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Factors associated with recurrent sickness absence patterns among Norwegian patients accessing a specialist spinal pain outpatient clinic: a retrospective cohort study

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Abstract

Background

Prolonged periods of sickness absence have been associated with increased risk of permanent labour-market exit. However, little is known of risk factors which may lead to recurrent sickness absence. The study aim is two-fold: 1) to describe recurrent sickness absence certified by a general practitioner (GP) including duration and recurrence among patients attending specialist spinal pain outpatient clinics over a period of 10 years in Norway, and 2) to explore associated socio-demographic, lifestyle, occupational, pain, quality of life and diagnostic factors.

Methods

Patient data from the Norwegian neck and back register linked with administrative welfare register data from the Norwegian Labour and Welfare Organisation (2016–2022) were used. Recurrent sickness absence was categorised into tertiles: low (0–219), moderate (220–483), and high (484–1946 days). Multinomial logistic regression was used to identify predictors of high recurrent sickness absence among a complete-case subsample.

Results

Over 10 years, 96.8% of patients (N = 8,892) experienced at least one sickness absence episode; median of 225 prorated sick days. Women were overrepresented in the moderate and high recurrent sickness absence groups compared to no or low recurrent sickness absence groups. In contrast, men were found to have a reduced risk after adjustment (aRRR: 0.50, 95% CI: 0.44–0.57) to fall in the high recurrent sickness absence group. Psychological distress increased the risk of high recurrent sickness absence, whereas pain duration did not. Cognitive and emotional factors (e.g., fear avoidance) had a higher risk of high recurrent sickness absence compared to work environment factors (e.g., occupation).

Conclusions

This study identifies distinct gender differences in recurrent sickness absence, with women more likely to experience moderate and high recurrent sickness absence. Psychological, and cognitive and emotional factors increased the risk more for high recurrent sickness absence compared to physical symptoms or work characteristics, highlighting the importance of interventions that address employees' perceptions and responses to health and work demands alongside structural workplace modifications.

Introduction

Several countries within the Organisation for Economic Co-Operation and Development (OECD) have seen a steady increase in sickness and disability benefits receipt over recent decades (1). Recent data indicated an overall rate of 6.5% for sickness absence among Norwegian employees (2), higher than in other OECD countries. This rate has remained relatively stable over the last decade (2016–2024), ranging from 4.7% in the third quarter of 2018 to 8.2% in the first quarter of 2020 (3). The high incidence rate may be particularly evident in countries with a generous, accessible social security system, including Scandinavian countries and the Netherlands (4). However, this comes at a substantial cost to public finances, with estimates ranging from 2–5% of gross domestic product.

Historically, musculoskeletal conditions, including spinal pain, were the primary reason for benefit receipts (1, 4–8). Yet, in the past decade, mental health problems have become a dominant cause for sickness absence (9). Notably, this shift appears less pronounced in Norway, where other health conditions still remain as more prevalent contributors to benefit claims (1, 4, 7).

In Norway, employees aged 16–70 are entitled to paid sickness absence if illness or injury reduces their work capacity by at least 20%, provided eligibility criteria are met (10). GP-certified sickness absence (i.e., Sykemeldinger) can be issued from the first day the employee presents to their GP, and employers cover the first 16 days of absence. Self-certification is also permitted during the employer's liability period. After the initial 16-day period, costs are assumed by the national insurance system. Sick pay is generally available up to 52 weeks, regardless of whether leave is full or partial, after which individuals still unable to work may be eligible for alternative benefits such as work assessment allowance and disability pension (10).

