

BMJ Open

Disability pension due to common mental disorders and subsequent suicidal behaviour; a population-based prospective cohort study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2015-010152
Article Type:	Research
Date Submitted by the Author:	01-Oct-2015
Complete List of Authors:	Rahman, Syed; Karolinska Institutet, Clinical Neuroscience; syed rahman, Alexanderson, Kristina; karolinska institutet, Department of Clinical Neuroscience Jokinen, Jussi; Karolinska Institute, Clinical Neuroscience Mittendorfer-Rutz, Ellenor; Karolinska Institutet, Department of Clinical Neuroscience, Division of Insurance Medicine
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Occupational and environmental medicine, Public health, Epidemiology
Keywords:	common mental disorder, suicide, suicide attempt, MENTAL HEALTH, disability pension, Sick leave

SCHOLARONE™
Manuscripts

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 1 Disability pension due to common mental disorders and subsequent suicidal behaviour; a
4 2 population-based prospective cohort study
5 3

6
7 4 Rahman S,^{1*} Alexanderson K,¹ Jokinen J,^{2,3} Mittendorfer-Rutz E.¹
8
9 5

10
11
12 6 ¹ Department of Clinical Neuroscience, Division of Insurance Medicine, Karolinska Institutet,
13
14 7 Stockholm, Sweden.

15
16 8 ² Department of Clinical Neuroscience, Division of Psychiatry, Karolinska Institutet,
17
18 9 Karolinska University Hospital, Stockholm, Sweden.

19
20
21 10 ³ Department of Clinical Sciences, Division of Psychiatry, Umeå University, Umeå, Sweden.
22
23

24 11 Kristina Alexanderson, Professor

25
26 12 Kristina.Alexanderson@ki.se
27

28
29 13 Jussi Jokinen, Professor

30
31 14 Jussi.Jokinen@ki.se
32

33 15 Ellenor Mittendorfer-Rutz, Associate professor

34
35 16 Ellenor.Mittendorfer-Rutz@ki.se
36

37
38 17 *Corresponding author:

39
40
41 18 Syed Ghulam Rahman; MBBS, MMSc

42
43
44 19 Division of Insurance Medicine, Department of Clinical Neuroscience

45
46 20 Karolinska Institutet, 171 77 STOCKHOLM, Sweden
47

48
49 21 Tel +46 8-524 832 05
50

51
52 22 Email: syed.rahman@ki.se
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

23 Financial support: Swedish Research Council for Health, Working Life and Welfare (Project
24 numbers: K2009-61P-21304-04-4; K2009-61X-21305-01-1; K2011-80P-21782-01-4), and the
25 Karolinska Institutet's funding for doctoral students.

26 Abstract (with subheadings): 300 words

27 Main text (with headings and subheadings): 3688 words

28

For peer review only

Abstract

Objective: Adverse health outcomes including suicide, among individuals on disability pension (DP) due to mental diagnoses have been reported previously. Despite the fact that knowledge on the consequences of being on DP is of crucial clinical interest, the scientific knowledge on risk factors such as age, sex, underlying DP diagnoses, comorbidity, DP duration and grade, is surprisingly sparse. This study aimed to investigate the associations of different measures (main and side diagnoses, duration and grade) of DP due to common mental disorders (CMD) with subsequent suicidal behaviour (suicide attempt and suicide), considering sex and age differences.

Design: Nationwide population-based prospective cohort study based on Swedish national registers.

Methods: A cohort of 46515 individuals aged from 19-64 years and on DP due to CMD throughout 2005 was followed up for 5 years. In relation to different DP measures univariate and multivariate hazard ratios (HR) and 95% confidence intervals (CI) for suicidal behaviour were estimated by Cox regression. All analyses were stratified by sex and age.

Results: During 2006-2010, 1 036 (2.2%) individuals attempted and 207 persons (0.5%) completed suicide. Multivariate analyses showed that stress-related mental disorders as main DP diagnoses were associated with a lower risk of subsequent suicidal behavior than depressive disorders (HR range 0.4 to 0.7). Substance abuse and personality disorders as DP side diagnoses predicted suicide attempt in all sub groups (HR range 1.8 to 4.6) and suicide in women and younger individuals (HR range 2.2 to 7.7). Fulltime DP was associated with a higher risk of suicide attempt and suicide compared to part-time DP in women (HR range 1.8 to 2.3).

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80

Conclusions: Association between DP (using different measures; main and side diagnoses as well as DP grade) with subsequent risk of suicidal behavior in individuals on DP due to CMD varied with regard to sex and age.

Keywords: Sick leave, disability pension, mental health, suicide attempt, suicide, common mental disorder

Strengths:

- Nationwide study of the whole population using high quality data of a large number of variables
- Prospective cohort design with no loss to follow-up
- Considered diagnoses are not self-reported, but from the registers indicated by physicians

Limitations:

- For some analyses few suicide cases
- We have considered suicide attempts leading to inpatient care, thus the results mainly are valid for suicide attempts of higher medical severity

78 **Background**

79

80 Disability pension (DP) is a major public health issue in many European countries (1, 2) and
81 increasingly so regarding mental DP diagnoses (1, 3-5). In Sweden in 2012, mental diagnoses
82 accounted for 40% of the DPs granted to individuals aged 30-64 years and for 84% among
83 those aged 19-29 years (3). The majority of the mental DP diagnoses are common mental
84 disorders (CMD), e.g., depressive, anxiety, or stress-related mental disorders (1, 6). All these
85 are diagnoses for which usually adequate treatment and rehabilitation measures are or should
86 be available while inactivity, e.g., in terms of DP, may have an adverse effect (7). DP itself
87 may imply alteration of health behaviour (e.g., alcohol and tobacco use, exercise, diet) or
88 social isolation (8). This can be due to lack of ties to the labour market and eventually lack of
89 the potential positive effects of paid work, including social contacts with colleagues,
90 prospects of career and income development, sense of meaning, or even daily routines and
91 structures (9). Here, individuals who have been on DP for a shorter period might experience
92 less adverse effects of being excluded from the labour market than individuals on DP for
93 longer time (10). Similarly, part-time DP might be more protective with regard to any adverse
94 health or social outcomes than full-time DP (11, 12).

95

96 Adverse health outcomes, including suicide, among disability pensioners, especially among
97 those granted DP early in adult life due to mental diagnoses have been shown previously (8,
98 13). Still, little is known to date about specific risk factors related to eventual worse outcome
99 in individuals on DP (8), such as suicide attempt or suicide. Suicidal behaviour can be
100 considered as the utmost consequence of mental disorders, particularly of depressive
101 disorders or depression comorbid with anxiety (14-16). Comorbidity with mental and somatic

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 102 disorders has been shown to be associated with a higher risk of suicidal behaviour in patients
4
5 103 with depressive disorders (17-19). To date, knowledge is lacking regarding associations
6
7 104 between DP due to different diagnoses and eventual co-morbidity with subsequent suicidal
8
9 105 behaviour.
10

11
12 106
13
14
15 107 There are well documented sex and age differences with regard to both DP and suicidal
16
17 108 behaviour (13, 14, 20). However, there is a lack of studies investigating if effect sizes in the
18
19 109 associations with mental health outcomes vary with different measures of DP with regard to
20
21 110 sex and age. Moreover, associations with different socio-demographic factors, such as
22
23 111 educational level, family situation, country of birth, type of area of living as well as with
24
25 112 health care factors such as previous suicide attempt and in- or outpatient care due to mental
26
27 113 diagnoses, with subsequent suicidal behaviour have been identified in different studies (14,
28
29 114 17, 21-24). Therefore, it is important to consider both these socio-demographic and health
30
31 115 factors in analyses of DP and suicidal behaviour.
32
33
34
35
36
37
38

39 117 **Aim**

40
41
42 118
43
44 119 This study aimed to examine 1) how different DP measures (main diagnosis, secondary
45
46 120 diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide
47
48 121 attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these
49
50 122 associations with regard to sex and age.
51
52
53
54
55

56 124 **Methods and materials**

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 125

4
5 126 **Design**

6
7
8 127

9
10
11 128 A nationwide population-based prospective cohort study based on Swedish register data was
12
13 129 conducted. The cohort comprised all individuals aged 19-64 years, living in Sweden on
14
15 130 31.12.2004, and who were on DP due to CMD (main diagnoses, full- or part-time) throughout
16
17 131 2005 (n=48 803). Individuals treated in in- or outpatient health care with schizophrenic
18
19 132 spectrum or bipolar disorders or having this as a DP secondary diagnosis in 2001-05
20
21 133 (n=1 886) and people on old-age pension during 2005 (n=402) were excluded. The final
22
23 134 cohort hence included 46 515 individuals. They were followed up for five years (2006-2010).
24
25

26
27 135

28
29 136 Annual data covering 2001 to 2010 were obtained from the following four nationwide
30
31 137 registers: 1) Longitudinal integration database for health insurance and labour market studies
32
33 138 (LISA) held by Statistics Sweden: including socio-demographic information on sex, age,
34
35 139 educational level, type of living area, country of birth, family situation; 2) Two registers held
36
37 140 by the National Board of Health and Welfare, namely; (i) National patient register (NPR)
38
39 141 including information on date and diagnosis of inpatient an specialised outpatient care, (ii)
40
41 142 Cause of death register (CDR) with data on date and cause of death, and 3) Micro-data for
42
43 143 analyses of social insurance (MiDAS) with information on the date, diagnoses (main DP
44
45 144 diagnosis and one secondary diagnosis), duration, and grade of DP from the Social Insurance
46
47 145 Agency (SIA). Data from these registers were linked at individual level, using the unique
48
49 146 personal identification number of all residents in Sweden.
50
51

52
53 147

54
55
56 148 **Disability pension**

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 149

4
5 150 All residents in Sweden aged 19–64 years, who due to disease or injury have a permanent
6
7 151 reduction of their work capacity at least to an extent of 25% of ordinary working hours, are
8
9 152 eligible to receive disability pension from the Social Insurance Agency (3). In Sweden, DP
10
11 153 can be granted for 25, 50, 75, or 100% of ordinary working hours. Since 2003, people aged
12
13 154 19-29 years can be granted temporary disability pension if the work capacity is reduced for at
14
15 155 least one year (3). Temporary DP can also be granted to young individuals for extended
16
17 156 schooling if not able to complete compulsory or upper secondary school in due time due to
18
19 157 disability. DP benefit includes a minimum sum, and for those with previous income about
20
21 158 65% of lost income up to a certain level.
22
23
24
25
26
27

28

29 160 **Risk factors**

30
31
32 161
33
34

35 162 **Main and secondary DP diagnoses**

36
37 163 All information on DP diagnoses was based on the corresponding codes of the International
38
39 164 Classification of Diseases, version 10 (ICD-10) (25).
40
41
42
43
44

45

46 166 Main DP diagnoses were categorised into: ‘depressive disorders’ including ‘depressive
47
48 167 episode’ (F32) and ‘recurrent depressive disorder’ (F33), ‘anxiety disorders’ comprising
49
50 168 ‘phobic anxiety disorder’ (F40); ‘other anxiety disorder’ (F41); ‘obsessive-compulsive
51
52 169 disorder’ (F42); and ‘stress-related mental disorders’ including ‘reaction to severe stress, and
53
54 170 adjustment disorders, acute stress reaction and post-traumatic stress disorder’ (F43) (26, 27).
55

56
57 171
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

172 Secondary diagnoses were categorized as: 'No secondary diagnosis', 'Substance abuse
173 disorders' (F10-F19), 'Personality disorders' (F60-F69), 'Other mental disorders' (F00-F99
174 except F10-F19, F60-F69), 'Musculoskeletal disorders' (M00-M99), and 'Other somatic
175 disorders'(all diagnoses except M00-M99 and F00-F99).

176

177 The excluded bipolar and schizophrenic spectrum disorders included the following ICD-10
178 codes: F20-F29 and F31.

179

180 **Duration**

181

182 DP duration was calculated by subtracting start date of DP from the end date of exposure
183 (2005-Dec-12) in gross days. Later the days were converted into years and were categorized
184 into: '1 year', '2-3 years', and '≥4 years'.

185

186 **Grade**

187

188 DP grade was categorized into part- and full-time. Part-time included grade of 25%, 50%, and
189 75%, and full-time was 100%. In case of change of grade, the grade during the exposure year
190 (2005) was considered.

191

192 **Confounders**

193

194

195

196

197

198

199

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

193

194 All socio-demographic characteristics were measured at baseline (31.12.2004): age, sex,
195 educational level, family situation, country of birth, and area of living. Age was dichotomised
196 into 19-44 and 45-64 years. Educational level was categorized into 3 groups according to the
197 total number of years of completed education: 'compulsory (0-9 years)', 'upper secondary
198 school (10-12 years)', 'university (≥ 13 years)'. Family situation was coded into 4 groups:
199 'married/cohabiting with children at home', 'married/cohabiting with no children at home',
200 'single without children living at home', and 'single with children living at home'. Country of
201 birth included 'Sweden', 'other Nordic countries', 'EU 25 (except Nordic countries)', and
202 'rest of the world'. Type of area of living was divided into 'big cities', 'medium-sized cities',
203 and 'small cities/villages'. Missing values were coded as separate categories.

204 Health care factors, particularly previous suicide attempt, in- and outpatient care due to
205 mental diagnoses were measured from 2001 to 2005 and were dichotomised as 'yes' and 'no'.

206

207 **Outcome measures**

208

209 The outcome measure was defined as suicidal behaviour (suicide attempt from the register of
210 inpatient care and suicide according to the cause of death register) (ICD 10: X60-84 and Y10-
211 34) during 2006-2010. As suicide attempts and suicides are often underreported or reported as
212 "undetermined" causes (28, 29), "determined" (X60-84) and "undetermined" (Y10-34)
213 suicidal behaviour were combined to compensate for regional and temporal variation in
214 ascertainment methods and to limit underreporting (30). The combined outcome measures are
215 hereafter called suicide attempt and suicide, respectively.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

216

217 **Statistical analysis**

218

219 Chi-square statistics were used to test significant sex and age differences in the cohort. All
220 individuals were followed up from 01.01.2006 until the event (suicide attempt; suicide),
221 emigration, death (due to other causes in the analyses related to suicide as an outcome), or end
222 of follow up (31.12.2010), whichever occurred first. The partial likelihood ratio test was used
223 to test for possible interactions between the exposure variables (main and secondary DP
224 diagnoses, and duration and grade of DP) and age and sex. Univariate hazard ratios (HR) and
225 95% confidence intervals (CI) for the risk factors with regard to suicide attempt and suicide
226 were estimated by Cox proportional hazard regression models, after testing that the
227 proportionate hazard assumption was met. Multivariate models were built with adjustment for
228 socio-demographic and healthcare factors and mutual adjustment for all other covariates.
229 Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure
230 measures in relation to determined and undetermined suicide attempt and completed suicide
231 separately and after combining them. After assuring that these estimates were comparable, the
232 combined variables were introduced into the model. All analyses were stratified by sex and
233 age.

234

235 **Ethical statement**

236 This project was evaluated and approved by the Regional Ethical Review Board of,
237 Stockholm, Sweden (Dnr 2007/762-31).

