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# Risk factors of work disability in patients with inflammatory bowel disease — A Dutch nationwide web-based survey☆

## Work disability in inflammatory bowel disease

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*Abbreviations:* CD, Crohn's disease; UC, Ulcerative colitis; IBD, Inflammatory bowel disease; Anti-TNFα, Anti-tumour necrosis factor α; COIN, Costs of inflammatory bowel disease in the Netherlands; DTCs, Diagnosis treatment combinations; SD, Standard deviation; CI, Confidence interval

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**Abstract**

*Background:* Inflammatory bowel disease (IBD) is associated with high costs to society. Few data on the impact of IBD on work disability and potential predictive factors are available.
*Aim:* To assess the prevalence of and predictive factors for work disability in Crohn's disease (CD) and ulcerative colitis (UC).
*Methods:* A web-based questionnaire was sent out in seven university hospitals and seven general hospitals in the Netherlands. Initially, 3050 adult IBD patients were included in this prospective, nationwide cohort study, whereof 2629 patients were within the working-age (18–64 years). We used the baseline questionnaire to assess the prevalence rates of work disability in CD and UC patients within working-age. Prevalence rates were compared with the Dutch background population using age- and sex-matched data obtained from Statistics Netherlands. Multivariable logistic regression analyses were performed to identify independent demographic- and disease-specific risk factors for work disability.
*Results:* In CD, 18.3% of patients was fully disabled and 8.8% partially disabled, compared to 9.5% and 5.4% in UC patients ($p < 0.01$), respectively. Compared to Dutch controls, the prevalence was significantly higher, especially in CD patients. Higher age, low education, depression, chronic back pain, joint manifestations and typical disease-related risk factors such as penetrating disease course and surgery in the past were all found to be associated with work disability.
*Conclusion:* We report high work disability rates in a large sample of IBD patients in the Netherlands. CD patients suffer more frequently from work disability than UC patients. A combination of demographic and disease-related factors is predictive of work disability.


## 1. Introduction

Inflammatory bowel diseases (IBD) are chronic intestinal disorders, comprising Crohn's disease (CD) and ulcerative colitis (UC). IBD affects 2.5–3 million people in Europe, many of whom develop disease as working-age adults.[1] An important consequence is therefore a reduced ability to work, which can be decisive for future life expectations for patients themselves.[2–10] Work disability is associated with high costs to society.[7,9,11–13] The prevention or postponement of work disability should therefore be an important goal in the treatment of IBD patients.

The disability rates in previous reported studies vary considerably and range between 15 and 25% in CD and 5–13% in UC.[2–9,12] This is undoubtedly related to different patient populations, geographical differences and employed tools for the measurement of disability. Over the last decade, treatment goals of IBD have evolved from the induction and maintenance of clinical remission to the prevention of structural damage and long-term (work) disability with expanding use and early introduction of anti-tumour necrosis (anti-TNF) therapy and immunomodulators. Aggressive strategies seem to result in a substantially improved quality-of-life,[14] a reduction of hospitalisation and surgery,[15,16] and might benefit work productivity.[17,18] Knowledge on predictive factors for work disability could improve prevention strategies, increase quality-of-life and reduce future productivity losses.

To date, few studies have attempted to explore the predictive factors for work disability in IBD. Most of these were underpowered,[2,6] or were conducted in highly selected populations.[5,8] In the present study we aimed to 1) assess the prevalence of work disability rate in a large nationwide cohort of IBD patients, 2) compare the disability rates with the general Dutch population and 3) determine predictive factors for work disability.

## 2. Materials and methods

### 2.1. Study design

Between October 2010 and October 2011 we invited by letter all identified IBD patients aged 18 years or older from seven university hospitals and seven general hospitals (n = 9550) to participate in the COIN study. Identification was based on the Diagnosis Treatment Combinations (DTCs). We designed a secure web-based questionnaire and participants were invited to enter a username and password-secured and firewall-protected website to fill-out questionnaires. All patients were followed-up for 2 years at 3 month intervals. In total, 3050 patients were initially included in this cohort. Here,

we report on the results from the baseline questionnaire. For the current analysis, we only included patients within working-age, i.e. adults between 18 and 64 years. The cohort organisation, patient diagnostic criteria, the representativeness and validity (including a non-responder study) of the study cohort have been described in detail elsewhere.[13]

