

BMJ Open Changes in prescription of antidepressants and disability pension due to back pain, compared with other musculoskeletal and other somatic diagnoses: a cohort study in Sweden

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ABSTRACT

Objectives The aim was to investigate differences in the prescription of antidepressants during the transition to disability pension (DP) comparing DP due to back pain with DP due to other musculoskeletal and DP due to other somatic diagnoses.

Design A population-based cohort study with follow-up 3 years before and after the event. Estimated prevalence and adjusted ORs with 95% CIs for antidepressant prescription were computed for the 7-year window (ie, t-3 to t+3) around the DP by generalised estimating equations for repeated measures.

Setting and participants This Swedish population-based nationwide study with registry data included individuals aged 18–64 years, with DP due to back pain (n=2011), DP due to other musculoskeletal (n=3548) or DP due to other somatic diagnoses (n=11 809).

Primary outcome measures Prescription of antidepressants.

Results Before DP, the prevalence of prescription of antidepressants was stable in DP due to back pain, but increased for the other DP groups. Similarly, the likelihood of prescription increased only marginally before DP due to back pain (ORs from 0.86 at t-3 to 1.10 at t-1), but clearly in DP due to musculoskeletal (from 0.42 to 1.15) and somatic diagnoses (from 0.29 to 0.98). Both prevalence measures and risks remained at the elevated levels after DP.

Conclusions Pathways to DP due to musculoskeletal and somatic diagnoses seem to be partly driven by adverse mental health, which remains at a higher level after DP. The increasing prescription of antidepressants prior to DP suggests that special attention should be paid to mental health for prevention of DP. The period after DP needs attention to avoid deterioration of mental health.

BACKGROUND

Low back pain (LBP) constitutes one of the most critical public health problems today.¹ Particularly, the chronicity plays an important role in the often long process from onset of disease to becoming work disabled. LBP

Strengths and limitations of this study

- Use of longitudinal design with nationally representative high-quality registry data of disability pension (DP) with detailed diagnoses and dates.
- The data consisting of the whole working age population in a Nordic country enabled us to avoid not only selection and recall biases but also dropout and loss to follow-up.
- The time window was restricted to the 7 years, that is, 3 years preceding and following DP.
- Prescription of antidepressants was used as a proxy for mental health symptoms.
- The welfare system in Sweden may limit the results to be more applicable within Nordic countries having similar societal and welfare structures.

ranks among the most frequent causes of sickness absence (SA) and disability pension (DP) and covers a clinically heterogeneous patient group from unspecific pain to more specific disorders.^{1–3} In the ranking of risk factors for disease burden, occupational LBP ranks high although without attributable deaths.⁴ In addition, LBP and neck pain is the fourth leading cause of the burden of disease measured as loss of disability adjusted life years. This compares to ischaemic heart diseases and cerebrovascular diseases that are the number one and two, respectively, and to depressive disorders at 11th place.⁵

LBP is strongly interlinked with common mental disorders (ie, depressive and anxiety disorders),^{6,7} which may additionally worsen work ability.² In Europe, up to 30% of subjects with chronic pain (the majority with LBP) have a comorbid depression or anxiety.⁸ Partially based on the same dataset as in this study, coexisting common mental disorders and LBP increased the risk of granting DP.²

Still, to date the role of common mental disorders in the process to DP has received little scientific interest. Hence, a need exists to elaborate whether worsening mental health is aggravating the disabling process finally resulting in permanent work disability. For example, patterns related to the development of mental health problems in the process to DP might be specific for individuals with LBP or comparable to such patterns in individuals with other musculoskeletal or other somatic disorders. Elucidating any differences between LBP, mental disorders or their mutual effects is therefore warranted.

Although no time trend in depressive symptoms in association with DP has been shown,⁹ an expectation is that mental health may deteriorate after DP. However, also the opposite might be true, namely that mental health improves after a DP due to LBP as physical and psychological work demands are removed.¹⁰ Previous studies on DP due to mental diagnoses suggest a worsening of mental symptoms before DP, after which mental health seems to improve.¹¹ Indicators of mental health such as SA, inpatient or outpatient care due to mental diagnoses,^{2,12} or use of psychotropic drugs,^{11,13,14} can be used for assessing the development of mental health before and after granting of DP.