Some workers with neck and back complaints may be more predisposed to sickness absence than others (11). Research has consistently demonstrated a gender gap in sickness absence, with women reporting increased rates of musculoskeletal conditions (12–14) and experiencing higher rates of sickness absence than men (15, 16). Similarly, there are elevated absence rates among certain occupational groups (e.g. private and public sectors) and older workers (11, 17–20). These patterns are commonly interpreted through work-disability frameworks, which emphasise interactions between individual health, workplace conditions, and broader social and policy contexts (21). While active employment is generally associated with better health and wellbeing (22, 23), prolonged sickness absence is linked to adverse health and labour market outcomes including reduced likelihood of returning to employment (1). In response, policy efforts have increasingly focused on interventions such as partial or graded sickness absence schemes to maintain labour-market attachment during periods of ill health (24).

Research on sickness absence has predominantly focused on binary outcomes, particularly return-to-work, which is commonly treated as an indicator of recovery (25). From an employer's perspective, return-to-work represents an optimal outcome as the employee resumes work and sustains a satisfactory work performance (26). However, it may also result in employees returning to work too soon when they have not yet fully recovered (i.e., presenteeism) which may result in future sickness absence

(27). Consequently, return-to-work outcomes are frequently used as markers of successful interventions, with many studies concluding their investigation of sickness absence at this stage (25, 28). At the opposite end of the spectrum, disability benefit gives individuals the opportunity to reduce employment or exit from the labour market through receipt of financial government support (29, 30). Disability benefits are likely to play a necessary role for individuals managing long-term or severe health conditions including musculoskeletal conditions (31, 32).

Although the sickness absence process does not end with return to work or disability benefits (29, 33). Employees who return-to-work following long-term sickness absence are at increased risk of recurrent absence compared with those without a history of prolonged sickness absence (11, 34). This pattern has been observed particularly among individuals with musculoskeletal conditions such as neck and low back pain, where recurrent sickness absence has been documented (35). Yet explanations have largely focused on physical workload and job characteristics for employees with neck and back pain, with limited consideration of broader determinants including health and work performance beliefs (36–38). Moreover, relatively little research has examined recurrent sickness absence using longitudinal designs, despite their ability to capture patterns of behaviour over time such as work participation.

Prolonged periods of general sickness absence are well established as being associated with heightened risk of permanent labour-market exit (1). However, there is limited understanding of patterns of recurrent sickness absence, especially among individuals with longstanding neck and back conditions, and factors associated with patterns. Therefore, this study aimed to (1) describe patterns of GP-certified recurrent sickness absence among patients attending specialist outpatient clinics for neck and back conditions in Norway over a 10-year period, and (2) examine the socio-demographic, lifestyle, occupational, pain, quality of life and diagnostic factors associated with recurrent sickness absence tertiles.

Materials and methods

Dependent variable

The main outcome of interest was GP-certified sickness absence as derived from the welfare data. We excluded absences for maternity and paternity-related reasons as this would disproportionately impact specific subgroups of patients.

The number of recurrent sickness absences were converted into tertiles (low, moderate and high) in the 10 years leading up to the date patients attended a neck and back outpatient clinic and completed their intake questionnaire. This resulted in three categories: low recurrent sickness absence (0-219 days), moderate recurrent sickness absence (220-483 days) and high recurrent sickness absence (484-1946 days). We ensured that the number of sick days to inform the tertiles were prorated, meaning that we took into consideration the percentage of sickness absence (e.g. full or graded).

Independent variables

To understand factors associated with patterns of recurrent sickness absence, the following variables were explored: *1) socio-demographics and health behaviours:* sex, age, marital status, educational level, country of birth, geographical location of the health authority the clinic falls under, current smoking status and physical activity assessed using the Saltin-Grimby Physical Activity Level scale (SGPALS) (40), reading and writing difficulties (none/a little/a lot), *2) health symptoms:* pain duration (in months), pain rating at rest and during activity (0-10 scale ranging from no to worst pain imaginable), psychological distress measured using the 10-item Hopkins Symptom Checklist (HSCL) (41), EQ-5D-5L for pain and discomfort (1-5 item scale ranging from no problems-severe problem) (42), diagnosis for attending the clinic (neck, back, combination or other) *3) cognitive and emotional responses to symptoms*: fear avoidance beliefs measured using the 11-item Fear-Avoidance Behaviour Questionnaire (FABQ), consisting of 4-item sub scale exploring beliefs related to physical activity (cut-off 16 or more) and its impact on pain and a 7-item sub scale regarding how work may impact on pain (cut off 25 or more) (43), health-related quality of life (HRQoL) was measured using the European Quality of Life 5 Dimensions 5 Level Version (EQ-5D-5L) with Western preference pattern scoring (42), and *4)* work and working environment: occupation was recorded using the International Standard Classification of Occupations (ISCO) profession categories (44), job satisfaction (0-10 scale ranging from not satisfied to totally satisfied), and patient belief that the employer would like them to return to work (yes/no).