### 2.2. Outcome measure: work disability and predictive factors

We used the same definition for work disability as employed by the Dutch social security system.[19] The self-reported work disability is from 'all causes' and not exclusively attributable to IBD. There are two types of disability benefits; the first is for patients who are declared to be fully (>80%) disabled after assessment. These patients are entitled to an income-replacing disability benefit. The second type of benefit is for patients who are declared to be more than 35% disabled, but not fully and permanently after assessment. These partially disabled patients are entitled an income supplement benefit if their disability forces them to switch to a less-well paid job. To compare the work disability rates of the IBD patients with the Dutch background population, we retrieved data on age- and sex-matched work disability rates of the Dutch population from Statistics Netherlands.[20] Reference data from the Dutch population were from 2011. We compared disability by sex, by age groups, and separately for university hospitals and general hospitals. We used the International Classification of Functioning Disability and Health (ICF) to explain work disability and to classify possible predictive factors for work disability.[21] Fig. 1 clarifies the classification and classified all variables from the baseline questionnaire into demographic factors, disease related factors, impaired body function and structures, and external modifiers.

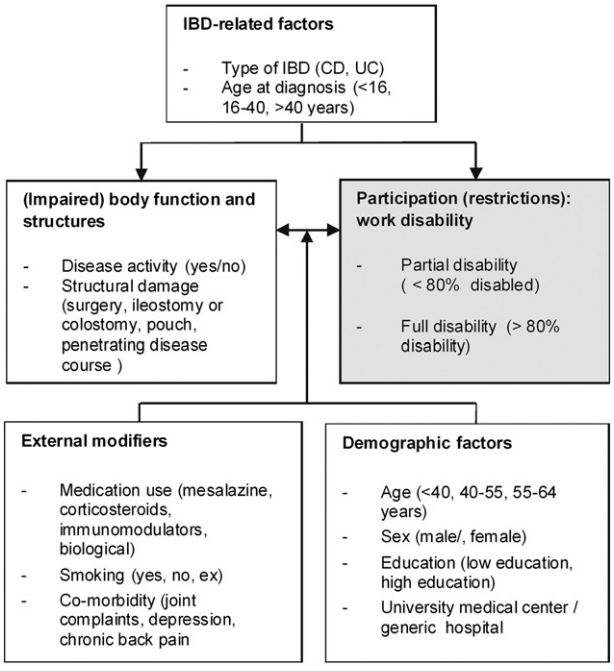


**Figure 1** Work disability according to the International Classification of Functioning, Disability and Health (ICF).[17]

### 2.3. Statistical considerations

We analysed our data using SPSS version 18.0. We used descriptive statistics to characterize patients with CD and UC. Differences among groups were assessed by Student t-test for continuous variables and $\chi^2$ for dichotomous variables, Fisher's exact test was used where appropriate. To compare the prevalence of work disability in our study cohort with the Dutch background population, we used the Student t-test. In order to determine factors associated with work disability, we performed univariable logistic regression analysis with demographic and disease characteristics. Demographic and disease specific characteristics that were associated ($p < 0.10$) with chronic disability following univariable analysis were included in the multivariable logistic regression analyses to identify independent risk factors for work disability.

### 2.4. Ethical statement

The study was centrally approved by the medical ethics committee of the University Medical Center Utrecht.

## 3. Results

### 3.1. Patient population

Fig. 2 shows the study flowchart. In total, 2282 patients were within working-age, of whom 1373 were with CD and 909 with UC. Table 1 presents the demographics and disease characteristics of the CD and UC population between 18 and 64 years old. There were more females in the CD group than in the UC group (65.7% and 56.2%, respectively). The mean ages of CD and UC patients were 44.1 (SD 11.8) and 46.1 (SD 11.4) years. Of all CD patients, 906 (66.0%) were cared for in university hospitals versus 510 (56.1%) of all UC patients. The remaining patients were treated in general hospitals. In total, 724 (52.7%) CD patients reported a penetrating disease course. Of all CD patients, 734 (53.5%) underwent abdominal surgery previously, as compared to 164 (18.0%) in UC patients. Of the CD patients, 457 (33.3%) received biological therapy in the past as compared to 87 (9.6%) of the UC patients Table 1.