Mental health trajectories following DP might also be related to the severity and progression of the disorder underlying the DP.¹⁵ Consideration of disease severity conceptualised by treatment in specialised healthcare is crucial. In specific, individuals seem to seek help for common mental disorders relatively late in the disease trajectory, hence potentially reflecting also the severity of common mental disorders.¹⁶ We hypothesised that the prescription of antidepressants would differ not only regarding timing in relation to DP but also with regard to diagnosis for DP and severity of the underlying disease.

AIM

This study aimed to investigate (1) if the years preceding and the years following granting of DP due to back pain were associated with changes in prescription of antidepressants, (2) if there were variations in these patterns regarding previous specialised healthcare and (3) if there were differences in comparison to DP due to other musculoskeletal and other somatic than musculoskeletal diagnoses.

METHODS

This study was based on the Insurance Medicine All Sweden (IMAS) project.¹⁷ The IMAS study comprises more than 9 million individuals 16–64 years of age resident in Sweden with retrospective and prospective data up to 2013, identified by registers from Statistics Sweden. Register data were available from the following three agencies: (1) statistics Sweden: sociodemographic factors and length of unemployment; (2) the Social Insurance Agency: DP (date, grade and diagnoses); (3) the National

Board of Health and Welfare: date and cause of inpatient and specialised outpatient care the 3 years preceding granting of DP, respectively; date and cause of death and prescription of dispensed medication (date and codes).

The sample of this study consisted of individuals aged 18–64 years (at 31 December the preceding year) with newly granted (incident) DP in Sweden in 2009 or in 2010 (n=17 368), whereas DP due to back pain (n=2011) constituted the study base. These years (2009–2010) were chosen to guarantee the availability of information on prescription of antidepressants several years before and after granting of DP. For comparison, a sample of incident granted DP due to musculoskeletal (other than back pain, n=3548) and DP due to somatic diagnoses other than musculoskeletal (n=11 809) were formed. To be eligible for DP, a medically confirmed disorder or injury, that reduces work capacity permanently by at least 25%, is required. All citizens in Sweden are covered by the national insurance scheme. Prescribed antidepressants were measured in the 7-year time window including 3 years before, during (1 year) and 3 years after granting DP. Sociodemographic factors and unemployment were measured at 31 December the year preceding granting of DP. Those who died or emigrated during the study period were not included in the study population.

Diagnoses and variables included: all diagnoses were coded according to the corresponding codes of the International Classification of Diseases (ICD) version 10. Back pain constituted of codes M50–54. Musculoskeletal other than back pain comprised ICD 10 codes M00–49, and M55–99 and somatic diagnoses included all ICD 10 codes for somatic diagnoses other than musculoskeletal diagnoses. Information on at least one annual prescription of antidepressants (for any length without assessment of recurrence) was based on the respective codes in the Anatomical Therapeutic Chemical Classification System (ATC codes N06A).

We used the information of inpatient and specialised outpatient healthcare, during the 3 years before the DP grant dichotomised into any specialised healthcare versus no in the analyses to assess the severity of the underlying disease. Sociodemographic characteristics comprising sex, age, education, family situation, previous unemployment, area of living and country of birth were coded as described in [table 1](#).

Patient and public involvement

This study was conducted on register-based data only, hence no contact to patients or individuals was involved.

Statistical methods

Analyses were based on annual prescription of antidepressants over a 7-year observation window. The year of DP granting (ie, 2009 or 2010) was defined as time point 't0' and the 3 years of observation for both before and after DP granting year comprised t-3 to t-1 and t+1 to t+3, respectively. To begin with, the between-cohort differences in annual prescription of antidepressants,

Table 1 Descriptive statistics of 17 368 women and men, aged 18–64 years, living in Sweden and granted disability pension (DP) in 2009–2010 due to back pain, musculoskeletal diagnoses (MSD) or other somatic diagnoses