As per previous analyses using this dataset (24), we permitted up to 25% of missing data on psychometric tests. Where appropriate, we used mean imputation if ≤25% of the measure items were missing (e.g. FABQ, HSCL and EQ-5D) (45). Missingness patterns were examined across work capability and health (e.g., global health, anxiety/depression symptoms) variables. Substantial clustering of missing data was observed, with a large proportion of participants missing all work capability and health measures simultaneously, indicating that missingness was not randomly distributed and as such, these variables were not included in the final analysis.

[TABLE 5 HERE FROM SUPPLEMENTARY MATERIALS]

Statistical analyses

All statistical analyses were conducted in Stata (v.17.0). Descriptive statistics were used to describe the sample and provide an overview of recurrent sickness absence. Recurrent sickness absence was grouped into low, moderate and high tertiles to report on recurrence patterns. Several variables of interest were transformed into tertiles to compare characteristics across recurrent sickness absence groups.

We conducted univariable multinomial logistic regression analysis to explore socio-demographic, health symptoms, cognitive and emotional responses to symptoms, work environment, and health behaviour factors associated with recurrent sickness absence tertiles. This was followed by multivariable multinomial logistic regression analysis, thereby adjusting for factors identified *a priori* (age, sex). Adjusted multinomial logistic regression models were estimated on a consistent analytic sample defined by variables with low-to-moderate missingness. The relative risk ratio (RRR) was reported with 95% CI for

all regression analyses and significance was interpreted if the 95% CI did not cross 1.0, which is consistent with a significance level of $p<0.05$.

Variables of interest were grouped into five models representing distinct explanatory domains; 1) baseline (age and sex), 2) health symptoms (mental and physical health symptoms), 3) cognitive and emotional responses to symptoms (quality of life and fear avoidance), 4) work environment (occupation, job satisfaction and perceived employer support for return-to-work), and 5) demographics and health behaviours (marital status, physical activity, smoking, educational level, country of birth, reading/writing abilities). Model fit and variance explained were assessed using Nagelkerke's pseudo-R^2 to indicate the proportion of variance explained by each model and allows comparison across models. In addition, variance explained analyses were conducted for combined models incorporating multiple explanatory domains.

Missingness

Missing data were assessed descriptively and using missingness pattern analysis. Variables with low levels of missingness (<10%) were analysed using complete-case analysis. Variables with moderate missingness (10–20%) were retained given their conceptual relevance, with sensitivity analyses conducted to assess robustness. Variables with substantial and clustered missingness (>40%), including work capability, overall health and anxiety/depression items, were not imputed and excluded to avoid biased model comparisons.

Sensitivity analyses were conducted by re-estimating models with the inclusion of variables with moderate missingness. The stability of effect estimates and confidence intervals was examined to assess robustness to missing data. Effect estimates were materially unchanged in sensitivity analyses including variables with moderate missingness (10-20%) and therefore included in the final analysis.