### 3.2. Prevalence of work disability

In total, 728 (53.0%) CD and 605 (66.6%) UC patients were currently employed ($p < 0.01$). In the CD group, 251 (18.3%) patients were fully disabled as compared to 86 (9.5%) of the UC patients ($p < 0.01$). Partial disability was encountered in 121 (8.8%) of CD patients and 49 (5.4%) of UC patients ($p < 0.01$). Among partially disabled patients, the mean work hours per week were 20 (SD 10) in CD patients and 22 (SD 9) in UC patients. This was significantly lower as compared to fully employed CD and UC patients, 32 (SD 10) and 33 (SD 9) hours per week respectively ($p < 0.01$), which is in line with the average work hours/week (32 h/week) for the Dutch background population aged 15 to 64 years.[16]

**Table 1** Demographic and disease characteristics of study population within the labour force (18–65 years).

| | CD | UC |
|---|---|---|
| | n = 1.373 | n = 909 |
| Male sex (%) | 471 (34.3) | 416 (45.8) |
| Age — years (±SD) | 44.1 (11.8) | 46.1 (11.4) |
| Smoking (%) | | |
| Current | 307 (22.4) | 86 (9.5) |
| Never | 691 (50.3) | 533 (58.6) |
| Ex smoker | 375 (27.3) | 290 (31.9) |
| Education (%) | | |
| Low education | 868 (65.2) | 519 (57.1) |
| Age at diagnosis — years (±SD) | 27.8 (10.7) | 32.0 (11.6) |
| Disease duration — median (IQR) | 16.4 (10.8) | 14.1 (9.9) |
| Disease localization (%) | | |
| Large bowel | 379 (27.6) | 909 (100) |
| Small bowel | 261 (19.0) | n.a. |
| Both small and large bowel | 691 (50.3) | n.a. |
| Unknown | 42 (3.1) | n.a. |
| Penetrating disease (%) | 724 (52.7) | n.a. |
| Disease in remission (%) | 1166 (85.0) | 759 (83.5) |
| Stoma (%) | 161 (11.7) | 51 (5.6) |
| Pouch (%) | 22 (1.6) | 86 (9.5) |
| Abdominal surgery (%) | 734 (53.5) | 164 (18.0) |
| Medication use — ever (%) | | |
| 5-ASA | 986 (71.8) | 745 (82.0) |
| Corticosteroids | 1063 (77.4) | 551 (60.6) |
| Immunomodulators | 865 (63) | 327 (36.0) |
| Biological therapy | 457 (33.3) | 87 (9.6) |
| Joint complaints (%) | 301 (21.9) | 158 (17.4) |
| Chronic back pain (%) | 143 (10.4) | 86 (9.5) |
| Depression (%) | 141 (10.3) | 90 (9.9) |
| Ùniversity medical centre — now (%) | 906 (66) | 510 (56.1) |

### 3.3. Comparison with the Dutch background population

Fig. 3.A and B shows work disability in CD, UC and the Dutch general population, stratified by age and sex. Overall work disability rates were significantly higher in both female and male CD patients than in the Dutch general population ($p < 0.01$). The highest prevalence rates were found among female CD patients. Unlike CD patients, UC patients treated in general hospitals did not have higher work disability rates than age- and sex-matched controls, whereas UC patients treated in university hospitals did have higher work disability rates than age- and sex-matched controls.

### 3.4. Predictive factors of work disability

Non-adjusted and adjusted odds ratios for work disability in CD and UC are presented in Tables 2 and 3, respectively. In both UC and CD higher age and lower education were associated with work disability. Females with CD, but not UC were prone to disability as well. Impaired body function (i.e. self-reported disease activity) and structural body functions (i.e. penetrating disease course and surgery in the past) were associated with work disability in CD. In UC patients, only abdominal surgery in the past was an independent predictor for work disability. Additional external modifiers such as co-morbidities (joint manifestations, chronic back pain and depression) were strong risk factors in both groups. Previous use of corticosteroids was an independent predictor for work disability in UC, while medication use in CD patients was not a significant predictive factor.

## 4. Discussion

In this large, nationwide study, we report high work disability rates in patients with IBD. The overall proportion of individuals with CD or UC with full work disability was 18.3% and 9.5%, respectively. Compared to the general Dutch population, the work disability rates were the highest among CD patients, especially those treated in university medical centres. UC patients cared for in general hospitals did not differ from the general Dutch population with respect to reported work disability.

