Treatment for somatic diseases in people with mental disorders: longitudinal analyses from the GAZEL cohort study.

Running headline: Mental and somatic diseases.

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Abstract

Background: Individuals with mental disorders have poorer physical health and a shorter life expectancy than general population. The aim of the present study was to examine whether differential treatment for common somatic diseases in a setting with a universal access to health care might be a possible explanation.

Methods: Treatment status of 3784, 5529, and 4772 participants of a large French occupational cohort (the GAZEL study) with a self-reported diagnoses of respiratory, cardio-vascular (CVD), and metabolic diseases respectively, was recorded yearly from 2001 to 2011. The mental disorder status was defined based on the diagnosis of all medically certified sickness absence episodes of more than 7 days for mental disorder recorded during the 11-year period preceding the beginning of the follow-up for somatic diseases.

Results: After controlling for sociodemographic factors, health-related behaviors, and self-rated health in cross-sectional analyses, there was no association between mental disorders and the probability of being treated for somatic diseases at the beginning of the follow-up. In a longitudinal analyses men with depressive disorders had a 7% annual decrease in the probability of receiving treatment for CVD over time [OR=0.93, (95% CI: 0.87-0.99)]. Those with substance use disorders had a 21% annual decrease in the probability of receiving treatment for metabolic diseases over time [OR=0.79, (95% CI: 0.65-0.96)].

Conclusion: Men with depressive and substance use disorders might be at an increased risk for not being treated for CVD and metabolic disorders, suggesting that clinicians should pay special attention to these patients.

Keywords: *cohort study, epidemiology, somatic diseases, mental disorders, treatments, internal medicine.*

Keywords from the submission system: CHRONIC DISEASES, COHORT STUDY, CO-MORBIDITY, MENTAL DISEASE, EPIDEMIOLOGY

Introduction

Somatic disorders are more prevalent in people with mental disorders compared to the general population [1, 2]. They account for 60% of excessive mortality among individuals with mental disorders, with cardiovascular disorders being the most common cause of death [3]. Although the association between mental disorders and physical health complications has long been recognized, medical conditions often remain neglected, and as a result the life expectancy for individuals with severe mental disorders is estimated 30% shorter than that of the general population [4, 5]. Several factors may explain why individuals with mental disorders are more likely to have poor physical health and these factors include genetic vulnerability, hazardous lifestyle, poor medical adherence, side-effects of psychotropic drugs, and disparities in access to care and quality of care [6, 7]. This latter hypothesis has recently attracted significant research attention, with several studies showing people with mental disorders to be less likely to have specialized interventions.

Precisely, various studies have shown individuals with serious mental disorders such as schizophrenia, bipolar disorders, schizoaffective disorder, and major depressive disorder are less likely to be adequately screened and treated for dyslipidemia (up to 88% untreated) and hypertension (up to 62% untreated) [8-10], colorectal, breast, cervical, and uterine cancers [11], and have a low rate of invasive coronary interventions such as coronary artery bypass graft, cardiac catheterization, and percutaneous transluminal coronary angioplasty or percutaneous coronary intervention [12]. However, these studies were limited by their cross-sectional design and/or a shorter period of follow-up [1, 13, 14]. Thus, it remains unknown whether the lower probability of patients with mental disorders to be treated for somatic disorders tracks over time.

In the present study, based upon data collected in a setting with a universal access to health care, we examine whether the presence of mental disorders creates inequalities in the treatment of three major groups of somatic diseases, including respiratory, cardiovascular, and metabolic diseases.

Materials and Methods

Study population

The GAZEL cohort study was established in 1989, further details of this study are available elsewhere [15]. Briefly, the target population consisted of employees of the French national gas and electricity company (EDF–GDF) who have civil servant like employment conditions. At baseline, 20 625 volunteers (15 011 men and 5 614 women), aged 35–50 years, consented to participate in this study. The study design consists of an annual questionnaire used to collect data on health, lifestyle, individual, familial, social and occupational factors and life events [16]. Various sources within EDF–GDF provide additional data on GAZEL participants. The company has an occupational health department, its own medical insurance and a detailed surveillance system that permits extensive follow-up and linkage of health records with exposure characteristics. The GAZEL study received approval from the national commission overseeing ethical data collection in France (Commission Nationale de L'Informatique et Libertés).

