-13.14 (13.72)	35.35 (26.19)	-13.04 (18.29)	187.20 (97.26)	-6.96 (18.47)

Note: Observations: 200. Robust standard errors in parentheses. Year dummies included. Significant results in bold: * $p < .05$, ** $p < .01$.

Cost analysis

The cost analysis was carried out on figures referring to the male population, only. In fact, all psychiatric disorders among women were not affected by UR, except for admissions due to organic and senile disorders; yet, given the controversial topic of cost analysis in health care, a conservative approach was preferred. First, the mean cost of hospital stay (12 [days] * 306.75 euros) per 100,000 was calculated, i.e. 3,681 euros. A 1% increase in male UR would have produced about 10 new admissions every 100,000 men per year (Table 3, column one): therefore, the annual extra expenditure for the health system should be equal to 36,819 euros per 100,000 people, theoretically. To obtain the actual annual increase of male UR, ΔU in years 2008-2014 was calculated, thus obtaining the following figures: 0.74%, 1.17%, 0.72%, 0.15%, 2.32%, 1.88%, 0.33%. By multiplying ΔU in each year per β_I (which is 10.03) the extra annual admissions (per 100,000) for all psychiatric disorders among men due to increased UR were obtained, per 100,000, from 2008 to 2014: 7.44, 11.73, 7.25, 1.55, 23.29, 18.90, 3.28. By adding these figures, 73.43 admissions per 100,000 people between 2008-2014 were obtained (mean: 10.50 per year). 73.43 admissions multiplied per 3,681 euros (which is the mean cost of one hospital stay in psychiatric wards) is equal to 270,295.83 euros, which represents the increased expenditure per 100,000 people between 2008 and 2014 (38,613.69 euros per 100,000 people per year). According to ISTAT, on 1 January 2019 the Italian population was 60,359,546 people, 29,384,766 men and 30,974,780 women. Since the coefficient of the male population was used, it is possible to estimate that in the whole Country, between 2008 and 2014, increased male hospitalizations due to all psychiatric disorders caused by increased male UR cost 79,425,797 euros to the NHS, i.e. 11,346,542 euros per year. Theoretically, this corresponds to 567,327 euros per region per year (11,346,542 euros / 20 regions).

DISCUSSION

Economic crises may impact mental health hospitalizations with gender specificity. The fact that men are frequently employed in highly cyclical industries, differently than women, may explain this specificity (Di Pietro, 2018). Also, an important gender gap still exists in Italy with respect to employment: it is possible that women be less influenced by the dynamics of labor market because they are already partially out of it. Differently, decreased GDP was associated with mental health outcomes among both genders, thus recalling the importance of poverty and inequalities as determinants of mental health (Faris & Dunham, 1939; Priebe, 2015; Di Pietro, 2018; Wang & Fattore, 2020).

The finding that economic downturns were associated with increased prevalence of mood disorders among men is consistent with studies concerning suicides (McKee-Ryan et al, 2005; Stankunas et al., 2006; Milner et al., 2013; Urbanos-Garrido et al., 2015; Barnay, 2016; Savvidou & Matamis, 2016; Mattei & Pistoressi, 2018). In Italy, following the onset of the global financial crisis, male suicides increased (De Vogli et al., 2013; De Vogli et al., 2019), possibly due to increased incidence of depressive disorders. This paper suggests that SP was not able to moderate this association, potentially due to the austerity measures adopted.

With respect to alcohol-related disorders, the results are in line with historical research (Hildebrandt, 1994), and confirm early observations concerning the global financial crisis in Italy (Mattei et al., 2014; Mattei et al., 2017). Italy represents an exception when compared to other countries, that in times of economic crises experienced a different pattern of alcohol consumption (Ruhm & Black, 2002; Johansson et al., 2006; Bor et al., 2014; Martin-Carrasco et al., 2016; Ásgeirsdóttir et al., 2016; Lantis & Teahan, 2018). It is known that economic crises may affect alcohol consumption via two mechanisms (de Goeij et al., 2015). A first economic mechanism is based on reduced income, that reduces expenditure for alcoholics. A second, psychological mechanism is based on increased stress due to worsened economic conditions, that may lead to increased alcohol intake. Our findings suggest that in Italy the second mechanism might prevail, among both men and women; psychological stress due to reduced income may lead people to drink alcoholics as a sort of coping mechanism. SP may reduce the psychological stress related to reduced (or fear of reduced) income. The fact that SP was not able to influence other psychiatric disorders may depend on the specific indicator of SP chosen.

The finding that during economic crises hospitalizations due to schizophrenia may increase is not in line with previous research concerning Italy (Wahn & Fatore, 2020). Yet, this result is not surprising, since economic crises may jeopardize vocational rehabilitation programs, which favor psychopathological stability and individuals' autonomy (Mattei et al., 2018; Mattei et al., 2020).

It is worth recalling that the rate of hospitalization is an indicator of the workload of psychiatric services, namely hospital acute inpatient units and community mental health services, where frequently patients are referred to after discharge. Therefore, the present study indirectly suggests that following the outbreak of the global financial crisis, the need of mental health care increased, in Italy. Yet, this study has several limitations that need to be acknowledged. First, since data were already collected and aggregated at the origin, their quality was not assessable. Yet, having derived them from ISTAT reliably guarantee their quality. Second, data were age-aggregated, therefore it was not possible to identify which age groups were more affected by the economic crisis. Yet, having included an aging index overcomes this limitation, at least partly. Third, having considered data for years 2005-2014 may reduce the generalizability of findings to longer periods. Further, time-series analyses are needed to overcome this limitation. A fourth limitation is that only the 'Italian case' was addressed. Yet, several studies in literature investigated other European countries; differently, there is a paucity of studies concerning Italy.

CONCLUSIONS

The global financial crisis caused increased psychiatric hospitalizations in Italy, with gender specificity, and increased the costs for the NHS budget. To protect the population's mental health during economic downturns, it is important to allocate adequate resources to mental health care and social protection.

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APPENDIX

Table 1 Appendix – Descriptive statistics on the variables used in the analysis.

Variable	Mean	Standard deviation	Observations
<i>Dependent variable: rates of hospital discharge (per 100,000 people) due to the following reasons</i>			
All psychiatric diagnoses, women	444.09	164.83	200
Mood disorders, women	141.24	52.32	200
Schizophrenia and related disorders, women	55.66	22.22	200
Alcohol use disorder, women	15.93	10.87	200
Substance use disorder, women	8.84	4.05	200
Anxiety, somatoform, dissociative and personality disorders, women	70.51	22.37	200
Other psychoses	28.10	9.04	200
Mental retardation	9.14	5.31	200
Organic and senile mental disorders	83.87	32.23	200
Disorders usually diagnosed in infancy, childhood, or adolescence	8.48	20.12	200
Other mental disorders	47.56	24.48	200
Screening and history of mental health and substance abuse codes	3.01	7.99	200
All psychiatric diagnoses, men	484.06	129.41	200
Mood disorders, men	94.79	34.41	200
Schizophrenia and related disorders, men	95.21	33.74	200
Alcohol use disorder, men	50.73	33.21	200
Substance use disorder, men	13.48	6.10	200
Anxiety, somatoform, dissociative and personality disorders, men	58.63	19.08	200
Other psychoses	32.26	11.59	200
Mental retardation	14.31	7.62	200
Organic and senile mental disorders	55.69	16.67	200
Disorders usually diagnosed in infancy, childhood, or adolescence	13.17	11.19	200
Other mental disorders	53.66	39.45	200
Screening and history of mental health and substance abuse codes	2.13	2.87	200
<i>Explanatory variables</i>			
Per capita real Gross Domestic Product (in euros), reference 2010	26,105.74	6,580.38	200
Unemployment rate (people seeking jobs as % of the total labor force), men	7.74	4.58	200
Unemployment rate (people seeking jobs as % of the total labor force), women	10.96	5.30	200
Aging index (ratio between the population aged 65 or more years old and the population aged 0-14 years old), men	79.89	46.51	200
Aging index (ratio between the population aged 65 or more years old and the population aged 0-14 years old), women	186.98	39.21	200
Rate of curative care beds in hospitals (per 100,000 inhabitants)	35.32	4.91	200
Per capita expenditure on social services and benefits delivered by single and associated municipalities (in euros)	122.48	73.26	200

Effectiveness of vocational rehabilitation programs in Italy: findings from the Modena Mental Health Department

ABSTRACT

Research has pointed out that vocational rehabilitation programs (VRPs) foster social integration, reduce symptoms, and help people affected by severe psychiatric disorders access the labor market. Aim of this study was to assess the efficacy and effectiveness of VRPs (namely, *apprenticeships*) carried out at the Modena Mental Health Department (MHD), Italy, and their impact on users' employability. A retrospective, monocentric observational study, not funded, approved by the local Ethic Committee and the Local Health Agency of the Province of Modena (Italy) was used. All users of the Modena MHD included in VRPs (carried out according to the model of supported employment) in 2018 were enrolled. For each participant, socio-demographic and clinical variables were collected, as well as variables related to the VRP. A before-after analysis was conducted with users exposed to VRPs, with respect to the beginning of the program. Also, exposed users were compared to a non-experimental control group, made up of users not included in VRPs in 2018, homogeneous in terms of socio-demographic characteristics and variables, diagnosis, and severity level. Of the 275 people involved in VRPs in 2018 at the Modena MHD, 62 ended the program (women 29, 46%; mean age 43 ± 13 years old), thus representing the sample of exposed users in this study. The before-after comparison showed that after the beginning of VRPs, the number and days of hospitalization significantly decreased. The mean reduction of hospitalizations was 0.01 per month per user, equal to 0.12 per user per year. Since the sample size was 62 users, this means 7.44 fewer hospitalizations in 2018. The mean days of hospitalization after the beginning of VRPs were 0.21 per month per user, equal to 2.52 per user per year, thus suggesting 156.24 fewer days of hospitalizations in 2018. Notably, no compulsory hospitalization occurred after the beginning of the VRP. The median of urgent (non-scheduled) health interventions declined after the beginning of the VRP ($z = 4.79$, $p\text{-value} < 0.01$). The conservative cost analysis showed that concluded VRPs made it possible to reduce costs up to 49,243.50 euros in 2018, i.e. 794.25 euros per user. On 31 December 2018, 24 users were employed (48% of the sample). This study suggests that VRPs foster users' clinical improvement and reduce the workload of psychiatric services; they also reduce costs for mental health care.

