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Occupational Grade and Depression Course in a Non-Clinical Setting: Results from the French GAZEL Cohort Study

Ahmed Yaogo[1,2], Jean-François Chastang[1,2], Marcel Goldberg[1,2], Marie Zins[1,2], Nadia Younès[3], and Maria Melchior[1,2]*

[1]Inserm, U1018, Centre for Research in Epidemiology and Population Health, CESP, Epidemiology of Occupational and Social Determinants of Health, F-94807, Villejuif, France
[2]University of Versailles Saint-Quentin, UMRS 1018, F-94807, Villejuif, France
[3]University of Versailles Saint-Quentin, EA 4047, F-78150 Le Chesnay, France

Abstract

Objectives: We tested the hypothesis that depression course varies with individuals' socioeconomic position, as measured by occupational grade.

Methods: Study participants (n=3,368) belong to the French GAZEL cohort study. Depressive symptoms were measured using the Center for Epidemiological Studies-Depression (CES-D) scale in 1996, 1999, 2002, 2005 and 2008. We studied the course of depressive symptoms in participants with a baseline CES-D score above a clinically significant cut-off in 1996. Socioeconomic position was measured by occupational grade. Analyses were controlled for demographic factors (sex and age), as well as covariates potentially associated with depression course which were measured both at study baseline and during follow-up: retirement status, social network, tobacco smoking, heavy alcohol use, body mass, prior depression, somatic chronic disease, life events and use of antidepressants. Data were analyzed in a repeated measures logistic regression framework (Generalized Estimating Equations, GEE).

Results: Compared with participants with high occupational grade, those with intermediate or low occupational grade were more likely to have persistent depression (respectively age and sex-adjusted ORs: intermediate occupational grade: 1.18, 95% CI 1.04-1.34; low occupational grade: 1.60, 95% CI 1.34-1.91). After adjusting for all covariates, associations between occupational grade and depression course decreased but remained statistically significant (fully adjusted ORs: intermediate occupational grade: 1.12, 95% CI 0.97-1.29; low occupational grade: 1.37, 95% CI 1.12-1.67).

Conclusions: Occupational grade predicts the course of depressive symptoms, which should be brought to the attention of policymakers and mental health specialists.

Introduction

Depression, which affects about 2-3% of men and 4-9% of women at any one point in time and up to 20% of individuals during their lifetime,[1,2] is a major public health problem. According to the World Bank and the World Health Organization, depressive disorder is currently the fourth leading cause of disability worldwide and may become second by 2020[3].

Despite the availability of effective treatment, 50-70% of depression cases persist over time (that is become chronic or recurrent) [4,5]. Factors associated with depression persistence include negative life events (ex. divorce, death of a loved one, employment loss), lack of adequate treatment, initial symptom severity, or presence of a chronic illness [6]. Additionally, depression course may vary with individuals' socioeconomic characteristics; however findings in this area have been mixed [7-18]. This may be due to methodological differences between prior studies: 1) some studies were conducted in clinical populations[11,12,14,19], 2) some had limited statistical power,[8,17,18] 3) in some depression course was assessed retrospectively[13,14], 4) measures of socioeconomic position varied from parental socioeconomic position[13], education level [7,9,14,18], individual income[17] to individual occupational grade [9,15].

A prior report from the GAZEL cohort based on a subsample of 298 participants in whom depression was assessed with a standardized diagnostic interview and followed for 7 years, suggested that individuals with low socioeconomic position were more likely to experience persistent depression. However, this study had limited statistical power and did not account for a number of relevant covariates [17]. Another investigation based on the entire GAZEL cohort study sample suggested the existence of a socioeconomic gradient with regard to depression trajectories, and particularly persistent symptoms. However, this study did not account for factors that can influence depression course over time [20]. The present analysis addresses the concerns risen by these two prior studies, by examining the relationship between occupational grade and depression course in 3,368 GAZEL study participants followed prospectively over up to 12 years, and controlling for factors potentially associated with occupational grade and depression measured at baseline and during follow-up (demographic characteristics including retirement status, social networks, negative life events, health behaviors, chronic illnesses including prior depression, Use of antidepressants).

Methods

Study population

Data come from the GAZEL cohort study, which was established in 1989 among then-employees of France's national gas and electricity company (Electricité de France - Gaz de France, EDF-GDF). 20,625 individuals (15,011 men and 5,614 women) aged 35 to 50 years were initially included and are since then followed yearly. Less than 1% of participants have been lost to follow-up since 1989 [21] and 75% complete the yearly GAZEL study questionnaire. The primary source of information on participants' health, living conditions, individual, familial, social and occupational characteristics is a yearly mailed questionnaire; additionally other data come from sources within and outside EDF-GDF (e.g. administrative records) [21].