Results

The final sample included N=9,190 patients, and sample characteristics are outlined in Table 1. Most of the sample had at least one account of sickness absence (*n* = 8,892; 96.8%). More women had at least one account of sickness absence (54.6%) compared to men (45.4%). Whereas more men had no sickness absence (66.4%) compared to women (33.6%). The mean age was comparable across both groups (48 years, SD 8.06). Most patients were in a professional occupation (i.e., science, health, teaching, business, technology and legal; 33.1%). However, a higher proportion of service and sales workers had at least one account of sickness absences (24.0%) compared to no sickness absences (16.2%).

When comparing educational attainment, more patients who went to university for 4 or more years had no sickness absence (41.6%) compared to those who did (23.5%). Similarly, the no sickness absence group had a smaller proportion of those with a primary school level education (5.9%) compared to the

sickness absence group (10.7%). A larger proportion of the sickness absence group were located in the western Norwegian region (32.3%) compared to the no sickness absence group (17.1%).

Patients with at least one count of sickness absence scored higher on symptom severity across several items (pain, psychological distress) and reported poorer quality of life (34.9%) compared to those with no sickness absences (14.7% and 21.2%, respectively).

[Table 1 HERE]

Table 2 describes sickness absence characteristics for the overall sample, including those with no sickness absence (N=9,190). A total of 3,490,649 prorated sick days were certified. Of this, 2,724,251 days were taken on full sickness absence. Half of the sample had sickness absence 10 years before presenting to the neck and back clinic (50.4%). A moderate-high Pearson's correlation coefficient of 0.55 was found between sickness absence episodes and prorated sick days.

[Table 2 HERE]

Table 3 describes characteristics of recurrent GP-certified sickness absence (low, moderate and high). Gender differences were evident across recurrent sickness absence. Men were more commonly represented in the low recurrent sickness absence group (53.0%), whereas women were overrepresented in the high recurrent sickness absence group (57.6%). Age was comparable across all groups. Those in a professional occupation had an increased percentage in the low recurrent sickness absence group (41.6%) compared to moderate (32.6%) and high (25.2%) recurrent sickness absence. Whereas service and sales workers were overrepresented in the high recurrent sickness absence group (29.1%) compared to the low recurrent sickness absence group (18.5%). A higher proportion of participants with ≥ 4 years of college/university educational level was observed in the low recurrent sickness absence group (34.3%) compared with the moderate (23.0%) and high (14.9%) recurrent sickness absence.

Work and health-related factors varied by recurrent sickness absence pattern. A greater proportion of patients in the high recurrent sickness absence tertile reported lower employer support for return-to-work (10.4%) and poorer quality of life (43.5%). Psychological distress was most prevalent for high recurrent sickness absence (56.7%).

[Table 3 HERE]

Table 4 presents multinomial logistic regression outcomes for recurrent sickness absence tertile groups (low vs. high). Restricting the dataset to complete-cases to account for missingness on variables included in the models resulted in a reduced analytic sample, which formed the basis of the regression analyses (N=7,617) (see supplementary materials).

After adjusting for sex and age, male patients had a moderately reduced risk of being in the high recurrent sickness absence group (aRRR: 0.50, 95% CI 0.44 – 0.57) compared to the low recurrent sickness absence group. Age was not significantly associated with the risk of belonging to any recurrent

sickness absence group. Never being married was associated with an increased relative risk of high recurrent sickness absence (aRRR: 1.54, 95% CI: 1.32 – 1.79) compared to low sickness absence. Higher education attainment was associated with reduced relative risks of high recurrent sickness absence (aRRR: 0.30, 95% CI 0.25 – 0.35) and primary education increased the risk of high recurrent sickness absence compared to the low recurrent sickness absence (aRRR: 1.37, 95% CI: 1.08 – 1.73). Agricultural, trade roles and manufacturing occupations all increased the risk of high recurrent sickness absence.

Health and work-related factors were strongly associated with recurrent sickness absence patterns. Whilst pain increased the relative risk of high recurrent sickness absence across several items, duration of pain showed no association with recurrent sickness absence patterns. Patients who did not believe their employer wanted them to return to work had a strongly increased relative risk of high recurrent sickness absence (aRRR: 3.94, 95% CI: 2.75 – 5.64). Similar findings were reported for patients' fear avoidance for work among high recurrent sickness absence (aRRR: 4.16, 95% CI 3.57 – 4.85).