Rates of IBD-related work disability in literature range widely between 5% and 25%.[2–9] The two largest studies to date reported high disability rates in line with our data,[4,5] although the former included IBD patients of younger age with a relative short disease duration of 7 years (SD 3), and the latter studied a highly selected group with CD patients with moderate to severe disease activity enrolled in a clinical trial. Lower disability rates of 15% in CD patients and 5% in UC patients have been reported by Bernklev et al.[3] These results were based on data, generated from 5 year follow-up visits of newly diagnosed patients. Comparison of work disability rates between different countries is hampered by differences in socioeconomic and political factors.

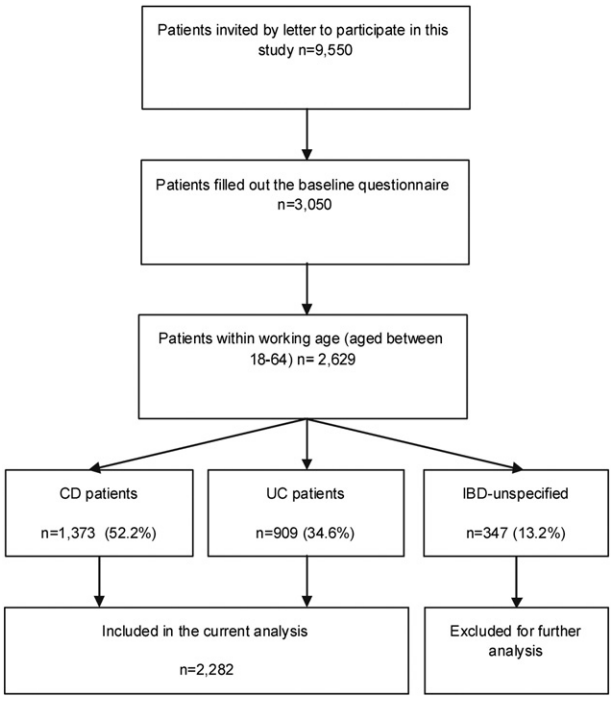


**Figure 2** Study flowchart.

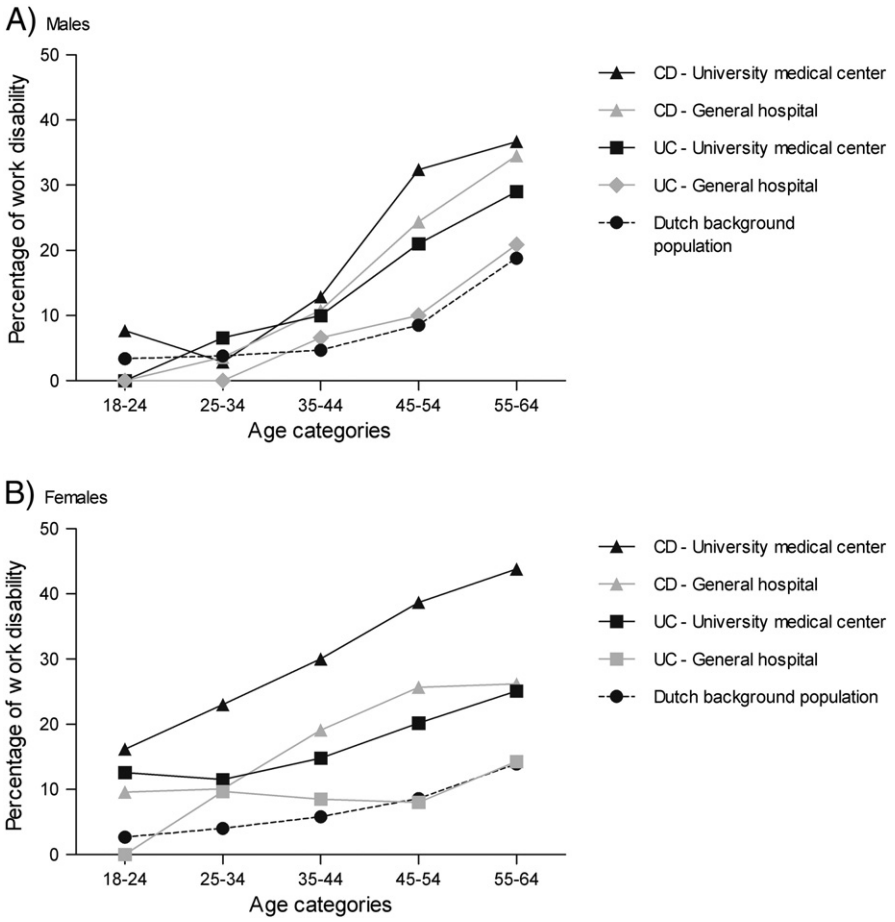


**Figure 3** Work disability in patients aged between 18 and 65 years with Crohn's Disease (CD) and ulcerative colitis (UC) compared to the general population in the Netherlands.