The GAZEL study received approval from France's national Ministry of Research Review Board (CCTIRS: Comité Consultatif sur le Traitement de l'Information pour la Recherche en santé), the national commission overseeing ethical data collection (CNIL: Commission Nationale Informatique et Liberté) and the INSERM Institutional Review Board (CQI: Comité de qualification institutionelle).

Measures

Depressive symptoms: Participants' depressive symptoms were assessed by the Center for Epidemiological Studies-Depression (CES-D) scale in 1996, 1999, 2002, 2005 and 2008[22-26]. This scale includes 20 items that describe symptoms and behaviors characteristic of depressive disorder. Previous research has shown that this instrument has good psychometric properties and is generally valid against clinical diagnosis [22]. To identify individuals with clinically significant depressive symptoms (which we refer to as depression from here onwards), we used a cut-off of 17 in men and 23 in women, as validated in France [22].

Occupational grade: Participants' occupational grade was collected from company administrative records [26,27]. We contrasted participants with intermediate (technical staff, line managers or administrative associate professionals) or low (manual worker or clerk) occupational grade to those with high occupational grade (engineer or manager) [26]. Participants' occupational grade was associated with household income (p<0.0001), implying that it is a valid indicator of socioeconomic position in this population.

Covariates: Analyses were adjusted for a range of factors which

	Study baseline				During follow-up			
	Total n=3368	Male n=2408	Female n=960	p***** (M/F)	Total n=3368	Total n=3368	Female (n=960	p***** (M/F)
	%	%	%		%	%	%	
Occupational grade: High	26.8	34.6	7.4		-	-	-	
Intermediate	57.2	52.4	69.4		-	-	-	-
Low	15.9	13.0	23.2	<0.0001	-	-	-	
Age : >50 years	52.0	59.4	33.3		-	-	-	
≤50 years	48.0	40.6	66.7	<0.0001	-	-	-	-
Retirement status: No	88.8	87.5	92.0		8.6	2.5	23.8	
Yes	11.3	12.5	8.0	0.0002	91.4	97.5	76.2	<0.0001
Social network: High	16.2	19.0	8.9		15.5	18.1	8.0	
Intermediate	80.3	79.3	82.8	<0.0001	80.3	79.4	82.8	<0.0001
Low	3.6	1.7	8.3		4.2	2.5	9.2	
Life events: * No	68.1	67.1	70.7		49.7	49.2	51.1	
Yes	31.9	33.0	29.3	0.04	50.3	50.8	48.9	0.3
Health behaviors								
Tobacco smoking : No	64.6	62.5	70.0		73.2	71.6	77.3	
Yes	35.4	37.5	30.0	<0.0001	26.8	28.4	22.7	0.0009
Heavy alcohol use:** No	72.5	66.1	88.9		71.2	65.1	86.6	
Yes	27.5	33.9	11.1	<0.0001	28.8	34.9	13.4	<0.0001
Underweight:* No	96.7	99.3	90.2		97.3	99.2	92.4	
Yes	3.3	0.7	9.8	<0.0001	2.7	0.8	7.6	<0.0001
Overweight: * No	40.2	30.2	65.4		27.8	21.2	44.4	
Yes	59.9	69.8	34.6	<0.0001	72.2	78.8	55.6	<0.0001
Chronic illness								
Prior depression: No	46.0	55.4	22.5		-	-	-	
Yes	54.0	44.6	77.5	<0.0001	-	-	-	-
Somatic illness:** No	32.2	34.0	27.6		16.7	17.9	13.7	
Yes	67.8	66.0	72.4	0.0003	83.3	82.1	86.3	0.003
Antidepressants: No	-	-	-		82.3	88.2	67.4	
Yes	-	-	-	-	17.7	11.8	32.6	<0.0001

*Life events concerned divorce or separation, death of spouse, hospitalization of spouse or unemployment of spouse.
**Heavy alcohol use: women, ≥21 units of alcohol/week; men, ≥28 units of alcohol /week.
***Body mass index : underweight: ≤18.5 kg/m², overweight: ≥25 kg/m²
****Chronic somatic illness: coronary heart disease, respiratory disease, diabetes, rheumatic, cancer.
***** p-value comparing men and women.