Keywords: *vocational rehabilitation programs; mental health; Italy; Region Emilia-Romagna*

INTRODUCTION

The employment rate among people affected by major psychiatric disorders is remarkably low, between 10% and 25% (Modini, 2016), much lower than the general population (Mueser et al., 2001; Marwaha & Johnson 2004; Marwaha et al. 2007; Waghorn et al. 2012). Yet, it has been proven that employment is beneficial for people affected by psychic suffering. In fact, besides remunerative and economical aspects, employment promotes self-esteem, wellness and independence, social relations, and reduces the number of accesses to mental health care services (Bond, 2004). Moreover, in western societies work identity has become a key element of personal identity and has a meaning that is not only economical (i.e., related to wage and income). Indeed, work is a source of recognition, of being part of a relational network, of one's life organization. Therefore, it is a crucial element for the development of the individual's self-identity and is strongly intertwined with stigma and self-stigma (Orsenigo, 2009; Ferrari et al., 2020).

Vocational rehabilitation programs (VRPs) help people affected by severe psychiatric disorders (SPD) gain a job. Such programs should comply with the "Mental Health Recovery-Oriented Practice" principles: uniqueness of an individual, dignity and respect, communication and partnership with Services, continuous evaluation and clinical and personal outcomes measurement, and recovery-oriented attitude. This because integration in the work environment of people affected by psychiatric disorders is complex and involves different actors. For this reason, several operational models were developed in psychiatry to carry out VRPs (Anthony et al., 2002; Anthony, 2013).

Standard programs, (e.g. sheltered workshops, "Job Clubs", "Working counselling", and pre-vocational training) represented for a long time the main model for vocational rehabilitation, until the advent of most recent methods. Though looking like "normal" working places, sheltered workshops are peculiar environments, separated from the normal productive context, in which only people with psychic disability work together, in the presence of supervisors. Tasks and jobs are simple, the working day is short, wages are lower than standard. No transition toward the free labor market is promoted: rather, such programs tend to make patients more dependent on the institution (Bond, 2004).

Supported Employment (SE), introduced in the United States in the 1970s, overturns the traditional paradigm of rehabilitation by working. It replaces the "train and place" with its opposite "place and train" (Michielin, 2001): professionals working in the field of rehabilitation first identify working places that make integration easy, then patients receive specific training, directly in the working place. This method, alternative to the traditional ones, aims to a quicker integration in a competitive working environment and, later, helps the patient to keep the job; it is successful in 40-60% of overall cases, vs. 20% of traditional, standard programs (Bond 2004). SE is also beneficial for a reduced number of hospitalizations, a reduction of positive and negative symptoms of psychosis, and a better quality of life (Bond et al. 2001).

The Individual Placement and Support (IPS; Becker & Drake, 2003) is an evolution of the SE model, and is considered nowadays in the United States as the "golden standard" for vocational rehabilitation (Bond al. 2001; Becker et al., 2006; Fioritti et al., 2014). This evidence-based model is built on the idea that everybody

can sustain competitive work when appropriately supported. The main goal is to get a competitive job according to the user's preferences in a short time, since too much gradualism in placement leads to patient demotivation (Modini et al., 2016). Several RCTs carried out on the IPS model showed that 58% of users get a competitive job within 12 - 18 months, against 20% using standard methods (Giustini, 2001; Kinoshita et al. 2013).

The Italian legislation concerning vocational rehabilitation is complex, composed of both national and regional acts, frequently modified through the years. Regarding national legislation, it is worth recalling act 381/1991, act 196/1997, and act 68/1999, all described in detail elsewhere (Trono et al., 2009; Fioritti et al., 2016). Concerning regional legislation, since the present study was carried out in region Emilia-Romagna, the following acts are worth recalling: act 17/2005, 7/2013, 14/2015, and 1/2019. All these acts assure people affected by disability the right to carry out any working activity or job that is compatible with their skills (act 17/2015), and discipline apprenticeships. The latter are "part of active labor market programs and consist of a period of orientation and training that is not an employment relationship" (Agreement between Government and Regions, 24 February 2013). In 2018, 29,378 apprenticeships were started, 49,4% involving women. 21.443 apprenticeships involved people aged 16-29 years old, 6.753 people aged 30-54 years old, and 1.182 people aged 55 years old or more (Region Emilia-Romagna, 2019). Other types of ALMPs are available in Italy, namely in Emilia-Romagna: placement in Type B social enterprises [*cooperative sociali*], orienteering and work placement in the free market, and professional education. Yet, since apprenticeships represent the measures more commonly adopted, the present study deals with them.

The focus of this research is on VRPs carried out within the Modena Mental Health Department, which refers to the Province of Modena (705.422 inhabitants), placed in region Emilia-Romagna, Italy. The MHD is made up of eight Community Mental Health Centers (CMHCs), while other facilities are also available (e.g. acute inpatient units, day hospital services, residences, consultation-liaison services). In 2018, the average hospital stay was 11.8 days. Mandatory hospitalizations accounted for 24.4 per 100,000 adult residents. The mandatory hospitalizations represented the 9.0% of total admissions on an urgent basis (Starace, 2019).

In the light of the above, aim of this study was to assess the effectiveness of VRPs carried out by the Modena MHD. Building on the previous research of our group involving only one CMHC (Mattei et al., 2020; Spiga et al., 2020), it was hypothesized that VRPs may impact on the clinical and organizational level, i.e. determining psychopathological improvement and reduced workload for mental health services. Yet, the previous studies did not involve the entire Modena MHD and lacked data concerning users' employability. Thus, in the present study assessed: the clinical outcomes of VRPs, their impact on users' employability, and their effect on the MHD budget. The main clinical outcome was the number and days of hospitalizations. The intervention was deemed effective, when able to reduce hospital admissions in psychiatric wards. On the other hand, clinical improvement does not necessarily mean increased employability; therefore, the latter was recorded at the end of the program. Finally, research pointed out that VRPs were able to reduce hospitalizations, which means improved clinical conditions for the users, and theoretically reduced costs for the MHD. Therefore, the study included a cost-analysis on the impact of VRPs on the Modena MHD budget.

METHODS

Study Design and data collection

This is a retrospective, monocentric observational study, not funded, approved by the local Ethics Committee and the Local Health Agency of the Province of Modena (Italy), conducted according to the principles of the Declaration of Helsinki, and the GDPR 679/2016.

For each participant, the following variables were collected:

- (1) Socio-demographic variables: gender, age, ethnicity (whether of Italian origin or not), presence of a stable relationship, with whom the user lives, and education;
- (2) Clinical variables: diagnosis, currently seen or not by the CMHC, number of previous contacts with the CMHC, treatment duration and number of health interventions (HIs) (e.g., meetings with doctor or nurse at the CMHC, home visits, medications delivery, etc.), both scheduled and non-scheduled (i.e. urgent);
- (3) Variables related to the VRP: previous participation to VRPs, duration of the last program (when it was started and when it was concluded), type of rehabilitation program (apprenticeship, training course, socio-rehabilitative programs, according to the national and regional legislation), program outcome (gained employment or dropped-out), type of employment contract (fixed-term or open-ended contract) and type of firm (public/private company or Social Enterprises).

Sources for all variables were the CMHC register, where VRPs activity is recorded for service purposes, and the Information & Communication Systems (ICT) of the Mental Health Department of Modena. All data were anonymized.

Users were enrolled when fulfilling the following inclusion criteria: 1) users of both genders; 2) users aged 18 years old or older; 3) users were part of the caseload of the Modena MHD (Adult Mental Health Sector) during the observation period; 4) users who were involved in VRPs.

All patients fulfilling inclusion criteria (1)-(4) made up the group of exposed to VRPs. Moreover, a second non-experimental group of “not exposed” users was enrolled, made up of users fulfilling criteria (1)-(3), yet never involved in VRPs. This control group was homogeneous in terms of socio-demographic variables, diagnosis, and severity level (defined by diagnosis and a dummy variable recorded in the ICT system by the psychiatrist, indicating the severity of the users). To identify potentially eligible users in the group of not exposed users, random extraction from the ICT system of the Modena MHD was used. The main socio-demographic characteristics, as well as the clinical features that do not constitute outcome variables (e.g. psychiatric diagnosis) were compared between exposed and not exposed, using appropriate statistical tests (Student’s T test for the comparison of continuous variable means, Wilcoxon-Mann-Whitney test for the comparison of medians, Pearson’s Chi-squared test and Fisher’s Exact test for the comparison of the frequency of quantitative binary variables, e.g. gender and presence of relapse).

All users included in VRPs from 1 January 2018 to 31 December 2018 were enrolled. As far as the control group is concerned, users under care of CMHCs during 2018 were included in the analysis.

Statistics

Data analysis was carried out using STATA 13.1 (College Station, Texas). For descriptive statistics, means, medians, frequencies, standard deviations, and ranges were used. For inferential statistics, firstly a pre-post analysis was carried out, by means of the Student's T-Test and the Wilcoxon–Mann–Whitney Test, when appropriate. Secondly, OLS multiple regression models were used to identify differences between exposed and not exposed to VRPs, regarding the main outcome of the study, i.e. hospital admissions. In the regression models, the dependent variable was the number and the days of hospitalizations (per month); the main co-variable was a dummy having value 1 for the group of exposed and 0 for the control group. The regression analysis was adjusted for those characteristics that significantly differed between exposed and not exposed.

To assess the effectiveness of VRPs, a cost analysis was performed. In 2018 the overall cost of the activities of the Modena MHD was € 42.906.246. The daily cost per bed in acute inpatient units (ex-post calculation based on actual consumptive costs) was € 655.7 at Carpi Hospital and € 614.6 at NOCSAE Baggiovara Hospital (Starace, 2018), the two hospitals in the province of Modena that provide public psychiatric acute inpatient care. To carry out a conservative estimate, data of Region Emilia-Romagna were used, according to which one day of hospital stay in psychiatric wards costs 315.18 euros (BURERT, 2014). This is a theoretical cost, similar to the DRG tariffs for in- and outpatient procedures. This daily cost was multiplied for the average reduction in the days of hospital stay per month per patient; this result was then multiplied for 12 months, thus obtaining the average annual reduction in hospitalization costs per patient.