238

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

239 Results

240

241 Of the 46 515 individuals on DP due to CMD during 2005, the majority (66.4%) were women
242 and 70% were aged between 45–64 years (Table 1). Nearly half of the women (48.3%) had
243 depressive disorders as main DP diagnoses while a large proportion of the men had anxiety
244 disorders as main DP diagnoses (31.7%). Depressive disorders as main DP diagnosis was
245 more common among the older individuals (51.5%) whereas anxiety disorders as main DP
246 diagnosis was more frequent among the younger people (43.1%). The two predominant
247 specific main DP diagnoses for the entire cohort were ‘depressive episode’ (36.8%) and
248 ‘stress-related mental disorder’ (23.6%) (data not in table).

249

250 In the cohort, nearly half of the individuals did not have any secondary DP diagnoses (43.1%)
251 (Table 1). Substance abuse disorders as secondary diagnoses were more prevalent among men
252 and older individuals while personality disorders were more frequent among women and
253 younger individuals ($p<0.001$). The majority of the individuals had full-time DP (75.6%).
254 Part-time DP was more common among women (28%) than men (17.4%) and among older
255 (26.7%) than younger individuals (19.2%) ($p<0.001$).

256

257 With regard to the covariates, nearly half (47%) of the study population had been to high
258 school, most lived in big or medium sized cities (74%), and 75% were born in Sweden (data
259 not in table). Almost half of them (42%) lived without a partner and without children at home.

260

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 261 In the cohort, 1 036 (2.2%) individuals were treated in inpatient care due to suicide attempt
4
5 262 and 207 (0.5%) committed suicide during the five-year follow up (2006–10) (table 2). Women
6
7 263 were somewhat more likely than men to attempt suicide (women: 2.4%, men: 2.0%, $p < 0.01$)
8
9 264 while a higher proportion of men completed suicide (women: 0.3%, men: 0.7%. $p < 0.001$).
10
11 265 Mean follow-up time for suicide attempt and suicide was 4.85 (standard deviation (SD): 0.70)
12
13 266 and 4.91 (SD: 0.52) years, respectively.
14
15
16
17 267

18
19
20 268 Table 2 and 3 show univariate HRs and Table 4 and 5 show multivariate HRs for suicide
21
22 269 attempt and suicide, stratified by sex and age with regard to main and secondary DP
23
24 270 diagnoses as well as duration and grade of DP.
25
26
27 271

28
29
30 272 In the univariate analyses, ‘anxiety disorder’ as main diagnosis was associated with a higher
31
32 273 risk for suicide attempt in both women and men (range of HRs 1.4 to 1.5) and suicide in the
33
34 274 younger age group (HR 1.9; 95% CI: 1.1-3.3) compared to ‘depressive disorder’. These
35
36 275 associations became insignificant after controlling for socio-demographic variables in the
37
38 276 multivariate models, except for suicide in individuals aged from 19-44 years (HR 1.7; 95%
39
40 277 CI: 1.0-3.0). Compared to ‘depressive disorder’, ‘stress-related mental disorders’ as main
41
42 278 diagnosis was associated with a lower risk for both suicide attempt and suicide (except for
43
44 279 women and the age group 19-44 years) in both crude and multivariate adjusted models. There
45
46 280 was a significant interaction between age and main diagnosis ($p = 0.017$) for suicide.
47
48
49

50 281 Individuals aged 45-64 years with a main DP diagnosis of ‘stress-related mental disorder’ had
51
52 282 a significantly lower risk for committing suicide during the follow-up compared to individuals
53
54 283 with ‘depressive disorder’ as main DP diagnosis (HR 0.4; 95% CI: 0.2-0.6). This association
55
56 284 was not observed in younger individuals.
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

285

286 In the univariate models, all analysed groups of mental secondary diagnoses were associated
287 with a higher risk for subsequent suicide attempt regardless of sex and age (range of HRs 1.2
288 to 7.1). These associations remained significant (range of HRs 1.3 to 2.3) in the multivariate
289 models except the association of 'other mental disorders' as secondary diagnoses with
290 subsequent suicide attempt in men and the age group 45-64 years. 'Substance abuse disorders'
291 and 'personality disorders' as secondary diagnoses were associated with higher risks also for
292 suicide (range of HRs 1.9 to 9.6) in women and both age groups in the crude analyses
293 compared to their counterparts without a secondary diagnosis. However, in the adjusted
294 model, only 'substance abuse disorders' predicted suicide among women and younger
295 individuals (range of HRs 2.6 to 3.3). A statistically significant interaction between sex and
296 secondary diagnoses ($p = 0.029$) in relation to subsequent suicide was found. Women with
297 'substance abuse disorder' or 'personality disorder' as secondary DP diagnosis were at a
298 higher risk for subsequent suicide compared to women without a secondary diagnosis. These
299 associations were not observed for men.

300

301 DP duration for four years or more predicted suicide attempt among women and older
302 individuals (range of HRs 1.2 to 1.4) in the crude models, compared to individuals with a DP
303 duration of one year. These associations were not statistically significant in the adjusted
304 models. In the univariate analyses, full-time DP was associated with a higher risk for suicidal
305 behaviour in all sex and age categories (range of HRs 1.3 to 3.1) compared to individuals on
306 part-time DP. After multivariate adjustment, these associations remained significant (range of
307 HRs 1.4 to 1.7) except for suicide attempt and suicide among men, and suicide in women and
308 younger individuals. Statistically significant interaction was observed between sex and DP
309 grade ($p = 0.001$) in relation to subsequent suicide attempt. Women on full-time DP had a

14

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

310 higher risk for future suicide attempt compared to women who were on part-time DP. No such
311 association was found for their male counterparts (table 4).

312

313 Discussion

314

315 In this nationwide prospective cohort study of people on DP due to CMD, we explored the
316 risk of suicidal behaviour related to DP diagnoses, duration, and grade. Stress-related mental
317 disorders as the main DP diagnosis was associated with a lower risk of subsequent suicidal
318 behaviour compared to depressive disorders as main DP diagnosis. Moreover, comorbid
319 substance abuse and personality disorders as well as full-time DP were associated with a
320 higher risk of suicide attempt and suicide during follow up. Some sex and age differences in
321 these associations emerged.

322

323 To the best of our knowledge, this is the first study to investigate different measures of DP as
324 risk factors for suicidal behaviour in individuals on DP due to CMD. Main strengths of our
325 study are that we have used high quality population-based Swedish nationwide register data
326 (31, 32), and the prospective cohort design with several years of follow up. We included
327 register data from different sources on the whole working age population of Sweden and
328 thereby avoided selection and recall bias. Moreover, there was no loss to follow up and all
329 data are register based including physician based diagnoses, that is, not based on self-reports.
330 The study group was large and the statistical power was sufficient even with regard to such
331 infrequent outcomes as suicide attempt and suicide. This study had also the opportunity to

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

332 include a wide range of potential confounders like educational level, family situation, country
333 of birth, type of living area, and previous health care.

334

335 There are some limitations of the study. In spite of the long follow up, there were only 207
336 suicides, leading to wide confidence intervals. Another limitation is that only the main, and
337 when given, the secondary DP diagnoses could be included. Other diagnoses contributing to
338 the patients' work incapacity were not listed in the MiDAS register. Having such information
339 might have improved the analyses – however, most studies on DP only have access to the
340 main diagnoses. A topic of frequent discussions in this research field is the validity of DP
341 diagnoses. There are no studies on this. A study, conducted in Sweden in 1991, showed high
342 validity of sick-leave diagnoses when compared to diagnoses from medical records (33).

343 Additionally, DP in most cases is preceded by long-term sickness absence and is granted after
344 a long process of medical evaluation and work capacity assessments, as DP benefits are often
345 paid for several years (3). Moreover, due to the stigma around mental diagnoses (34, 35), the
346 validity of mental DP diagnoses can be assumed to be good, meaning that people with a
347 mental DP diagnosis are likely to have a mental disorder. On the other hand, this also means
348 that some individuals with mental disorders were not given a mental DP diagnosis as a main
349 diagnosis or given this as a secondary diagnosis to a somatic main DP diagnosis. Thus, they
350 would not be included in this study. This can be seen as a strength, as our cohort of CMD is
351 more strictly defined than when including also secondary diagnoses, or as a limitation as we
352 do not know if including them would have affected the results. Further studies are required
353 regarding these issues. Also, stigma of mental disorders might have led to underreporting of
354 some mental disorders as secondary diagnoses. The reported secondary diagnoses might
355 therefore reflect higher medical severity. It should also be mentioned, that we have considered

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

356 suicide attempts leading to inpatient care, thus the results mainly are valid for suicide attempts
357 of higher medical severity.

358

359 In this study, the risk of subsequent suicidal behaviour related to a main DP diagnosis of
360 anxiety did not differ from that of a main DP diagnosis of depressive disorder, while those
361 with stress-related mental disorders as main DP diagnosis had lower risk for future suicidal
362 behaviour. This is in line with a recent study on diagnosis-specific sickness absence,
363 suggesting higher risk estimates for subsequent suicide among people on sickness absence
364 due to depressive and anxiety disorders than due to stress-related mental disorders, after
365 adjustment for socio-demographic factors (36).

366

367 There was a significant interaction with age and main diagnoses. While there was a
368 significantly lower risk for suicide in the older age group (45-64 years) with a main DP
369 diagnosis of ‘stress-related mental disorders’ compared to ‘depressive disorders’, this
370 association was not found in the younger individuals. On the other hand, ‘anxiety disorders’
371 as main diagnoses were associated with a higher risk of subsequent suicide in the individuals
372 aged between 19-44 years, compared to the similar age group with main DP diagnosis as
373 ‘depressive disorders’ in the multivariate analyses. One likely explanation of such findings
374 includes age differences in the association of mental disorders with suicide risk (37). Early
375 detection and adequate treatment of anxiety disorders for prevention of suicidal behaviour
376 might be of particular importance (15, 16) especially for younger individuals. These
377 associations warrant further investigations.

378

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 379 As our analyses showed, any mental DP secondary diagnosis was associated with a higher
4
5 380 risk of suicide attempt and suicide compared to those without a secondary diagnosis, which is
6
7 381 in line with previous research regarding the general population (14, 38) or individuals with a
8
9 382 mental disorder (17, 18, 39). Among the mental secondary diagnoses, particularly substance
10
11 383 abuse disorder was a strong predictor of subsequent suicidal behaviour. This is consistent with
12
13 384 previous studies showing that substance abuse is a strong risk factor for suicidal behaviour
14
15 385 (19, 38, 40).
16
17
18
19
20
21

22 387 A significant interaction was observed between substance abuse as secondary DP diagnosis
23
24 388 and sex in relation to subsequent suicide. Substance abuse might be less prevalent and less
25
26 389 frequently diagnosed in women compared to in men. Therefore, it can be hypothesised that
27
28 390 having such a DP diagnosis might be a reflection of severe medical condition, particularly in
29
30 391 women, which might be a reason for the higher suicide risk (14, 19, 40). Moreover,
31
32 392 personality disorder as secondary diagnosis was strongly associated with a higher risk of
33
34 393 suicide attempt compared to those who did not have any secondary diagnosis. Current
35
36 394 literature suggests that personality disorder, comorbid with depression or by itself, involves a
37
38 395 higher risk of suicide attempt (41, 42).
39
40
41
42
43
44

45 397 Full-time DP was associated with a higher risk of suicidal behaviour compared to part-time
46
47 398 DP. This is in line with a previous study reporting a higher risk of suicidal behaviour in case
48
49 399 of full-time compared to part-time sickness absence (43). Full-time DP might here be
50
51 400 associated with a higher severity of the underlying disorder. On the other hand, full-time DP
52
53 401 might be related to an alteration in health behaviour (alcohol consumption, smoking, physical
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

402 activity, diet etc.) or social isolation (8, 44), which might be associated with total exclusion
403 from the labour market (9).

404

405 Statistically significant interaction was observed between sex and DP grade, women with full-
406 time DP had a higher risk for subsequent suicide attempt than women with part-time DP. The
407 proportion of women on part-time DP tends to be much higher compared to men in Sweden
408 (3). It might be anticipated that if women are granted full-time DP they might have a higher
409 severity of the underlying mental disorder and, therefore, they might have a higher risk of
410 subsequent suicide attempt (43). Further studies are warranted to investigate pathways to
411 suicidal behaviour related to DP grade.

412

413 **Conclusion**

414

415 Stress-related mental disorders as main DP diagnosis was associated with a lower risk of
416 subsequent suicidal behaviour compared to depressive disorders in individuals on DP due to
417 common mental disorders. Moreover, comorbid substance abuse and personality disorder as
418 well as full-time DP were associated with a higher risk of suicide attempt and suicide during
419 the five-year follow up. Sex and age differences in these associations emerged. Approaches
420 for intervention in this group of disability pensioners should take the individual variation in
421 risk factors into account.

422

423 **Competing interests:** none.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

424 **Authors' contributions:**

425 EMR is responsible for the core idea and all authors contributed in the study design. SR and
426 EMR carried out the data analyses and drafted the manuscripts. SR, KA, JJ, and EMR
427 participated in interpretation of results, critically revised the manuscript for important
428 intellectual content, contributed to successive drafts, and agreed on the final. All authors read
429 and approved the final manuscript.

430
431 **Acknowledgement:** none.

432
433 **Data Sharing Statement**

434 We are not allowed to make the micro-level data used in this study publically available, due to
435 their sensitive nature. According to the Swedish Ethical Review Act, the Personal Data Act,
436 and the Administrative Procedure Act, data can be made available after legal review for
437 researchers who meet the criteria for access to this type of sensitive and confidential data. For
438 questions about this, please contact Professor Kristina Alexanderson, responsible for the data
439 set.