[Table 4 HERE]

[TABLE 6 HERE FROM SUPPLEMENTARY MATERIALS]

Discussion

The study presents data on GP-certified recurrent sickness absence patterns over a 10-year period and associated factors among patients attending specialist spinal pain outpatient clinics across Norway. Our findings indicated that the majority of patients had at least one episode of sickness absence. More than 50% of sickness absence was attributed to back pain, identifying that back conditions were more prevalent among patients referred to specialist care compared to neck conditions. In a Norwegian context, overall sickness absence levels may be comparatively higher due to national policies that provide relatively generous sick pay, potentially lowering barriers to taking sick leave compared to other countries (e.g., the United Kingdom) (46, 47). However, such policy factors alone do not explain why certain spinal pain patients appear to be at an increased risk of accumulating more sick days.

Gender and age

From our findings, women were disproportionately represented in the high recurrent sickness absence group, while men were more commonly observed in the low recurrent sickness absence group. This pattern was supported by the adjusted analyses, which indicated that being male was associated with a reduced likelihood of belonging to the high recurrent sickness absence group. These findings align with the established sickness absence gender gap in Norway and across Europe, where women are consistently reported to have higher sickness absence rates than men (15, 16). Taking the sample characteristics into account, this finding is not surprising. Commonly, women are reported to have a heightened prevalence of musculoskeletal issues, such as neck and back complaints, compared to men (12, 13). This gender difference is also identified in condition severity, with more women presenting with severe musculoskeletal symptoms (14). A recent Norwegian study found that being a woman increased

the likelihood of recurrent graded sickness absence or full sickness absence following return-to-work with musculoskeletal issues; however, no association was found for men (48). Therefore, we might anticipate women attending a spinal pain outpatient clinic to have more recurrent sickness absence.

However, other factors beyond the sample's spinal pain might explain gender differences in recurrent sickness absence (49). Despite increased labour market participation, women continue to carry a disproportionate share of domestic and caregiving responsibilities alongside paid employment (50). This work-family conflict or 'double-burden' may further compound health strain or simply drive women to take more days off sick to fulfil caregiving responsibilities (51–53). In addition, male patterns of underutilising sickness absence may contribute to presenteeism (27), paired with increased help-seeking behaviours for women (54), could further contribute to the observed gender differences in recurrent sickness absence. Taken together, gender differences in the presentation of spinal pain provide further evidence supporting the need to holistically explore gender differences in sickness absence beyond presentation complaints. The findings highlight a key area for further investigation, with implications for tailoring sickness absence policies such as graded sickness absence to improve recurrence rates.

Interestingly, no associations were observed between age and recurrent sickness absence patterns. We had anticipated a positive association, whereby increasing age would be accompanied by a greater accumulation of sick days (11, 19). However, this hypothesis was not supported by our findings but may be explained by iatrogenic effects of Norwegian sickness absence policy (55). Long-term sickness absence is a substantial risk factor for non-RTW, and in a generous system with full sick leave compensation sickness absence periods can extend in the absence of financial incentives. The ultimate result being disability pension, a group excluded from our analyses. One possible explanation is the 'healthy survivor' effect (56, 57), where older workers who remain in employment, not on disability benefits or retired, tend to be healthier. Indeed, there is growing evidence to suggest that employment can be beneficial for health (22, 23), while unemployment is associated with poorer health outcomes (58, 59). However, the reduced age range of patients included in the study may have influenced this outcome, as younger and older workers were excluded.