RESULTS

In 2018, 275 users were involved in VRPs in the Modena MHD (women 51%; mean age 41±11 years). Of them, 62 users concluded the VRP (22.30%), and were considered for statistical analysis; their descriptive features are reported in Table 1. The majority of users were male, of Italian origin, aged 43±13 years old, with a secondary school education level; moreover, most of the users were not involved in a stable relationship, and did not present a substance use disorder. With respect to the diagnosis, psychotic disorders were most prevalent, followed by severe personality disorders.

Table 1 – Main features of the sample of users exposed to VRPs in 2018, who concluded them.

	N	%	Obs.
1. Gender			62
Male	33	53	
Female	29	46	
2. Age (binary, range: 19-65)			62
<45	31	50	
≥45	31	50	
3. Ethnicity			62
Italian	53	85	
Not Italian	9	15	
4. Education			58
Primary school (5 years)	5	7	
Secondary school (8 years)	38	66	
High school diploma (13 years)	15	26	
5. Education (binary, range: 5-13)			58
8	43	74	
≥8	15	25	
6. Stable relationship			60
Yes	15	25	
No	45	75	
7. With whom the user lives			60
Alone	9	15	
With original family, in-law family, other	51	85	
8. Diagnosis			62
Psychotic disorder	31	50	
Neurotic disorder	11	18	
Personality disorder	18	29	
Substance Use Disorder	1	2	
Other	1	1	
9. Dual diagnosis			62
Yes	5	8	
No	57	92	

The clinical features of the sample are detailed in Table 2, namely the duration of the taking charge, the number of health interventions (scheduled and urgent) and hospitalizations. All data are disaggregated according to the period, before or after the beginning of the VRP.

Compulsory hospitalizations were reported only before the beginning of the VRP, while no compulsory hospitalization occurred after.

Table 2 – Descriptive statistics of the clinical variables collected.

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
1. No. of months of taking charge (<i>before</i> the onset of the VRP)	66.52	65.11	2	319.07	62
2. No. of health interventions (<i>before</i> the onset of the VRP)	163.92	216.47	0	968	62
3. Ratio between variable 2. and 1.	2.49	2.67	0	14.53	62
4. No. of urgent health interventions (<i>before</i> the onset of the VRP)	5.77	9.85	0	46	62
5. Ratio between variable 4. and 1.	0.17	0.36	0	2.20	62
6. No. of months of taking charge (<i>after</i> the onset of the VRP)	9.48	5.48	0	24.3	62
7. No. of health interventions (<i>after</i> the onset of the VRP)	21.19	25.61	0	114	62
8. Ratio between variable 7. and 6.	2.08	2.03	0	9.37	62
9. No. of urgent health interventions (<i>after</i> the onset of the VRP)	0.97	3.72	0	26	62
10. Ratio between variable 9. and 6.	0.22	0.69	0	4.30	62
11. No. of hospitalizations <i>before</i> the onset of the VRP)	0.87	1.78	0	10	62
12. Ratio between variable 11. and 1.	0.02	0.05	0	0.32	62
13. Days of hospitalizations (<i>before</i> the onset of the VRP)	15.90	42.90	0	221	62
14. Ratio between variable 13. and 1.	0.22	0.45	0	2.38	62
15. No. of compulsory hospitalizations <i>before</i> the onset of the VRP)	0.15	0.51	0	3	62
16. Days of compulsory hospitalizations (<i>before</i> the onset of the VRP)	3	11.11	0	60	62
17. No. of hospitalizations <i>after</i> the onset of the VRP)	0.05	0.28	0	2	62
18. Ratio between variable 11. and 6.	0.003	0.02	0	0.17	62
19. Days of hospitalizations <i>after</i> the onset of the VRP)	0.16	1.04	0	8	59
20. Ratio between variable 11. and 6.	0.01	0.09	0	0	59

The before-after comparison concerning users exposed to VRPs is displayed in Table 3. Data are reported per month. After the beginning of VRPs, the number and days of hospitalization significantly decreased: the mean reduction in hospitalizations was 0.01 per month per patient, equal to 0.12 per patient per year. Since the sample was made up of 62 users, this means 7 fewer hospitalizations in 2018.

The mean days of hospitalization after the beginning of VRPs were 0.21 per month per patient, equal to 2.5 days per patient per year. In the sample enrolled in this study, this means 156 fewer days of hospitalizations in 2018. These findings refer only to users who ended the VRP and are part of the original group of 273 users: no estimation was made concerning the potential benefits of VRPs to the overall group of users.

Table 3 – Student’s T-Test comparison of health interventions and hospitalizations before and after the onset of VRPs.

Variable	Mean	Std. Dev.	Obs	Difference (M±SD)	T	P-value
No. of health interventions (<i>before</i> the onset of the VRP) / No. of months of taking charge (<i>before</i> the onset of the VRP)	2.49	2.67	62	0.40±0.43	0.95	0.32
No. of health interventions (<i>after</i> the onset of the VRP) / No. of months of taking charge (<i>after</i> the onset of the VRP)	2.08	2.03	62			
No. of urgent health interventions (<i>before</i> the onset of the VRP) / No. of months of taking charge (<i>before</i> the onset of the VRP)	0.17	0.36	62	0.09±0.10	1.45	0.15
No. of urgent health interventions (<i>after</i> the onset of the VRP) / No. of months of taking charge (<i>after</i> the onset of the VRP)	0.10	0.30	62			
No. of hospitalizations <i>before</i> the onset of the VRP) / No. of months of taking charge (<i>before</i> the onset of the VRP)	0.02	0.05	62	0.01±0.01	2.16	0.03
No. of hospitalizations <i>after</i> the onset of the VRP) / No. of months of taking charge (<i>after</i> the onset of the VRP)	0.004	0.02	62			
Days of hospitalizations (<i>before</i> the onset of the VRP) / No. of months of taking charge (<i>before</i> the onset of the VRP)	0.22	0.45	59	0.21±0.06	3.45	<0.01
No. of hospitalizations <i>after</i> the onset of the VRP) / No. of months of taking charge (<i>after</i> the onset of the VRP)	0.01	0.09	59			

As Table 3 shows, no significant results stemmed out regarding the number and type of health interventions. On the one hand, this might be due to the sample size; on the other, to the distribution of such variables, that was not gaussian, as proved by visual inspection. Therefore, the analysis was repeated using the Wilcoxon-Mann-Whitney Test for the comparison of medians. In the group of 62 patients involved in VRPs, no significant result was noticeable concerning all health interventions ($Z=1.24$, $p\text{-value}=0.21$). Differently, the medians of urgent health interventions significantly declined, from 0.04 intervention per patient per month to zero ($z = 4.79$, $p\text{-value}<0.01$).

Finally, Table 4 shows the results of the analysis carried out on the sample representativeness. Users enrolled in the statistical analysis are compared to 213 users not enrolled. As noticeable, the level of education was significantly lower in the group involved in VRPs, who concluded them.

Table 4 – Sample representativeness: comparisons between the sample of 62 users included in the analysis (for having ended the VRP) and the 213 users not included.

	<i>Users included in VRPs N=62</i>	<i>Users no not included in VRPs N=213</i>	<i>P-value</i>	<i>Total N=275</i>
<i>Age (M±SD)</i>	43.0 ± 1.5	40.8 ± 10.6	0.23	41.4 ± 11.0
<i>Males</i>	26 (46.8%)	104 (48.8%)	0.78	133 (48.4%)
<i>Ethnicity: not Italian</i>	9 (14.5%)	28 (13.2%)	0.78	37 (13.5%)
<i>Education < 8years</i>	43 (74.1%)	117 (56.0%)	0.01	160 (59.9%)
<i>Not in a stable relationship</i>	45 (75.0%)	170 (81.3%)	0.28	215 (79.9%)
<i>With whom the patient lives</i>	9 (15.0%)	30 (14.2%)	0.88	39 (14.4%)
<i>Diagnosis</i>				
<i>Psychosis</i>	31 (50.0%)	123 (57.8%)	0.55	154 (56.0%)
<i>Personality disorder</i>	18 (29.0%)	54 (25.4%)		72 (26.2%)
<i>Neurosis</i>	11 (17.7%)	26 (12.2%)		37 (13.5%)
<i>Other</i>	2 (3.3%)	10 (4.6%)		12 (4.3%)

The 62 users making up the control group were compared with a non-experimental group made up of 63 users randomly extracted by the ICT of the Modena MHD. Table 5 shows the main features of both groups. As noticeable, they differed with respect to the number of scheduled interventions before and after the beginning of the VRP. Again, it is worth noting that no compulsory hospitalization occurred after the onset of VRP, namely among the exposed.

Table 5 – Main features and statistical comparison of users exposed to VRPs and users not-exposed (control group).

	Health interventions				Hospitalizations			
	Scheduled interventions before VRP (mean per month)	Non-scheduled interventions before VRP (mean per month)	Scheduled interventions after VRP (mean per month)	Non-scheduled interventions after VRP (mean per month)	Mean hospitalizations before VRP	Mean days of hospitalizations before VRP	Mean compulsory hospitalizations before VRP	Mean hospitalizations after VRP
Not exposed	1.50±1.26	0.09±0.02	1.52±0.30	0.10±0.04	0.03±0.02	0.35±0.17	0.0004±0.0003	0.02±0.01
Exposed	2.43±2.66	0.19±0.05	2.12±0.26	0.08±0.04	0.02±0.01	0.22±0.06	0.0015±0.0008	0.004±0.01
P-value - Student's T-Test [Wilcoxon Test among brackets]	0.01 [<0.01]	0.08	0.14 [<0.01]	0.74 [0.53]	0.56	0.46	0.22	0.13 [0.16]

In Table 6, the results of the multiple regression models are displayed. In model (1), the outcome was the number of days of hospitalizations per month. In the group of exposed to VRPs, a significant reduction of 0.14 days per month per patient was noticeable. As far as the number of hospitalizations is concerned, as detailed in model (2) there were 0.01 fewer hospitalizations per patient per month in the group of those exposed to VRPs. Both regression models were adjusted for the number of health interventions before and after the beginning of vocational rehabilitation, given that such variables significantly differed between the two groups, as previously pointed out.

