

RESEARCH REPORT

Effect of psychiatric illness and labour market status on suicide: a healthy worker effect?

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Study objective: To describe the association between labour market status and death by suicide with focus on admission with a psychiatric disorder.

Design: Nested case-control study. Data from routine registers.

Setting: Entire Danish population.

Participants: 9011 people aged 25–60 years who committed suicide during 1982–1997 and 180 220 matched controls.

Main results: In the general population, not being fully employed is associated with a twofold to threefold increased relative risk of death by suicide, compared with being fully employed. In contrast, fully employed people who have been first admitted to a psychiatric hospital within the past year are at increased suicide risk. Patients who are unemployed, social benefits recipients, disability pensioners, or otherwise marginalised on the labour market have a suicide risk of 0.60 (95% CI: 0.46 to 0.78), 0.41 (0.23 to 0.74), 0.70 (0.45 to 1.08), and 0.86 (0.53 to 1.41), respectively. Although a similar risk decrease is found in women, men, people younger than 30 years, people older than 45 years, and in people who become unemployed, the reversed effect attenuates with time since admission, and little association is seen when a marginal structural model is applied.

Conclusions: Although the results show an increased suicide mortality associated with unemployment and labour market marginalisation in the general population, the results suggest little or an inverse association between unemployment and suicide in people with psychiatric illness. The associations seen suggest the need to consider healthy worker selection effects when studying the causal pathway from unemployment and psychiatric illness to suicide.

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Suicide is more frequent among the unemployed and among people with a weak labour market affiliation.^{1–3} Studies have suggested that the suicide-unemployment link is causal,⁴ or partly attributable to selection processes by which the effect of an unobserved factor, such as psychiatric illness, leads to both suicide and unemployment,⁵ or that the link is reverse causal,⁶ where a suicidal behaviour leads to unemployment, or that there is little indication of unemployment causing suicide⁷ or mortality in the short term.⁸

The association between suicide and unemployment, own⁹ as well as familial,¹⁰ is confounded by psychiatric disorders. The suicide-unemployment association among people suffering from a psychiatric disorder seems less clear^{11–13} as studies have suggested no association¹⁴ or even a non-significant 30% reduction in risk,¹⁵ and a study even suggests that the suicide rate increases with increasing income among patients.¹⁶ Furthermore, individual longitudinal studies of deliberate self harm and unemployment do not present a coherent picture,¹⁷ which further suggests that the association between suicide, psychiatric illness, and unemployment is not fully understood. It might be that unemployment increases the risk of being admitted with a psychiatric disorder, which then increases the risk of suicide, or alternatively, that those suffering from a psychiatric disorder are more likely to become unemployed and also more likely to commit suicide.^{11–13}

This study used a nested case-control design including all adult suicides in Denmark to assess the relation of suicide, unemployment, and severe psychiatric illness. The aim was to examine whether unemployment and other types of labour market marginalisation caused suicide and especially whether the unemployment-suicide association was the same among patients suffering from a severe psychiatric illness.

These questions are of particular interest because it has been suggested that economic and social policies that reduce unemployment will reduce the suicide rate,⁴ and because about half of those who commit suicide have previously been admitted to a psychiatric hospital.^{9–18}

METHODS

Source of data and population based registers

Data were obtained by linking Danish population based registers using the unique personal identification number, which is assigned to all persons living in Denmark and used across all registration systems.¹⁹

The Danish Medical Register on Vital Statistics contains dates and causes of all deaths in Denmark recorded from the cause of death certificates since 1976 and for suicide since 1970.²⁰ Suicide was defined as ICD8²¹ codes E950–959 and ICD10²² codes X60–X84.

The Danish Psychiatric Central Register includes all admission and discharge dates and diagnoses according to the World Health Organisation ICD8 and ICD10 classification of all psychiatric inpatient facilities in Denmark since 1969.²³ There are no private psychiatric hospitals in Denmark, and all treatment is free of charge.

The integrated database for longitudinal labour market research²⁴ covers the entire population and contains yearly information for the period 1980 and onwards with information from administrative registers on people who were living in Denmark on 1 January.