We found higher disability rates in our IBD cohort as compared to the Dutch general population, in line with a previously published Dutch population-based study.[4] A Norwegian inception cohort study, however, found higher disability rates for patients with CD, but not for patients with UC.[3] An explanation for this discrepancy could be the high prevalence of work disability among the general Norwegian population, being 8.8% (as compared to 6.6% in Dutch controls).

The large size of our cohort of IBD patients enabled us to study a large panel of possible predictive factors for work disability. In order to explain work disability as a multifactorial problem, we classified predictive variables according to the International Classification of Functioning Disability and Health into demographic factors, IBD-related factors, impaired body function or structural damage, and external modifiers. We found that in patients with CD, demographic factors such as female gender, increasing age and low education are associated with work disability. The analysis of patients with UC offered a similar picture, except that female gender was not found to be a predictive factor. We did not find consistent evidence that disease duration predicted work disability. It is possible that disease activity hampers work disability most profoundly in early disease, whereas structural damage and IBD-related complications may become more important in long-term disease.

Most of the factors related to impaired body functions or body structures were associated with increased risk of work disability. We found abdominal surgery in the past to be an independent predictor for work disability in both CD and UC. This has been reported in previous studies as well, with a 1.6 to 7.1 time higher risk for work disability.[2,4,5] Furthermore, we found an association between penetrating disease course and work disability. Previous studies showed a comparable cumulative risk of perianal involvement in CD of 50%, which is in line with our findings.[22,23] One potential explanation for the increased risk of work disability is the poor prognosis of CD patients with fistulas. Perianal fistulas are associated with high morbidity, local pain and discomfort, frequent surgical drainage with associated risks of complications, and therefore have a negative impact on quality of life and subsequently work productivity.[22,23] These findings underscore the importance of preventing structural damage. Whether this can be achieved by adopting an accelerated step-up or early top-down approach remains to be proven.[24,25]

In multivariate analysis, CD patients with joint complaints have a 2.6-fold increased risk of work disability as compared to a 2.3-fold increased risk in UC patients. These musculoskeletal disorders are known to be a primary cause of disability in the general working population. Joint manifestations are reported

**Table 2** Univariate and multivariate analysis of factors associated with work disability in employed or disabled Crohn's disease (CD) patients aged 18 to 65 years.