Table 6 – Results of the multiple OLS regression models. In model (1), the outcome is represented by days of hospitalization in acute psychiatric inpatient units, per month. In model (2), the outcome is the number of hospitalizations, per month. Both models are adjusted for the number of health interventions before and after the beginning of VRPs, per month.

	(1)	(2)
	Days of hospitalization (per month)	No. of hospitalizations (per month)
Exposed to VRP vs not Exposed	-0.14**	-0.01*
	(0.07)	(0.01)
Health interventions (before VRP) (per month)	-0.04	-0.002
	(0.03)	(0.003)
Health interventions (after VRP) (per month)	0.05	0.01
	(0.05)	(0.004)
Const.	0.14*	0.01
	(0.07)	(0.01)
Obs.	125	125
R^2	0.10	0.10

Note: standard errors in parentheses; * $p < .10$, ** $p < .05$

Cost analysis

As shown in Table 3, after the beginning of VRPs the reduction in days of hospital stay was on average 0.21 ± 0.06 per month. In Region Emilia-Romagna, one day of hospital stay in psychiatric wards costs 315.18 euros (BURERT, 2014); the latter, multiplied per 0.21, equals 66.19 euros, that is the theoretical reduction in hospitalizations cost per month for each patient enrolled; on an annual level, it is 794.25 euros ($66.19 * 12$ months). Since the sample consisted of 62 users, a net reduction of 49,243.50 euros per year ($794.25 \text{ euros} * 62 \text{ users}$) was calculated. This is a conservative estimate, which does not include the documented reduction in

the number of non-scheduled interventions, as well as the potential beneficial effect on users involved in VRPs who do not end such programs. Moreover, it should be noted that while the regional cost of 1 day of hospital stay is 315.18 in Region Emilia-Romagna, the ex-post analysis carried out within the Modena MHD pointed out a cost of one day of hospitalization equal to 655.7 at Carpi Hospital and of 614.6 euros at NOCSAE Baggiovara Hospital (Starace, 2019). Using a mean between such figures (635.15 euros), the potential reduction of costs of hospitalization due to VRPs would double, up to 99,235.84 euros.

Employability

Of the 62 users who ended VRPs, on 31 December 2018 twenty-seven were employed (44% of the sample). Eleven users had an open-end contract while sixteen users had a fixed-term contract.

DISCUSSION

This study aimed to assess the efficacy and effectiveness of VRPs carried out within the Modena Mental Health Department. It stemmed out that such programs can promote clinical stabilization by reducing psychiatric hospitalizations and non-scheduled health intervention, consistently with previous research of our group as well as with international literature (Bond et al., 2001; Becker et al., 2006; Burns et al., 2007; Bush et al., 2009; Mattei et al., 2020; Spiga et al., 2020)

It is worth noting that of the initial 273 users who started a VRP, only 62 concluded it; among the latter, 27 were employed at the end of the VRP (44% of the sample). This figure is consistent with literature, suggesting a range between 40% and 60%, and with a previous study of our group, in which it was found that the 50% of users involved in VRPs in only one CMHC of the Modena MHD gained a job (Bond, 2004; Mattei et al., 2020). Therefore, apprenticeships seem useful to help the users of CMHCs gain a job. Broadly speaking, apprenticeships are useful active labor market programs, able to foster the re-inclusion of users within society, by means of bringing them close to the labor market. Apprenticeships (that are, by definition, fixed-term) promote the transition toward fixed-term rather than open-end contracts, at least in the short run. On the other hand, an issue that should be considered is the compensation received during the apprenticeship, i.e. at least 450 euro per month.

However, beginning with the assumption that patients involved in VRP have a more severe clinical condition, the impact of VRP on hospitalizations and health interventions should not be underestimated. It should be noted that this study was not able to assess whether VRPs apprenticeships can increase users' employability in the medium- and long term, i.e. after years. This is an important issue: in fact, on the one hand VRPs seem able to reduce clinical severity but on the other hand, current findings suggest they might increase the degree of dependency from psychiatric services, thus favoring chronicization. In other words, the risk is that a recovery-oriented practice may turn into an instrument of "*soft chronicization*", not far from the original aim of ergotherapy in the asylum era. To be sure that VRPs promote employability, i.e. the access to

the labor market, follow up data on the users' job situation are needed. This represents an avenue of further development of the present study.

Another risk is that users may become victims of a sort of exploitation systems, which “employs” them using apprenticeships and similar measures, though not providing features connected to real work (e.g. wage, insurance, and so forth).

Regarding the effectiveness of VRPs, the cost analysis suggested that such rehabilitation programs may be useful at reducing the budget costs of the MHD. The conservative estimation suggested that in 2018 VRPs reduced expenditure of at least about 50,000 euros, building only on 62 patients who ended their programs. It should be noted that this estimation includes only direct costs. It is known that working days lost due to psychiatric disorders impact significantly on productivity. Besides reducing the expenditures of MHDs and assuring an income to the users, promoting work-oriented recovery programs may also foster increased production and growth. This topic is beyond the aim of the present study, and was addressed by other authors (Chong et al., 2013; Whiteford et al., 2013; Abdin et al., 2016).

The present research provided evidence that ALMPs, namely apprenticeships, help disadvantaged people gain a job and enter the labor market. In other words, ALMPs contribute reducing unemployment, namely long-term unemployment, that typically features people affected by severe mental disorders. As the findings stemmed out by the present study suggest, in this group of people high levels of unemployment seem to coexist with a lack of qualified labor. Notably, in Italy, which is featured by a long-lasting crisis of employment, labor policies should provide people (both employed and unemployed) with enough protection in the form of adequate occupational skills, so to make individuals less vulnerable in the labor market (Biagi, 1993). Therefore, apprenticeships may be conceived as active measures able to reduce the level of vulnerability among people who are already vulnerable and at risk of social exclusion. By doing this, apprenticeships may help tackling the rising inequalities within Western Societies, specifically in Italy.

This study has several limitations that need to be acknowledged. First, for its observational, retrospective nature, no causal inferences can be drawn. Second, with respect to the variables collected, it was not possible to include data concerning medications. Yet, number of voluntary/compulsory hospitalizations was available, as well as number and type of health interventions. Such variables provided information with respect to the users' clinical conditions; moreover, “medications provision” represents the 16.4% of all interventions (Starace, 2019). Third, the sample size was relatively small, and no randomization was adopted. This may impair the generalizability of findings. Yet, the results were consistent with the current literature on this topic, this suggests the appropriateness of the methods chosen. Fourth, findings refer only to users who ended the VRP, and are part of the original group of 275 users. No estimation is here provided with respect to the potential benefits of VRPs to the rest of the users (211), concerning clinical indicators and budget reduction. Again, it is possible that the present study underestimates the positive effects of VRPs for both users and mental health services.

To sum up, this study showed that after VRPs zero compulsory admissions occurred, the number and days of psychiatric hospitalizations decreased, the number of non-scheduled interventions decreased, and the costs of hospitalization is reduced. Data on employability are consistent with literature.

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The association between work environment factors and risk of depression after retirement in Italy: findings from SHARE

ABSTRACT

Aim of this study was to measure the association between work environment factors and risk of depression after retirement in Italy. A secondary retrospective analysis was carried out using the Survey of Health, Ageing and Retirement in Europe (SHARE), wave 6 and 7. The latter is also known as SHARELIFE and provided retrospective data on the respondents' working conditions before retirement. Simple and multiple binary logistic regressions were used to analyze the associations between presence of depression after retirement (detected by the Euro-D scale) and work environment factors. In a final sample made up of 584 individuals, with respect to work environment factors only fair salary was associated with reduced risk of depression after retirement (OR=0.75, p=0.047). Female gender, number of chronic diseases and presence of the partner in the household increased the risk of depression (OR=1.84, p<0.01; OR=1.58, p<0.01; OR=1.45, p<0.01, respectively), while higher education decreased it (OR=0.88, p=0.048). With respect to personality, the risk of depression after retirement increased a higher level of neuroticism (OR=1.49, <0.01). Differently, increased conscientiousness was associated with decreased risk of depression (OR=0.73, p=0.06) This study provided evidence that work environment factors, namely unfair salary, may increase the risk of depression after retirement in Italy, and prompt to the adoption of proper policies able to tackle this important work and health issue.

Keywords: *work factors; depression; retirement; Italy; SHARE*

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INTRODUCTION

Common mental disorders are currently the main cause of work absenteeism in the Western countries (Black, 2008; Duijts et al., 2007; Harvey et al., 2009; Whiteford et al., 2013). Such disorders include anxiety and depressive (non-psychotic) disorders, and are largely treatable and preventable (Knudsen et al., 2013; Knudsen et al., 2010; Lelliott et al., 2008; Mykletun & Harvey, 2012).

According to the Global Burden of Disease research initiative, in 2010 psychiatric disorders represented the first cause of years lived with disability (YLDs) worldwide. Depression alone caused 40.5% of all disability-adjusted life years (DALYs) due to psychiatric disorders in the same year (Whiteford et al., 2013; Starace, 2016). These data are hard to explain only in the light of biological or genetic causes and encourage the search for possible environmental risk factors (Mattei, et al., 2018).

A growing body of research produced in the last decades has suggested that work environmental factors play an important role in the onset and maintenance of depressive and anxiety disorders (Wang, et al., 2010a; Wang et al., 2010b). In health care settings (specifically, nursing), several individual and work-related factors were identified, associated with the development of depression: role overload (i.e. an imbalance between available resources and the work demand), job strain, and lower perceived respect from superiors and colleagues (Ohler et al., 2010). Despite this topic is frequently addressed, especially in the health care sector (Finn, 2001; Hanson, Jenkins, & Ryan, 1990; Unruh & Zhang, 2013), no consensus still exists with respect to the work factors able to influence the workers' mental health.

According to the recent review by Harvey et al. (2017), twelve work environmental risk factor may be identified, featured by a good level of evidence: high job demand, low job control, low workplace social support, effort-reward imbalance (ERI), low organizational procedural justice, low organizational relational justice, organizational change, job insecurity, temporary employment status, atypical working hours, bullying and role stress. The authors have proposed a model that groups those twelve factors in three dimensions, given the high level of interrelation and overlap. The first cluster of workplace risk factors, named "imbalance job design", includes job demands, job control, ERI, and occupational social support. The second cluster, named "occupational uncertainty", includes job control, procedural justice, organizational change, job insecurity, and temporary employment status. Finally, the third cluster, named "lack of value and respect within the workplace", includes ERI, procedural justice, relational justice, temporary employment status, and occupational social support.