Study population

All subjects, aged 25 to 60 years, who had committed suicide in the period 1982 to 1997, were identified from the Danish Medical Register on Vital Statistics. Using a nested

Table 1 Rate ratios (95% CI) for suicide in relation to labour market affiliation the previous year and time since first admission to a psychiatric hospital in Denmark during the period 1982–1997

	Never admitted		First admitted after 1 January the previous year		First admitted before 1 January the previous year	
	Number of cases/ controls	Rate ratio*	Number of cases/ controls	Rate ratio*	Number of cases/ controls	Rate ratio*
Unemployed	1378/37112	1.67 (1.60,1.79)	353/253	0.60 (0.46,0.78)	870/2298	1.01 (0.89,1.14)
Social benefits	121/1481	3.12 (2.57,3.79)	29/35	0.41 (0.23,0.74)	260/413	1.38 (1.14,1.68)
Disability pensioner	305/5406	2.34 (2.06,2.66)	69/55	0.70 (0.45,1.08)	1167/2526	0.98 (0.87,1.11)
Others	189/6091	1.75 (1.50,2.04)	65/42	0.86 (0.53,1.41)	221/405	1.28 (1.04,1.58)
Fully employed	2450/121033	1	549/217	1	985/2853	1

*Adjusted for time since latest discharge in each of the two groups (currently admitted, <7, 8–30, 31–182, 183–365, +366 days), diagnosis (depression, schizophrenia, mania, alcohol, other), and marital status (living single, married and cohabitant, and living with partner).

case-control design,²⁵ each person committing suicide was matched to a random subsample of exactly 20 persons of the same sex, who were born the same year, who were alive at the particular matching date and age (in days)—that is, the sex-birth year stratified controls were at risk at the same age and calendar date.²⁶ To make the selection feasible and to minimise the computational burden, a random 5% longitudinal sample was selected from the entire population within which controls were randomly selected. Cases and controls were only included if they had been living in the country during the two preceding years.

Definitions of explanatory variables

The demographic and socioeconomic factors included were variables describing marital status on 1 January (married or cohabitant and living with partner, living alone). The annual labour market status was categorised as (1) fully employed or self employed, (2) unemployed and receiving unemployment benefits, (3) recipients of social benefits including sickness benefits, (4) disability pensioner, (5) others—a category comprising those outside the labour market who did not receive unemployment benefits or other transferrals of income. Unemployment benefits were only paid to the unemployed who were actively seeking work or who had unemployment insurance. The status of being a disability pensioner, a recipient of social benefits, or belonging to the other group is registered in November, and therefore, persons who within the same year had been unemployed and, for example, disability pensioners were grouped as being unemployed. Because of the age range, only a few were students and they were grouped with the fully employed.

The variables derived from the Danish Psychiatric Central Register were duration of current discharge period and date of the first admission since 1969. The ICD8 and ICD10 diagnoses at latest discharge were grouped as depression (ICD-8 code: 296.09, 296.29; ICD-10 code: F32.0–F32.9), schizophrenia (ICD-8: 295; ICD-10: F20), mania (ICD8: 296.19, 296.39; ICD10: F30.0–F30.9, F38.00), alcohol (ICD-8: 291, 303; ICD-10: F102), and all others.

Data analyses

To explore the overall association between the suicide risk, labour market status, and admission with a psychiatric disorder, the data were initially analysed by conditional logistic regression with each case forming a separate stratum using the PHREG procedures in SAS (version 8.2)²⁶ Invoking the stationary population assumption,²⁷ which is related to the assumption that hazards should be proportion over calendar time, and as the controls were selected randomly within the appropriate risk sets, estimated rates based on the conditional logistic regression will be called rate ratios.^{27–28} Compared with a Cox regression for full open cohort data, the estimated rate ratios (also called incidence/hazard rate

ratios²⁹) will remain unbiased, consistent, and have an asymptotical normal distribution.³⁰

To focus on people admitted with a psychiatric disorder and to examine whether the results were produced by a particular change in labour market affiliation or by a difference between people ever and never admitted with a psychiatric disorder, the data were subsequently restricted to the subset containing people who had previously been admitted with a psychiatric disorder. Odds ratios of suicide in relation to exposure among the previously admitted subjects were calculated by unconditional logistic regression analysis³¹ stratified by sex and age (younger than 30 years and older than 45 years) using the GENMOD procedure in SAS.