Characteristics	All (n=2 011)		DP due to back pain (n=3 548)		DP due to other somatic diagnoses (n=11 809)		χ^2 test for the difference between diagnostic groups	P value
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)		
Prescription of antidepressants in 2006 (yes)	3127 (18)	436 (22)	729 (21)	1962 (17)	<0.001			
Prescription of antidepressants in 2007 (yes)	3763 (22)	498 (25)	872 (25)	2393 (20)	<0.001			
Prescription of antidepressants in 2008 (yes)	4439 (26)	538 (27)	983 (28)	2918 (25)	0.001			
Prescription of antidepressants in 2009 (yes)	4488 (26)	527 (26)	961 (27)	3000 (25)	0.124			
Prescription of antidepressants in 2010 (yes)	4504 (26)	485 (24)	889 (25)	3130 (27)	0.032			
Prescription of antidepressants in 2011 (yes)	4357 (25)	495 (25)	878 (25)	2984 (25)	0.717			
Prescription of antidepressants in 2012 (yes)	4182 (24)	476 (24)	830 (23)	2876 (24)	0.453			
Prescription of antidepressants in 2013 (yes)	4133 (24)	465 (23)	842 (24)	2826 (24)	0.730			
Sex					<0.001			
Female	9191 (53)	1096 (55)	2440 (69)	5655 (48)				
Male	8177 (47)	915 (46)	1108 (31)	6154 (52)				
Age (in years)					<0.001			
18–24	1951 (11)	20 (1)	62 (2)	1869 (16)				
25–34	830 (5)	54 (3)	131 (4)	645 (6)				
35–44	2043 (12)	285 (14)	443 (13)	1315 (11)				
45–54	4315 (25)	668 (33)	977 (28)	2670 (23)				
55–64	8229 (47)	984 (49)	1935 (55)	5310 (45)				
Education (in years)					<0.001			
≤9	5513 (32)	585 (29)	944 (27)	3984 (34)				
10–12	8143 (47)	1090 (54)	1900 (54)	5153 (44)				
≥13	3712 (21)	336 (17)	704 (20)	2672 (23)				
Family situation*					<0.001			
Married/living with partner without children	4623 (27)	603 (30)	1158 (33)	2862 (24)				
Married/living with partner with children	4145 (24)	594 (30)	965 (27)	2586 (22)				
Single/divorced/separated/widowed without children	5925 (34)	613 (31)	1094 (31)	4218 (36)				
Single/divorced/separated/widowed with children	2675 (15)	201 (10)	331 (9)	2143 (18)				

Continued

Table 1 Continued

Characteristics	All		DP due to back pain (n=2 011)		DP due to MSD (n=3 548)		DP due to other somatic diagnoses (n=11 809)		χ^2 test for the difference between diagnostic groups	P value
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)		
Area of residence										<0.001
Metropolitan area	5232 (30)	512 (26)	942 (27)	3778 (32)						
Medium-sized city/town	6609 (38)	810 (40)	1417 (40)	4382 (37)						
Small town/village	5527 (32)	689 (34)	1189 (34)	3649 (31)						
Country of birth										<0.001
Sweden	14087 (81)	1531 (76)	2798 (79)	9758 (83)						
Other Nordic countries and EU25	1215 (7)	153 (8)	312 (9)	750 (6)						
Rest of the world	2066 (12)	327 (16)	438 (12)	1301 (11)						
Amount of days with unemployment benefit during the year preceding DP										<0.001
None	14 155 (82)	1565 (78)	2821 (80)	9769 (83)						
1–180 days	2368 (14)	340 (17)	514 (15)	1514 (13)						
>180 days	845 (5)	106 (5)	213 (6)	526 (5)						
Previous healthcare (in- or outpatient care)	15 994 (92)	1765 (88)	3220 (91)	11 009 (93)						<0.001

*Adolescent living with parents, 16–20 years included in the category of 'single/divorced/separated/widowed without children'; children living at home.