Work environment vs. work performance beliefs

A substantial body of literature has focused on modifying workplace environments, policies, and implementing interventions to reduce sickness absence. While workplace interventions remain important, especially for those with specific health complaints (i.e., spinal pain), the present findings suggest that such approaches alone may be limited. Cognitive and emotional responses related to work and health (i.e., belief employers support return-to-work, fear avoidance of work) had a larger relative risk of high recurrent sickness absence than work environment factors (i.e., occupation, job satisfaction). These findings indicate that interventions focusing solely on workplace modifications such as job adjustments or altered work patterns (36, 37) may not fully address the drivers of recurrent sickness absence. Multidisciplinary interventions are shown to be effective return-to-work strategies by targeting several components including physical and wellbeing issues (60). Further, interventions targeting

employees' internal beliefs of their ability to return-to-work may improve recurrent sickness absence. For example, interventions where employers stay in contact with the employee during sickness absence periods (60). Consistent communication may support integration back into the workplace as employees never feel separated from the workplace (61). It is possible that cognitive and emotional responses partly reflect underlying symptom severity, and without addressing health issues, cognitive and emotional beliefs will co-occur. However, their independent contribution to explained variance suggests they represent distinct and meaningful targets for intervention.

This does not reduce the importance of addressing the work environment to improve recurrent sickness absence. The results show that both cognitive and emotional responses (e.g., work-related fear avoidance) and work environment factors (e.g., profession, job satisfaction and belief employer wants you back) were all associated with an increased risk of high recurrent sickness absences. Strategies to improve recurrent sickness absence should also target employees' health-related beliefs and cognitive-emotional responses to work (62, 63) to better support return to work and reduce long-term and recurrent sickness absence.

Mental and physical health

In the current study, health symptoms were shown to increase the risk of high recurrent sickness absence. This finding is unsurprising given that sickness absence is inherently linked to underlying health complaints (9). Notably, despite the sample comprising patients with spinal pain, psychological health symptoms showed a substantially stronger association with an increased risk of high recurrent sickness absence than physical health symptoms such as pain. In particular, no association was observed between chronic pain duration and recurrent sickness absence, whereas psychological distress remained significantly associated with increased risk after adjustment.

This finding is consistent with previous evidence suggesting that psychological health problems exert a greater influence on sickness absence than physical health conditions, with estimates indicating a threefold greater effect (64). One study found that 90% of employees who had their first episode of sickness absence for common mental disorders had at least one recurrence (65). Similar to cognitive and emotional responses, psychological difficulties may co-occur with physical health complaints but function as a key predictor of recurrent sickness absence, especially when individuals do not feel psychologically ready to return to work (37). However, patients on disability pension or WAA were excluded from the analyses, and our sensitivity analyses highlighted associations between disability pension and WAA, and pain symptoms; it can be assumed that this exclusion reinforced selection bias and impacted outcomes. Nevertheless, these findings reinforce earlier results highlighting the central role of psychological, cognitive and emotional factors for patients in regular employment (e.g., not on disability pension or WAA), rather than physical symptoms alone, in shaping patterns of recurrent sickness absence.

Strengths and limitations

This study presents detailed data on over 9,000 patients with chronic spinal pain, supplemented with high-quality administrative data on sickness absence. Previous research has shown that reliance on self-reported sickness absence data is poor, as patients generally underestimate their absence, especially over prolonged periods of time, such as in our study, which covered over a decade of welfare data (66). The national coverage of the NNRR data is also notable, and data were collected in a naturalistic setting from patients attending the clinic without incentives. However, this study has some limitations.