To account for (the observable) selection into being unemployed, the data were further restricted to the subset with people who were admitted for the first time after 1 January the previous year. A weighted logistic regression model was used to estimate the parameters of a marginal structural model.^{32–35} The weights, which were the estimated inverse probability of being unemployed the previous year, were estimated as predicted values from a logistic regression model with covariates containing information on employment status two years earlier, time since latest discharge, psychiatric diagnosis, marital status, sex, age, and calendar year. Briefly, a logistic regression of X (= being unemployed or not) was regressed on Z (= previous employment, etc, as mentioned above) and used to obtain the propensity score,³⁶ which is the predicted probability, $\Pr(X|Z)$, of being unemployed (or not). The weights were calculated as $SW = \Pr(X)/\Pr(X|Z)$, where the numerator was the predicted marginal probability of being unemployed (or not), which is merely added to stabilise the weights. Assuming no unmeasured confounders, this weighting procedure created a pseudo-population where unemployment the previous year was unconfounded by unemployment two years earlier, time since last discharge and psychiatric diagnosis, marital status, sex, age, and year. In this pseudo-population, the counterfactual probabilities of suicide associated with being unemployed or fully employed will be the same as in the true study population.^{32–35} Given no unmeasured confounder, this weighting procedure created odds ratios that were likely to have a causal interpretation. However, the use of these weights induced within subject correlation as the weights were obtained from the same study population and as the weights generated replicates of the same person. Therefore, a marginal structural model will tend to produce too narrow confidence bands,^{32–35} which presumably is counterbalanced by calculating robust confidence intervals based on generalised estimation equations.³⁷ Note, with nested case-control designs and conditional logistic regression, the weighting technique is merely heuristic as marginal structural models have not (yet) been developed in connection herewith.

Table 2 Odds ratios and 95%CI for suicide in relation to labour market affiliation the two previous years among people admitted to a psychiatric hospital, Denmark, 1982–1997

	First admitted after 1 January the previous year			First admitted before 1 January the previous year		
	Number of cases/controls	Unadjusted odds ratio	Adjusted odds ratio*	Number of cases/controls	Unadjusted odds ratio	Adjusted* odds ratio
Unemployed the two previous years	277/207	0.50 (0.39,0.64)	0.65 (0.49,0.86)	737/1972	1.13 (1.01,1.27)	1.01 (0.89,1.15)
Becoming unemployed: unemployed the previous year, fully employed two years earlier	101/66	0.57 (0.40,0.82)	0.79 (0.53,1.16)	279/502	1.68 (1.42,1.99)	1.38 (1.15,1.65)
Becoming employed: fully employed the previous year, not fully employed two years earlier	55/32	0.64 (0.40,1.03)	0.82 (0.53,1.36)	195/463	1.27 (1.06,1.53)	1.15 (0.94,1.41)
Social benefits the previous year, not fully employed two years earlier	23/32	0.27 (0.15,0.47)	0.44 (0.24,0.81)	220/359	1.85 (1.54,2.23)	1.37 (1.11,1.69)
Disability pensioner the previous year, not fully employed two years earlier	64/51	0.47 (0.31,0.70)	0.67 (0.42,1.05)	1108/2458	1.36 (1.23,1.52)	1.08 (0.95,1.22)
Others the previous year, not fully employed two years earlier	51/29	0.66 (0.41,1.07)	0.60 (0.35,1.02)	174/351	1.50 (1.23,1.83)	1.07 (0.86,1.41)
Fully employed the two previous years	494/185	1	1	790/2390	1	1

*Adjusted for time since latest discharge (currently admitted, <30, 31–182, 183–365, +366 days), diagnosis (depression, schizophrenia, mania, alcohol, other), and marital status (living single, married and cohabitant and living with partner), sex, age, and calendar year. Stratified by whether the first admission was before or after 1 January the previous year.

RESULTS

In total, 9011 cases (2867 women) and 180 220 controls were identified. The distribution of cases and controls over important risk factors were shown in each of the tables. The distributions associated with the adjustment factors have been published earlier.³⁸ For cases and controls, respectively, 51% and 5% had been admitted to hospital with a psychiatric disorder, 39% and 63% were fully employed the previous year, 62% and 38% were living single.