sociodemographic and healthcare characteristics were assessed by χ^2 test, and by Kruskal-Wallis test and trend test across ordered groups for ordered categorical variables (age, education and amount of days with unemployment benefit during the year preceding DP). Estimated annual prevalence of antidepressant prescriptions with 95% CIs were assessed during the 3 years before, DP granting year and 3 years after DP. Hereby, repeated measure logistic regression analysis with a generalised estimating equations (GEE) method and autoregressive correlation structure were used. As GEE is sensitive to missing information in the fixed variables, individuals with missing information on sociodemographics, 11 in 'Country of birth' and 882 in 'Education in years at baseline' were merged into categories 'Rest of the world' and 'Low education', respectively. Crude and multivariable analyses were carried out. Both estimated annual prevalence and ORs with 95% CIs were computed first adjusting for age and sex. Then, we adjusted the models for age, sex, education, place of residence, country of birth, family situation, previous unemployment and any previous inpatient or specialised outpatient care (yes/no) due to their known association with both DP and use of antidepressants.^{2 18} To consider duration of treatment by frequency of prescription of antidepressants, we ran sensitivity analyses to see if expanding our measure to include more than one annual prescription of antidepressants (ie, an individual receiving more than one prescription per a year) would influence our results. For estimated annual prevalence, this resulted in slight increase as expected although the trajectories across time points and DP diagnostic groups remained the same. The likelihood of antidepressant prescription retained the magnitude and direction across time and DP diagnostic groups. Hence, we chose not to present the results. Analyses regarding ORs related to DP due to back pain were stratified by previous healthcare (inpatient or specialised outpatient care) due to any diagnoses. All the analyses were performed using V.20 of the SPSS statistical software.

RESULTS

In 2009–2010, 17 368 individuals were granted DP due to back pain, other musculoskeletal or due to other somatic diagnoses in Sweden (table 1). The frequencies of DP due to back pain and due to other somatic diagnoses were similar across gender, but those who had DP due to musculoskeletal diagnoses were more often women (69%) than men (31%). In all diagnostic groups, those between 55 and 64 years formed the largest proportions of individuals with granted DPs. The proportions of persons 18–24 years of age was 1% in DP due to back pain and 2% in DP due to musculoskeletal diagnoses, but highest (16%) in DP due to somatic diagnoses. Prescription of antidepressants differed between the DP diagnostic groups before ($p \leq 0.001$) and during ($p = 0.032$) the DP grant, but not after DP. Education, family situation, area of residence, country of birth or amount of lost working days due to

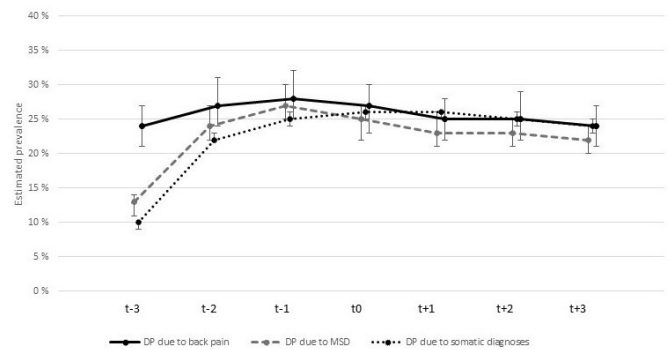


Figure 1 Estimated prevalence of prescription of antidepressants adjusted for age and sex 3 years before (t-3) up to 3 years after (t+3) granting disability pension (DP) due to back pain, other musculoskeletal (MSD) and other somatic disorders.

unemployment differed between the DP diagnostic groups ($p < 0.001$).

Prescription of antidepressants was higher among those with DP due to back pain than in DP due to musculoskeletal or somatic diagnoses 3 years before DP. In the years preceding DP, the prescription of antidepressants increased from t-3 to t-2 only very little in DP due to back pain, but more clearly in DP due to musculoskeletal and somatic diagnoses. Then, the prescription of antidepressants remained at a stable level even 3 years after DP both in the model adjusted for age and sex (figure 1) and in the model adjusted for all covariates (figure 2).

ORs for prescription of antidepressants increased gradually before DP and remained at the elevated level after DP. The ORs were highest in the last year (t-1) preceding DP: the OR for DP due to back pain was 1.09 (95% CI 1.00 to 1.19), for DP due to musculoskeletal diagnoses 1.15 (95% CI 1.08 to 1.22) and for DP due to somatic diagnoses 0.98 (95% CI 0.95 to 1.01) in the models adjusted for age and sex. The ORs following DP indicated stable trends being between 0.86 and 0.99 one to 3 years after DP. The ORs were only marginally attenuated in the model accounting for all remaining covariates (figure 3).