| | CD patients | | | |
|---|---|---|---|---|
| | Disabled n = 372 | Employed n = 728 | Unadj. OR (95% CI) | Adj. OR (95% CI) |
| *Demographic factors* | | | | |
| Female sex (%) | 258 (69.4) | 285 (39.1) | 1.46 (1.12–1.89) | 1.55 (1.13–2.13) |
| Age — years (%) | | | | |
| <40 | 84 (22.6) | 326 (44.8) | 1.00 | 1.00 |
| 40–55 | 171 (46.0) | 304 (41.8) | 2.18 (1.61–2.96) | 1.48 (1.01–2.19) |
| >55 | 117 (31.5) | 98 (13.5) | 4.87 (3.42–6.94) | 3.44 (2.15–5.51) |
| Low education (%) | 301 (78.6) | 381 (52.0) | 3.38 (2.55–4.49) | 2.63 (1.90–3.65) |
| *Disease related factors* | | | | |
| Age at diagnosis — years (%) | | | | |
| <16 | 35 (9.1) | 64 (8.7) | 1.00 | – |
| 16–40 | 279 (72.8) | 568 (77.6) | 0.90 (0.58–1.39) | |
| >40 | 69 (18.0) | 100 (13.7) | 1.26 (0.76–2.11) | |
| Disease duration — years (%) | | | | |
| <10 | 71 (18.8) | 290 (39.8) | 1.00 | 1.00 |
| 10–20 | 130 (34.9) | 235 (32.2) | 2.32 (1.66–3.24) | 1.37 (0.92–2.04) |
| >20 | 172 (46.2) | 203 (27.9) | 3.61 (2.60–5.01) | 1.52 (0.97–2.37) |
| *Body function and structures* | | | | |
| Self reported flare (%) | 80 (21.5) | 89 (12.2) | 1.94 (1.39–2.70) | 1.60 (1.07–2.39) |
| Penetrating disease (%) | 242 (65.1) | 347 (47.7) | 2.11 (1.63–2.73) | 1.47 (0.94–2.30) |
| Stoma (%) | 71 (19.1) | 60 (8.2) | 2.77 (1.93–3.99) | 1.55 (1.13–2.13) |
| Pouch (%) | 7 (1.9) | 12 (1.6) | 1.18 (0.49–2.87) | – |
| Abdominal surgery (%) | 262 (70.4) | 344 (47.3) | 2.65 (2.04–3.44) | 1.57 (1.12–2.19) |
| *External modifiers* | | | | |
| Medication use — ever (%) | | | | |
| 5-ASA | 283 (76.1) | 513 (70.5) | 1.30 (0.98–1.72) | – |
| Corticosteroids | 318 (85.5) | 541 (74.3) | 1.95 (1.41–2.70) | 1.37 (0.90–2.09) |
| Immunomodulators | 259 (69.6) | 445 (61.1) | 1.46 (1.12–1.90) | 1.09 (0.75–1.58) |
| Biological therapy | 156 (41.9) | 215 (29.5) | 1.69 (1.30–2.19) | 1.40 (0.99–1.97) |
| Joint complaints (%) | 147 (39.5) | 94 (12.9) | 4.41 (3.28–5.94) | 2.60 (1.84–3.69) |
| Chronic back pain (%) | 76 (20.4) | 728 (6.5) | 3.85 (2.62–5.65) | 2.47 (1.55–3.94) |
| Depression (%) | 62 (16.7) | 47 (6.5) | 2.82 (1.88–4.21) | 1.92 (1.19–3.10) |
| University medical centre (%) | 279 (75.0) | 447 (61.4) | 1.87 (1.42–2.47) | 1.68 (1.21–2.35) |
| Smoking (%) | | | | |
| Never | 141 (37.9) | 401 (55.1) | 1.00 | 1.00 |
| Current | 104 (28.0) | 141 (19.4) | 2.08 (1.51–2.85) | 1.34 (0.91–1.96) |
| Ex-smoker | 127 (34.1) | 186 (25.5) | 1.98 (1.48–2.65) | 1.36 (0.96–1.93) |

in 16 to 33% of all IBD patients, which is in line with the rates found in our study.[26] Furthermore, axial arthropathies are common in IBD and can result in chronic back pain.[27] Almost 10% of our study population reported chronic back pain (IBD related or non-IBD related) which was associated with a 2.5-fold increased risk of work disability in CD patients and 2.7-fold increased risk in UC patients.

To our knowledge, this is the largest study to date, examining the prevalence and risk factors for work disability in IBD patients. The inclusion of patient from both university and general hospitals throughout the Netherlands ascertained a good case mix. In order to enrol a large number of patients, we opted for the present web-based design. An inherent limitation of such a strategy is sampling bias. We assessed the representativeness of our study by performing a non-responder study. Significant differences in demographic and disease characteristics between responders and non-responders were not identified.[13] In addition, data on disease characteristics and employment status were self-reported, possibly introducing bias as well. Yet, previous studies showed that the accuracy of responses to health-related questionnaires from patients with IBD is as high as 95%.[28]

In an era of increasing financial pressure on every stakeholder in the society, it is imperative to maximize the value of healthcare costs by also demonstrating a return on investment through improvement in work productivity. Collaboration of medical specialists and occupation physicians might prevent future work disability or job loss and decrease prevalent work