Table 1 shows the adjusted rate ratios in relation to labour market status by psychiatric admission status. As anticipated, people who had never been admitted with a severe psychiatric disorder were at higher risk for suicide if they were unemployed, recipients of social benefits, disability pensioner, or otherwise marginalised on the labour market when compared with the fully employed. The association between suicide and labour market status was reversed among people who had been first admitted after 1 January the previous year. People who were fully employed had a higher suicide risk than people who were unemployed, recipients of social benefits, disability pensioner, or otherwise marginalised on the labour market. Thus, for example, the adjusted suicide rate associated with being unemployed was 0.60 (95% CI 0.46 to 0.78), and the stratified analyses showed similar results for men (adjusted rate ratio 0.63; 0.47 to 0.84), for women (0.58; 0.36 to 0.92), for those younger than 30 years (0.54; 0.28 to 1.03), and those older than 45 years (0.51; 0.32 to 0.83). Furthermore, the suicide risk in the four groups of people who were not fully employed were not statistically different (adjusted $p = 0.22$). Among people who had their first admission before the 1 January the previous year, the suicide risk was higher among people who were recipients of social benefits or otherwise marginalised on the labour

market, whereas there seemed to be little risk difference between people who were fully employed, unemployed, or disability pensioners.

Table 2 shows the effect of labour market status the two previous years among people admitted with a psychiatric disorder. Among people first admitted after 1 January the previous year, the suicide risk was lower in those who had been unemployed the two previous years, or became unemployed, as well as, among those who left unemployment and became fully employed compared with those who were fully employed in both years. These effects were less pronounced when adjusting for other factors. Among people who have had their first admission before the 1 January the previous year, the event of becoming unemployed increased the suicide risk more than being unemployed both years (adjusted $p < 0.01$), whereas people who were unemployed both years or who became fully employed had the same suicide risk as those who were fully employed both years.

Table 3 shows estimates of the suicide odds ratio attributable to unemployment in the group of people who

Key points

- The suicide mortality is associated with unemployment and labour market marginalisation in the general population.
- Unemployment and labour market marginalisation have little or an inverse association with death by suicide in people with psychiatric disorders.

Table 3 Odds ratios and 95%CI for suicide in relation to employment status the previous year for people first admitted after 1 January the previous year

	Number of cases/controls	Unadjusted* odds ratio	Adjusted† odds ratio	Weighted‡ odds ratio
Unemployed or otherwise not fully employed	516/385	0.51 (0.42,0.63)	0.67 (0.54,0.85)	0.91 (0.65,1.27)
Fully employed the previous year	549/217	1	1	1

*Adjusted for sex, age, and calendar year. †The standard model is adjusted for the covariates: time since latest discharge, psychiatric diagnosis, marital status, sex, age, and calendar year. ‡The weights in the marginal structural model are calculated using information on employment status two years earlier, time since latest discharge, psychiatric diagnosis, marital status, sex, age, and calendar year. The model is further adjusted for sex, age, and year.

had been first admitted after 1 January the previous year. Both the unadjusted odds ratio (0.51; 0.42 to 0.63) and the adjusted odds ratio (0.67; 0.54 to 0.85) from the standard model suggested that the suicide risk was lower among people who were unemployed or not fully employed compared with the fully employed. The odds ratio from the marginal structural model suggested a somewhat higher and non-significant lower suicide risk (odds ratio 0.91; 0.65 to 1.27) among the not fully employed. The mean, minimum, and maximum of the estimated weights were 1.008, 0.438, and 12.933, respectively, which implies that a person on average contributed with one unit to the pseudo-population, and that this contribution varies between 0.438 and 12.933 units.

DISCUSSION

This paper presents results of the analysis of suicide risk in relation to unemployment using Danish population based routine registers. The main finding is that the suicide-unemployment association is ambiguous. Unemployed people, who have never been admitted with a psychiatric disorder, are at increased suicide risk. In contrast, unemployed people, who have been admitted for the first time after 1 January the previous year, are at decreased suicide risk. Unemployed people, who have had their first admission earlier, seem to be at less increased risk for suicide.

The results from the unadjusted model are in keeping with previous reports of an increased suicide risk among unemployed people.^{1 4 39} In this study, fully employed people are less likely to commit suicide, and consequently, the suicide risk is increased among people who receive unemployment, social, or disability benefits and among those who are otherwise not active on the labour market. Our results, however, suggest that the relation between unemployment and suicide is rather different among people who have been admitted with a psychiatric disorder.