Table 1: Occupational grade, demographic, behavioral and health characteristics of GAZEL study participants depressed in 1996 (1996-2008, n=3,368).

can be associated both with occupational grade and depression. We used all measurements available to us between 1989 and 2008. We used categorical variables in order to test between-group differences and to identify groups of participants with a high probability of adverse depression course. Demographic characteristics included sex (male vs. female); age in 1996 (≤50 vs. >50 years) and retirement status (retired vs. non-retired). Participants' social network was measured in 1991 (baseline) and 2004 (follow-up) using the Berkman Social Network and Social Support Questionnaire. An individual's social network was ascertained by a sum of their marital status, contacts with family, friends, and participation in voluntary organizations. The social network score was then trichotomized (low and intermediate vs. high social network) [28,29]. Important life events were defined as any one of the following events in the preceding 12 months (divorce/partner separation, partner death, partner hospitalization, partner unemployment: yes vs. no) [30-32]. Health behaviors included tobacco smoking status (smoker vs. nonsmoker), heavy alcohol use (≥28 units of alcohol/week in men and ≥21 units of alcohol/week in women; yes vs. no), and body mass index (underweight: ≤18.5 kg/m², overweight: ≥25 kg/m² vs. normal weight: 18.5-25 kg/m²) [33-35]. Health status included depression prior to 1996

(treated depression or sleep problems: yes vs. no) and chronic somatic illness (coronary heart disease, respiratory disease, diabetes, arthritis or cancer: yes vs. no) [26,32,36-38]. Use of antidepressants during follow-up was ascertained by participants' self-reported antidepressant use (yes vs. no). Each time, we summed all measures available to us to create a summary measure prior to baseline (1989-1996) or during follow-up (1996-2008). When >30% of data were missing, the summary covariate was dropped from the analysis. Sensitivity analyses were carried out using a multiple imputation technique to account for missing data (MICE method).

Statistical Analysis

Our aim was to test the hypothesis that occupational grade predicts the course of depressive symptoms over time. Therefore the analysis was restricted to GAZEL study participants who had a) clinically significant depressive symptoms in 1996 and b) reported at least one measure of depressive symptoms subsequently (n=3,368). 127 participants died during follow-up, 3 left the company and 16 asked not to be part of the GAZEL cohort. Average duration of follow-up was 11.8 years (±0.95), ranging from 3.1 to 12.0.

	Study baseline		Follow-up	
	OR [95%CI]	P	OR [95%CI]	p
Occupational grade: High	1.00		-	
Intermediate	1.21[1.07-1.36]	0.002	-	
Low	1.64[1.39-1.94]	<0.0001	-	-
Sex: Male	1.00		-	
Female	1.16[1.04-1.30]	0.009	-	-
Age: >50 years	1.00		-	
≤50 years	1.10[1.00-1.22]	0.06	-	-
Year of CES-D measurement:1999	-		1.00	
2002	-		0.64 [0.59-0.70]	<0.0001
2005	-		0.53 [0.49-0.58]	<0.0001
2008	-	-	0.46 [0.42-0.51]	<0.0001
Retirement status: No	1.00		1.00	
Yes	1.45[1.23-1.72]	<0.0001	0.54[0.50-0.58]	<0.0001
Social network : High	1.00		1.00	
Intermediate	1.31[1.13-1.52]	0.0003	1.46[1.25-1.71]	<0.0001
Low	2.41[1.71-3.40]	<0.0001	3.02[2.17-4.19]	<0.0001
Life events:* No	1.00		1.00	
Yes	1.09[0.98-1.22]	0.13	1.13[1.04-1.23]	0.003
Tobacco smoking status : No	1.00		1.00	
Yes	1.21 [1.08-1.34]	0.0008	1.34 [1.19-1.50]	<0.0001
Heavy alcohol use:* No	1.00		1.00	
Yes	0.99 [0.88-1.12]	0.90	0.95 [0.85-1.06]	0.35
Underweight:* No	1.00		1.00	
Yes	1.30[0.97-1.75]	0.08	1.57 [1.12-2.21]	0.009
Overweight:* No	1.00		1.00	
Yes	0.99[0.89-1.10]	0.79	0.97 [0.88-1.06]	0.47
Prior depression: No	1.00		-	
Yes	2.07[1.87-2.30]	<0.0001	-	-
Somatic illness: **** No	1.00		1.00	
Yes	1.37[1.23-1.53]	<0.0001	1.19[1.09-1.29]	<0.0001
Antidepressants: No	-	-	1.00	
Yes	-		2.81[2.40-3.30]	<0.0001

*Life events concerned divorce or separation, death of spouse, hospitalization of spouse or unemployment of spouse.   ** Heavy alcohol use: women, ≥21 units of alcohol /week; men, ≥28 units of alcohol /week.
***Body mass index: underweight: ≤18.5 kg/m², overweight: ≥25 kg/m²
**** Chronic somatic illness: coronary heart disease, respiratory disease, diabetes, rheumatic, cancer.