**Table 3** Univariate and multivariate analysis of factors associated with work disability in ulcerative colitis (UC).

| | UC patients | | | |
|---|---|---|---|---|
| | Disabled n = 135 | Employed n = 605 | Unadj. OR (95% CI) | Adj. OR (95% CI) |
| *Demographic factors* | | | | |
| Female sex (%) | 69 (51.1) | 306 (50.6) | 0.97 (0.67–1.39) | 1.08 (0.70–1.66) |
| Age — years (%) | | | | |
| <40 | 23 (17.0) | 203 (33.6) | 1.00 | 1.00 |
| 40–55 | 59 (43.7) | 281 (46.4) | 1.85 (1.11–3.10) | 1.41 (0.78–2.53) |
| >55 | 53 (39.3) | 121 (20.0) | 4.41 (2.60–7.50) | 4.31 (2.24–8.30) |
| Low education (%) | 99 (69.2) | 304 (50.2) | 2.24 (1.52–3.30) | 1.77 (1.14–2.76) |
| *Disease related factors* | | | | |
| Age at diagnosis — years (%) | | | | |
| <16 | 10 (7.0) | 36 (6.0) | 1.00 | – |
| 16–40 | 84 (58.7) | 436 (72.1) | 0.69 (0.33–1.45) | |
| >40 | 49 (34.3) | 133 (22.0) | 1.33 (0.61–2.87) | |
| Disease duration — years (%) | | | | |
| <10 | 34 (25.2) | 269 (44.5) | 1.00 | 1.00 |
| 10–20 | 55 (40.7) | 183 (30.2) | 2.35 (1.50–3.70) | 1.85 (1.11–3.06) |
| >20 | 46 (34.1) | 153 (25.3) | 2.24 (1.40–3.60) | 1.02 (0.58–1.80) |
| *Body function and structures* | | | | |
| Self reported flare (%) | 21 (15.6) | 103 (17.0) | 0.89 (0.54–1.47) | – |
| Stoma (%) | 14 (10.4) | 26 (4.3) | 2.81 (1.47–5.39) | 1.03 (0.45–2.33) |
| Pouch (%) | 24 (17.8) | 49 (8.1) | 2.53 (1.51–4.23) | 0.92 (0.45–1.88) |
| Abdominal surgery (%) | 262 (70.4) | 344 (47.3) | 3.71 (2.46–5.60) | 3.62 (2.01–6.52) |
| *External modifiers* | | | | |
| Medication use — ever (%) | | | | |
| 5-ASA | 109 (80.7) | 501 (82.8) | 0.89 (0.56–1.42) | – |
| Corticosteroids | 100 (74.1) | 349 (57.7) | 2.26 (1.49–3.41) | 2.43 (1.49–3.96) |
| Immunomodulators | 51 (37.8) | 210 (34.7) | 1.17 (0.80–1.70) | – |
| Biological therapy | 15 (11.1) | 53 (8.8) | 1.22 (0.67–2.24) | – |
| Joint complaints | 45 (33.3) | 71 (11.7) | 4.05 (2.65–6.19) | 2.27 (1.36–3.78) |
| Chronic back pain | 23 (17.0) | 42 (6.9) | 2.71 (1.58–4.64) | 2.51 (1.31–4.83) |
| Depression | 27 (20.0) | 45 (7.4) | 3.04 (1.82–5.07) | 2.25 (1.23–4.11) |
| University medical centre (%) | 97 (71.9) | 326 (53.9) | 2.00 (1.35–2.30) | 1.37 (0.86–2.16) |
| Smoking (%) | | | | |
| Never | 72 (53.3) | 359 (59.3) | 1.00 | 1.00 |
| Current | 20 (14.8) | 57 (9.4) | 1.77 (1.01–3.09) | 1.32 (0.68–2.55) |
| Ex-smoker | 43 (31.9) | 189 (31.2) | 1.19 (0.80–1.79) | 0.81 (0.51–1.30) |

disability. This study shows that disease activity, and structural damage due to surgery and penetrating disease are associated with loss of productivity. We need long-term prospective studies to determine whether or not improving the management of IBD will result in preventing structural damage, improvements in work productivity and a reduction in the economic burden of the disease.

## Author contribution

Study concept and design: MvdV, BO, MJM, MvO. Acquisition of data: MvdV, BO, MJM, MvO. Interpretation of data: MvdV, BO, MJM, MvO, ML. Drafting of manuscript: MvdV. Critical revision of the manuscript: All authors. Final approvement of the submitted manuscript: All authors.

## Author statement

The manuscript, including related data, figures and tables has not been previously published and the manuscript is not under consideration elsewhere.

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## Conflict of interest statement

AAvB has acted as a consultant for Abbott and MSD and received payments for lectures from Abbott and Ferring.

HHF has acted as a consultant for Abbott. DJdJ has acted as a consultant for Synthon Netherlands and received payments for lectures from Abbott, Ferring and MSD. JvdW has acted as a consultant for Abbott, Ferring, Shire and MSD and received payment for lectures from Abbott, Falk Pharma and MSD. CYP has acted as a consultant for Abbott and received payments for lectures from Ferring and MSD. AEvdMJ has acted as a consultant for Abbott. MGHvO has acted as a consultant for Abbott. BO has acted as a consultant for Abbott and MSD and received payment for lectures and manuscript preparation from Ferring.

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