Measures

Mental disorders

The epidemiological database established by the Health Insurance department of EDF-GDF included all episodes of sickness absence from work and a medical diagnosis associated with each sickness absence, irrespective of its length, coded by company physicians using an abridged version of the International Classification of Diseases, Ninth Revision and Tenths versions. All sickness absences due to a mental disorder exceeding 7 days recorded during a 11-year exposure window (from January 1, 1989 to December 31, 2000), and preceding the start of the follow-up of somatic diseases (i.e. from January 1, 2001 to December 31, 2011) were considered [29, 30]

To meet criteria for mental disorders, participant had to have at least one sickness absence episode exceeding 7 days caused by these disorders. We first created a dichotomized "mental disorder" variable coded as "0" for participants without sickness absence for mental disorder and "1" for those with at least one sickness absence episode for mental disorder. To further explore the associations, we divided the study population into six groups: 1) "no mental disorder" group included participants with no sickness absence for mental disorder, 2) "depressive disorder" group included participants with at least one sickness absence episode for dysthymic disorder (ICD-9: 300.4), depressive episode (ICD-10: F32) or recurrent depressive disorder (ICD-10: F33), 3) "substance use disorders" group included participants with only sickness absence episode for alcohol dependence syndrome (ICD-9: 303), nondependent abuse of drugs (ICD-9: 305) or mental disorders due to use of alcohol (ICD-10: F10), 4) "other mental disorders" group included participants with only sickness absence episodes for unspecified nonpsychotic mental disorder (ICD-9: 300.9), dementia in Alzheimer disease (ICD-10: F00), persistent mood disorders (ICD-10: F34), phobic anxiety and other anxiety disorders (ICD-10: F40-F41), obsessive-compulsive disorder (ICD-10: F42) or other mental disorder (ICD-10: F99), 5) "mixed mental disorders" group included participants with sickness absence episodes for at least two of the following diagnosis: "depressive disorder", "substance use disorders", "other mental disorders" and "mixed anxiety and depressive disorder (ICD-10: F41.2)" and 6) "severe mental disorder" group included participants with at least one sickness absence episode for psychoses (ICD-9: 290-299), schizophrenia or delusional disorder (ICD-10: F20-F29) or maniac episode or bipolar disorder (ICD-10: F30-F31).

Cases and treatment of somatic diseases

Only participants who reported somatic diseases (respiratory, cardio-vascular, metabolic diseases) during the period between January 1 2001 to December 31 2011 were included in the study. The beginning of the follow-up of somatic diseases is different for each participant and refers to the first report of somatic disease in the period between 2001 and 2011. Somatic diseases were determined for each disease group by asking participants to respond to the following question*: "In the list of health problems, please choose those from which you suffer or suffered during the last 12 months (with or without sick leave, with or without treatment)".* From the list of diagnoses we chose to consider only those with high chronicity. Respiratory diseases included recurrent respiratory infections, chronic bronchitis, asthma; cardiovascular diseases included hypertension, angina, myocardial infarction, pulmonary embolism, stroke, peripheral vascular disease, phlebitis, hemorrhoids, vein circulation problems; and endocrine/metabolic diseases included diabetes, dyslipidemia, gout and diabetes. The participants were followed for treatment of somatic diseases from January 1, 2001 to December 31, 2011. The follow-up time for treatment is also different for each individual and equals the number of years between the beginning of the follow-up of somatic diseases and 2011. For each disease we created two categories: treated and not treated. Given that the duration of the diseases might influence the probability of receiving treatment, we excluded participants who reported to have a disease during the five years preceding the beginning of follow-up of somatic disease.

Covariates

Sociodemographic covariates included gender, age, marital status, occupational position (high, middle, and low), and education (university degree, higher secondary school or lower than higher secondary school). We used occupational position from the baseline of the Gazel study (1989). Age, marital status, education, self-reported alcohol consumption (none, moderate (1–20 drinks per week

for men, 1–13 for women) or heavy drinkers (>21 for men, >14 for women)), smoking (never-smoker, ex-smoker and current smoker), self-rated health (good or suboptimum) were measured at the beginning of follow-up of somatic disease.

Statistical analyses

Differences in participants' characteristics at the beginning of the follow-up of somatic diseases as a function of the treatment status for each group of diseases were assessed using a chi-square test. To estimate the likelihood of receiving treatment for somatic diseases as a function of mental disorders at the beginning of the follow-up and changes with time, we fitted two serially adjusted longitudinal logistic regression models implemented with generalized estimating equations (GEEs) [21]. In model 1, odds ratios (ORs) were adjusted for sociodemographic factors (age, sex, marital status, occupational grade, and education), and significant interactions between these variables with time.; model 2 was additionally adjusted for smoking, alcohol intake, self-rated health, and their interactions significantly associated with time.