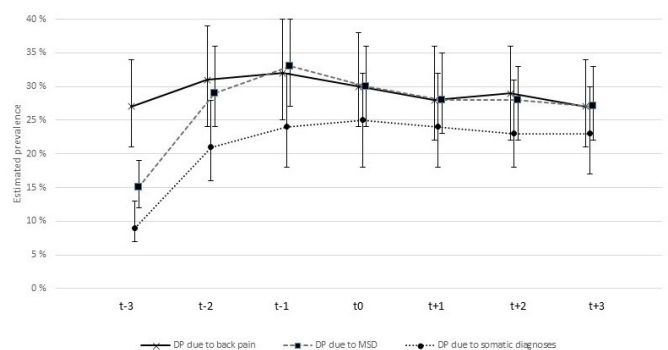


Figure 2 Estimated prevalence of prescription of antidepressants in the multivariable adjusted model for 3 years before (t-3) up to 3 years after (t+3) granting disability pension (DP) due to back pain, other musculoskeletal (MSD) and other somatic disorders.

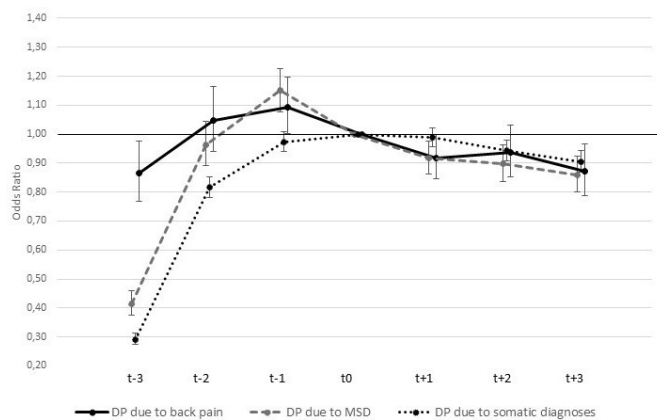


Figure 3 ORs and 95% CIs in the multivariable adjusted GEE model for prescription of antidepressants 3 years before (t-3) up to 3 years after (t+3) disability pension due to back pain, other musculoskeletal (MSD) and somatic diagnoses. GEE, generalised estimating equations.

In a subanalysis focusing on DP due to back pain, the stratification by previous healthcare (inpatient or specialised outpatient care) indicated similar ORs for those with or without previous healthcare for the prescription of antidepressants in the years before DP due to back pain. Those who had received such healthcare before DP seemed, however, to have a higher risk of prescription of antidepressants 2 years after DP grant than those without previous healthcare OR 0.97 (95% CI 0.87 to 1.07) compared with OR 0.69 (95% CI 0.48 to 0.97), respectively (figure 4).

DISCUSSION

Principal findings

This large population-based study, of 17 368 individuals with incident DP in 2009 or 2010, aimed to investigate changes in prescription of antidepressants in association

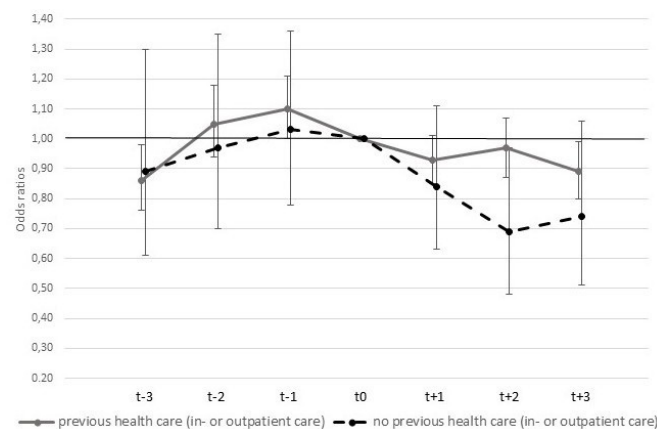


Figure 4 ORs and 95% CIs of GEE model for prescription of antidepressants among those with (n=1765) and without previous inpatient or specialised outpatient healthcare (n=246) 3 years before (t-3) up to 3 years after (t+3) disability pension due to back pain. GEE, generalised estimating equations.

with transition to DP and 3 years after DP due to back pain and compare them to such changes related to DP due to musculoskeletal or other somatic diagnoses. Both in the analyses controlling for age and sex, and in the multivariable analyses, prescription of antidepressants increased only very modestly towards DP due to back pain and following the DP the trend was also only slightly decreasing, regardless of previous level of specialised healthcare. Trajectories of prescribed antidepressants prior to DP due to musculoskeletal and somatic disorders resembled those of DP due to back pain but increases prior to DP were more pronounced.