440

441

442 **References**

443

- 444 1. OECD. *Sickness, Disability and Work: Breaking the Barriers. A synthesis of findings across*
445 *OECD countries.* Paris: 2010.
- 446 2. Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health Care (SBU).
447 Chapter 1. Aim, background, key concepts, regulations, and current statistics. *Scandinavian journal of*
448 *public health Supplement.* 2004;63:12-30.
- 449 3. Social Insurance Agency (*försäkringskassan*). *Social Insurance in Figures 2013.* Sweden: The
450 *Social Insurance Agency, ISBN: 978-91-7500-376-4; ISSN: 2000-1703.*
- 451 4. Henderson M, Harvey SB, Overland S, Mykletun A, Hotopf M. Work and common psychiatric
452 disorders. *Journal of the Royal Society of Medicine.* 2011;104(5):198-207.
- 453 5. Mykletun A, Overland S, Dahl AA, Krokstad S, Bjerkset O, Glozier N, et al. A population-
454 based cohort study of the effect of common mental disorders on disability pension awards. *The*
455 *American journal of psychiatry.* 2006;163(8):1412-8.
- 456 6. Järvisalo J, Anderson B, Boedeker W, Houtman I, editors. *Mental disorders as a major*
457 *challenge in prevention of work disability: experiences in Finland, Germany, the Netherlands and*
458 *Sweden.* Helsinki: Kela; 2005.
- 459 7. Kupfer DJ, Frank E, Phillips ML. Major depressive disorder: new clinical, neurobiological, and
460 treatment perspectives. *Lancet.* 2012;379(9820):1045-55.
- 461 8. Vingard E, Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health
462 Care (SBU). Chapter 9. Consequences of being on sick leave. *Scandinavian journal of public health*
463 *Supplement.* 2004;63:207-15.
- 464 9. Waddell G, Burton K. *Is working good for your health and well-being?* . UK: Published by TSO
465 (The Stationery Office) 2006.
- 466 10. Bryngelson A, Asberg M, Nygren A, Jensen I, Mittendorfer-Rutz E. All-Cause and Cause-
467 Specific Mortality after Long-Term Sickness Absence for Psychiatric Disorders: A Prospective Cohort
468 Study. *PloS one.* 2013;8(6):e67887.
- 469 11. Karlsson NE, Carstensen JM, Gjesdal S, Alexanderson KA. Mortality in relation to disability
470 pension: findings from a 12-year prospective population-based cohort study in Sweden. *Scandinavian*
471 *journal of public health.* 2007;35(4):341-7.
- 472 12. Johansson AE, Johansson U. Disability pension and everyday life: a period of transition and
473 subjective aspects of future occupational life. *Work (Reading, Mass).* 2011;40(4):375-84.
- 474 13. Rahman S, Alexanderson K, Jokinen J, Mittendorfer-Rutz E. Risk factors for suicidal behaviour
475 in individuals on disability pension due to common mental disorders - a nationwide register-based
476 prospective cohort study in Sweden. *PloS one.* 2014;9(5):e98497.
- 477 14. Hawton K, van Heeringen K. Suicide. *Lancet.* 2009;373(9672):1372-81.
- 478 15. Fawcett J. The detection and consequences of anxiety in clinical depression. *The Journal of*
479 *clinical psychiatry.* 1997;58 Suppl 8:35-40.
- 480 16. Fawcett J. Targeting treatment in patients with mixed symptoms of anxiety and depression.
481 *The Journal of clinical psychiatry.* 1990;51 Suppl:40-3.
- 482 17. Hawton K, Casanas ICC, Haw C, Saunders K. Risk factors for suicide in individuals with
483 depression: a systematic review. *Journal of affective disorders.* 2013;147(1-3):17-28.
- 484 18. Kanwar A, Malik S, Prokop LJ, Sim LA, Feldstein D, Wang Z, et al. The association between
485 anxiety disorders and suicidal behaviors: a systematic review and meta-analysis. *Depression and*
486 *anxiety.* 2013;30(10):917-29.
- 487 19. Cavanagh JTO, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a
488 systematic review. *Psychological Medicine.* 2003;33(3):395-405.
- 489 20. Crump C, Sundquist K, Sundquist J, Winkleby MA. Sociodemographic, psychiatric and somatic
490 risk factors for suicide: a Swedish national cohort study. *Psychological Medicine.* 2013:1-11.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

- 1
- 2
- 3 491 21. Laaksonen M, Gould R. The effect of municipality characteristics on disability retirement.
- 4 492 European journal of public health. 2014;24(1):116-21.
- 5 493 22. Leinonen T, Martikainen P, Lahelma E. Interrelationships between education, occupational
- 6 494 social class, and income as determinants of disability retirement. Scand J Public Health.
- 7 495 2012;40(2):157-66.
- 8 496 23. Osterberg T, Gustafsson B. Disability pension among immigrants in Sweden. Social science &
- 9 497 medicine (1982). 2006;63(3):805-16.
- 10 498 24. Pompili M, Innamorati M, Szanto K, Di Vittorio C, Conwell Y, Lester D, et al. Life events as
- 11 499 precipitants of suicide attempts among first-time suicide attempters, repeaters, and non-attempters.
- 12 500 Psychiatry research. 2011;186(2-3):300-5.
- 13 501 25. WHO. International Statistical Classification of Diseases and Related Health Problems, 10
- 14 502 revision (ICD 10). 2010.
- 15 503 26. Koopmans PC, Bultmann U, Roelen CA, Hoedeman R, van der Klink JJ, Groothoff JW.
- 16 504 Recurrence of sickness absence due to common mental disorders. International Archives of
- 17 505 Occupational and Environmental Health. 2011;84(2):193-201.
- 18 506 27. Deverill C KM. Common Mental Disorders. In: McManus S MH, Brugha T, Bebbington P, R J,
- 19 507 editors. Adult psychiatric morbidity in England. London: The NHS Information Centre for health and
- 20 508 social care; 2009. p. 25-7.
- 21 509 28. Rutz EM, Wasserman D. Trends in adolescent suicide mortality in the WHO European Region.
- 22 510 European child & adolescent psychiatry. 2004;13(5):321-31.
- 23 511 29. Allebeck P, Allgulander C, Henningsohn L, Jakobsson S. Causes of death in a cohort of 50465
- 24 512 young men—validity of recorded suicide as underlying cause of death. Scandinavian Journal of Social
- 25 513 Medicine. 1991;19:242-47.
- 26 514 30. Mittendorfer-Rutz E, Rasmussen F, Wasserman D. Restricted fetal growth and adverse
- 27 515 maternal psychosocial and socioeconomic conditions as risk factors for suicidal behaviour of
- 28 516 offspring: a cohort study. Lancet. 2004;364(9440):1135-40.
- 29 517 31. Ludvigsson JF, Andersson E, Ekbom A, Feychting M, Kim JL, Reuterwall C, et al. External
- 30 518 review and validation of the Swedish national inpatient register. BMC Public Health. 2011;11:450.
- 31 519 32. Socialstyrelsen. The Cause of Death register. Stockholm, Sweden: National Board of Health
- 32 520 and Welfare, 2012 August 2013. Report No.: 2013-8-6 Contract No.: 2013-8-6.
- 33 521 33. Ljungdahl LO, Bjurulf P. The accordance of diagnoses in a computerized sick-leave register
- 34 522 with doctor's certificates and medical records. Scand J Soc Med. 1991;19(3):148-53.
- 35 523 34. Shrivastava A, Johnston M, Bureau Y. Stigma of Mental Illness-1: Clinical reflections. Mens
- 36 524 sana monographs. 2012;10(1):70-84.
- 37 525 35. Lauber C. Stigma and discrimination against people with mental illness: a critical appraisal.
- 38 526 Epidemiologia e Psichiatria Sociale. 2008;17(1):10-3.
- 39 527 36. Mittendorfer-Rutz E, Kjeldgard L, Runeson B, Perski A, Melchior M, Head J, et al. Sickness
- 40 528 absence due to specific mental diagnoses and all-cause and cause-specific mortality: a cohort study
- 41 529 of 4.9 million inhabitants of Sweden. PloS one. 2012;7(9):e45788.
- 42 530 37. Conwell Y, Duberstein PR, Cox C, Herrmann JH, Forbes NT, Caine ED. Relationships of age and
- 43 531 axis I diagnoses in victims of completed suicide: a psychological autopsy study. Am J Psychiatry.
- 44 532 1996;153(8):1001-8.
- 45 533 38. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts
- 46 534 in the National Comorbidity Survey. Archives of general psychiatry. 1999;56(7):617-26.
- 47 535 39. Isometsa E. Suicidal behaviour in mood disorders—who, when, and why? Canadian journal of
- 48 536 psychiatry Revue canadienne de psychiatrie. 2014;59(3):120-30.
- 49 537 40. Vijayakumar L, Kumar MS, Vijayakumar V. Substance use and suicide. Current opinion in
- 50 538 psychiatry. 2011;24(3):197-202.
- 51 539 41. Amore M, Innamorati M, Vittorio CD, Weinberg I, Turecki G, Sher L, et al. Suicide attempts in
- 52 540 major depressed patients with personality disorder. Suicide & life-threatening behavior.
- 53 541 2014;44(2):155-66.
- 54
- 55
- 56
- 57
- 58
- 59
- 60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

542 42. Paris J. Chronic suicidality among patients with borderline personality disorder. *Psychiatric*
543 *services* (Washington, DC). 2002;53(6):738-42.
544 43. Ishtiak-Ahmed K, Perski A, Mittendorfer-Rutz E. Predictors of suicidal behaviour in 36,304
545 individuals sickness absent due to stress-related mental disorders -- a Swedish register linkage cohort
546 study. *BMC Public Health*. 2013;13.
547 44. Floderus B, Goransson S, Alexanderson K, Aronsson G. Self-estimated life situation in patients
548 on long-term sick leave. *Journal of rehabilitation medicine*. 2005;37(5):291-9.
549

For peer review only

BMJ Open: first published as 10.1136/bmjopen-2015-010152 on 4 April 2016. Downloaded from <http://bmjopen.bmj.com/> on April 19, 2024 by guest. Protected by copyright.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 1. Descriptive statistics with regard to main and secondary disability pension (DP) diagnoses, duration, and grade of DP in the cohort of 46 515 women and men, aged 19-64 years, living in Sweden on 31.12.2004, and in 2005 on DP due to common mental disorders.

Characteristics	All		Women		Men		Age 19-44 years		Age 45-64 years		P value for difference by Chi ²
	N	%	n	%	n	%	n	%	n	%	
Total	46 515	100	30 883	100	15 632	100	13 931	100	32 584	100	
Main DP diagnosis											
Depressive disorder	22 032	47.4	14 907	48.3	7 125	45.6	5 242	37.6	16 790	51.5	p <0.001
Anxiety disorder	13 516	29.1	8 558	27.7	4 958	31.7	6 007	43.1	7 509	23.0	
Stress-related mental disorder	10 967	23.6	7 418	24.0	3 549	22.7	2 682	19.3	8 285	25.4	
Secondary DP diagnosis											
No side diagnosis	20 042	43.1	13 254	42.9	6 788	43.4	5 217	37.4	14 825	45.5	p <0.001
Substance abuse disorders	950	2.0	378	1.2	572	3.7	344	2.5	606	1.9	
Personality disorders	2313	5.0	1 294	4.2	1 019	6.5	1 232	8.8	1 081	3.3	
Other mental disorders	12 329	26.5	8 237	26.7	4 092	26.2	4 924	35.3	7 405	22.7	
Musculoskeletal disorders	4 911	10.5	3 716	12.0	1 195	7.6	980	7.0	3 931	12.1	
Other somatic disorders	5 970	12.8	4 004	13.0	1 966	12.6	1 234	8.9	4 736	14.5	
Number of years on DP in 2005											
1 year	14 055	30.2	9 718	31.5	4 337	27.7	4 995	35.9	9 060	27.8	p >0.01
2-3 years	17 347	37.3	11 624	37.6	5 723	36.6	5 313	38.1	12 034	36.9	
≥4 years	15 113	32.5	9 541	30.9	5 572	35.7	3 623	26.0	11 490	35.3	
DP grade in 2005											
Part-time	11 371	24.4	8651	28.0	2720	17.4	2 671	19.2	8 700	26.7	p <0.001
Full-time	35 144	75.6	22 232	72.0	12 912	82.6	11 260	80.8	23 884	73.3	

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 2. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (in 2006-10), in 46 515 individuals, aged 19-64 years, living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by sex.

Characteristics	Suicide attempt						Suicide					
	Women			Men			Women			Men		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95%CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	355	34.3	1	139	13.4	1	53	25.6	1	50	24.2	1
Anxiety disorders	278	26.8	1.4 (1.2-1.6)	140	13.5	1.5 (1.1-1.8)	32	15.5	1.1 (0.7-1.6)	47	22.7	1.3 (0.9-2.0)
Stress-related mental disorders	99	9.6	0.6 (0.5-0.7)	25	2.4	0.4 (0.2-0.5)	17	8.2	0.6 (0.4-1.1)	8	3.9	0.3 (0.2-0.7)
Secondary DP diagnosis												
No secondary diagnosis	232	22.4	1	100	9.7	1	34	16.4	1	45	21.7	1
Substance abuse disorders	43	4.2	7.1 (5.1-9.8)	34	3.3	4.3 (2.9-6.3)	9	4.3	9.6 (4.6-20.1)	7	3.4	1.9 (0.9-4.3)
Personality disorders	83	8.0	3.8 (2.9-4.8)	39	3.8	2.7 (1.8-3.8)	12	5.8	3.6 (1.9-7.0)	9	4.4	1.3 (0.7-2.8)
Other mental disorders	253	24.4	1.8 (1.5-2.1)	95	9.2	1.6 (1.2-2.1)	27	13.0	1.3 (0.8-2.1)	29	14.0	1.1 (0.7-1.7)
Musculoskeletal disorders	56	5.4	0.9 (0.6-1.2)	10	1.0	0.6 (0.3-1.1)	<7	2.9	0.6 (0.3-1.5)	<7	2.4	0.6 (0.3-1.6)
Other somatic disorders	65	6.3	0.9 (0.7-1.2)	26	2.5	0.9 (0.6-1.4)	14	6.8	1.4 (0.7-2.5)	10	4.8	0.8 (0.4-1.5)
Number of years on DP in 2005												
1 year	217	21.0	1	92	8.9	1	29	14.0	1	35	16.9	1
2-3 years	260	25.1	1.0 (0.8-1.2)	107	10.3	0.9 (0.7-1.2)	38	18.4	1.1 (0.7-1.8)	44	21.3	1.0 (0.6-1.5)
≥4 years	255	24.6	1.2 (1.0-1.5)	104	10.0	0.9 (0.7-1.2)	35	16.9	1.2 (0.8-2.0)	26	12.6	0.6 (0.4-1.0)
DP grade												
Part-time	84	8.1	1	42	4.1	1	16	7.7	1	10	4.8	1
Full-time	648	62.8	3.1 (2.4-3.8)	262	25.4	1.3 (1.0-1.9)	86	41.6	2.1 (1.2-3.6)	95	45.9	2.0 (1.1-3.9)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 3. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age.

Characteristics	Suicide attempt						Suicide					
	Age 19-44 years			Age 45-64 years			Age 19-44 years			Age 45-64 years		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	217	21.0	1	277	26.7	1	20	9.7	1	83	43.0	1
Anxiety disorders	278	26.8	1.1 (0.9-1.3)	140	13.5	1.1 (0.9-1.4)	44	21.3	1.9 (1.1-3.3)	35	16.9	0.9 (0.6-1.4)
Stress-related mental disorders	62	6.0	0.6 (0.4-0.7)	62	6.0	0.5 (0.3-0.6)	12	5.8	1.2 (0.6-2.4)	13	6.3	0.3 (0.2-0.6)
Secondary DP diagnosis												
No secondary diagnosis	140	13.5	1	192	18.5	1	20	9.7	1	59	28.5	1
Substance abuse disorders	40	3.9	4.7 (3.3-6.7)	37	3.6	5.0 (3.5-7.2)	8	3.9	6.3 (2.8-14.3)	8	3.9	3.5 (1.7-7.3)
Personality disorders	85	8.2	2.6 (2.0-3.5)	37	3.6	2.7 (1.9-3.8)	13	6.3	2.8 (1.4-5.6)	8	3.9	1.9 (1.0-3.9)
Other mental disorders	233	22.5	1.8 (1.5-2.2)	115	11.1	1.2 (1.0-1.5)	30	14.5	1.6 (0.9-2.7)	27	13.0	0.9 (0.6-1.4)
Musculoskeletal disorders	23	2.2	0.9 (0.6-1.4)	43	4.2	0.8 (0.6-1.2)	<7	1.9	1.1 (0.4-3.1)	7	3.4	0.5 (0.2-1.0)
Other somatic disorders	36	3.5	1.1 (0.8-1.6)	55	5.3	0.9 (0.7-1.2)	<7	1.0	0.4 (0.1-1.8)	22	10.6	1.2 (0.7-1.9)
Number of years on DP in 2005												
1 year	198	19.1	1	112	10.8	1	23	11.1	1	41	19.8	1
2-3 years	202	19.5	1.0 (0.8-1.2)	165	15.9	1.1 (0.9-1.4)	36	17.4	1.5 (0.9-2.5)	46	22.2	0.9 (0.6-1.3)
≥4 years	157	15.2	1.1 (0.9-1.4)	202	19.5	1.4 (1.1-1.8)	17	8.2	1.0 (0.6-1.9)	44	21.3	0.9 (0.6-1.3)
DP grade												
Part-time	56	5.4	1	70	6.8	1	7	3.4	1	19	9.2	1
Full-time	501	48.6	2.2 (1.6-2.9)	409	39.6	2.2 (1.7-2.8)	69	33.3	2.4 (1.1-5.1)	112	54.1	2.2 (1.3-3.6)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 4. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by sex[□].