The interaction term between sex, time and mental disorder suggested differences in associations between mental disorder and probability of receiving treatment over time in men and women for cardio-vascular diseases ($p<0.01$), but not for respiratory ($p=0.47$) and metabolic diseases ($p=0.88$), leading us to stratified the analysis by sex. Similar analyses were undertaken to estimate ORs over the follow-up as a function of mental disorders diagnostics groups. All tests were two-sided and p-values were considered significant at the 0.05 level. All statistical analyses were conducted using STATA (version 12, Stata Corp, College Station, Texas, USA).

Results

During the 2001-2011 period, a total of 3784, 5529 and 4772 participants reported at least one of the considered respiratory, cardiovascular, and metabolic/endocrine diseases, respectively. Characteristics of participants as a function of the treatment status (treated vs. not treated) of each somatic disease are presented in **Table 1**.

Mental disorders and probability of receiving treatment for somatic diseases over time

Mental disorders and treatment of respiratory diseases

Table 2 shows the association between mental disorders and treatment status for respiratory diseases over time. In both men [OR=1.13, (95%, 1.00-1.27)] and women [OR=1.08, (95%, 0.99-1.18)] the likelihood of receiving treatment for respiratory disorders did not change over time. After controlling for sociodemographic factors, no association was observed between the presence of mental disorder and the likelihood of receiving treatment for respiratory diseases at the beginning of follow-up and over the duration of follow-up both in men and women. When diagnostic categories were considered, there was no difference in probability of being treated for respiratory diseases at the beginning of the follow-up and over time between participants with any of five types mental disorders and those without a mental disorder. Similar patterns of associations were observed after additional adjustment for health-related behaviours and self-rated health.

Mental disorders and treatment of cardiovascular diseases

Table 3 displays measures of associations between mental disorders and treatment status for cardio-vascular diseases at the beginning of follow-up and over the follow-up. The probability of being treated for cardiovascular diseases increased over time both in men [OR=1.10, (95%, 1.08-1.13)] and in women [OR=1.08, (95%, 1.03-1.14)]. No significant difference in the likelihood of receiving

treatment for cardio-vascular diseases was observed in men and women with mental disorder in comparison to those without mental disorders at the beginning of follow-up and over the duration of follow-up. When diagnostic categories were taken into account, in model 1 (initial model), men with depressive disorders had a significantly lower increase in the probability of being treated for cardio-vascular diseases over the period of follow-up [OR=0.93, (95%, 0.87-0.99)] compared to those without any mental disorder. The adjustment for health-related behaviors, and self-rated health in model 2 [OR=0.93, (95%, 0.87-0.99)] did not affect the association.

Mental disorders and treatment of metabolic/endocrine diseases

Table 4 shows the associations between mental disorders and the likelihood of being treated for metabolic/endocrine diseases at the beginning of follow-up and over the follow-up. The probability of being treated for metabolic diseases did not change over time in men [OR=1.06, (95%, 1.00-1.12)] and women [OR=1.00, (95%, 0.95-1.05)]. We found no association between the presence of mental disorder and the likelihood of treatment for metabolic diseases at the beginning of the follow-up and over the duration of follow-up in both men and women. Compared to those without mental disorders, men with substance use disorders had a 21% greater annual decrease in the probability [OR=0.79, (95% CI=0.65-0.96)] of receiving treatment for metabolic/endocrine disorders over the follow-up period.

Discussion

In our study, based on a large longitudinal occupational cohort we examined the influence of mental disorders on the likelihood of receiving treatment for most common somatic diseases such as respiratory, cardiovascular, and metabolic diseases. In cross-sectional analysis, there was no association between mental disorders and the probability of being treated for somatic diseases at the beginning of the follow-up. In the longitudinal analysis, men with depressive disorders and substance use disorders had a greater annual decrease in the probability of reporting treatment for cardiovascular and metabolic diseases, respectively over time. To the best of our knowledge, this is the first large longitudinal cohort study that examines the prospective association between mental disorder and the likelihood of treatment of somatic diseases. Previous studies have examined the association between mental disorders in general [22-25] or severe mental disorders such as schizophrenia and bipolar disorder [9, 26] and major depression [23, 27] and the likelihood to receive treatment for specific somatic disorders. In contrast to our well characterized cohort study, previous studies were based on medico-administrative databases [28, 29], which limited their ability to examine the role of potential covariates such as education, occupational position, and health-related behaviors. They also had a cross-sectional design [1, 13, 14]. All these might have underestimated the real effect of mental disorder on the likelihood of receiving treatment for somatic disorder. We were able to track treatment of somatic diseases over 11 years. To our knowledge, no studies assessed the change of likelihood of receiving treatment over time.