Strengths and weaknesses of the study

This study has several strengths, including the use of longitudinal design with nationally representative high-quality registry data of DP with detailed diagnoses and dates. Furthermore, the registry data were comprehensive for a large set of relevant covariates in the analyses including inpatient and specialised outpatient care due to somatic and mental diagnoses.^{19 20} In addition, the access to data consisting of the whole working age population in a Nordic country enabled us to avoid not only selection and recall biases but also dropout and loss to follow-up. Moreover, the study was not hampered by lack of power in the analyses of DP due to various diagnostic groups which is often the case even in population-based samples.²¹ The frequency of antidepressants use in our sample was similar as in the general Swedish population.^{22 23} However, we also need to address some limitations. The time window was restricted to the 7 years, that is, 3 years preceding and following DP. It is of course true that the progress from a chronic condition to permanent work incapacity can last for various lengths. However, this unique dataset provided us with the rare possibility to investigate those granted DP and follow them both retrospectively and prospectively. That has seldom been done before and many previous studies have been limited to specific occupational cohorts with restricted generalisability to the general population.^{11 13} However, we also need to acknowledge the lack of comparison with individuals in the general population, who are also at risk of transition to DP. A further limitation is that prescription of antidepressants was used as a proxy for mental health symptoms. With regard to somatic disorders, antidepressants can be prescribed for the symptoms of an underlying depression or anxiety.²⁴ Alternatively, musculoskeletal pain even without symptoms of a common mental disorders can be directly targeted by prescription of antidepressants, although no consensus for this exists in the literature. On the other hand, there is consensus regarding a specific type of antidepressants (tricyclic antidepressants, TCAs) related to the treatment of neuropathic or chronic back pain (Chou *et al* 2007;²⁴ Dharmshaktu *et al* 2012).²⁵ However, TCAs form usually a small fraction of used antidepressants¹⁸ and more widely used antidepressants including selective serotonin reuptake inhibitors have a weak evidence base regarding improvement of symptoms of chronic pain.

In interpreting the findings, these limitations should be considered. Still, it is rather unlikely that the trajectories of antidepressants before and after DP are mainly driven by the treatment of chronic pain without symptoms of common mental disorders.

Another potential limitation may be due to the characteristics of the welfare system in Sweden. Moreover, the procedures related to treatment and care before DP may differ between countries. Hence, these results may be more applicable within Nordic countries having similar societal and welfare structures. Moreover, the risk of unmeasured, residual confounding should be mentioned when using specialised healthcare as a proxy for the medical severity of the underlying morbidity in individuals with granted DP. Particularly back pain is rarely treated in specialised healthcare.²⁶

Strengths and weaknesses in relation to other studies

The main findings of this study, almost no increase in prescription of antidepressants before DP due to back pain, but the increase before DP due to musculoskeletal or somatic diagnoses is in line with earlier studies of old-age pension and DP (without evaluation of DP due to different diagnostic groups) from Finland.^{11 13} The detected increase may be a proxy of selection into work incapacity due to worsening of mental health, although the period preceding DP may include more treatment and rehabilitation than earlier periods of life. Of course, we cannot rule out the effect of diagnostic procedures and treatment due to seeking medical help for mental health symptoms as shown in an earlier study regarding unemployment.²⁷ Since both the level and risk of prescription of antidepressants remained at increased levels after DP, one may also assume that the work incapacity process itself can play a role in being stressful and consequently promote continuation of the prescription of antidepressants. However, stable trends after DP are contracting earlier findings of decreases after DP.^{11 13} Particularly back pain is known to be associated with common mental disorders.^{6 7} Hence, one may expect that beyond comorbidity, it is likely that antidepressants are used for treating back pain (that may consequently be severe enough to lead to DP).