Table 2: Demographic, behavioral and health characteristics in relation with depression course: GAZEL cohort study, univariate analysis, GEE (1996-2008, n=3,368).

First, we tested unadjusted associations between occupational grade and depression course. Second, we adjusted the analysis for sex, age, and year of measurement of depressive symptoms. Third, we adjusted the analysis for baseline characteristics associated with depression course with a p-value of 0.10 in univariate regression models. Fourth, we further adjusted the analysis for follow-up characteristics associated with depression course with a p-value of 0.10 in univariate models. We chose to retain variables significant at $p<0.10$ because some variables which are not statistically associated with the study outcome at $p<0.05$ statistical significance level in univariate regression models can become statistically significant in multivariate regression models. Thus, this strategy makes it possible to include the maximum number of covariates. Analyses were carried out in a repeated measures logistic regression framework, using the generalized estimating equations method with autoregressive correlation structure (GEE) [39]. We found no statistically significant interactions between occupational grade and sex; therefore men and women were studied jointly. All analyses were carried out using the SAS statistical software, version 9.2 (SAS Institute Inc, North Caroline).

Results

Table 1 presents study participants' demographic, social, behavioral, and health characteristics. Table 2 presents univariate associations between participants' characteristics and depression course. Compared with participants employed in a high occupational grade at the beginning of follow-up, those with intermediate or low occupational grade were more likely to have persistent depression (intermediate occupational grade: OR= 1.21, 95%CI 1.07-1.36; low occupational grade: OR= 1.64, 95%CI 1.39-1.94). Other factors significantly associated with depression course included sex, age, retirement status, social network, tobacco smoking status, being underweight, prior depression, and somatic chronic illness at study baseline, as well as retirement status, social network, negative life events, tobacco smoking status, being underweight, chronic somatic illness, and use of antidepressants during follow-up.

After adjusting for all covariates associated with depression course (Table 3), the ORs associated with occupational grade were slightly reduced but remained elevated and statistically significant. Compared with participants with high occupational grade at the beginning of follow-up, after adjusting for sex, age and year of measurement, participants with intermediate occupational grade were 1.18 times

and those with low occupational grade 1.60 times more likely to be persistently depressed. After additional adjustment for baseline retirement status, social network, tobacco smoking, being underweight, prior depression and chronic somatic illness, corresponding ORs decreased to 1.14 in participants with intermediate occupational grade (95%CI 0.99-1.30) and 1.42 in participants with low occupational grade (95%CI 1.16-1.69). After further adjustment for retirement status, social network, negative life events, tobacco smoking, being underweight, chronic somatic illness, and use of antidepressants during follow up, corresponding ORs decreased to 1.12 in participants with intermediate occupational grade (95%CI 0.97-1.29) and 1.37 in participants with low occupational grade (95%CI 1.12-1.67).

In sensitivity analyses ORs associated with occupational grade were slightly higher but consistent with the main findings we report (fully adjusted ORs: intermediate occupational grade: 1.15, 95%CI 1.06-1.26; low occupational grade: 1.49, 95%CI 1.32-1.67).

Discussion

Using data from a large, prospective, non-clinical cohort study, we found that occupational grade predicts the course of depressive symptoms over a follow-up period of up to 12 years. Compared to participants with high occupational grade, those with intermediate and low occupational grade were 1.21 and 1.64 times more likely to have persistent depression and this association remained statistically significant after adjusting for demographic, behavioral, social and health characteristics at study baseline and during follow-up. Moreover, depression disproportionately persisted in participants who were female, younger than 50 years, not retired, who had low social network, experienced life events, smoked cigarettes, were underweight, previously had depression or used antidepressants during follow-up. Socioeconomic inequalities in depression at any point in time may partly reflect disparities in depression course over time. Individuals who belong to socioeconomically disadvantaged groups may require special attention from health professionals addressing their mental health needs.