In line with our findings, a lower likelihood of treatment receipt for physical illness including emphysema was observed in a study based on a large sample of community patients [30]. Similarly to our results, previous studies reported lower likelihood of receiving treatment for myocardial infarction, coronary heart disease, and hypertension. For instance, a study conducted in a national cohort of patients hospitalized for a confirmed myocardial infarction, showed that people with any

comorbid mental illness were less likely to undergo percutaneous transluminal coronary angioplasty and cardiac catheterization [22]. A British cross-sectional study based on the medical records of patients with coronary heart disease showed that eligible patients with schizophrenia were 15% less likely than those with no mental disorder to have had statins prescribed in the last 12 months [9]. Another study based on Medicare patients admitted to the private hospital with myocardial infarction revealed that the presence of any mental disorder predicted a 13% decrease in the likelihood of obtaining reperfusion therapy. In addition, patients with mental disorders were 10% less likely to receive aspirin, beta-blockers, and angiotensin-converting-enzyme inhibitor than those without any mental disorder [5]. In contrast to our findings previous studies based on the records of the 38 020 veterans admitted to medical centers with diabetes [24], on data from 300 patients with type diabetes II attending community outpatient clinics [26], and on 313 586 veteran health patients with diabetes [25] demonstrated that treatment receipt for diabetes did not differ between participants with and without mental disorders.

The association we observed could be interpreted to suggest that men with depression and substance use disorder do not have an adequate access to primary care. Nevertheless, our results based on a cohort of people with a civil servant status, the access to the Occupational Health and Social Security system, and residing in the country with universal healthcare, renders less likely this hypothesis. In setting like France where the access to healthcare is universal, our results suggest that the 'quality' of care provided and a change in the help seeking behavior or medical adherence rather than the access to care matters. Indeed, people with severe mental disorders are less likely to recognize and spontaneously report physical symptoms because of cognitive impairment associated with some conditions [33, 34], disorganized thinking, impaired insight into illness, or due to the reduced pain sensitivity associated with psychotropic medications including antipsychotics[3, 6, 35]. In addition, depressive disorders are associated with decision-making difficulties, lack of motivation, anxiety, and poor social abilities that may lead to the deterioration of physician-patient

relationships, irregular visits, noncompliance to treatment [3, 36]. Retirement can also influence the probability of treatment receipt, in particular in this cohort where employees are entitled to extensive health surveillance, but exit this system after retirement [37]; these results underscore the importance of physician-patients relationships in providing appropriate long-term treatment and follow-up. Furthermore, diminished expectation that general practitioners have from psychiatric patients as a collaborators and a low confidence in their compliance to recommendations may lead "therapeutic nihilism", when patients with mental disorders are not provided health related information that could help them to change their lifestyle and to prevent diseases [38, 39]. General practitioners may feel uneasy [40] or lack a necessary experience [41, 42] and time to treat multiple health problems of patients with mental disorders [38, 43, 44], whereas psychiatrists may not believe that physical health of these patients is their responsibility and may therefore prioritize psychiatric issues and neglect physical problems [45, 46]. The reason why only men with depressive and substance use disorders (not women) had a greater decrease in the probability of receiving treatment for somatic disorders remains unclear. Several hypotheses seem possible. First, there are number of population-based [47-49], longitudinal [50], and smaller scales studies [51, 52] of the health care utilization showed that men make less use of health-care services than women, as a result of the 'hegemonic' masculine code in which 'real' men are understood to be physically fit, uninterested in their health and self-reliant. Second, other study suggests that man may have the negative attitudes related to psychological openness that contribute to their underutilization of mental health services [53] and can be a barrier for treatment seeking for general health problems.