Characteristics	Suicide attempt		Suicide	
	Women	Men	Women	Men
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.0 (0.9-1.2)	1.0 (0.8-1.2)	0.9 (0.6-1.4)	1.3 (0.8-2.0)
Stress-related mental disorders	0.8 (0.6-1.0)	0.6 (0.4-0.9)	0.9 (0.5-1.6)	0.4 (0.2-0.9)
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.1 (1.5-2.9)*	1.6 (1.0-2.4)	3.3 (1.5-7.1)*	0.8 (0.3-1.7)
Personality disorders	1.4 (1.1-1.8)*	1.4 (1.0-2.1)	1.8 (0.9-3.5)	0.9 (0.4-1.8)
Other mental disorders	1.3 (1.1-1.5)*	1.2 (0.9-1.6)	1.1 (0.6-1.8)	0.9 (0.6-1.5)
Musculoskeletal disorders	1.1 (0.8-1.5)	0.7 (0.4-1.4)	0.8 (0.3-2.0)	0.7 (0.3-1.9)
Other somatic disorders	1.1 (0.9-1.5)	1.0 (0.7-1.6)	1.6 (0.9-3.0)	0.8 (0.4-1.7)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.9 (0.8-1.1)	0.9 (0.7-1.2)	1.0 (0.6-1.7)	0.9 (0.6-1.5)
≥ 4 years	1.1 (0.9-1.3)	1.0 (0.7-1.3)	1.1 (0.7-1.8)	0.5 (0.3-0.9)
DP grade				
Part-time	1	1	1	1
Full-time	1.7 (1.4-2.2)*	0.9 (0.6-1.3)	1.5 (0.8-2.6)	1.7 (0.9-3.3)

□Adjusted for: Age, Educational level, Family situation, Country of birth, Type of living area, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 5. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age[□].

Characteristics	Suicide attempt		Suicide	
	Age 19-44 years	Age 45-64 years	Age 19-44 years	Age 45-64 years
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.1 (0.9-1.3)	0.9 (0.8-1.2)	1.7 (1.0-3.0)	0.9 (0.6-1.3)
Stress-related mental disorders	0.8 (0.6-1.1)	0.7 (0.5-0.9)	1.7 (0.8-3.6)	0.4 (0.2-0.8)*
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.3 (1.6-3.3)*	1.5 (1.1-2.2)*	2.6 (1.1-6.1)	1.0 (0.5-2.3)
Personality disorders	1.5 (1.1-2.0)*	1.6 (1.1-2.2)*	1.7 (0.8-3.4)	1.1 (0.5-2.3)
Other mental disorders	1.5 (1.2-1.9)*	1.0 (0.8-1.3)	1.3 (0.8-2.4)	0.8 (0.5-1.3)
Musculoskeletal disorders	1.1 (0.7-1.8)	0.9 (0.7-1.3)	1.7 (0.6-4.9)	0.6 (0.3-1.3)
Other somatic disorders	1.2 (0.8-1.8)	1.1 (0.8-1.4)	0.5 (0.1-2.1)	1.3 (0.8-2.2)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.8 (0.7-1.0)	1.0 (0.8-1.3)	1.3 (0.8-2.2)	0.8 (0.5-1.2)
≥4 years	1.0 (0.8-1.2)	1.2 (0.9-1.5)	0.8 (0.4-1.5)	0.7 (0.5-1.1)
DP grade				
Part-time	1	1	1	1
Full-time	1.4 (1.1-1.9)*	1.5 (1.1-1.9)*	1.3 (0.6-3.0)	1.7 (1.0-2.8)

□Adjusted for: Sex, Educational level, Family situation, Country of birth, Type of living area, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Disability pension (DP) due to common mental disorders (CMD) and subsequent suicidal behaviour; a population-based prospective cohort study	1
		(b) See Abstract	3-4
Introduction			
Background/rationale	2	See Background	5-6
Objectives	3	To examine 1) how different DP measures (main diagnosis, secondary diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these associations with regard to sex and age. See Aim	6
Methods			
Study design	4	Prospective cohort design. See Methods and Materials: Design	7
Setting	5	See Methods and Materials: Design, Risk factors	7, 8, 9
Participants	6	(a) See Methods and Materials: Design, Disability pension, Statistical analyses, Table 1	7, 8, 11
		(b) N/A	
Variables	7	See Methods and Materials: Risk factors, Confounders, Outcome measures	8-10
Data sources/ measurement	8*	See Methods and Materials: Design, Statistical Analyses	7,11
Bias	9	The bias is limited by using a population based study population based on data with nation-wide coverage and information on a large number of confounders. See Methods and Materials: Design	7
Study size	10	See Methods and Materials: Design	7
Quantitative variables	11	See Methods and Materials: Risk factors, Confounders, Outcome measures, Statistical analyses	8-11
Statistical methods	12	(a) Uni- and multivariate hazard ratios and 95% confidence intervals (CI) for the risk factors with regard to suicide attempt and suicide were estimated by Cox proportional hazard regression models, after testing that the proportionate hazard assumption was met. See Methods and Materials: Statistical Analyses	11
		(b) Chi-square statistics were used to test significant sex and age differences in the. See Methods and Materials: Statistical	11

		Analyses	
		(c) Missing values were coded as separate categories. See Methods and Materials: Confounders	10
		(d) There was practically no loss to follow-up	
		(e) Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Materials: Statistical Analyses	11
Results			
Participants	13*	(a) See Methods and Materials: Design, Results, Table 1	7, 12
		(b) This is a register based and population based study with data on individuals on disability pension covering information from the whole country	11
		(c) --	
Descriptive data	14*	(a) See Results, Table 1, Table 2, Table 3	12,13
		(b) Only the confounder 'Education level in years' had missing for 504 (1.1%) individuals and was categorized as a separate category. See Methods and Materials: Confounders	10
		(c) See Results	13
Outcome data	15*	See Methods and Materials: Outcome measures, Results	10, 12-14
Main results	16	(a) See Results, Table 2-5	12-14
		(b) See Table 1 for categories of 'Number of years on DP in 2005'. Analyses were stratified for age, age was dichotomised. See Methods and Materials: Confounders	10
		(c) --	
Other analyses	17	-All analyses were stratified for age and sex. See Table 1-5. -Partial likelihood ratio test was used to test interactions with sex and age. See Methods and Materials: Statistical analyses -Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Material: Statistical analyses	11 11
Discussion			
Key results	18	See Discussion	15
Limitations		See Discussion	16
Interpretation	20	See Discussion, Conclusion	15-19
Generalisability	21	The findings are generalisable to countries with comparable health care and social insurance systems.	

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

Other information			
Funding	22	See Title page: Financial support	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

For peer review only

BMJ Open

Disability pension due to common mental disorders and subsequent suicidal behaviour; a population-based prospective cohort study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2015-010152.R1
Article Type:	Research
Date Submitted by the Author:	11-Dec-2015
Complete List of Authors:	Rahman, Syed; Karolinska Institutet, Clinical Neuroscience; syed rahman, Alexanderson, Kristina; karolinska institutet, Department of Clinical Neuroscience Jokinen, Jussi; Karolinska Institute, Clinical Neuroscience Mittendorfer-Rutz, Ellenor; Karolinska Institutet, Department of Clinical Neuroscience, Division of Insurance Medicine
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Occupational and environmental medicine, Public health, Epidemiology
Keywords:	common mental disorder, suicide, suicide attempt, MENTAL HEALTH, disability pension, Sick leave

SCHOLARONE™
Manuscripts

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 1 Disability pension due to common mental disorders and subsequent suicidal behaviour; a
4 2 population-based prospective cohort study
5 3

6
7 4 Rahman S,^{1*} Alexanderson K,¹ Jokinen J,^{2,3} Mittendorfer-Rutz E.¹
8
9 5

10
11
12 6 ¹ Department of Clinical Neuroscience, Division of Insurance Medicine, Karolinska Institutet,
13
14 7 Stockholm, Sweden.

15
16 8 ² Department of Clinical Neuroscience, Division of Psychiatry, Karolinska Institutet,
17
18 9 Karolinska University Hospital, Stockholm, Sweden.

19
20
21 10 ³ Department of Clinical Sciences, Division of Psychiatry, Umeå University, Umeå, Sweden.
22

23
24 11 Kristina Alexanderson, Professor
25

26 12 Kristina.Alexanderson@ki.se
27

28
29 13 Jussi Jokinen, Professor

30
31 14 Jussi.Jokinen@ki.se
32

33 15 Ellenor Mittendorfer-Rutz, Associate professor

34
35 16 Ellenor.Mittendorfer-Rutz@ki.se
36

37
38 17 *Corresponding author:
39

40
41 18 Syed Ghulam Rahman; MBBS, MMSc
42

43
44 19 Division of Insurance Medicine, Department of Clinical Neuroscience
45

46
47 20 Karolinska Institutet, 171 77 STOCKHOLM, Sweden
48

49
50 21 Tel +46 8-524 832 05
51

52
53 22 Email: syed.rahman@ki.se
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

23 Financial support: Swedish Research Council for Health, Working Life and Welfare, the
24 Swedish research council (Project numbers: K2009-61P-21304-04-4; K2009-61X-21305-01-
25 1; K2011-80P-21782-01-4), and the Karolinska Institutet's funding for doctoral students.

26 Abstract (with subheadings): 300 words

27 Main text (with headings and subheadings): 3965 words

28

For peer review only

Abstract

Objective: Adverse health outcomes including suicide, among individuals on disability pension (DP) due to mental diagnoses have been reported previously. Nevertheless, the scientific knowledge on possible risk factors for suicidal behavior (suicide attempt and suicide) in this group, such as age, sex, underlying DP diagnoses, comorbidity, DP duration and grade, is surprisingly sparse. This study aimed to investigate the associations of different measures (main and side diagnoses, duration and grade) of DP due to common mental disorders (CMD) with subsequent suicidal behaviour, considering sex and age differences.

Design: Nationwide population-based prospective cohort study based on Swedish national registers.

Methods: A cohort of 46515 individuals aged from 19-64 years and on DP due to CMD throughout 2005 was followed up for five years. In relation to different measures of DP univariate and multivariate hazard ratios (HR) and 95% confidence intervals (CI) for suicidal behaviour were estimated by Cox regression. All analyses were stratified by sex and age.

Results: During 2006-2010, 1036(2.2%) individuals attempted and 207(0.5%) completed suicide. Multivariate analyses showed that stress-related mental disorders as main DP diagnoses were associated with a lower risk of subsequent suicidal behavior than depressive disorders (HR range 0.4 to 0.7). Substance abuse and personality disorders as DP side diagnoses predicted suicide attempt in all sub groups (HR range 1.8 to 4.6) and suicide in women and younger individuals (HR range 2.2 to 7.7). Fulltime DP was associated with a higher risk of suicide attempt and suicide compared to part-time DP in women (HR range 1.8 to 2.3).

Conclusions: In this first study of associations between DP due to CMD (using different measures of DP; main and side diagnoses as well as DP grade and duration) with subsequent

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

53 risk of suicidal behavior among individuals on such DP, some of such associations varied
54 with sex and age.

55 **Keywords:** Sick leave, disability pension, mental health, suicide attempt, suicide, common
56 mental disorder

57
58 **Strengths:**

- 59 • Nationwide study of the whole population using high quality data of a large number
60 of variables
- 61 • Prospective cohort design with no loss to follow-up
- 62 • Considered diagnoses are not self-reported, but from the registers and provided by
63 physicians

64 **Limitations:**

- 65 • For some analyses, few suicide cases
- 66 • We have considered suicide attempts leading to inpatient care, thus the results mainly
67 are valid for suicide attempts of higher medical severity

79 **Background**

80

81 Disability pension (DP) is a major public health issue in many European countries (1, 2) and
82 increasingly so regarding mental DP diagnoses (1, 3-5). In Sweden in 2012, mental diagnoses
83 accounted for 40% of the DPs granted to individuals aged 30-64 years and for 84% among
84 those aged 19-29 years (3). The majority of the mental DP diagnoses are common mental
85 disorders (CMD), e.g., depressive, anxiety, or stress-related mental disorders (1, 6). All these
86 are diagnoses for which usually adequate treatment and rehabilitation measures are or should
87 be available while inactivity, e.g., in terms of DP, that is, long-term or permanent exclusion
88 from the labour market/working life, may have adverse effects (7). DP itself may imply
89 alteration of health behaviour (e.g., alcohol and tobacco use, exercise, diet) or social isolation
90 (8). This can be due to lack of ties to the labour market and eventually lack of the potential
91 positive effects of paid work, including social contacts with colleagues, prospects of career
92 and income development, sense of meaning, or even daily routines and structures (9). Here,
93 individuals who have been on DP for a shorter period might experience less adverse effects of
94 being excluded from the labour market than individuals on DP for longer time (10). Similarly,
95 part-time DP might be more protective with regard to any adverse health or social outcomes
96 than full-time DP (11, 12).

97

98 Adverse health outcomes, including suicide, among disability pensioners, especially among
99 those granted DP early in adult life due to mental diagnoses have been shown previously (8,
100 13). Still, little is known to date about specific risk factors related to eventual worse outcome
101 in individuals on DP (8), such as suicide attempt or suicide. Suicidal behaviour can be
102 considered as the outmost consequence of mental disorders, particularly of depressive

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 103 disorders or depression comorbid with anxiety (14-16). Comorbidity with mental and somatic
4
5 104 disorders has been shown to be associated with a higher risk of suicidal behaviour in patients
6
7 105 with depressive disorders (17-19). To date, knowledge is lacking regarding associations
8
9 106 between DP due to different diagnoses and eventual co-morbidity with subsequent suicidal
10
11 107 behaviour.