Strengths and Limitations

Our study has limitations that need to be acknowledged before interpreting the results. First, when the GAZEL cohort was established, participants were employed by France's national gas and electricity company which guaranteed its employees job security. Therefore we

		OR [95%CI]	P
Model 1	Occupational grade in 1996 adjusting for sex, age, and year of measurement.		
	High	1.00	
	Intermediate	1.18[1.04-1.34]	0.01
	Low	1.60[1.34-1.91]	<0.0001
Model 2	Occupational grade in 1996 adjusting for sex, age, year of measurement and baseline characteristics*		
	High	1.00	
	Intermediate	1.14 [0.99-1.30]	0.06
	Low	1.42 [1.16-1.69]	0.0005
Model 3	Occupational grade in 1996 adjusting for sex, age, year of measurement, baseline* and follow-up** characteristics		
	High	1.00	
	Intermediate	1.12 [0.97-1.29]	0.11
	Low	1.37 [1.12-1.67]	0.002

* **Baseline characteristics:** retirement status, social network, tobacco smoking, body mass index, prior depression and chronic somatic illness.
** **Follow-up characteristics:** retirement status, social network, tobacco smoking status, body mass index, chronic somatic illness, life events and use of antidepressants.
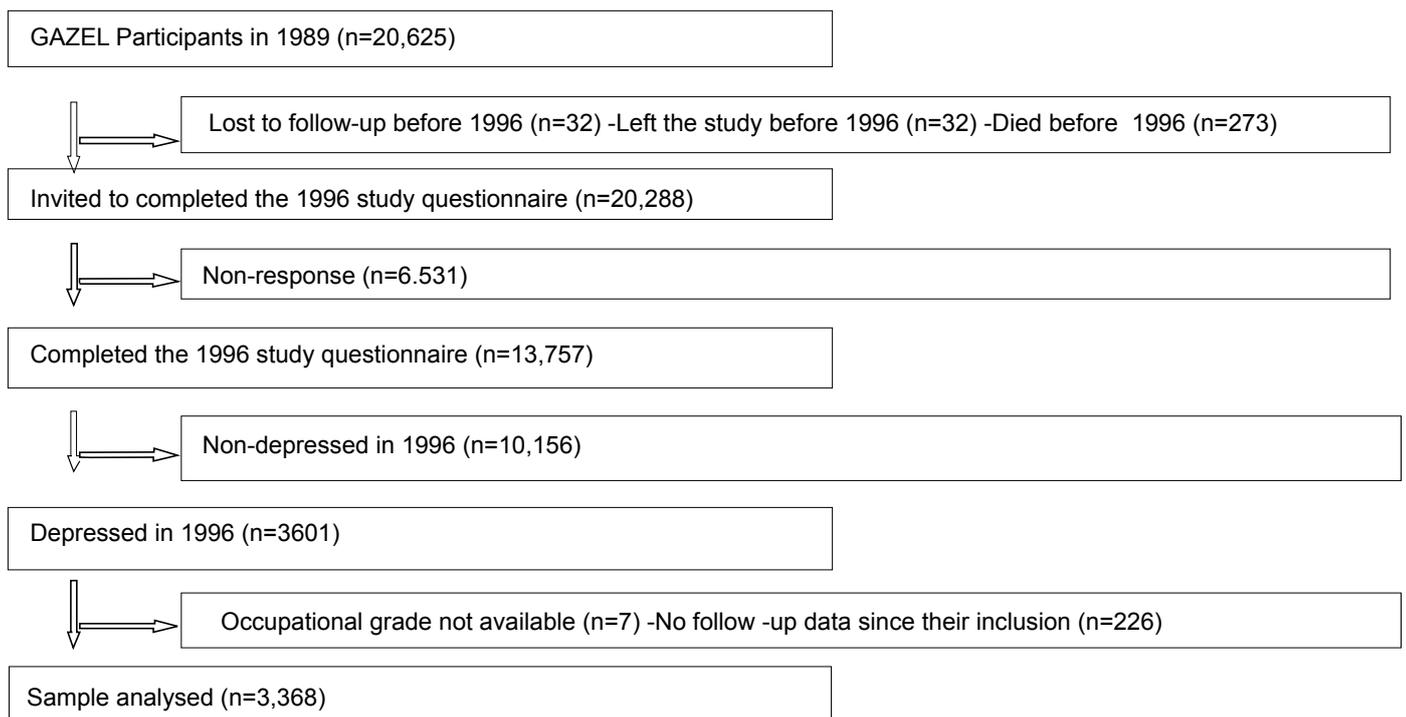
Table 3: Association between occupational grade and depression course: GAZEL cohort study, multivariate analysis, GEE (1996-2008, n=3,368).