All participants were actively seeking support for spinal pain, indicating help-seeking behaviours and access to support. Such support may mitigate prolonged or recurrent sickness absence or inflate GP-certified sickness absence use. Thus, the findings from this study may not be generalisable to workers who are not help-seeking for health complaints or healthier patient groups. A limitation of this study is the presence of substantial and clustered missing data for some work capability and health variables, which restricted their inclusion in certain analyses. However, this approach was adopted to minimise potential bias associated with non-random missingness. Similarly, the analysis highlights limitations for selection bias through the exclusion of patients on disability pension or WAA. However, sustained absence under Norwegian policy for disability pension and WAA, we might anticipate skewed patterns of sickness absence, given the prolonged nature of work detachment for this group. As such, it was deemed appropriate to exclude this group whilst acknowledging this exclusion would potentially influence the analysis outputs (e.g., health symptoms). Further, despite the survey collecting data on a range of physical and mental health issues, it could be argued that the list of health variables is not exhaustive. This pattern is also evident in the work environment, where a more comprehensive analysis could be achieved by incorporating a broader range of work-related variables, such as interpersonal relationships, workload, and burnout. Yet, despite the secondary nature of the data collected, we have been able to examine several factors which may impact recurrent sickness absence beyond physical health symptoms associated with spinal pain.

Conclusion

This study provides novel insights into patterns of recurrent sickness absence among patients with spinal pain. The study highlights distinct gender differences in patterns of recurrent sickness absence, with women more likely to accumulate higher recurrent sickness absences than men. This emphasises the importance of considering gendered experiences of recurrent sickness absence and calls for further exploratory research. While workplace factors such as profession and job satisfaction were associated with sickness absence, cognitive, emotional and psychological factors are stronger explanatory drivers of high recurrent sickness absence risk. Together, these findings suggest that reducing recurrent sickness absence requires a shift beyond solely structural workplace interventions towards approaches that also address how employees perceive, interpret, and respond to health and work demands.

Abbreviations

aRRR - Adjusted relative risk ratio

EQ-5D-5L - European Quality of Life 5 Dimensions 5 Level Version

GP - General practitioner

HRQoL - Health-related quality of life

HSCL - The Hopkins Symptom Checklist

ISCO - International Standard Classification of Occupations

N - number

NAV - Norwegian Labour and Welfare Administration

NDI - Neck Disability Index

NNRR - Norwegian Neck and Back Register

ODI - Oswestry Disability Index

OECD - Organisation for Economic Co-Operation and Development

RRR - Relative risk ratio

SD - Standard deviation

SGPALS - Saltin-Grimby Physical Activity Level scale

UK - United Kingdom

WAA – Work Assessment Allowance

WePP - Western Preference Pattern

Declarations

Ethical approval and consent to participate

This study was approved by the Regional Committee of Medical and Health Research Ethics (REC North), (#138597). Approval was granted by the NNRR council in April 2022 to access data from outpatient clinics, with all patients consenting to participate including the anonymisation of data linked to national registries. Approval for NAV data was given in January 2023 (#22/18149). Linkage was performed in accordance with the Norwegian General Data Protection Regulation requirements, and the study was conducted in accordance with the Declaration of Helsinki ethical guidelines.

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Conflict of interest

The funder had no contribution in the study design, data collection, analysis and interpretation of the data, manuscript writing and the decision to submit the paper for publication. SAMS is funded by the National Institute for Health Research (NIHR) Maudsley Biomedical Research Centre at South London and Maudsley NHS Foundation Trust and King's College London, and an NIHR Advanced Fellowship [ref: NIHR 300592]. ARM is funded by the Wellcome Trust. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR, the Department of Health and Social Care or the Wellcome Trust. There are no other competing interests for any of the authors.

Contributor statement

SAMS conceptualised the study with input from SS, AM and NA. SAMS, LT, SS, ARM and IB took the lead in data curation. SAMS, LT and ARM led on the methodology and statistical analyses. ARM and SAMS wrote the majority of the manuscript with input from SS, AM and NA. ARM led the discussion of the manuscript with input from SAMS, SS, AM and NA. AM and BB acquired funding for the study with support from NA. All authors commented on the final draft of the manuscript.

Data availability

The data supporting this paper may be shared once an application to the scientific board of the NNRR and NAV has been made. Further, data access requires ethical approval from REC North.

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Tables

Tables 1 to 6 are available in the Supplementary Files section.