To investigate the relationship between such work environmental factors and depression the Survey of Health, Ageing and Retirement in Europe (SHARE) was used. The latter is a multidisciplinary, panel database of micro data collected in 27 European Countries and Israel, on a sample made up of about 140,000 individuals aged 50 years old or more. SHARE gathers data on socio-economic status, social network, and health. Up to the moment, 8 waves have been carried out, the first in 2004. Each wave cross-sectionally investigates the sample enrolled in SHARE, thus permitting a longitudinal evaluation. Moreover, waves 3 and 7 collected data retrospectively, and are called SHARELIFE. Several approaches may be adopted to use the data provided by

SHARE and SHARELIFE waves (Brugiavini et al., 2013). Since SHARELIFE gathers information concerning the respondent's life, in this study an event occurred in the past (work) is related to other individual outcomes later in the respondent's life (presence of depression after retirement).

As previously recalled, depression is highly prevalent, especially in the elderly and after retirement (Blazer, 2003). Validated, standardized tools help measure the prevalence of depression in different Countries and permit cross-national comparison. To this aim, SHARE questionnaires include the EURO-D scale (Prince et al., 1999), that measures depressive symptoms in late-life across European countries. The value of 4 or more predicts depression as detected by Geriatric Mental State (GMS: Copeland et al., 1986) and the SHORT-CARE (Prince et al., 1999), as well as defined by the Diagnostic and Statistical Manual of Mental Disorders-III-Revised among older individuals (Larraga et al., 2006).

The development of depression is linked to life events as well as to individuals' characteristics, such as personality. According to one of the most widely accepted models, the Five-Factor Model, (McCrae and Costa, 2013), it is possible to recognize five dimension featuring personality: Extraversion, Agreeableness, Conscientiousness, Neuroticism, Openness. Higher levels of Neuroticism, and lower levels of Extraversion and Conscientiousness have been associated with depression in younger (Kotov et al., 2010; Malouff et al., 2005) and older adults (Hayward et al., 2013; Koorevaar et al., 2013; Weber et al., 2010, 2012). Therefore, individual personality features were included as control variables in the present study. In fact, placed within the framework of the vulnerability-stress model, depression may be caused by the "encounter" between individual's characteristics (e.g., personality traits) and environmental stressors (work environment factors). Also, rather than being a single nosological entity, depression is a spectrum of different disorders (e.g. melancholic, atypical, psychotic, episodic, recurrent, etc.). The attempts made in literature to correlate personality traits and type of depression are available elsewhere (Angst et al., 2007; Baumeister & Gordon, 2012; Gili et al., 2012; Lamers et al., 2010; Rhebergen, 2012). For the aim of this study, it is worth recalling that the association between personality traits and depression may be studied both categorically and dimensionally. The former approach is focused on the presence of depressive symptoms, while the latter approach is focused on the presence of depression as a specific syndrome, and was adopted in the present study, that aimed to measure the association between work environment factors and risk for depression after retirement in Italy. All variables concerning work environment available in SHARE were collected, to assess their association with depression. This research aims to fill the literature gap represented by the lack of studies focused on the long-term outcomes of workplace risk factors on workers' mental health. While several studies addressed this association cross-sectionally or in the short-term, the present study focuses on the long-term, namely on the association between work environment factors and the onset of depression after retirement.

METHODS

Study design and data collection

This is a retrospective study. SHARE wave 6 and SHARELIFE wave 7 were used for data collection (Börsch-Supan et al., 2013; Malter & Börsch-Supan, 2017; Börsch-Supan, 2020a, 2020b; Bergmann et al., 2019). The datasets were merged using the person identifier (mergeid_) to obtain data concerning the Italian sample and to retired individuals only.

The following variables were collected:

- (1) Socio-demographic and household variables: age, gender, education, household size, number of children, presence of chronic diseases, presence of partner in the household, mean household income (in euros per month).
- (2) Mental health variables: presence of depression, according to the EURO-D caseness, which is a categorical binary variable that detects the presence/absence of depression (according to a cut-off of four or more at the EURO-D scale); personality features, identified by means of the Big 5 Inventory, which concerns five dimensions of personality: extraversion, agreeableness, conscientiousness, neuroticism, openness.
- (3) Work environment variables: individuals were asked about the following issues: work was physically demanding, work was uncomfortable, work had heavy time pressure, work was emotionally demanding, work involved conflicts, work had little freedom to decide, work allowed development of skills, work gave recognition, work had adequate salary, work had adequate support, work atmosphere, work employees were treated fair, work health risk reduced. Four possible answers were available for each variable: strongly agree, agree, disagree, strongly disagree. Therefore, for each variable concerning work environment, a new variable was generated, ranging from 0 (strongly disagree) to 3 (strongly agree), so to have increasing values and facilitate data interpretation. Moreover, building on the International Standard Classification of Occupations (ISCO-88) four categories of employees were identified. The first category is represented by high skilled white collar workers, i.e. legislators, senior officials and managers, professionals and technicians and associate professionals, identified by ISCO codes 1, 2 and 3. The second category is represented by clerks and service workers and shop and market sales workers low skilled white collar, as defined by ISCO codes 4 and 5. The third category, high skilled blue collar worker, is made up of skilled agricultural and fishery workers and craft and related trades workers (referring to ISCO codes 6 and 7). Finally, low skilled blue-collar jobs include plant and machine operators and assemblers and elementary occupations, identified by ISCO codes 8 and 9. Please note that armed forces and law enforcement agents are excluded.

The complete dataset is detailed in the Appendix (Table A1).

Appendix Table A2 shows the correspondence between work environment factors collected from SHARELIFE, the twelve evidence-based work-related risk factors identified by Harvey et al. (2017), and the

three clusters proposed by the same authors. As noticeable, the work factors included in the present study refer to all three clusters.

Data analysis

Descriptive statistics were carried out by means of mean, median, frequency, standard deviation, range. Inferential statistics were made with multiple binary logistic regression models, with robust standard errors. The outcome absence (0) or presence (1) of clinical symptoms of depression, as detected by the EURO-D. First, univariate logistic regressions were run. Then, a multivariate logistic model was built, including as explanatory variables only covariates that had reached a $p < 0.25$ level of statistical significance at the univariate analysis. This significance cut-off, higher than the usual one, was set to reduce Type II error, i.e. the possibility to exclude potentially significant covariates from the final analysis. In the multivariate regression analyses the usual level of significance ($p < 0.05$) was set to identify variables significantly associated with the presence of depression after retirement (Hosmer & Lemeshow, 2000).

Ethics

All data were anonymized, aggregated at the origin and in the public domain: therefore, Ethics Committee's approval was not necessary. The guidelines governing research from the Declaration of Helsinki were followed.

RESULTS

The sample features and descriptive statistics are presented in Table 1. The correlation analysis between work environment factors displayed in Table A2 showed a high correlation between work atmosphere, work employees treated fair, work health risk reduced, and work support. Therefore, only the latter was included in the analysis.

The results of the univariate regression analysis are displayed in Table 2. Only covariates that had reached a significance level < 0.25 were included in the multiple regression analysis, displayed in Table 3. The variable featured by the highest p-value was excluded, and the regression was run again. This manual stepwise approach was repeated up to the result displayed in Table 4.

As Table 2 shows, the following variables reached a significance level < 0.25 : female gender, age, number of chronic diseases, partner in the household, education, number of children, agreeableness, conscientiousness, neuroticism, openness, work physically demanding, uncomfortable work atmosphere, work featured by conflicts, work allowed development of skills, work featured by adequate salary (i.e. fair payment), work featured by adequate support. The manual stepwise procedure led to the model displayed in Table 3, which shows the results of the study. Seven variables were significantly associated with the outcome (i.e. presence

of depression). Among sociodemographic variables, female gender, number of chronic diseases, presence of partner in the household, and education were all associated with the outcome. Female gender was associated with increased risk of depression (OR=1.84, $p<0.01$) similarly to number of chronic diseases and presence of partner in the household (OR=1.56, $p<0.01$, and OR=1.45, $p<0.01$, respectively). Differently, higher education was associated with decreased risk of depression (OR=0.89, $p=0.08$) With respect to personality traits, increased consciousness was associated with decreased risk of depression (OR=0.73, $p=0.06$), while neuroticism with increased risk (OR=1.49, $p<0.01$). As far as work environment factors are concerned, only fair payment was associated with the outcome. In particular, the perception of fair salary was associated with decreased risk of depression (OR=0.75, $p=0.047$).

Table 1 – Descriptive statistics on the variables used in the study

<i>Continuous variables</i>	<i>Observations</i>	<i>Mean</i>	<i>Std. Dev.</i>
Age	960	70.60	6.85
No. of chronic diseases	960	1.62	1.50
Household size	960	2.18	0.89
Mean household income (per month), in euros	543	1908.39	1453.36
No. of children	956	1.84	1.17
Extraversion (Big Five personality inventory)	941	3.17	0.79
Agreeableness (Big Five personality inventory)	941	3.67	0.74
Conscientiousness (Big Five personality inventory)	940	4.00	0.70
Neuroticism (Big Five personality inventory)	941	2.67	0.84
Openness (Big Five personality inventory)	935	3.24	0.88
<i>Categoric variables</i>	<i>Observations</i>	<i>N</i>	<i>%</i>
Gender	960		
Female		376	39.17
Male		584	60.83
Partner in the household	960		
Yes		745	77.60
No		215	22.40
International Standard Classification of Education (0-8)	608		
ISCED 0		65	10.69
ISCED 1		209	34.38
ISCED 2		170	27.96
ISCED 3		89	14.64
ISCED 4		17	2.80
ISCED 5		9	1.48
ISCED 6		2	0.33
ISCED 7		46	7.57
ISCED 8		1	0.16
Occupation	927		
Low skilled blue collar (ISCO codes 8,9)		765	82.52