The results of the present study should be considered in light of several study limitations. First, diagnosis of mental disorders was based on medically certified sickness absence episodes exceeding seven days rather than structured clinical interviews. Although several studies, including those conducted in the GAZEL cohort [18, 54], have demonstrated the validity of this approach, nevertheless misclassification bias and underdetection of mild disease cases cannot be ruled out.

Second, although the GAZEL cohort covers all regions of France and a wide socioeconomic range, it did not include unemployed workers, thus it is not representative of the general population limiting the generalizability of our findings. The cohort participants were found to have a better health status that the source population [54] that can lead to the underestimation of the observed associations. Finally, participants' reports typically underestimate the treatment receipt [55], which could have led to the underreporting of treatment in our study. Fourth, we did not directly account for the severity of the somatic condition; nevertheless we used self-rated health as indirect way to account for it.

Despite these potential limitations, this study makes a unique contribution, as it is the first large prospective longitudinal population-based study to assess the association between the treatment for common somatic diseases as a function of mental disorders over an extended follow-up period. The fact that our findings were based on an occupational cohort where employees had job security, stable income as well as occupational health, and security system in charge of their health surveillance strongly suggest that inadequate medical care and a change in the help seeking behavior or medical adherence rather than the access to care matter here. Despite the fact that French, European, and International experts proposed several guidelines on the attendance of physical health of patients with mental disorders [56-58], currently there are no generally recognized recommendations on whose role it is to prevent and treat general health problems in people with mental disorders [35]. Our findings raise an important question about the need of integration, colocation and cooperation between general medical and mental healthcare to support early diagnosis, treatment, and timely access to a higher quality of care for their patients with mental disorders.

Conclusion: Overall, we found that depressive disorders and substance use disorders in men were associated with a greater decrease in probability of receiving treatment for cardio-vascular and

metabolic diseases over time. Men with depressive disorders and substance use disorders might be a group of a high risk for unmet need for treatment. Appropriate preventive and adequate and long term treatment of somatic diseases in these patients has the potential to decrease health care expenditures by reducing the hospitalizations rates and to improve health outcomes among this vulnerable group of patients [59]. General practitioners and psychiatrists should pay a special attention to the treatment of cardiovascular and metabolic diseases in these groups of patients.

Conflict of interest statement: None of the authors have conflict of interest in relation to this study to report. Cedric Lemogne has accepted paid speaking engagements in industry-sponsored symposia from Astra Zeneca, Lundbeck, and Servier.

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Table 1. Characteristics of individuals with somatic disease as a function of treatment for the considered somatic diseases at the beginning of the follow-up of these diseases.in 2001.

	Respiratory disease (n=3784)			**Cardio-vascular diseases** (n=5529)			**Metabolic diseases** (n=4772)		
	Treated (n=573)	**Not treated** (n=3211)	**p-value**	**Treated** (n=2148)	**Not treated** (n=3381)	**p-value**	**Treated** (n=2322)	**Not treated** (n=2450)	**p-value**
	No.(%)	No. (%)		No. (%)	No. (%)		No. (%)	No. (%)	
Sex									
Men	422 (73.6)	2290 (71.3)	0.25	1716 (79.9)	2408 (71.2)	0.0001	1676 (72.2)	1649 (67.3)	0.0001
Women	151 (26.4)	921 (28.7)		432 (20.1)	973 (28.8)		646 (27.8)	801 (32.7)	
Age									
≥47<52	19 (3.3)	105 (3.3)	0.71	46 (2.1)	148 (4.4)	0.0001	77 (3.3)	88 (3.6)	0.01
≥52-<57	123 (21.5)	763 (23.8)		431 (20.1)	882 (26.1)		579 (24.9)	679 (27.7)	
≥57-<62	247 (43.1)	1300 (40.5)		850 (39.6)	1348 (39.9)		928 (40.0)	1006 (41.1)	
≥62-<67	151 (26.4)	841 (26.2)		661 (30.8)	848 (25.1)		588 (25.3)	558 (22.8)	
≥67	33 (5.8)	202 (6.3)		160 (7.4)	155 (4.6)		150 (6.5)	119 (4.9)	
Marital status									
married/cohabiting	476 (83.1)	2695 (83.9)	0.61	1829 (85.1)	2832 (83.8)	0.17	1987 (85.6)	2029 (82.8)	0.009
single	97 (16.9)	516 (16.1)		319 (14.9)	549 (16.2)		335 (14.4)	421 (17.2)	
Occupation grade									
high	158 (27.6)	852 (26.5)	0.60	588 (27.4)	837 (24.8)	0.06	614 (26.4)	549 (22.4)	0.003
middle	338 (59.0)	1877 (58.5)		1233 (57.4)	1975 (58.4)		1344 (57.9)	1468 (59.9)	
low	77 (13.4)	482 (15.0)		327 (15.2)	569 (16.8)		364 (15.7)	433 (17.7)	
Education									
university degree	113 (19.7)	675 (21.0)	0.78	433 (20.2)	694 (20.5)	0.62	464 (20.0)	435 (17.8)	0.13
high secondary school	341 (59.5)	1876 (58.4)		1257 (58.5)	2003 (59.2)		1382 (59.5)	1485 (60.6)	
lower than high secondary school	119 (20.8)	660 (20.6)		458 (21.3)	684 (20.2)		476 (20.5)	530 (21.6)	
Smoking status									
smoker	517 (90.2)	2747 (85.5)	0.003	1933 (90.0)	2933 (86.7)	0.0001	2018 (86.9)	2149 (87.7)	0.40