12
13
14
15 108

16
17 109 There are well documented sex and age differences with regard to both DP and suicidal
18
19 110 behaviour (13, 14, 20). However, there is a lack of studies investigating if effect sizes in the
20
21 111 associations between sex and age with suicidal behaviour vary with different measures of DP.
22
23 112 Moreover, associations between different socio-demographic factors, such as educational
24
25 113 level, family situation, country of birth, type of area of living, and morbidity in terms of
26
27 114 previous suicide attempt or in- or outpatient care due to mental diagnoses, with subsequent
28
29 115 suicidal behaviour have been identified in different studies (14, 17, 21-24). Additionally,
30
31 116 excess mortality including suicide after disability pension due to mental diagnoses, compared
32
33 117 to the general population, has been reported (25-27). Therefore, it is important to consider
34
35 118 both these socio-demographic and health factors in analyses of association between DP and
36
37 119 subsequent suicidal behaviour.
38
39
40
41
42

43 120

44 45 121 **Aim**

46
47
48 122

49
50 123 This study aimed to examine 1) how different measures of DP (main diagnosis, secondary
51
52 124 diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide
53
54 125 attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these
55
56 126 associations with regard to sex and age.
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 127
4
5
6

128 **Methods and materials**

7
8
9 129
10

11 **Design**

12
13
14 131
15
16
17

18 132 A nationwide population-based prospective cohort study based on Swedish register data was
19 133 conducted. The cohort comprised all individuals aged 19-64 years, living in Sweden on
20 134 31.12.2004, who were on DP due to CMD (as main DP diagnosis, full- or part-time)
21 135 throughout 2005 (n=48803). Individuals treated in in- or outpatient health care with
22 136 schizophrenic spectrum or bipolar disorders or having this as a DP secondary diagnosis in
23 137 2001-05 (n=1886) and people on old-age pension during 2005 (n=402) were excluded. The
24 138 final cohort hence included 46 515 individuals. They were followed up for five years (2006-
25 139 2010).

26
27
28
29
30
31
32
33
34
35
36 140
37

38 141 Annual data covering 2001 to 2010 were obtained from the following four nationwide
39 142 registers: 1) Longitudinal integration database for health insurance and labour market studies
40 143 (LISA) held by Statistics Sweden: including socio-demographic information on sex, age,
41 144 educational level, type of living area, country of birth, family situation; 2) Two registers held
42 145 by the National Board of Health and Welfare, namely; (i) National patient register including
43 146 information on date and diagnosis of inpatient an specialised outpatient care, (ii) Cause of
44 147 death register with data on date and cause of death, and 3) Micro-data for analyses of social
45 148 insurance (MiDAS) with information on the date, diagnoses (the main and secondary DP
46 149 diagnoses), duration, and grade of DP from the Social Insurance Agency. Data from these
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

150 registers were linked at individual level, using the unique personal identification number of all
151 residents in Sweden.

152

153 **Disability pension system in Sweden**

154

155 In 2005, all residents in Sweden aged 19–64 years, who due to disease or injury had a long-
156 lasting or permanent reduction of their work capacity at least to an extent of 25% of ordinary
157 working hours, could be granted temporary or permanent disability pension from the Social
158 Insurance Agency (3). In Sweden, DP can be granted for 25, 50, 75, or 100% of ordinary
159 working hours. Since 2003, people aged 19-29 years can be granted temporary disability
160 pension if the work capacity is reduced for at least one year also of their disability meant that
161 they could not complete compulsory or upper secondary school in due time (3). Disability
162 pension amounts up to about 65% of lost income, up to a certain level. For those with no
163 previous income, there is a minimum sum.

164

165 **Risk factors**

166

167 **Main and secondary DP diagnoses**

168 All information on DP diagnoses was based on the corresponding codes of the International
169 Classification of Diseases, version 10 (ICD-10) (28). Information on main and secondary DP
170 diagnosis was available from MiDAS.

171

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 172 Main DP diagnoses were categorised into: ‘depressive disorders’ including ‘depressive
4
5 173 episode’ (F32) and ‘recurrent depressive disorder’ (F33), ‘anxiety disorders’ comprising
6
7 174 ‘phobic anxiety disorder’ (F40); ‘other anxiety disorder’ (F41); ‘obsessive-compulsive
8
9 175 disorder’ (F42); and ‘stress-related mental disorders’ including ‘reaction to severe stress, and
10
11 176 adjustment disorders, acute stress reaction and post-traumatic stress disorder’ (F43) (29, 30).
12
13

14
15 177

16
17
18 178 Secondary diagnoses were categorized as: ‘No secondary diagnosis’, ‘Substance abuse
19
20 179 disorders’ (F10-F19), ‘Personality disorders’ (F60-F69), ‘Other mental disorders’ (F00-F99
21
22 180 except F10-F19, F60-F69), ‘Musculoskeletal disorders’ (M00-M99), and ‘Other somatic
23
24 181 disorders’(all diagnoses except M00-M99 and F00-F99).
25
26

27 182

28
29
30 183 The excluded bipolar and schizophrenic spectrum disorders included the following ICD-10
31
32 184 codes: F20-F29 and F31.
33
34

35 185

36
37
38 186 **Duration**

39
40
41 187

42
43
44 188 DP duration was calculated by subtracting start date of DP from the end date of exposure
45
46 189 (2005-Dec-12) in gross days. Thereafter, the days were converted into years and were
47
48 190 categorized into: ‘1 year’, ‘2-3 years’, and ‘ ≥ 4 years’, respectively.
49

50
51 191

52
53
54 192 **Grade**

55
56
57 193
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

194 DP grade was categorized into part- and full-time. Part-time included grade of 25%, 50%, and
195 75%, and full-time was 100%. In case of change of grade, the grade during the exposure year
196 (2005) was considered.

197

198 **Confounders**

199

200 All socio-demographic characteristics were measured at baseline (31.12.2004): age, sex,
201 educational level, family situation, country of birth, and area of living. Age was dichotomised
202 into 19-44 and 45-64 years. Educational level was categorized into 3 groups according to the
203 total number of years of education at three levels: 'compulsory (0-9 years)', 'upper secondary
204 school (10-12 years)', 'university (≥ 13 years)'. Family situation was coded into four groups:
205 'married/cohabiting with children at home', 'married/cohabiting with no children at home',
206 'single without children living at home', and 'single with children living at home'. Country of
207 birth included 'Sweden', 'other Nordic countries', 'EU 25 (except Nordic countries)', and
208 'rest of the world'. Type of area of living was divided into 'big cities', 'medium-sized cities',
209 and 'small cities/villages'. Missing values were coded as separate categories.

210 Health care factors, particularly previous suicide attempt, in- and outpatient care due to
211 mental diagnoses were measured from 2001 to 2005 and were dichotomised as 'yes' and 'no'.

212

213 **Outcome measures**

214

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 215 The outcome measure was defined as suicidal behaviour (suicide attempt from the inpatient-
4
5 216 care register and suicide according to the cause of death register) (ICD 10: X60-84 and Y10-
6
7 217 34) during 2006-2010. As suicide attempts and suicides are often underreported or reported as
8
9 218 “undetermined” causes (31, 32), “determined” (X60-84) and “undetermined” (Y10-34)
10
11 219 suicidal behaviour were combined to limit underreporting and to compensate for regional and
12
13 220 temporal variation in ascertainment methods. Combining these two outcome measures is a
14
15 221 common procedure in research on suicidal behaviour (33). The combined outcome measures
16
17 222 are hereafter called suicide attempt and suicide, respectively, that is, also the undetermined
18
19 223 are included.
20
21
22
23
24

25 225 **Statistical analysis**

26
27
28
29 226
30
31
32 227 Chi-square statistics were used to test significant sex and age differences in the cohort.
33
34 228 Univariate hazard ratios (HR) and 95% confidence intervals (CI) for the risk factors with
35
36 229 regard to suicide attempt and suicide were estimated by Cox proportional hazard regression
37
38 230 models, after testing that the proportionate hazard assumption was met. All individuals were
39
40 231 followed up from 01.01.2006 until the event (suicide attempt; suicide), emigration, death (due
41
42 232 to causes other than X06-84 and Y10-34, in the analyses related to suicide as an outcome), or
43
44 233 end of follow up (31.12.2010), whichever occurred first. The partial likelihood ratio test was
45
46 234 used to test for possible interactions between the exposure variables (main and secondary DP
47
48 235 diagnoses, and duration and grade of DP) and age and sex in relation to the outcome.
49
50 236 Multivariate models were built with adjustment for socio-demographic and healthcare factors
51
52 237 and mutual adjustment for all other covariates. In order to check if the estimates before and
53
54 238 after combining the determined and undetermined suicidal behaviour were comparable,
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

239 sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure
240 measures in relation to determined and undetermined suicide attempt and completed suicide
241 both separately and after combining them. After assuring that these estimates were
242 comparable, the combined variables were introduced into the model. All analyses were
243 stratified by sex and age.

244 All analyses were performed in SPSS v.22.

245

246 **Ethical statement**

247 This project was evaluated and approved by the Regional Ethical Review Board of,
248 Stockholm, Sweden.

249

250 **Results**

251

252 Of the 46 515 individuals on DP due to CMD during 2005, the majority (66.4%) were women
253 and 70% were aged between 45–64 years (Table 1). Nearly half of the women (48.3%) had
254 depressive disorders as main DP diagnosis while a large proportion of the men had anxiety
255 disorders as main DP diagnosis (31.7%). Depressive disorders as main DP diagnosis was
256 more common among the older individuals (51.5%) whereas anxiety disorders as main DP
257 diagnosis was more frequent among the younger people (43.1%). The two predominant
258 specific main DP diagnoses for the entire cohort were ‘depressive episode’ (36.8%) and
259 ‘stress-related mental disorder’ (23.6%) (data not in table).

260

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 261 In the cohort, nearly half of the individuals did not have any secondary DP diagnosis (43.1%)
4
5 262 (Table 1). Substance abuse disorders as secondary diagnosis were more prevalent among men
6
7 263 and older individuals while personality disorders were more frequent among women and
8
9 264 younger individuals ($p < 0.001$). The majority of the individuals had full-time DP (75.6%).
10
11 265 Part-time DP was more common among women (28%) than men (17.4%) and among older
12
13 266 (26.7%) than younger individuals (19.2%) ($p < 0.001$).
14
15
16
17
18
19

20 268 With regard to the covariates, nearly half (47%) of the study population had been to high
21
22 269 school, most lived in big or medium sized cities (74%), and 75% were born in Sweden (data
23
24 270 not in table). Almost half of them (42%) lived without a partner and without children at home.
25
26
27
28

271

29
30 272 In the cohort, 1036 (2.2%) individuals were treated in inpatient care due to suicide attempt
31
32 273 and 207 (0.5%) committed suicide during the five-year follow up (2006–10) (table 2). Women
33
34 274 were somewhat more likely than men to attempt suicide (women: 2.4%, men: 2.0%, $p < 0.01$)
35
36 275 while a higher proportion of men completed suicide (women: 0.3%, men: 0.7%. $p < 0.001$).
37
38 276 Mean follow-up time for suicide attempt and suicide was 4.85 (standard deviation (SD): 0.70)
39
40 277 and 4.91 (SD: 0.52) years, respectively.
41
42
43
44

278

45
46
47 279 Table 2 and 3 show univariate HRs and Table 4 and 5 show multivariate HRs for suicide
48
49 280 attempt and suicide, stratified by sex and age with regard to main and secondary DP
50
51 281 diagnoses as well as duration and grade of DP.
52
53
54

282

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 283 In the univariate analyses, 'anxiety disorder' as main diagnosis was associated with a higher
4
5 284 risk for suicide attempt in both women and men (range of HRs 1.4 to 1.5) and suicide in the
6
7 285 younger age group (HR 1.9; 95% CI: 1.1-3.3) compared to 'depressive disorder'. These
8
9 286 associations became insignificant after controlling for socio-demographic variables in the
10
11 287 multivariate models, except for suicide in individuals aged from 19-44 years (HR 1.7; 95%
12
13 288 CI: 1.0-3.0). Compared to 'depressive disorder', 'stress-related mental disorders' as main
14
15 289 diagnosis was associated with a lower risk for both suicide attempt and suicide (except for
16
17 290 women and the age group 19-44 years) in both crude and multivariate adjusted models. There
18
19 291 was a significant interaction between age and main diagnosis ($p = 0.017$) regarding suicide.
20
21 292 Individuals aged 45-64 years with a main DP diagnosis of 'stress-related mental disorder' had
22
23 293 a significantly lower risk for committing suicide during the follow up compared to individuals
24
25 294 with 'depressive disorder' as main DP diagnosis (HR 0.4; 95% CI: 0.2-0.6). This association
26
27 295 was not observed in younger individuals.
28
29
30
31

32 296
33
34
35 297 In the univariate models, all analysed groups of mental secondary diagnoses were associated
36
37 298 with a higher risk for subsequent suicide attempt, regardless of sex and age (range of HRs 1.2
38
39 299 to 7.1). These associations remained significant (range of HRs 1.3 to 2.3) in the multivariate
40
41 300 models except the association of 'other mental disorders' as secondary diagnoses with
42
43 301 subsequent suicide attempt in men and the age group 45-64 years. 'Substance abuse disorders'
44
45 302 and 'personality disorders' as secondary diagnosis were associated with higher risks also for
46
47 303 suicide (range of HRs 1.9 to 9.6) in women and both age groups in the crude analyses
48
49 304 compared to their counterparts without a secondary diagnosis. However, in the adjusted
50
51 305 model, only 'substance abuse disorders' predicted suicide among women and younger
52
53 306 individuals (range of HRs 2.6 to 3.3). A statistically significant interaction between sex and
54
55 307 secondary diagnoses ($p=0.029$) in relation to subsequent suicide was found. Women with
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

308 'substance abuse disorder' or 'personality disorder' as secondary DP diagnosis were at a
309 higher risk for subsequent suicide compared to women without a secondary diagnosis. These
310 associations were not observed for men.

311

312 A DP duration of four years or more predicted suicide attempt among women and older
313 individuals (range of HRs 1.2 to 1.4) in the crude models, compared to individuals with a DP
314 duration of one year. These associations were not statistically significant in the adjusted
315 models. In the univariate analyses, full-time DP was associated with a higher risk for suicidal
316 behaviour in all sex and age categories (range of HRs 1.3 to 3.1) compared to individuals on
317 part-time DP. After multivariate adjustment, these associations remained significant (range of
318 HRs 1.4 to 1.7) except for suicide attempt and suicide among men, and suicide in women and
319 younger individuals. Statistically significant interaction was observed between sex and DP
320 grade ($p=0.001$) in relation to subsequent suicide attempt. Women on full-time DP had a
321 higher risk for future suicide attempt compared to women who were on part-time DP. No such
322 association was found for their male counterparts (table 4).

323

324 Discussion

325

326 In this nationwide prospective cohort study of people on DP due to CMD, we explored the
327 risk of suicidal behaviour related to DP diagnoses, duration, and grade. Stress-related mental
328 disorders as the main DP diagnosis was associated with a lower risk of subsequent suicidal
329 behaviour compared to depressive disorders as main DP diagnosis. Moreover, comorbid
330 substance abuse and personality disorders as well as full-time DP were associated with a

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

331 higher risk of suicide attempt and suicide during follow up. Some sex and age differences in
332 these associations emerged.