High skilled blue collar (ISCO codes 6, 7)		62	6.69
Low skilled white collar (ISCO codes 4, 5)		28	3.02
High skilled white collar (ISCO codes 1,2,3)		72	7.77
Work was physically demanding	960		
Strongly disagree		53	5.52
Disagree		169	17.60
Agree		388	40.42
Strongly agree		350	36.46
Work was uncomfortable	959		
Strongly disagree		152	15.85
Disagree		320	33.37
Agree		336	35.04
Strongly agree		151	15.75
Work had heavy time pressure	959		
Strongly disagree		74	7.72
Disagree		306	31.91
Agree		408	42.54
Strongly agree		171	17.83
Work was emotionally demanding	959		
Strongly disagree		106	11.05
Disagree		342	35.66
Agree		341	35.56
Strongly agree		170	17.73
Work involved conflicts	959		
Strongly disagree		154	16.06
Disagree		468	48.80
Agree		240	25.03
Strongly agree		97	10.11
Work had little freedom to decide	960	169	17.60
Strongly disagree		356	37.08
Disagree		292	30.42
Agree		143	14.90
Strongly agree			
Work allowed development of skills	959		
Strongly disagree		110	11.47
Disagree		272	28.36
Agree		409	42.65
Strongly agree		168	17.52
Work gave recognition	959		
Strongly disagree		52	5.42
Disagree		198	20.65
Agree		534	55.68
Strongly agree		175	18.25
Work had adequate salary	958		
Strongly disagree		48	5.01
Disagree		243	25.37

Agree		530	55.32
Strongly agree		137	14.30
Work had adequate support	957		
Strongly disagree		57	5.96
Disagree		241	25.18
Agree		565	59.04
Strongly agree		94	9.82
Work atmosphere was uncomfortable	957		
Strongly disagree		57	5.96
Disagree		241	25.18
Agree		565	59.04
Strongly agree		94	9.82
Work employees treated fair	957		
Strongly disagree		57	5.96
Disagree		241	25.18
Agree		565	59.04
Strongly agree		94	9.82
Work health risk reduced	957		
Strongly disagree		57	5.96
Disagree		241	25.18
Agree		565	59.04
Strongly agree		94	9.82
Depression	931		
Yes (Euro-D ≥ 4)		255	27.39
No(Euro-D < 3)		676	72.61

Table 2 – Results of univariate logistic regression. Bold p-values indicate significant covariables ($p < 0.25$) at the univariate analysis, therefore included in the multiple analysis

	<i>OR</i>	<i>p-value</i>	<i>95% CI</i>
Female gender	1.92	<0.01	1.43 - 2.57
Age classes	1.31	<0.01	1.08 - 1.59
No. of chronic diseases	1.49	<0.01	1.35 - 1.65
Household size	0.91	0.29	0.75 - 1.09
Partner in the household	1.49	<0.01	1.26 - 1.75
Education (according to the International Standard, Classification of Education, range: 0-8)	0.88	0.03	0.78 - 0.99
Mean household income (per month), in euros	1.00	0.46	0.99 - 1.01
No. of children	1.14	0.05	1.01 - 1.29
Occupation (according to the ISCO codes, range: 1-9)	0.95	0.55	0.80 - 1.13
Extraversion (Big Five personality inventory)	1.00	0.97	0.82 - 1.20
Agreeableness (Big Five personality inventory)	0.79	0.02	0.65 - 0.97
Conscientiousness (Big Five personality inventory)	0.72	<0.01	0.58 - 0.89
Neuroticism (Big Five personality inventory)	1.53	<0.01	1.28 - 1.82
Openness (Big Five personality inventory)	0.75	<0.01	0.64 - 0.88
WQ2 Work was physically demanding	1.23	0.02	1.03 - 1.48
WQ3 Work atmosphere was uncomfortable	1.10	0.22	0.94 - 1.29
WQ4 Work had heavy time pressure	1.06	0.52	0.89 - 1.26
WQ5 Work was emotionally demanding	1.07	0.44	0.91 - 1.25
WQ6 Work involved conflicts	1.14	0.13	0.96 - 1.35

WQ7 Work had little freedom to decide	1.04	0.59	0.89 - 1.22
WQ8 Work allowed development of skills	0.84	0.03	0.71 - 0.98
WQ9 Work gave recognition	0.98	0.81	0.81 - 1.18
WQ10 Work had adequate salary	0.72	<0.01	0.59 - 0.88
WQ11 Work had adequate support	0.84	0.09	0.69 - 1.03

Table 3 – Results of the multiple logistic regression (N= 578, Pseudo R2 = 0.17).

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.84	0.43	<0.01	1.16 - 2.90
Age	1.00	0.16	0.98	0.73 - 1.37
No. of chronic diseases	1.56	0.12	<0.01	1.35 - 1.82
Partner in the household	1.49	0.19	<0.01	1.17 - 1.90
Education (according to the International Standard, Classification of Education, range: 0-8)	0.89	0.06	0.09	0.78 - 1.02
No. of children	1.15	0.13	0.20	0.93 - 1.43
Agreeableness (Big Five personality inventory)	0.92	0.15	0.60	0.67 - 1.26
Conscientiousness (Big Five personality inventory)	0.74	0.13	0.08	0.52 - 1.04
Neuroticism (Big Five personality inventory)	1.46	0.20	0.01	1.11 - 1.92
Openness (Big Five personality inventory)	0.89	0.12	0.38	0.68 - 1.16
WQ2 Work was physically demanding	1.10	0.16	0.52	0.83 - 1.46
WQ3 Work atmosphere was uncomfortable	0.86	0.12	0.29	0.66 - 1.13
WQ6 Work involved conflicts	1.11	0.15	0.43	0.86 - 1.44
WQ8 Work allowed development of skills	0.90	0.12	0.44	0.70 - 1.17
WQ10 Work had adequate salary	0.68	0.11	0.02	0.49 - 0.94
WQ11 Work had adequate support	1.33	0.23	0.09	0.95 - 1.86
Constant	0.22	0.31	0.29	0.01 - 3.62

Table 4 – Results of the multiple logistic regression, final model (N= 585, Pseudo R2 = 0.15)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.84	0.40	<0.01	1.20 - 2.83
No. of chronic diseases	1.56	0.11	<0.01	1.37 - 1.82
Partner in the household	1.45	0.17	<0.01	1.15 - 1.82
Education (according to the International Standard, Classification of Education, range: 0-8)	0.89	0.06	0.08	0.78 – 1.00
Consciousness (Big Five personality inventory)	0.73	0.12	0.06	0.53 - 1.01
Neuroticism (Big Five personality inventory)	1.49	0.19	<0.01	1.15 – 1.92
WQ10 Work had adequate salary	0.75	0.11	0.047	0.56 – 0.99
constant	0.23	0.21	0.11	0.01 – 1.38

DISCUSSION

Aim of the present study was to measure the association between work environment factors and risk of depression after retirement. After controlling for socio-demographic and personality features, it stemmed out that unfair payment was associated with higher risk of depression after retirement. This finding is consistent with the literature review by Harvey et al. (2017), suggesting that effort-reward imbalance (ERI) is a work environment factor strongly associated with the risk of developing common mental disorders, namely depression. According to the ERI model, the unmatching between effort made and work reward generates the most stressful work condition. The notion that unfair treatment, i.e. increased ERI in the workplace, be associated with risk of depression is consistent with previous studies (Stansfeld & Candy, 2006; Nieuwenhuijsen et al., 2010). Notably, out of the twelve factors identified by Harvey et al. (2017), only unfair payment was significant at the multiple regression analysis, suggesting that this item may be particularly relevant in the Italian labor market. A possible reason of this may be found in the role of black economy that still represents a relevant problem for the Italian system.

Also, the finding concerning unfair payment is consistent with previous research pointing out both short- and long-term health outcomes of unfair payment, possibly via increased individual stress, proxied by heart rate variability (Vermunt & Steensma, 2003; Golbidi et al., 2015; Falk et al., 2016). Important differences exist between acute and chronic stress. On the one hand, acute stress may promote chemotaxis and adhesion molecules expression, via a sympatho-adrenergic response. This mechanism seems able to promote the migration of immune cells to sites of infections or inflammation. On the other hand, chronic stress decreases the ability of the immune system to respond when needed, e.g. decreasing the lymphocytes NK cytotoxic capacity. Similarly, the mobilization of T lymphocytes is impaired by chronic stress. Finally, it was shown that chronic stress reduces the production of antibodies when a vaccine is administered (Dragoș & Tănăsescu, 2010). Moreover, the bidirectional relationship between depression and immunological impairment is well established (Dantzer, 2018). Therefore, placed within the stress-vulnerability-coping model (Kessler et al., 1985), this finding might be explained as follows. Unfair payment may cause a state of persistent stress, which is able to cause outcomes at the psychological, neurological, immunological, and endocrinological level even in the long run, i.e. after retirement. This condition of long-term stress may impact the brain, making the individual at risk of developing depression. The same mechanism might play a role with respect to health-related behavior, as previously suggested (Mattei et al., 2017). Interestingly, the adoption of a psycho-neuro-endocrine-immunological (PNEI) approach to this topic represents an avenue of further research (Mancini et al., 2021).

Of course, a psychological mechanism may act, as well. Receiving an unfair wage may represent a narcissistic wound that may promote the development of reactive depressions, as happens in mourning and its equivalents.

Notably, the associations between unfair salary and risk of depression after retirement stemmed out after controlling for the major individual sociodemographic and psychological variables. This study confirmed that female gender and increased number of chronic diseases are associated with presence of depression. The

presence of the partner in the household was associated with risk of depression as well: this may sound surprising, at first sight. Yet, this finding might be due to the fact that a sample of retired people was investigated, i.e., with mean age higher than the general population. The same could be said for their partners. It is known that chronic diseases increase with age, so it is possible that even partners of individuals in the sample be affected by higher number of chronic diseases. In this sense, the presence of the partner in the household may turn he/she in a psychological burden, rather than in a resource, i.e. a caregiver. On the other hand, higher education level was associated with lower risk of depression, consistent with the notion that psychiatric disorders are more prevalent among less affluent people (Priebe, 2015).

With respect to personality factors, this study confirmed that consciousness represents a protective factor from depression, while neuroticism represents a risk factor, as pointed out by other authors (Koorevaar et al., 2013). Yet, this study even suggests that unfair wage represents a factor independently associated with the risk of developing depression after retirement, irrespectively from personality traits.