non smoker	56 (9.8)	464 (14.5)		215 (10.0)	448 (13.3)		304 (13.1)	301 (12.3)	
Alcohol consumption									
none	83 (14.5)	427 (13.3)	0.10	300 (14.0)	460 (13.6)	0.76	335 (14.4)	345 (14.1)	0.92
moderate	438 (76.4)	2394 74.6)		1597 (74.3)	2505 (74.1)		1711 (73.7)	1814 (74.0)	
heavy	52 (9.1)	390 (12.1)		251 (11.7)	416 (12.3)		276 (11.9)	291 (11.9)	
Self-percieved health									
good	456 (79.6)	2586 (80.5)	0.60	1721 (80.1)	2820 (83.4)	0.002	1916 82.5	2001 (81.7)	0.45
suboptimal	117 (20.4)	625 (19.5)		427 (19.9)	561 (16.6)		406 17.5	449 (18.3)	
Mental disorders									
no	513 (89.5)	2868 (89.3)	0.88	1972 (91.8)	3016 (89.2)	0.002	2059 (88.7)	2123 (86.7)	0.03
yes	60 (10.5)	343 (10.7)		176 (8.2)	365 (10.8)		263 (11.3)	327 (13.3)	
Mental disorders by type									
No mental disorder	513 (89.5)	2868 (89.3)	0.32	1972 (91.8)	3016 (89.2)	0.07	2059 (88.7)	2123 (86.7)	0.25
Depressive disorders	36 (6.3)	223 (6.9)		116 (5.4)	234 (6.9)		168 (7.2)	221 (9.0)	
Substance use disorders	8 (1.4)	30 (0.9)		17 (0.8)	37 (1.1)		30 (1.3)	31 (1.3)	
Other mental disorders	2 (0.3)	35 (1.1)		17 (0.8)	36 (1.1)		29 (1.2)	27 (1.1)	
Mixed mental disorders	13 (2.3)	53 (1.7)		24 (1.1)	53 (1.6)		34 (1.5)	45 (1.8)	
Severe mental disorder	1 (0.2)	2 (0.1)		2 (0.1)	5 (0.1)		2 (0.1)	3 (0.1)	