333

334 To the best of our knowledge, this is the first study to investigate different measures of DP as
335 risk factors for suicidal behaviour in individuals on DP due to CMD. Main strengths of our
336 study are that we have used high quality population-based Swedish nationwide register data
337 (34, 35) and the prospective cohort design with several years of follow up. We included
338 register data from different sources on the whole working age population of Sweden and
339 thereby avoided selection and recall bias. Moreover, there was no loss to follow up and all
340 data are register based, including physician-based diagnoses, that is, not based on self-reports.
341 The study group was large and the statistical power was sufficient even with regard to such
342 infrequent outcomes as suicide attempt and suicide. This study had also the opportunity to
343 include a wide range of potential confounders like educational level, family situation, country
344 of birth, type of living area, and previous health care.

345

346 There are some limitations of the study. In spite of the long follow up, there were only 207
347 suicides, leading to wide CIs. Another limitation is that only the main, and when given, the
348 secondary DP diagnoses could be included. Other diagnoses contributing to the patients' work
349 incapacity were not listed in the MiDAS register. Having such information might have
350 improved the analyses – however, most studies on DP only have access to the main diagnosis.
351 A topic of frequent discussions in this research field is the validity of DP diagnoses. There are
352 no studies on this. A study, conducted in Sweden in 1991, showed high validity of sick-leave
353 diagnoses when compared to diagnoses from medical records (36). Additionally, DP in most
354 cases is preceded by long-term sickness absence and is granted after a long process of medical
355 evaluation and work capacity assessments, as DP benefits are often paid for several years (3).

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 356 Moreover, due to the stigma around mental diagnoses (37, 38), the validity of mental DP
4
5 357 diagnoses can be assumed to be good, meaning that people with a mental DP diagnosis are
6
7 358 likely to have a mental disorder. On the other hand, this also means that some individuals with
8
9 359 mental disorders might not have been given a mental diagnosis as the main DP diagnosis, but
10
11 360 as a secondary diagnosis to a somatic main DP diagnosis. Thus, they would not be included in
12
13 361 this study. This can also be seen as a strength, as our cohort of CMD is more strictly defined
14
15 362 then when using also secondary diagnoses for inclusion, or as a limitation as we do not know
16
17 363 if including them would have affected the results. Further studies are required regarding these
18
19 364 issues. Also, stigma of mental disorders might have led to underreporting of some mental
20
21 365 disorders as secondary diagnoses. The reported secondary diagnoses might therefore reflect
22
23 366 higher medical severity. It should also be mentioned, that we have considered suicide attempts
24
25 367 leading to inpatient care, thus the results mainly are valid for suicide attempts of higher
26
27 368 medical severity. It is also important to keep in mind that DP not only reflects to what extent
28
29 369 the disease affects an individual's work capacity, but also factors at other structural levels
30
31 370 such as possibilities at the labour market, adjustment policies, attitudes, and the economic
32
33 371 situation of a country (39).

372

373 In this study, the risk of subsequent suicidal behaviour related to a main DP diagnosis of
374 anxiety did not differ from that of a main DP diagnosis of depressive disorder, while those
375 with stress-related mental disorders as main DP diagnosis had lower risk for future suicidal
376 behaviour. This is in line with a recent study on diagnosis-specific sickness absence,
377 suggesting higher risk estimates for subsequent suicide among people on sickness absence
378 due to depressive and anxiety disorders than due to stress-related mental disorders, after
379 adjustment for socio-demographic factors (40).

380

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 381 There was a significant interaction with age and main DP diagnoses in relation to suicide.
4
5 382 While there was a significantly lower risk for suicide in the older age group (45-64 years)
6
7 383 with a main DP diagnosis of 'stress-related mental disorders' compared to 'depressive
8
9 384 disorders', this association was not found in the younger individuals. On the other hand,
10
11 385 'anxiety disorders' as main diagnoses were associated with a higher risk of subsequent suicide
12
13 386 in the individuals aged between 19-44 years, compared to the similar age group with main DP
14
15 387 diagnosis as 'depressive disorders' in the multivariate analyses. One likely explanation of
16
17 388 such findings includes age differences in the association of mental disorders with suicide risk
18
19 389 (14, 41). Anxiety disorders often have an early onset, and younger individuals may tend to
20
21 390 have higher impulsivity, which might have contributed to suicidal behaviour (42). Moreover,
22
23 391 early onset anxiety disorders leading to DP might be more difficult to treat and probably
24
25 392 associated with a high degree of comorbidity. Anxiety disorders are highly comorbid with
26
27 393 depressive or personality disorders (14, 15, 43), and might have also contributed to suicidal
28
29 394 behaviour of these young individuals. Early detection and adequate treatment of anxiety
30
31 395 disorders for prevention of suicidal behaviour might be of particular importance (15, 16)
32
33 396 especially for younger individuals. These associations warrant further investigations.
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

397
398 As our analyses showed, any mental DP secondary diagnosis was associated with a higher
399 risk of suicide attempt and suicide compared to those without a secondary diagnosis, which is
400 in line with previous research regarding the general population (14, 44) or individuals with a
401 mental disorder (17, 18, 45). Among the mental secondary diagnoses, particularly substance
402 abuse disorder was a strong predictor of subsequent suicidal behaviour. This is consistent with
403 previous studies showing that substance abuse is a strong risk factor for suicidal behaviour
404 (19, 44, 46).

405

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ **NOT TO BE CITED**

1
2
3 406 A significant interaction was observed between substance abuse as secondary DP diagnosis
4
5 407 and sex in relation to subsequent suicide. Substance abuse might be less prevalent and less
6
7 408 frequently diagnosed in women compared to in men. Therefore, it can be hypothesised that
8
9 409 having such a DP diagnosis might be a reflection of severe medical condition, particularly in
10
11 410 women, which might be a reason for the higher suicide risk (14, 19, 46). It is, therefore,
12
13 411 possible that health consequences of substance abuse disorders might be worse in women
14
15 412 compared to men (47). Moreover, substance abuse disorders may aggravate an existing
16
17 413 comorbid depression, which itself is a risk factor for both substance abuse and suicidal
18
19 414 behaviour and may act as a mediator between substance abuse and suicidal behaviour (47-50).
20
21 415 Personality disorder as secondary diagnosis was strongly associated with a higher risk of
22
23 416 suicide attempt compared to those who did not have any secondary diagnosis. Current
24
25 417 literature suggests that personality disorder, comorbid with depression or by itself, involves a
26
27 418 higher risk of suicide attempt (51, 52).
28
29
30
31
32
33
34

35 420 Full-time DP was associated with a higher risk of suicidal behaviour compared to part-time
36
37 421 DP. This is in line with a previous study reporting a higher risk of suicidal behaviour in case
38
39 422 of full-time compared to part-time sickness absence (53). Full-time DP might here be
40
41 423 associated with a higher severity of the underlying disorder. On the other hand, full-time DP
42
43 424 might be related to an alteration in health behaviour (alcohol consumption, smoking, physical
44
45 425 activity, diet etc.) or to social isolation (8, 54), which might be associated with total exclusion
46
47 426 from the labour market (9). More knowledge is warranted on such associations (8).
48
49
50
51
52
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

429 Statistically significant interaction was observed between sex and DP grade, women with full-
430 time DP had a higher risk for subsequent suicide attempt than women with part-time DP. The
431 proportion of women on part-time DP tends to be much higher compared to among men in
432 Sweden (3). It might be anticipated that if women are granted full-time DP they might have a
433 higher severity of the underlying mental disorder and, therefore, they might have a higher risk
434 of subsequent suicide attempt (53). Further studies are warranted to investigate pathways to
435 suicidal behaviour related to DP grade.

436

437 **Conclusion**

438

439 In this first study of associations between DP due to CMD (using different measures of DP;
440 main and side diagnoses as well as DP grade and duration) with subsequent risk of suicidal
441 behavior among individuals on such DP, some of such associations varied with sex and age.
442 Approaches for intervention in this group of disability pensioners should take the individual
443 variation in risk factors into account.

444

445 **Competing interests:** none.

446 **Authors' contributions:**

447 EMR is responsible for the core idea and all authors contributed in the study design. SR and
448 EMR carried out the data analyses and drafted the manuscripts. SR, KA, JJ, and EMR
449 participated in interpretation of results, critically revised the manuscript for important

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

1
2
3 450 intellectual content, contributed to successive drafts, and agreed on the final. All authors read
4
5 451 and approved the final manuscript.
6
7 452

8
9
10 453 **Acknowledgement:** none.
11
12 454

13 14 15 455 **Data Sharing Statement**

16
17 456 No additional data available.
18
19 457

20
21
22
23 458
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

459 **References**

460

- 461 1. OECD. *Sickness, Disability and Work: Breaking the Barriers. A synthesis of findings across*
462 *OECD countries.* Paris: 2010.
- 463 2. Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health Care (SBU).
464 Chapter 1. Aim, background, key concepts, regulations, and current statistics. *Scandinavian journal of*
465 *public health Supplement.* 2004;63:12-30.
- 466 3. Social Insurance Agency (*försäkringskassan*). *Social Insurance in Figures 2013.* Sweden: The
467 *Social Insurance Agency, 2014* ISBN: 978-91-7500-376-4; ISSN: 2000-1703.
- 468 4. Henderson M, Harvey SB, Overland S, Mykletun A, Hotopf M. Work and common psychiatric
469 disorders. *Journal of the Royal Society of Medicine.* 2011;104(5):198-207.
- 470 5. Mykletun A, Overland S, Dahl AA, Krokstad S, Bjerkset O, Glozier N, et al. A population-
471 based cohort study of the effect of common mental disorders on disability pension awards. *The*
472 *American journal of psychiatry.* 2006;163(8):1412-8.
- 473 6. Järvisalo J, Anderson B, Boedeker W, Houtman I, editors. *Mental disorders as a major*
474 *challenge in prevention of work disability: experiences in Finland, Germany, the Netherlands and*
475 *Sweden.* Helsinki: Kela; 2005.
- 476 7. Kupfer DJ, Frank E, Phillips ML. Major depressive disorder: new clinical, neurobiological, and
477 treatment perspectives. *Lancet.* 2012;379(9820):1045-55.
- 478 8. Vingard E, Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health
479 Care (SBU). Chapter 9. Consequences of being on sick leave. *Scandinavian journal of public health*
480 *Supplement.* 2004;63:207-15.
- 481 9. Waddell G, Burton K. *Is working good for your health and well-being?* . UK: Published by TSO
482 (The Stationery Office) 2006.
- 483 10. Bryngelson A, Asberg M, Nygren A, Jensen I, Mittendorfer-Rutz E. All-Cause and Cause-
484 Specific Mortality after Long-Term Sickness Absence for Psychiatric Disorders: A Prospective Cohort
485 Study. *PloS one.* 2013;8(6):e67887.
- 486 11. Karlsson NE, Carstensen JM, Gjesdal S, Alexanderson KA. Mortality in relation to disability
487 pension: findings from a 12-year prospective population-based cohort study in Sweden. *Scandinavian*
488 *journal of public health.* 2007;35(4):341-7.
- 489 12. Johansson AE, Johansson U. Disability pension and everyday life: a period of transition and
490 subjective aspects of future occupational life. *Work (Reading, Mass).* 2011;40(4):375-84.
- 491 13. Rahman S, Alexanderson K, Jokinen J, Mittendorfer-Rutz E. Risk factors for suicidal behaviour
492 in individuals on disability pension due to common mental disorders - a nationwide register-based
493 prospective cohort study in Sweden. *PloS one.* 2014;9(5):e98497.
- 494 14. Hawton K, van Heeringen K. Suicide. *Lancet.* 2009;373(9672):1372-81.
- 495 15. Fawcett J. The detection and consequences of anxiety in clinical depression. *The Journal of*
496 *clinical psychiatry.* 1997;58 Suppl 8:35-40.
- 497 16. Fawcett J. Targeting treatment in patients with mixed symptoms of anxiety and depression.
498 *The Journal of clinical psychiatry.* 1990;51 Suppl:40-3.
- 499 17. Hawton K, Casanas ICC, Haw C, Saunders K. Risk factors for suicide in individuals with
500 depression: a systematic review. *Journal of affective disorders.* 2013;147(1-3):17-28.
- 501 18. Kanwar A, Malik S, Prokop LJ, Sim LA, Feldstein D, Wang Z, et al. The association between
502 anxiety disorders and suicidal behaviors: a systematic review and meta-analysis. *Depression and*
503 *anxiety.* 2013;30(10):917-29.
- 504 19. Cavanagh JTO, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a
505 systematic review. *Psychological Medicine.* 2003;33(3):395-405.
- 506 20. Crump C, Sundquist K, Sundquist J, Winkleby MA. Sociodemographic, psychiatric and somatic
507 risk factors for suicide: a Swedish national cohort study. *Psychological Medicine.* 2013:1-11.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