This study has policy implications that need to be highlighted, with respect to the regulation on minimum wage. The Italian Constitution (art. 36) states that “The worker has the right to receive a wage proportionate to the quantity and quality of his/her work, and in any case sufficient to assure the worker and his/her family a free and dignified existence” [my translation from Italian]. Yet, Italy does not have any act determining the minimum wage. Moreover, the gender pay gap (i.e., the difference between the gross hourly earnings between working men and working women) is still a crucial issue in Italy as well as in the European Union Member States, where in 2017 women earned on average 16% less per hour than men (European Commission, 2019). Of course, important differences exist between the EU countries, with respect to this topic. As far as Italy is concerned, in 2017 the annual income of an Italian working woman was on average 25% less than an Italian working man (15.373 euros vs 20.453 euros; in 2008 it was 28% (Sabbadini, 2020). Proper policies are needed to tackle this issue in Italy, with respect to women as well as minorities (Mattei et al., 2020).

One strength of the present study is to provide empirical evidence of the association between workplace environmental factors (namely, the perception of a fair wage) and depression. Also, while previous studies addressed the risk of common mental disorders due to effort-reward imbalance in the work environment, the present study specifically investigated the risk of depression, as suggested by Harvey et al. (2017). Yet, this study has several limitations that need to be acknowledged. First, the data used were already collected and aggregated at the origin, therefore it was not possible to assess their quality. Yet, having derived them from SHARE guarantee their quality. Second, self-report answers concerning work environmental factors were used. The lack of an objective definition and measure may have partly biased the analysis. Therefore, specific, validated measures should be adopted in future studies. Third, life history interviews may be affected by the so-called ‘recall bias’, concerning the ability of respondents of reporting correctly past events. This might be even the case of SHARELIFE. Yet, Havari and Mazzonna (2011) carefully analyzed SHARELIFE, concluding that such issue does not jeopardize the validity of the SHARELIFE dataset. Fourth, data were not disaggregated by region or macro-region, though important differences exist in Italy between North and South

with respect to labor market and health care. Yet, fair payment and gender gap involve the whole country, despite regional specificities.

Despite all the above-mentioned limitations, this study provided evidence that work environment factors, namely unfair salary, may increase the risk of depression after retirement in Italy, and prompt to the adoption of proper policies able to tackle this important work and health issue.

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APPENDIX

Table A1 – Variables collected in the dataset: description and corresponding questionnaire variables.

Variables	Description	Questionnaire variables
Mergeid	Individual identifier; it is fixed across waves and modules	Mergeid_
Gender	Refers to the respondent's gender (female or male)	gender (cv_r module)
Age (at interview)	Refers to the respondent's age at interview	age_int (w6) (cv_r module)
Education	Indicates the level of education according to International Standard Classification of Education: = none; 1-8 refers to ISCED 1-8, as follows: ISCED 0: Early childhood education ('less than primary' for educational attainment) ISCED 1: Primary education ISCED 2: Lower secondary education ISCED 3: Upper secondary education ISCED 4: Post-secondary non-tertiary education ISCED 5: Short-cycle tertiary education ISCED 6: Bachelor's or equivalent level ISCED 7: Master's or equivalent level ISCED 8: Doctoral or equivalent level	isced2011_r (gv module)
Country	Indicates the respondent's country of residence at the time of the interview	country (cv_r module)
Retired	Identifies the current job situation, specifically the condition of retirement	ep005_ (ep module)
Household size	Indicates the number of individuals making up the household	hhsiz (hh module)
Mean household income (per month)	Indicates the total income received by all household-members an average month in the previous year, in euros	hh017ub (hh module)
Presence of the partner in the household	Indicates the presence of the partner in the household	Partnerinhh (cv_r module)

Personality variables	Refer to five dimensions of the respondent's personality as per the Big 5 Inventory: extraversion, agreeableness, conscientiousness, neuroticism, openness	bfi10_extra bfi10_agree bfi10_consc bfi10_neuro bfi10_open (mh module)
Depression variable	Refer to the presence of depression both categorically (presence vs. absence of depression, eurodcat) and dimensionally (presence vs. absence of depressive symptoms, eurod). Also, mh018_ differentiated individuals who ever suffered from depression from those who did not	Eurodcat
Comorbidity	Refer to the number of chronic diseases present	chronicw6c (gv_health module)
Work environment features	Investigate the following dimensions of working environment (before retirement, and referring to the main job): Work was physically demanding Work was uncomfortable Work had heavy time pressure Work was emotionally demanding Work involved conflicts Work had little freedom to decide Work allowed development of skills Work gave recognition Work had adequate salary Work had adequate support Work atmosphere Work employees treated fair Work health risk reduced	wq002_ wq003_ wq004_ wq005_ wq008_ wq009_ wq010_ wq011_ wq012_ wq013_ wq014_ (ep module)
Occupation	Low skilled blue collar (ISCO codes 8,9) High skilled blue collar (ISCO codes 6, 7) Low skilled white collar (ISCO codes 4, 5) High skilled white collar (ISCO codes 1,2,3)	ep152isco

Table A2 – Correspondence between work-environment factors included in SHARELIFE, the evidence-based work-related risk factor identified by Harvey et al. (2017), and the clusters proposed by the same authors.

Work-environment factors (included in SHARELIFE)	Evidence-based work-related risk factor (Harvey et al., 2017)	Cluster – according to the model by Harvey et al., 2017
Work was physically demanding	High job demand	Imbalance job design
Work was uncomfortable	Low workplace social support	Imbalanced job design; Lack of value and respect in the workplace
Work had heavy time pressure	High job demand	Imbalance job design
Work was emotionally demanding	High job demand	Imbalance job design
Work involved conflicts	Workplace conflict/bullying Organizational change	Lack of value and respect in the workplace Occupational uncertainty
Work had little freedom to decide	Low job control Atypical working hours	Imbalanced job design; Occupational uncertainty
Work allowed development of skills	low organizational procedural justice low organizational relational justice	Imbalanced job design; Lack of value and respect in the workplace; Occupational uncertainty
Work gave recognition	Effort–reward imbalance (ERI) Role stress	Imbalanced job design; Lack of value and respect in the workplace; Occupational uncertainty
Work had adequate salary	Effort–reward imbalance (ERI) Role stress	Imbalanced job design; Lack of value and respect in the workplace; Occupational uncertainty
Work had adequate support	Low workplace social support	Imbalanced job design; Lack of value and respect in the workplace
Work atmosphere	low organizational procedural justice low organizational relational justice Job insecurity Temporary employment status	Imbalanced job design; Lack of value and respect in the workplace; Occupational uncertainty
Work employees treated fair	low organizational relational justice	Lack of value and respect in the workplace
Work health risk reduced	low organizational procedural justice	Imbalanced job design; Lack of value and respect in the workplace; Occupational uncertainty

Table A3 – Correlation analysis between all work environment variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	1.00												
(2)	0.46	1.00											
	<.01												
(3)	0.31	0.35	1.00										
	<.01	<.01											
(4)	0.13	0.15	0.41	1.00									
	<.01	<.01	<.01										
(5)	0.11	0.21	0.34	0.40	1.00								
	<.01	<.01	<.01	<.01									
(6)	0.16	0.26	0.18	0.11	0.18	1.00							
	<.01	<.01	<.01	<.01	<.01								
(7)	-0,14	-0,16	-0,004	0.10	-0,01	-0,14	1.00						
	<.01	<.01	0.47	<.01	0.07	<.01							
(8)	-0,12	-0,18	-0,13	-0,04	-0,19	-0,14	0.35	1.00					
	<.01	<.01	<.01	<.01	<.01	<.01	<.01						
(9)	-0,16	-0,15	-0,14	-0,09	-0,12	-0,09	0.22	0.44	1.00				
	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01					
(10)	-0,12	-0,15	-0,16	-0,09	-0,21	-0,09	0,27	0,47	0,41	1.00			

	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01				
(11)	-0,12	-0,15	-0,16	-0,09	-0,21	-0,09	0,27	0,47	0,41	1,00	1,00		
	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01			
(12)	-0,12	-0,15	-0,16	-0,09	-0,21	-0,09	0,27	0,47	0,41	1,00	1,00	1,00	
	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01		
(13)	-0,12	-0,15	-0,16	-0,09	-0,21	-0,09	0,27	0,47	0,41	1,00	1,00	1,00	1,00
	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	

List of variables concerning work environment (self-perceived):

- (1) Work was physically demanding
- (2) Work was uncomfortable
- (3) Work had heavy time pressure
- (4) Work was emotionally demanding
- (5) Work involved conflicts
- (6) Work had little freedom to decide
- (7) Work allowed development of skills
- (8) Work gave recognition
- (9) Work had adequate salary
- (10) Work had adequate support
- (11) Work atmosphere
- (12) Work employees treated fair
- (13) Work health risk reduced

Table A4 – Results of the stepwise multiple regression models. First step (N= 578, Pseudo R2 = 0.17)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.84	0.43	<0.01	1.16 - 2.90
Age	1.00	0.16	0.98	0.73 - 1.37
No. of chronic diseases	1.56	0.12	<0.01	1.35 - 1.82
Partner in the household	1.49	0.19	<0.01	1.17 - 1.90
Education	0.89	0.06	0.09	0.78 - 1.02
No. of children	1.15	0.13	0.20	0.93 - 1.43
Agreeableness (Big Five personality inventory)	0.92	0.15	0.60	0.67 - 1.26
Conscientiousness (Big Five personality inventory)	0.74	0.13	0.08	0.52 - 1.04
Neuroticism (Big Five personality inventory)	1.46	0.20	<0.01	1.11 - 1.92
Openness (Big Five personality inventory)	0.89	0.12	0.38	0.68 - 1.16
WQ2 Work was physically demanding	1.10	0.16	0.52	0.83 - 1.46
WQ3 Work atmosphere was uncomfortable	0.87	9.12	0.29	0.66 - 1.13
WQ6 Work involved conflicts	1.11	0.15	0.43	0.86 - 1.44
WQ8 Work allowed development of skills	0.90	0.12	0.44	0.70 - 1.167
WQ10 Work had adequate salary	0.68	0.11	0.02	0.49 - 0.94
WQ11 Work had adequate support	1.33	0.23	0.09	0.95 - 1.86
Constant	0.22	0.31	0.29	0.01 - 3.62