Possible explanations and implications for clinicians and policymakers

One of the specific interests of this study, comparison between three diagnosis groups for DP indicated minor differences in the prevalence and risk of prescription of antidepressants in the 3 years before DP awarding year. A difference was expected based on the fact that both depression and anxiety have been shown to be associated with back pain,^{6 7} and in this study, those granted DP due to back pain had higher levels and risk estimates of prescription of antidepressants before DP than those with DP due to musculoskeletal or somatic diagnoses. However, an important aspect was also that the prescription of antidepressants was more pronounced prior

to DP in individuals with DP due to back pain than in those with DP due to musculoskeletal or somatic diagnoses. One explanation might be that mental ill-health or even worsening of mental health is already reflected by antidepressant medication as was shown in the prevalence of prescriptions of antidepressants among those with DP due to back pain. Furthermore, the increase in prescription of antidepressants among DP due to musculoskeletal or somatic diagnoses before DP may reflect that those with these diagnoses may be under-treated for mental health problems in earlier years, which might be reflected in the lower rate of prescription of antidepressants prior to DP.

However, worsening of mental health might be more linked with DP due to musculoskeletal or somatic diagnoses since back pain is known to be associated with common mental disorders.^{6 7} Furthermore, a potential explanation may be that the relatively high prescription of antidepressants both before and after DP suggests that mental disorders or symptoms may occur even before back pain. In addition, the severity of disease might play a role, but further studies would be needed to clarify this assumption. Alternatively, rehabilitation measures or return to work programme may have affected the prescription of antidepressants, pain or workability and therefore failed to prevent the pathway to DP due to back pain.^{28 29} About DP due to musculoskeletal and somatic diagnoses, the process of becoming work incapacitated seems to be accompanied with an increasing severity of mental ill-health based on the pronounced increase in prevalence and risk of prescription of antidepressants in this study, contributing in driving the decision to grant DP.

We also detected that LBP patients with specialised healthcare before DP granting had higher antidepressant treatment after DP than those without such care. Still, this should be interpreted with caution due to low power. Whether the difference is due to health, that is, those without previous healthcare being healthier than those with healthcare, or due to events occurring in the process to DP cannot be assessed with this study. Moreover, it can be assumed that there may be several influential factors affecting the prescription of antidepressants in individuals with DP. This may suggest that comorbidity,³⁰ lifestyle²¹ or other factors such as work-related ones³¹ may play a role in the associations between prescription of antidepressants and DP, and the effects of these factors may be main effects, mediation or modification depending on the main diagnosis of DP. An earlier study has indicated that in relation to statutory retirement, the prescription of antidepressants decreases after retirement showing somewhat a similar trend than after granting of DP, although the level of prescription of antidepressants remained at slightly higher level in our study.¹³ Hence, these findings call for contact and control from healthcare in order to avoid a worsening prognosis and to identify the true state of mental health when the loading of work has been relieved.

CONCLUSIONS

Pathways to DP due to musculoskeletal and somatic diagnoses seem to be partly driven by adverse mental health, which remains at a higher level after DP. The increasing prescription of antidepressants prior to DP suggests that special attention should be paid to mental health during the process of becoming work incapacitated in terms of early identification and prevention of mental disorders or symptoms and consequently of DP. Furthermore, the period after DP needs also attention to avoid deterioration of mental health.

Contributors EM-R, TED, AR, MH and PS were involved in the study conception and design. EM-R was responsible for acquisition of data. EM-R, SGR and AR conducted the statistical analyses. AR drafted the manuscript, and all the authors contributed to interpretation of data and the critical revision of the manuscript.

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Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The study population was identified by linking several nationwide registers. In Sweden, ethical approval is always required when using sensitive register data from authorities. The ethical vetting was performed by the Regional Ethical Review Board of Stockholm, Sweden according to the Swedish Ethical Review Act and after that also by each of the three different authorities/data keepers (Statistics Sweden, the National Board of Health and Welfare, and the National Social Insurance Agency) according to the Public Access to Information and Secrecy Act, the Personal Data Act, and the Administrative Procedure Act. The Regional Ethical Review Board can waive the requirement to consult in these type of large register studies, and for this project stated that the consent to participate was not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

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