Figures

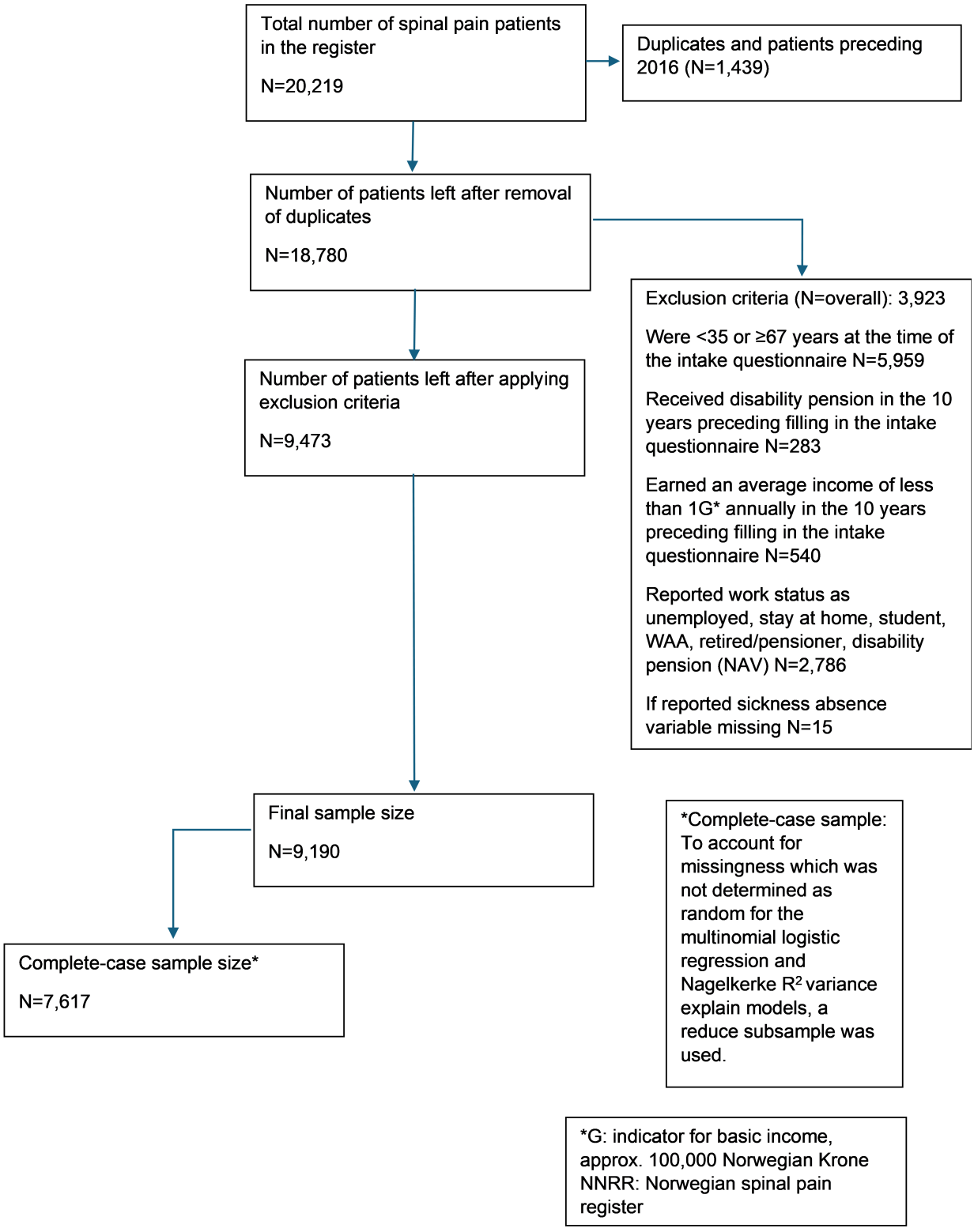


Figure 1

Flow diagram describing the final sample size included in the current study.

Supplementary Files

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- Tables.docx