The most striking finding of the study is that fully employed people who have been admitted with a psychiatric disorder seem to have an increased suicide risk compared with unemployed patients. Among people who have recently been admitted for the first time, being unemployed, a recipient of social or disability benefits, or being otherwise marginalised on the labour market, as well as becoming unemployed, seem to be protective against suicide. As noted earlier,¹⁶ among people suffering from a severe psychiatric illness, British studies have shown no association¹⁴ and a non-significant 30% reduction in risk¹⁵ in the unemployed. Employed people might be particularly exposed to the stigma associated with psychiatric illness,⁴⁰ which would agree with the more pronounced risk closer to the first admission, and with the rather similar rates among subgroups of the not fully employed. Alternatively, employed people, who have been admitted with a severe psychiatric illness, might be in a particularly stressful situation caused by a risk of losing their

job. Employed people might have a shorter hospital stay, and therefore, less treatment or time where they are restrained from available means to commit suicide. Furthermore, a minority of the admitted people shows an increase in psychological wellbeing once they become unemployed.⁴¹

Although the findings are adjusted for time since discharge and psychiatric diagnosis, the declining suicide rate with decreasing income might be partly explained by confounding attributable to severity of illness,¹⁶ as richer people might avoid stigma by postponing or averting an admission, which here would imply that employed people tended to shorten, postpone, or avoid admission. It is, however, a less probable explanation, as receiving a disability pension would reflect the social welfare system's recognition of the disabling impact of the psychiatric disorder and thereby reflect a more severe psychiatric illness. The finding could be the result of a higher admission threshold for the fully employed, or similarly, if those who are unemployed or otherwise marginalised on the labour market are more likely to be admitted for less severe illnesses. Note, there are no private psychiatric hospitals and all hospital treatment is free of charge in Denmark.

Another contributing factor could be that treatment and aftercare perhaps focus on the large proportion of people who are marginalised and not fully employed, and who are likely to be the most vulnerable people with psychiatric illness, but perhaps not necessarily at highest suicide risk.¹⁴ On the other hand, this might partially explain the lower suicide rate seen in the not fully employed. Assuming that psychiatrically ill persons are more likely to be suicidal, the reverse causal hypothesis,⁶ where suicidal people supposedly avoid employment, seems less likely, as this would have resulted in an opposite risk pattern.

The results from the marginal structural model suggest that the low suicide rate among unemployed patients could be attributable to a selection effect. The healthy worker effect,⁴² which is a term characterising the two sided selection of healthy people into the labour market and the exclusion of the unhealthy, should be kept in mind when interpreting the results. The results suggest that the primary selection out of the labour market has taken place, and furthermore, that psychiatric admission is merely a factor on the causal pathway between unemployment and suicide, which is keeping with the conjecture by Lewis and Sloggett.⁴ Although some labour market marginalisation seems to occur before the actual first admission, psychiatric disorders are known to have a profound impact on labour market outcomes.⁴³⁻⁴⁵ This study suggests that the association between unemployment and suicide is limited among the recently first admitted people, and that this limited association attenuates with time since the initial selection. Fully employed patients seem to have a lower suicide risk in the long run, so that those who become unemployed or recipients of social benefits are at increased risk of suicide, which suggests that the hospitalisation effect may level off with passage of time.

This study is limited by the fact that only data from routine registers are available, and although this minimises the chance of differential misclassification, information on previous suicide attempts, the particular work environment, psychiatric illness not leading to hospitalisation, and other important individual events are absent. Although unemployment and labour market status have been measured previously, the study is limited by unemployment being measured on an annual basis, and particularly limited by unemployment being measured during the previous year with 1 January being the cut off point, so that an immediate effect of an unemployment spell within the period from 1 January until the matching date is unknown.

Policy implications

- It has been suggested that policies that reduce unemployment will reduce the suicide rate, which is in keeping with the findings of this paper regarding the general population.
- Employment programmes aimed at people who have been admitted with a severe psychiatric illness might have little impact, which is important as about half of all people committing suicide have been admitted with a psychiatric illness.

It has been suggested that policies that reduce unemployment will also reduce the suicide rate,^{4–46} which is in keeping with our findings among the never admitted people and with most ecological studies.^{1–47–48} Some studies in the field of economics find a procyclical variation in mortality,^{49–50} where a rise in joblessness is associated with a decrease in the death rate, with suicides sometimes being a notable exception.⁵¹ Our results are corrected for cyclic variation by design and analysis. Our results further suggest that employment programmes aimed at people who have been admitted with a severe psychiatric illness might have little impact, which is important as about half of all people committing suicide have been admitted with a psychiatric illness.^{9–18} This study could not tell whether psychiatric illness is a mediator on the causal pathway between unemployment and suicide. It suggests that disentangling the causal pathways from unemployment and psychiatric illness to suicide is a demanding task. The result, however, will have important implications for suicide prevention.

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