- 1
- 2
- 3 508 21. Laaksonen M, Gould R. The effect of municipality characteristics on disability retirement.
- 4 509 European journal of public health. 2014;24(1):116-21.
- 5 510 22. Leinonen T, Martikainen P, Lahelma E. Interrelationships between education, occupational
- 6 511 social class, and income as determinants of disability retirement. Scand J Public Health.
- 7 512 2012;40(2):157-66.
- 8 513 23. Osterberg T, Gustafsson B. Disability pension among immigrants in Sweden. Social science &
- 9 514 medicine (1982). 2006;63(3):805-16.
- 10 515 24. Pompili M, Innamorati M, Szanto K, Di Vittorio C, Conwell Y, Lester D, et al. Life events as
- 11 516 precipitants of suicide attempts among first-time suicide attempters, repeaters, and non-attempters.
- 12 517 Psychiatry research. 2011;186(2-3):300-5.
- 13 518 25. Leinonen T, Martikainen P, Laaksonen M, Lahelma E. Excess mortality after disability
- 14 519 retirement due to mental disorders: variations by socio-demographic factors and causes of death.
- 15 520 Social psychiatry and psychiatric epidemiology. 2013.
- 16 521 26. Bjorkenstam C, Alexanderson K, Bjorkenstam E, Lindholm C, Mittendorfer-Rutz E. Diagnosis-
- 17 522 specific disability pension and risk of all-cause and cause-specific mortality—a cohort study of 4.9
- 18 523 million inhabitants in Sweden. BMC Public Health. 2014;14:1247.
- 19 524 27. Jonsson U, Alexanderson K, Kjeldgard L, Westerlund H, Mittendorfer-Rutz E. Diagnosis-
- 20 525 specific disability pension predicts suicidal behaviour and mortality in young adults: a nationwide
- 21 526 prospective cohort study. BMJ Open. 2013;3(2).
- 22 527 28. WHO. International Statistical Classification of Diseases and Related Health Problems, 10
- 23 528 revision (ICD 10). 2010.
- 24 529 29. Koopmans PC, Bultmann U, Roelen CA, Hoedeman R, van der Klink JJ, Groothoff JW.
- 25 530 Recurrence of sickness absence due to common mental disorders. International Archives of
- 26 531 Occupational and Environmental Health. 2011;84(2):193-201.
- 27 532 30. Deverill C KM. Common Mental Disorders. In: McManus S MH, Brugha T, Bebbington P, R J,
- 28 533 editors. Adult psychiatric morbidity in England. London: The NHS Information Centre for health and
- 29 534 social care; 2009. p. 25-7.
- 30 535 31. Rutz EM, Wasserman D. Trends in adolescent suicide mortality in the WHO European Region.
- 31 536 European child & adolescent psychiatry. 2004;13(5):321-31.
- 32 537 32. Allebeck P, Allgulander C, Henningson L, Jakobsson S. Causes of death in a cohort of 50465
- 33 538 young men—validity of recorded suicide as underlying cause of death. Scandinavian Journal of Social
- 34 539 Medicine. 1991;19:242-47.
- 35 540 33. Mittendorfer-Rutz E, Rasmussen F, Wasserman D. Restricted fetal growth and adverse
- 36 541 maternal psychosocial and socioeconomic conditions as risk factors for suicidal behaviour of
- 37 542 offspring: a cohort study. Lancet. 2004;364(9440):1135-40.
- 38 543 34. Ludvigsson JF, Andersson E, Ekbohm A, Feychting M, Kim JL, Reuterwall C, et al. External
- 39 544 review and validation of the Swedish national inpatient register. BMC Public Health. 2011;11:450.
- 40 545 35. Socialstyrelsen. The Cause of Death register. Stockholm, Sweden: National Board of Health
- 41 546 and Welfare, 2013 August 2013. Report No.: ISSN 1400-3511; ISBN 978-91-7555-090-9; Report no.
- 42 547 2013-8-6.
- 43 548 36. Ljungdahl LO, Bjurulf P. The accordance of diagnoses in a computerized sick-leave register
- 44 549 with doctor's certificates and medical records. Scand J Soc Med. 1991;19(3):148-53.
- 45 550 37. Shrivastava A, Johnston M, Bureau Y. Stigma of Mental Illness-1: Clinical reflections. Mens
- 46 551 sana monographs. 2012;10(1):70-84.
- 47 552 38. Lauber C. Stigma and discrimination against people with mental illness: a critical appraisal.
- 48 553 Epidemiologia e Psichiatria Sociale. 2008;17(1):10-3.
- 49 554 39. Allebeck P, Mastekaasa A. Swedish Council on Technology Assessment in Health Care (SBU).
- 50 555 Chapter 3. Causes of sickness absence: research approaches and explanatory models. Scandinavian
- 51 556 journal of public health Supplement. 2004;63:36-43.
- 52 557 40. Mittendorfer-Rutz E, Kjeldgard L, Runeson B, Perski A, Melchior M, Head J, et al. Sickness
- 53 558 absence due to specific mental diagnoses and all-cause and cause-specific mortality: a cohort study
- 54 559 of 4.9 million inhabitants of Sweden. PloS one. 2012;7(9):e45788.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

- 1
2
3 560 41. Conwell Y, Duberstein PR, Cox C, Herrmann JH, Forbes NT, Caine ED. Relationships of age and
4 561 axis I diagnoses in victims of completed suicide: a psychological autopsy study. *Am J Psychiatry*.
5 562 1996;153(8):1001-8.
6 563 42. McGirr A, Renaud J, Bureau A, Seguin M, Lesage A, Turecki G. Impulsive-aggressive
7 564 behaviours and completed suicide across the life cycle: a predisposition for younger age of suicide.
8 565 *Psychol Med*. 2008;38(3):407-17.
9 566 43. Jylha P, Rosenstrom T, Mantere O, Suominen K, Melartin T, Vuorilehto M, et al. Personality
10 567 disorders and suicide attempts in unipolar and bipolar mood disorders. *Journal of affective disorders*.
11 568 2015;190:632-9.
12 569 44. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts
13 570 in the National Comorbidity Survey. *Archives of general psychiatry*. 1999;56(7):617-26.
14 571 45. Isometsa E. Suicidal behaviour in mood disorders--who, when, and why? *Canadian journal of*
15 572 *psychiatry Revue canadienne de psychiatrie*. 2014;59(3):120-30.
16 573 46. Vijayakumar L, Kumar MS, Vijayakumar V. Substance use and suicide. *Current opinion in*
17 574 *psychiatry*. 2011;24(3):197-202.
18 575 47. Erol A, Karpyak VM. Sex and gender-related differences in alcohol use and its consequences:
19 576 Contemporary knowledge and future research considerations. *Drug Alcohol Depend*. 2015;156:1-13.
20 577 48. Boykoff N, Schneekloth TD, Hall-Flavin D, Loukianova L, Karpyak VM, Stevens SR, et al.
21 578 Gender differences in the relationship between depressive symptoms and cravings in alcoholism. *Am*
22 579 *J Addict*. 2010;19(4):352-6.
23 580 49. Goldstein RB, Dawson DA, Chou SP, Grant BF. Sex differences in prevalence and comorbidity
24 581 of alcohol and drug use disorders: results from wave 2 of the National Epidemiologic Survey on
25 582 Alcohol and Related Conditions. *J Stud Alcohol Drugs*. 2012;73(6):938-50.
26 583 50. Moscato BS, Russell M, Zielezny M, Bromet E, Egri G, Mudar P, et al. Gender differences in
27 584 the relation between depressive symptoms and alcohol problems: a longitudinal perspective. *Am J*
28 585 *Epidemiol*. 1997;146(11):966-74.
29 586 51. Amore M, Innamorati M, Vittorio CD, Weinberg I, Turecki G, Sher L, et al. Suicide attempts in
30 587 major depressed patients with personality disorder. *Suicide & life-threatening behavior*.
31 588 2014;44(2):155-66.
32 589 52. Paris J. Chronic suicidality among patients with borderline personality disorder. *Psychiatric*
33 590 *services (Washington, DC)*. 2002;53(6):738-42.
34 591 53. Ishtiak-Ahmed K, Perski A, Mittendorfer-Rutz E. Predictors of suicidal behaviour in 36,304
35 592 individuals sickness absent due to stress-related mental disorders -- a Swedish register linkage cohort
36 593 study. *BMC Public Health*. 2013;13.
37 594 54. Floderus B, Goransson S, Alexanderson K, Aronsson G. Self-estimated life situation in patients
38 595 on long-term sick leave. *Journal of rehabilitation medicine*. 2005;37(5):291-9.

596

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 1. Descriptive statistics with regard to main and secondary disability pension (DP) diagnoses, duration, and grade of DP in the cohort of 46 515 women and men, aged 19-64 years, living in Sweden on 31.12.2004, and in 2005 on DP due to common mental disorders.

Characteristics	All		Women		Men		Age 19-44 years		Age 45-64 years		P value for difference by Chi ²
	N	%	n	%	n	%	n	%	n	%	
Total	46 515	100	30 883	100	15 632	100	13 931	100	32 584	100	
Main DP diagnosis											
Depressive disorder	22 032	47.4	14 907	48.3	7 125	45.6	5 242	37.6	16 790	51.5	p <0.001
Anxiety disorder	13 516	29.1	8 558	27.7	4 958	31.7	6 007	43.1	7 509	23.0	
Stress-related mental disorder	10 967	23.6	7 418	24.0	3 549	22.7	2 682	19.3	8 285	25.4	
Secondary DP diagnosis											
No side diagnosis	20 042	43.1	13 254	42.9	6 788	43.4	5 217	37.4	14 825	45.5	p <0.001
Substance abuse disorders	950	2.0	378	1.2	572	3.7	344	2.5	606	1.9	
Personality disorders	2 313	5.0	1 294	4.2	1 019	6.5	1 232	8.8	1 081	3.3	
Other mental disorders	12 329	26.5	8 237	26.7	4 092	26.2	4 924	35.3	7 405	22.7	
Musculoskeletal disorders	4 911	10.5	3 716	12.0	1 195	7.6	980	7.0	3 931	12.1	
Other somatic disorders	5 970	12.8	4 004	13.0	1 966	12.6	1 234	8.9	4 736	14.5	
Number of years on DP in 2005											
1 year	5 994	12.5	4 168	13.5	1 826	11.7	2 280	16.4	3 714	11.4	p >0.01
2-3 years	20 846	44.8	14 162	45.9	6 684	42.8	6 726	48.3	14 120	43.3	
≥4 years	19 675	42.3	12 553	40.6	7 122	45.6	4 925	35.4	14 750	45.3	
DP grade in 2005											
Part-time	11 371	24.4	8 651	28.0	2 720	17.4	2 671	19.2	8 700	26.7	p <0.001
Full-time	35 144	75.6	22 232	72.0	12 912	82.6	11 260	80.8	23 884	73.3	

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 2. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (in 2006-10), in 46 515 individuals, aged 19-64 years, living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by sex.

Characteristics	Suicide attempt						Suicide					
	Women			Men			Women			Men		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95%CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	355	34.3	1	139	13.4	1	53	25.6	1	50	24.2	1
Anxiety disorders	278	26.8	1.4 (1.2–1.6)	140	13.5	1.5 (1.1–1.8)	32	15.5	1.1 (0.7-1.6)	47	22.7	1.3 (0.9-2.0)
Stress-related mental disorders	99	9.6	0.6 (0.5-0.7)	25	2.4	0.4 (0.2-0.5)	17	8.2	0.6 (0.4-1.1)	8	3.9	0.3 (0.2-0.7)
Secondary DP diagnosis												
No secondary diagnosis	232	22.4	1	100	9.7	1	34	16.4	1	45	21.7	1
Substance abuse disorders	43	4.2	7.1 (5.1–9.8)	34	3.3	4.3 (2.9–6.3)	9	4.3	9.6 (4.6-20.1)	7	3.4	1.9 (0.9-4.3)
Personality disorders	83	8.0	3.8 (2.9-4.8)	39	3.8	2.7 (1.8-3.8)	12	5.8	3.6 (1.9-7.0)	9	4.4	1.3 (0.7-2.8)
Other mental disorders	253	24.4	1.8 (1.5-2.1)	95	9.2	1.6 (1.2-2.1)	27	13.0	1.3 (0.8-2.1)	29	14.0	1.1 (0.7-1.7)
Musculoskeletal disorders	56	5.4	0.9 (0.6-1.2)	10	1.0	0.6 (0.3-1.1)	<7	2.9	0.6 (0.3-1.5)	<7	2.4	0.6 (0.3-1.6)
Other somatic disorders	65	6.3	0.9 (0.7-1.2)	26	2.5	0.9 (0.6-1.4)	14	6.8	1.4 (0.7-2.5)	10	4.8	0.8 (0.4-1.5)
Number of years on DP in 2005												
1 year	100	13.7	1	42	13.8	1	13	12.7	1	14	13.3	1
2-3 years	308	42.1	0.9 (0.7-1.1)	137	45.1	0.9 (0.6-1.3)	46	45.1	1.0 (0.6-1.9)	51	48.6	1.0 (0.6-1.8)
≥4 years	324	44.3	1.1 (0.9-1.4)	125	41.1	0.8 (0.5-1.1)	43	42.2	1.1 (0.6-2.1)	40	38.1	0.7 (0.4-1.4)
DP grade												
Part-time	84	8.1	1	42	4.1	1	16	7.7	1	10	4.8	1
Full-time	648	62.8	3.1 (2.4-3.8)	262	25.4	1.3 (1.0-1.9)	86	41.6	2.1 (1.2-3.6)	95	45.9	2.0 (1.1-3.9)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 3. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age.

Characteristics	Suicide attempt						Suicide					
	Age 19-44 years			Age 45-64 years			Age 19-44 years			Age 45-64 years		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	217	21.0	1	277	26.7	1	20	9.7	1	83	43.0	1
Anxiety disorders	278	26.8	1.1 (0.9-1.3)	140	13.5	1.1 (0.9-1.4)	44	21.3	1.9 (1.1-3.3)	35	16.9	0.9 (0.6-1.4)
Stress-related mental disorders	62	6.0	0.6 (0.4-0.7)	62	6.0	0.5 (0.3-0.6)	12	5.8	1.2 (0.6-2.4)	13	6.3	0.3 (0.2-0.6)
Secondary DP diagnosis												
No secondary diagnosis	140	13.5	1	192	18.5	1	20	9.7	1	59	28.5	1
Substance abuse disorders	40	3.9	4.7 (3.3-6.7)	37	3.6	5.0 (3.5-7.2)	8	3.9	6.3 (2.8-14.3)	8	3.9	3.5 (1.7-7.3)
Personality disorders	85	8.2	2.6 (2.0-3.5)	37	3.6	2.7 (1.9-3.8)	13	6.3	2.8 (1.4-5.6)	8	3.9	1.9 (1.0-3.9)
Other mental disorders	233	22.5	1.8 (1.5-2.2)	115	11.1	1.2 (1.0-1.5)	30	14.5	1.6 (0.9-2.7)	27	13.0	0.9 (0.6-1.4)
Musculoskeletal disorders	23	2.2	0.9 (0.6-1.4)	43	4.2	0.8 (0.6-1.2)	<7	1.9	1.1 (0.4-3.1)	7	3.4	0.5 (0.2-1.0)
Other somatic disorders	36	3.5	1.1 (0.8-1.6)	55	5.3	0.9 (0.7-1.2)	<7	1.0	0.4 (0.1-1.8)	22	10.6	1.2 (0.7-1.9)
Number of years on DP in 2005												
1 year	95	17.1	1	47	9.8	1	7	9.2	1	20	15.3	1
2-3 years	254	45.6	0.9 (0.7-1.1)	191	39.9	1.1 (0.8-1.5)	39	51.3	1.9 (0.9-4.2)	58	44.3	0.8 (0.5-1.3)
≥4 years	208	37.3	1.0 (0.8-1.3)	241	50.3	1.3 (1.0-1.8)	30	39.5	2.0 (0.9-4.5)	53	40.5	0.7 (0.4-1.1)
DP grade												
Part-time	56	5.4	1	70	6.8	1	7	3.4	1	19	9.2	1
Full-time	501	48.6	2.2 (1.6-2.9)	409	39.6	2.2 (1.7-2.8)	69	33.3	2.4 (1.1-5.1)	112	54.1	2.2 (1.3-3.6)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 4. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by sex[□].

Characteristics	Suicide attempt		Suicide	
	Women	Men	Women	Men
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.0 (0.9-1.2)	1.0 (0.8-1.2)	0.9 (0.6-1.4)	1.3 (0.8-2.0)
Stress-related mental disorders	0.8 (0.6-1.0)	0.6 (0.4-0.9)	0.9 (0.5-1.6)	0.4 (0.2-0.9)
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.1 (1.5-2.9)*	1.6 (1.0-2.4)	3.3 (1.5-7.1)*	0.8 (0.3-1.7)
Personality disorders	1.4 (1.1-1.8)*	1.4 (1.0-2.1)	1.8 (0.9-3.5)	0.9 (0.4-1.8)
Other mental disorders	1.3 (1.1-1.5)*	1.2 (0.9-1.6)	1.1 (0.6-1.8)	0.9 (0.6-1.5)
Musculoskeletal disorders	1.1 (0.8-1.5)	0.7 (0.4-1.4)	0.8 (0.3-2.0)	0.7 (0.3-1.9)
Other somatic disorders	1.1 (0.9-1.5)	1.0 (0.7-1.6)	1.6 (0.9-3.0)	0.8 (0.4-1.7)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.9 (0.7-1.1)	1.0 (0.7-1.4)	1.0 (0.5-1.8)	1.0 (0.6-1.8)
≥ 4 years	1.0 (0.8-1.2)	0.9 (0.6-1.3)	1.0 (0.5-1.8)	0.7 (0.4-1.3)
DP grade				
Part-time	1	1	1	1
Full-time	1.7 (1.4-2.2)*	0.9 (0.6-1.3)	1.5 (0.8-2.6)	1.7 (0.9-3.3)

□Adjusted for: Age, Educational level, Family situation, Country of birth, Type of living area, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 5. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age[□].