Tables A5 – Results of the stepwise multiple regression models Second step. (N= 578, Pseudo R2 = 0.17)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.84	0.43	<0.01	1.16 - 2.90
No. of chronic diseases	1.57	0.12	<0.01	1.35 - 1.81
Partner in the household	1.49	0.19	<0.01	1.17 - 1.91
Education	0.89	0.06	0.09	0.78 - 1.02
No. of children	1.15	0.13	0.20	0.93 - 1.43
Agreeableness (Big Five personality inventory)	0.92	0.15	0.59	0.67 - 1.25
Conscientiousness (Big Five personality inventory)	0.74	0.13	0.08	0.52 - 1.04
Neuroticism (Big Five personality inventory)	1.46	0.20	<0.01	1.11 - 1.91
Openness (Big Five personality inventory)	0.89	0.12	0.38	0.68 - 1.16
WQ2 Work was physically demanding	1.10	0.16	0.52	0.83 - 1.46
WQ3 Work atmosphere was uncomfortable	0.87	0.12	0.28	0.67 - 1.13
WQ6 Work involved conflicts	1.11	0.15	0.43	0.86 - 1.44
WQ8 Work allowed development of skills	0.91	0.12	0.44	0.70 - 1.16
WQ10 Work had adequate salary	0.68	0.11	0.02	0.49 - 0.94
WQ11 Work had adequate support	1.33	0.23	0.09	0.95 - 1.86
Constant	0.22	0.31	0.28	0.01 - 3.51

Table A6 – Results of the stepwise multiple regression models. Third step (N= 578, Pseudo R2 = 0.17)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.84	0.43	<0.01	1.17 - 2.90
No. of chronic diseases	1.57	0.12	<0.01	1.35 - 1.81
Partner in the household	1.50	0.19	<0.01	1.18 - 1.91
Education	0.89	0.06	0.09	0.78 - 1.02
No. of children	1.15	0.13	0.20	0.93 - 1.43
Conscientiousness (Big Five personality inventory)	0.73	0.13	0.08	0.52 - 1.03
Neuroticism (Big Five personality inventory)	1.48	0.20	<0.01	1.14 - 1.93
Openness (Big Five personality inventory)	0.88	0.12	0.34	0.68 - 1.14
WQ2 Work was physically demanding	1.10	0.16	0.50	0.83 - 1.46
WQ3 Work atmosphere was uncomfortable	0.86	0.12	0.27	0.66 - 1.12
WQ6 Work involved conflicts	1.11	0.15	0.42	0.86 - 1.44
WQ8 Work allowed development of skills	0.91	0.12	0.44	0.70 - 1.17
WQ10 Work had adequate salary	0.68	0.11	0.02	0.49 - 0.93
WQ11 Work had adequate support	1.33	0.22	0.09	0.95 - 1.85
Constant	0.16	0.21	0.16	0.01 - 1.98

Table A7 – Results of the stepwise multiple regression models. Fourth step (N= 578, Pseudo R2 = 0.17)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.84	0.43	<0.01	1.16 - 2.90
No. of chronic diseases	1.56	0.12	<0.01	1.35 - 1.81
Partner in the household	1.51	0.19	<0.01	1.19 - 1.93
Education	0.88	0.06	0.07	0.77 - 1.01
No. of children	1.16	0.13	0.19	0.93 - 1.44
Conscientiousness (Big Five personality inventory)	0.73	0.13	0.08	0.52 - 1.04
Neuroticism (Big Five personality inventory)	1.49	0.20	<0.01	1.15 - 1.93
Openness (Big Five personality inventory)	0.87	0.11	0.29	0.67 - 1.13
WQ3 Work atmosphere was uncomfortable	0.89	0.11	0.34	0.69 - 1.13
WQ6 Work involved conflicts	1.11	0.15	0.43	0.86 - 1.43
WQ8 Work allowed development of skills	0.91	0.12	0.47	0.71 - 1.17
WQ10 Work had adequate salary e	0.67	0.11	0.01	0.49 - 0.91
WQ11 Work had adequate support	1.33	0.23	0.09	0.95 - 1.85
Constant	0.21	0.26	0.20	0.02 - 2.31

Table A8 – Results of the stepwise multiple regression models. Fifth step (N= 578, Pseudo R2 = 0.16)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.87	0.43	<0.01	1.20 - 2.93
No. of chronic diseases	1.56	0.12	<0.01	1.35 - 1.81
Partner in the household	1.51	0.19	<0.01	1.19 - 1.92
Education	0.88	0.06	0.06	0.77 - 1.01
No. of children	1.16	0.13	0.19	0.93 - 1.44
Conscientiousness (Big Five personality inventory)	0.74	0.13	0.08	0.52 - 1.04
Neuroticism (Big Five personality inventory)	1.49	0.20	<0.01	1.15 - 1.93
Openness (Big Five personality inventory)	0.85	0.11	0.22	0.66 - 1.10
WQ3 Work atmosphere was uncomfortable	0.90	0.11	0.38	0.71 - 1.14
WQ6 Work involved conflicts	1.11	0.15	0.43	0.86 - 1.44
WQ10 Work had adequate salary	9.66	0.10	<0.01	0.48 - 0.90
WQ11 Work had adequate support	1.31	0.22	0.12	0.94 - 1.82
Constant	0.18	0.21	0.15	0.02 - 1.89

Table A9 – Results of the stepwise multiple regression models. Sixth step (N= 578, Pseudo R2 = 0.16)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.89	0.43	<0.01	1.21 - 2.96
No. of chronic diseases	1.56	0.12	<0.01	1.35 - 1.80
Partner in the household	1.51	0.19	<0.01	1.19 - 1.92
Education	0.89	0.06	0.07	0.78 - 1.01
No. of children	1.16	0.13	0.17	0.94 - 1.44
Conscientiousness (Big Five personality inventory)	0.72	0.12	0.06	0.51 - 1.01
Neuroticism (Big Five personality inventory)	1.49	0.20	<0.01	1.15 - 1.93
Openness (Big Five personality inventory)	0.86	0.11	0.23	0.66 - 1.10
WQ3 Work atmosphere was uncomfortable	0.91	0.11	0.46	0.72 - 1.16
WQ10 Work had adequate salary	0.66	0.10	<0.01	0.48 - 0.90
WQ11 Work had adequate support	1.27	0.21	0.15	0.92 - 1.77
Constant	0.26	0.29	0.23	0.03 - 2.36

Table A10 – Results of the stepwise multiple regression models. Seventh step (N= 578, Pseudo R2 = 0.16)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.94	0.44	<0.01	1.25 - 3.02
No. of chronic diseases	1.57	0.12	<0.01	1.35 - 1.81
Partner in the household	1.50	0.18	<0.01	1.18 - 1.91
Education	0.90	0.06	0.09	0.79 - 1.02
No. of children	1.16	0.13	0.19	0.93 - 1.43
Conscientiousness (Big Five personality inventory)	0.72	0.12	0.06	0.51 - 1.01
Neuroticism (Big Five personality inventory)	1.48	0.20	<0.01	1.14 - 1.92
Openness (Big Five personality inventory)	0.87	0.11	0.25	0.68 - 1.11
WQ10 Work had adequate salary	0.67	0.11	0.01	0.49 - 0.91
WQ11 Work had adequate support	1.29	0.22	0.14	0.92 - 1.79
Constant	0.19	0.19	0.11	0.02 - 1.44

Table A11 – Results of the stepwise multiple regression models. Eighth step (N= 581, Pseudo R2 = 0.16)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.90	0.42	<0.01	1.23 - 2.94
No. of chronic diseases	1.57	0.11	<0.01	1.36 - 1.8
Partner in the household	1.50	0.18	<0.01	1.18 - 1.90
Education	0.88	0.06	0.05	0.78 - 0.10
No. of children	1.15	0.12	0.19	0.93 - 1.43
Conscientiousness (Big Five personality inventory)	0.70	0.12	0.04	0.50 - 0.98
Neuroticism (Big Five personality inventory)	1.48	0.19	<0.01	1.15 - 1.91
WQ10 Work had adequate salary	0.68	0.11	0.01	0.49 - 0.91
WQ11 Work had adequate support	1.30	0.22	0.12	0.93 - 1.80
Constant	0.13	0.13	0.04	0.02 - 0.87

Table A12 – Results of the stepwise multiple regression models. Ninth step (N= 584, Pseudo R2 = 0.15)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.86	0.41	<0.01	1.21 - 2.85
No. of chronic diseases	1.59	0.12	<0.01	1.38 - 1.83
Partner in the household	1.45	0.17	<0.01	1.15 - 1.83
Education	0.87	0.06	0.04	0.77 - 0.99
Conscientiousness (Big Five personality inventory)	0.72	0.12	0.06	0.52 - 1.01
Neuroticism (Big Five personality inventory)	1.49	0.19	<0.01	1.16 - 1.92
WQ10 Work had adequate salary	0.67	0.11	0.01	0.49 - 0.91
WQ11 Work had adequate support	1.31	0.22	0.11	0.94 - 1.83
Constant	0.15	0.15	0.05	0.02 - 0.02

Table A13 – Results of the stepwise multiple regression models. Tenth step (N= 584, Pseudo R2 = 0.15)

	<i>OR</i>	<i>Rob. Std. Err.</i>	<i>P-value</i>	<i>95% Confidence Intervals</i>
Female gender	1.84	0.40	<0.01	1.20 - 2.83
No. of chronic diseases	1.58	0.11	<0.01	1.37 - 1.82
Partner in the household	1.45	0.17	<0.01	1.15 - 1.83
Education	0.88	0.06	0.05	0.78 – 1.00
Conscientiousness (Big Five personality inventory)	0.73	0.12	0.06	0.53 - 1.01
Neuroticism (Big Five personality inventory)	1.49	0.19	<0.01	1.15 - 1.92
WQ10 Work had adequate salary	0.75	0.11	0.05	0.56 - 1.00
Constant	0.23	0.21	0.12	0.04 - 1.38

Note

Marco Biagi's quotation at the beginning of the thesis is taken from his paper titled *Job Creation And Labour Law: From Protection Towards Pro-Action*, first published in *Industrial Law Journal*, Vol. 30, No. 4., 2001, pp. 417-420, and now included in M. Tiraboschi (ed.), 2003. *Marco Biagi, Selected Writings*. The Hague: Kluwer Law International, pp. 105-143.

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