Table 2. Mental disorders and treatment for respiratory diseases

Respiratory diseases	Men				Women			
	Model 1 (initial model)		Model 2(fully-adjusted model)		Model 1 (initial model)		Model 2(fully-adjusted model)	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Time, per year	1.07	1.03-1.12**	1.13	1.00-1.27^{ns}	1.08	0.99-1.18^{ns}	1.08	0.99-1.18^{ns}
Cross-sectional analyses								
Mental disorder								
No	1(ref)		1(ref)		1(ref)		1(ref)	
Yes	1.23	0.82-1.87 ^{ns}	1.28	0.84-1.95 ^{ns}	0.98	0.68-1.40^{ns}	1.00	0.69-1.43^{ns}
Mental disorders categories								
No mental disorder	1(ref)		1(ref)		1(ref)		1(ref)	
Depressive disorders	1.58	0.94-2.65 ^{ns}	1.64	0.98-2.75 ^{ns}	0.87	0.57-1.33 ^{ns}	0.85	0.58-1.35 ^{ns}
Substance use disorders	1.60	0.55-4.65 ^{ns}	1.92	0.65-5.63 ^{ns}	1.11	0.39-3.18 ^{ns}	1.20	0.42-3.42 ^{ns}
Other mental disorders	-	-	-		1.11	0.40-3.11 ^{ns}	1.09	0.39-3.03 ^{ns}
Mixed mental disorders	1.25	0.48-3.31 ^{ns}	1.26	0.48-3.35 ^{ns}	1.59	0.72-3.47 ^{ns}	1.59	0.72-3.49 ^{ns}
Severe mental disorder	6.25	0.25-170.95^{ns}	-		-		-	
Longitudinal analyses								
Mental disorder x Time								
No	1(ref)		1(ref)		1(ref)		1(ref)	
Yes	0.96	0.83-1.11 ^{ns}	0.95	0.82-1.10 ^{ns}	0.95	0.82-1.11 ^{ns}	0.95	0.82-1.10 ^{ns}
Mental disorders categories x Time								
No mental disorder	1(ref)		1(ref)		1(ref)		1(ref)	
Depressive disorders	0.91	0.78-1.07^{ns}	0.91	0.77-1.07^{ns}	0.95	0.81-1.11 ^{ns}	0.94	0.80-1.11 ^{ns}
Substance use disorders	1.16	0.77-1.75 ^{ns}	1.15	0.76-1. 73 ^{ns}	0.92	0.53-1.61 ^{ns}	0.91	0.52-1.57 ^{ns}
Other mental disorders	-		-		1.10	0.81-1.49 ^{ns}	1.11	0.82-1.50 ^{ns}
Mixed mental disorders	0.45	0.11-1.79 ^{ns}	0.42	0.10-1.77 ^{ns}	0.35	0.08-1.44 ^{ns}	0.36	0.09-1.49 ^{ns}
Severe mental disorder	0.93	0.60-1.45 ^{ns}	-		-		-	

Model 1 (initial model): OR adjusted for sex, age group, marital status, occupational grade, income level, education, the interaction of time and alcohol consumption
Model 2 (fully-adjusted model): OR model 2 additionally adjusted for smoking, alcohol use, and self-rated health
*p<0.05; **p<0.01; ***p<0.001 ; ^{ns}not significant; "-"-not able to calculate odds ratios due to a small sample size

Table 3. Mental disorders and treatment for cardio-vascular diseases.

CVD	Men				Women			
	Model 1 (initial model)		Model 2(fully-adjusted model)		Model 1 (initial model)		Model 2(fully-adjusted model)	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Time, per year	1.10	1.08-1.13***	1.10	1.08-1.13***	1.08	1.03-1.14**	1.08	1.03-1.14**
Cross-sectional analyses								
Mental disorder								
No	1(ref)		1(ref)		1(ref)		1(ref)	
Yes	0.95	0.75-1.20 ns	0.93	0.73-1.18 ns	1.01	0.78-1.29 ns	1.01	0.78-1.30 ns
Mental disorders categories								
No mental disorder	1(ref)		1(ref)		1(ref)		1(ref)	
Depressive disorders	0.99	0.74-1.32 ns	0.97	0.72-1.29 ns	1.10	0.83-1.48 ns	1.10	0.82-1.48 ns
Substance use disorders	0.93	0.49-1.74 ns	0.91	0.48-1.73 ns	1.06	0.50-2.22 ns	1.09	0.52-2.30 ns
Other mental disorders	0.79	0.38-1.62 ns	0.75	0.37-1.55 ns	0.81	0.38-1.72 ns	0.81	0.38-1.73 ns
Mixed mental disorders	0.86	0.44-1.68 ns	0.87	0.44-1.71 ns	0.78	0.42-1.45 ns	0.79	0.43-1.48 ns
Severe mental disorder	0.74	0.15-3.56	0.76	0.16-3.68 ns	0.17	0.001-19.34 ns	0.16	0.001-18.92 ns
Longitudinal analyses								
Mental disorder x Time								
No	1(ref)		1(ref)		1(ref)		1(ref)	
Yes	0.98	0.93-1.04 ns	0.98	0.92-1.04 ns	1.05	0.99-1.11 ns	1.05	0.99-1.11 ns
Mental disorders categories x Time								
No mental disorder	1(ref)		1(ref)		1(ref)		1(ref)	
Depressive disorders	0.93	0.87-0.99*	0.93	0.87-0.99*	1.04	0.98-1.11 ns	1.04	0.98-1.11 ns
Substance use disorders	1.11	0.96-1.28 ns	1.10	0.96-1.27 ns	1.11	0.96-1.27 ns	1.10	0.96-1.26 ns
Other mental disorders	1.13	0.88-1.45 ns	1.14	0.89-1.46 ns	1.04	0.88-1.22 ns	1.03	0.88-1.21 ns
Mixed mental disorders	1.15	0.90-1.47 ns	1.14	0.89-1.46 ns	1.01	0.81-1.24 ns	1.00	0.81-1.24 ns
Severe mental disorder	0.86	0.56-1.31 ns	0.86	0.56-1.34 ns	1.41	0.32-6.17 ns	1.41	0.32-6.15 ns