could not study the impact of unemployment or job insecurity on depression course and our study population did not include individuals who suffered from especially harsh socioeconomic circumstances. However, GAZEL participants hold a variety of occupations and live throughout France, and prior studies reported large socioeconomic inequalities in mortality and morbidity [27,28,40] in this sample. Nevertheless, in the population at large, socioeconomic inequalities in depression persistence are probably greater than we report. Second, our study did not take into account clinical characteristics such as early depression onset [41], the severity of the initial depression episode, comorbid psychiatric disorders, and family history of depression [6,42]. By adjusting the analyses for participants' prior depression and use of antidepressants during follow-up, we probably accounted for most variability due to depressive disorder severity [43,44]. Third, the CES-D scale may overestimate depression caseness, particularly in case of psychiatric or somatic comorbidity. Still, the CES-D is a well-validated, widely used questionnaire, which is sensitive to changes in mood and suitable for repeated measurements over time [22-26]. Our definition of depression based on cut-offs validated in France but higher than generally used (>=17 in men and >=23 in women) [22], probably limited the likelihood of false positives. Our study also has several strengths:1) a large non-clinical sample followed prospectively over a period of 12 years; 2) assessment of occupational grade directly from company records [26,27] that is limiting information bias and missing data; 3) inclusion of a wide range of factors associated with depression course measured both at the time of the index depressive episode and during follow-up.

Occupational Grade and Depression Persistence

In multivariate regression models, we found that occupational grade was significantly associated with depression persistence. Risk factors of depression occurrence and course can be different at different stages of the life course [45] and socioeconomic inequalities in this area can be explained both by „social selection" and „social causation" phenomena. The "social selection" hypothesis suggests that depression affects individuals' socioeconomic attainment and career mobility [46]. However, this phenomenon seems to play an especially important role in the case of severe mental illness and a more limited one in the case of depression [46]. The "social causation" hypothesis states that socioeconomic position is a cause of depression, through deleterious exposures and experiences that are associated with disadvantaged social standing. Our study was not specifically designed to test the contribution of these two processes to socioeconomic inequalities in depression, which are difficult to disentangle in observational studies. However, experimental or quasi-experimental studies suggest that changes in socioeconomic factors can yield improvements in mental health [46,47]. Additionally, mental health difficulties may have hindered study participants' career mobility, resulting in their working in a low occupational grade by the time they were middle-aged. A previous study based on the GAZEL cohort showed that compared to participants with low or intermediate alcohol use, those with high alcohol use levels were less likely to experience upward career mobility; depression may have a similar effect [48]. At the same time, study participants with low or intermediate occupational grade were more often exposed to a range of factors which increased their likelihood of poor mental health, such as social isolation or negative life events. Other research suggests that individuals from less advantaged socioeconomic backgrounds may have fewer cognitive and cultural resources to face such stress, compounding mental health risks [19]. Finally, differences in health care access may also contribute to our findings. Individuals who belong to high occupational groups may have better access to information on mental health, know ways to cope with mental health problems and be more likely to receive adequate treatment [19]. Unfortunately in an observational study treatment assignment is not random and we could not account for this phenomenon. In our study antidepressant treatment was actually associated with increased

GAZEL Participants in 1989 (n=20,625)

Lost to follow-up before 1996 (n=32) -Left the study before 1996 (n=32) -Died before 1996 (n=273)

Invited to completed the 1996 study questionnaire (n=20,288)

Non-response (n=6.531)

Completed the 1996 study questionnaire (n=13,757)

Non-depressed in 1996 (n=10,156)

Depressed in 1996 (n=3601)

Occupational grade not available (n=7) -No follow -up data since their inclusion (n=226)

Sample analysed (n=3,368)

probability of persistent depression, implying confounding by indication [43]. Future studies will need to examine the contribution of treatment adequacy in terms of type and duration, to socioeconomic disparities with regard to depression.

Conclusion and Policy Implications

Socioeconomic position, as measured by occupational grade, appears to predict the long-term course of depressive symptoms among middle-aged individuals drawn from the community. Future research should examine whether socioeconomic factors are already a risk marker at the time of onset of a first depressive episode. Overall, policymakers and mental health professionals may need to pay particular attention to socioeconomic inequalities with regard to depression.

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