Model1 (initial model): OR adjusted for sex, age group, marital status, occupational grade, income level and education, and interactions of time variable with sex and age
Model 2 (fully-adjusted model): OR model 2 additionally adjusted for smoking, alcohol use, and self-rated health
*p<0.05; **p<0.01; ***p<0.001 ; nsnot significant

Table 4. Mental disorders and treatment for metabolic/endocrine diseases.

	Men				Women			
	Model 1 (initial model)		Model 2(fully-adjusted model)		Model 1 (initial model)		Model 2(fully-adjusted model)	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Time, per year	1.09	1.07-1.11***	1.06	1.00-1.12^{ns}	1.06	1.03-1.09***	1.00	[0.95-1.05]^{ns}
Cross-sectional analyses								
Mental disorder								
No	1(ref)		1(ref)		1(ref)		1(ref)	
Yes	0.96	0.76-1.23^{ns}	0.98	0.76-1.24^{ns}	0.94	0.76-1.14^{ns}	0.92	0.75-1.13^{ns}
Mental disorders categories								
No mental disorder	1(ref)		1(ref)		1(ref)		1(ref)	
Depressive disorders	0.90	0.67-1.22^{ns}	0.92	0.68-1.24^{ns}	0.93	0.74-1.18^{ns}	0.92	0.73-1.17^{ns}
Substance use disorders	1.63	0.77-3.46^{ns}	1.65	0.77-3.50^{ns}	1.05	0.62-1.77^{ns}	1.02	0.60-1.73^{ns}
Other mental disorders	0.93	0.48-1.83^{ns}	0.95	0.48-1.86^{ns}	1.20	0.64-2.24^{ns}	1.16	0.62-2.18^{ns}
Mixed mental disorders	0.91	0.49-1.69^{ns}	0.92	0.49-1.71^{ns}	0.73	0.45-1.19^{ns}	0.73	0.45-1.19^{ns}
Severe mental disorder	0.86	0.09-8.63^{ns}	0.83	0.08-8.31^{ns}	0.55	0.06-5.05^{ns}	0.58	0.06-5.35^{ns}
Longitudinal analyses								
Mental disorder x Time								
No	1(ref)		1(ref)		1(ref)		1(ref)	
Yes	0.98	0.92-1.04^{ns}	0.98	0.91-1.04^{ns}	1.01	0.96-1.07^{ns}	1.01	0.95-1.06^{ns}
Mental disorders categories x Time								
No mental disorder	1(ref)		1(ref)		1(ref)		1(ref)	
Depressive disorders	1.01	0.93-1.10^{ns}	1.01	0.93-1.10^{ns}	1.01	0.95-1.07^{ns}	1.00	0.94-1.07^{ns}
Substance use disorders	0.79	0.65-0.97*	0.79	0.65-0.96*	1.04	0.91-1.19^{ns}	1.05	0.92-1.21^{ns}
Other mental disorders	0.95	0.78-1.16^{ns}	0.94	0.77-1.15^{ns}	0.99	0.81-1.21^{ns}	0.98	0.80-1.20^{ns}
Mixed mental disorders	1.03	0.87-1.23^{ns}	1.03	0.87-1.23^{ns}	1.00	0.88-1.13^{ns}	0.99	0.87-1.12^{ns}
Severe mental disorder	0.72	0.32-1.60^{ns}	0.73	0.33-1.62^{ns}	1.87	0.44-7.98^{ns}	1.79	0.41-7.80^{ns}

Model1 (initial model): OR adjusted for sex, age group, marital status, occupational grade, income level and education, and interactions of time variable with alcohol consumption and self-rated health
Model 2 (fully-adjusted model): OR model 2 additionally adjusted for smoking, alcohol use, and self-rated health
*p<0.05; **p<0.01; ***p<0.001 ; ^{ns}not significant