Characteristics	Suicide attempt		Suicide	
	Age 19-44 years	Age 45-64 years	Age 19-44 years	Age 45-64 years
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.1 (0.9-1.3)	0.9 (0.8-1.2)	1.7 (1.0-3.0)	0.9 (0.6-1.3)
Stress-related mental disorders	0.8 (0.6-1.1)	0.7 (0.5-0.9)	1.7 (0.8-3.6)	0.4 (0.2-0.8)*
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.3 (1.6-3.3)*	1.5 (1.1-2.2)*	2.6 (1.1-6.1)	1.0 (0.5-2.3)
Personality disorders	1.5 (1.1-2.0)*	1.6 (1.1-2.2)*	1.7 (0.8-3.4)	1.1 (0.5-2.3)
Other mental disorders	1.5 (1.2-1.9)*	1.0 (0.8-1.3)	1.3 (0.8-2.4)	0.8 (0.5-1.3)
Musculoskeletal disorders	1.1 (0.7-1.8)	0.9 (0.7-1.3)	1.7 (0.6-4.9)	0.6 (0.3-1.3)
Other somatic disorders	1.2 (0.8-1.8)	1.1 (0.8-1.4)	0.5 (0.1-2.1)	1.3 (0.8-2.2)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.8 (0.7-1.1)	1.0 (0.7-1.3)	1.8 (0.8-4.0)	0.7 (0.4-1.2)
≥4 years	0.9 (0.7-1.4)	1.0 (0.7-1.4)	1.7 (0.7-3.8)	0.6 (0.3-0.9)
DP grade				
Part-time	1	1	1	1
Full-time	1.4 (1.1-1.9)*	1.5 (1.1-1.9)*	1.3 (0.6-3.0)	1.7 (1.0-2.8)

□Adjusted for: Sex, Educational level, Family situation, Country of birth, Type of living area, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Disability pension (DP) due to common mental disorders (CMD) and subsequent suicidal behaviour; a population-based prospective cohort study	1
		(b) See Abstract	3-4
Introduction			
Background/rationale	2	See Background	5-6
Objectives	3	To examine 1) how different DP measures (main diagnosis, secondary diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these associations with regard to sex and age. See Aim	6
Methods			
Study design	4	Prospective cohort design. See Methods and Materials: Design	7
Setting	5	See Methods and Materials: Design, Risk factors	7, 8, 9
Participants	6	(a) See Methods and Materials: Design, Disability pension, Statistical analyses, Table 1	7, 8, 11
		(b) N/A	
Variables	7	See Methods and Materials: Risk factors, Confounders, Outcome measures	8-10
Data sources/ measurement	8*	See Methods and Materials: Design, Statistical Analyses	7,11
Bias	9	The bias is limited by using a population based study population based on data with nation-wide coverage and information on a large number of confounders. See Methods and Materials: Design	7
Study size	10	See Methods and Materials: Design	7
Quantitative variables	11	See Methods and Materials: Risk factors, Confounders, Outcome measures, Statistical analyses	8-11
Statistical methods	12	(a) Uni- and multivariate hazard ratios and 95% confidence intervals (CI) for the risk factors with regard to suicide attempt and suicide were estimated by Cox proportional hazard regression models, after testing that the proportionate hazard assumption was met. See Methods and Materials: Statistical Analyses	11
		(b) Chi-square statistics were used to test significant sex and age differences in the. See Methods and Materials: Statistical	11

		Analyses	
		(c) Missing values were coded as separate categories. See Methods and Materials: Confounders	10
		(d) There was practically no loss to follow-up	
		(e) Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Materials: Statistical Analyses	11
Results			
Participants	13*	(a) See Methods and Materials: Design, Results, Table 1	7, 12
		(b) This is a register based and population based study with data on individuals on disability pension covering information from the whole country	11
		(c) --	
Descriptive data	14*	(a) See Results, Table 1, Table 2, Table 3	12,13
		(b) Only the confounder 'Education level in years' had missing for 504 (1.1%) individuals and was categorized as a separate category. See Methods and Materials: Confounders	10
		(c) See Results	13
Outcome data	15*	See Methods and Materials: Outcome measures, Results	10, 12-14
Main results	16	(a) See Results, Table 2-5	12-14
		(b) See Table 1 for categories of 'Number of years on DP in 2005'. Analyses were stratified for age, age was dichotomised. See Methods and Materials: Confounders	10
		(c) --	
Other analyses	17	-All analyses were stratified for age and sex. See Table 1-5. -Partial likelihood ratio test was used to test interactions with sex and age. See Methods and Materials: Statistical analyses -Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Material: Statistical analyses	11 11
Discussion			
Key results	18	See Discussion	15
Limitations		See Discussion	16
Interpretation	20	See Discussion, Conclusion	15-19
Generalisability	21	The findings are generalisable to countries with comparable health care and social insurance systems.	

Other information			
Funding	22	See Title page: Financial support	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

For peer review only

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

BMJ Open

Disability pension due to common mental disorders and subsequent suicidal behaviour; a population-based prospective cohort study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2015-010152.R2
Article Type:	Research
Date Submitted by the Author:	26-Jan-2016
Complete List of Authors:	Rahman, Syed; Karolinska Institutet, Clinical Neuroscience; syed rahman, Alexanderson, Kristina; karolinska institutet, Department of Clinical Neuroscience Jokinen, Jussi; Karolinska Institute, Clinical Neuroscience Mittendorfer-Rutz, Ellenor; Karolinska Institutet, Department of Clinical Neuroscience, Division of Insurance Medicine
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Occupational and environmental medicine, Public health, Epidemiology
Keywords:	common mental disorder, suicide, suicide attempt, MENTAL HEALTH, disability pension, Sick leave

SCHOLARONE™
Manuscripts

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 1 Disability pension due to common mental disorders and subsequent suicidal behaviour; a
4 2 population-based prospective cohort study
5 3

6
7 4 Rahman S,^{1*} Alexanderson K,¹ Jokinen J,^{2,3} Mittendorfer-Rutz E.¹
8
9 5

10
11
12 6 ¹ Department of Clinical Neuroscience, Division of Insurance Medicine, Karolinska Institutet,
13
14 7 Stockholm, Sweden.

15
16 8 ² Department of Clinical Neuroscience, Division of Psychiatry, Karolinska Institutet,
17
18 9 Karolinska University Hospital, Stockholm, Sweden.

19
20
21 10 ³ Department of Clinical Sciences, Division of Psychiatry, Umeå University, Umeå, Sweden.
22
23

24 11 Kristina Alexanderson, Professor

25
26 12 Kristina.Alexanderson@ki.se
27

28
29 13 Jussi Jokinen, Professor

30
31 14 Jussi.Jokinen@ki.se
32

33 15 Ellenor Mittendorfer-Rutz, Associate professor

34
35 16 Ellenor.Mittendorfer-Rutz@ki.se
36

37
38 17 *Corresponding author:

39
40
41 18 Syed Ghulam Rahman; MBBS, MMSc

42
43
44 19 Division of Insurance Medicine, Department of Clinical Neuroscience

45
46 20 Karolinska Institutet, SE-171 77 STOCKHOLM, Sweden

47
48
49 21 Tel +46 8-524 832 05

50
51
52 22 Email: syed.rahman@ki.se
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

23 Financial support: Swedish Research Council for Health, Working Life and Welfare, the
24 Swedish Research Council (Project numbers: K2009-61P-21304-04-4; K2009-61X-21305-01-
25 1; K2011-80P-21782-01-4), and the Karolinska Institutet's funding for doctoral students.

26 Abstract (with subheadings): 296 words

27 Main text (with headings and subheadings): 3975 words

28

For peer review only

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 **Abstract**
4
5
6

7 **Objective:** Adverse health outcomes including suicide, among individuals on disability
8 pension (DP) due to mental diagnoses have been reported previously. Nevertheless, the
9 scientific knowledge on possible risk factors for suicidal behavior (suicide attempt and
10 suicide) in this group, such as age, gender, underlying DP diagnoses, comorbidity, DP
11 duration and grade, is surprisingly sparse. This study aimed to investigate the associations of
12 different measures (main and secondary diagnoses, duration, and grade) of DP due to
13 common mental disorders (CMD) with subsequent suicidal behaviour, considering gender and
14 age differences.
15
16
17
18
19
20
21
22
23
24

25 **Design:** Nationwide population-based prospective cohort study based on Swedish national
26 registers.
27
28
29

30 **Methods:** A cohort of 46515 individuals aged from 19-64 years and on DP due to CMD
31 throughout 2005 was followed up for five years. In relation to different measures of DP,
32 univariate and multivariate hazard ratios (HR) and 95% confidence intervals (CI) for suicidal
33 behaviour were estimated by Cox regression. All analyses were stratified by gender and age.
34
35
36
37
38

39 **Results:** During 2006-2010, 1036(2.2%) individuals attempted and 207(0.5%) completed
40 suicide. Multivariate analyses showed that 'stress-related mental disorders' as the main DP
41 diagnosis was associated with a lower risk of subsequent suicidal behavior than 'depressive
42 disorders' (HR range 0.4-0.7). Substance abuse or personality disorders as secondary DP
43 diagnosis predicted suicide attempt in all sub groups (HR range 1.8-4.6) and suicide in
44 women and younger individuals (HR range 2.2-7.7). Fulltime DP was associated with a
45 higher risk of suicide attempt and suicide compared to part-time DP in women (HR range 1.8-
46 2.3).
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80

Conclusions: In this first study of associations between DP due to CMD (using different measures of DP; main and secondary diagnoses as well as DP grade and duration) with subsequent risk of suicidal behavior among individuals on such DP, we found several such associations, and some varied with gender and age.

Keywords: Sick leave, disability pension, mental health, suicide attempt, suicide, common mental disorder

Strengths:

- Nationwide study of the whole population, using high quality data and a large number of variables
- Prospective cohort design with no loss to follow up
- Considered diagnoses were not self-reported, but from the registers and provided by physicians

Limitations:

- For some analyses, few suicide cases
- We have considered suicide attempts leading to inpatient care, thus, the results mainly are valid for suicide attempts of higher medical severity

78 **Background**

79

80 Disability pension (DP) is a major public health issue in many European countries[1, 2] and
81 increasingly so regarding mental DP diagnoses[1, 3-5]. In Sweden in 2012, mental diagnoses
82 accounted for 40% of the DPs granted to individuals aged 30-64 years and for 84% among
83 those aged 19-29 years[3]. The absolute majority of the mental DP diagnoses are common
84 mental disorders (CMD), e.g., depressive, anxiety, or stress-related mental disorders[1, 6].
85 These are diagnoses for which treatment and rehabilitation measures are available; however
86 inactivity, e.g., in terms of long-term or permanent exclusion from the working life due to DP
87 may have adverse effects[7]. DP itself may imply alteration of health behaviour (e.g.,
88 regarding alcohol and tobacco use, exercise, diet) or social isolation[8]. This can be due to
89 lack of ties to the labour market and eventually lack of the potential positive effects of paid
90 work, including social contacts with colleagues, prospects of career and income development,
91 sense of meaning, or even daily routines and structures[9]. Here, individuals who have been
92 on DP for a shorter period might experience less adverse effects of being excluded from the
93 labour market than individuals on DP for longer time[10]. Similarly, part-time DP might be
94 more protective concerning any adverse health or social outcomes than full-time DP[11, 12].

95

96 Adverse health outcomes, including suicide, among disability pensioners, especially among
97 those granted DP early in adult life due to mental diagnoses have been shown previously[8,
98 13]. Still, to date little is known about specific risk factors related to eventual worse outcome
99 in individuals on DP[8], such as suicide attempt or suicide. Suicidal behaviour can be
100 considered as the outmost consequence of mental disorders, particularly of depressive
101 disorders or depression comorbid with anxiety[14-16]. Comorbidity with mental and somatic

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

102 disorders has been shown to be associated with a higher risk of suicidal behaviour in patients
103 with depressive disorders[17-19]. To date, knowledge is lacking regarding associations
104 between DP due to different diagnoses and eventual co-morbidity with subsequent suicidal
105 behaviour.

106
107 There are well documented gender and age differences with regard to both DP and suicidal
108 behaviour[13, 14, 20]. However, there is a lack of studies investigating if gender and age is
109 associated with suicidal behaviour among recipients of DP due to CMD, and across different
110 measures of DP (such as main diagnosis, secondary diagnosis, duration, and grade). Previous
111 studies have found that socio-demographic factors, such as educational level, family situation,
112 country of birth, type of living area, are associated with morbidity (defined as previous
113 suicide attempt or in- or outpatient care due to mental diagnoses) and subsequent suicidal
114 behaviour[14, 17, 21-24]. Additionally, excess mortality including suicide among DP
115 recipients due to mental diagnoses compared to the general population not on DP has been
116 reported[25-27]. Therefore, it is important to consider both these socio-demographic and
117 health factors in analyses of association between DP and subsequent suicidal behaviour.

118

119 **Aim**

120

121 This study aimed to examine 1) how different measures of DP (main diagnosis, secondary
122 diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide
123 attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these
124 associations with regard to gender and age.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 125
4
5
6

126 **Methods and materials**

7
8
9 127
10

128 **Design**

13
14 129
15
16
17

18 130 A nationwide population-based prospective cohort study based on Swedish register data was
19 131 conducted. The cohort comprised all individuals aged 19-64 years, living in Sweden on
20 132 31.12.2004, who were on DP due to CMD (as main DP diagnosis, full- or part-time)
21 133 throughout 2005 (n=48 803). Individuals treated in in- or outpatient health care with
22 134 schizophrenic spectrum or bipolar disorders or having this as a secondary DP diagnosis in
23 135 2001-05 (n=1886) and people on old-age pension during 2005 (n=402) were excluded. The
24 136 final cohort hence included 46 515 individuals. They were followed up for five years (2006-
25 137 2010).
26
27
28
29
30
31
32
33
34
35
36
37

38 138

39 139 Annual data covering 2001 to 2010 were obtained from the following four nationwide
40 140 registers: 1) Longitudinal integration database for health insurance and labour market studies
41 141 (LISA) held by Statistics Sweden: including socio-demographic information on gender, age,
42 142 educational level, type of area of living, country of birth, family situation; 2) Two registers
43 143 held by the National Board of Health and Welfare, namely; (i) National patient register
44 144 including information on date and diagnosis of inpatient and specialised outpatient care, (ii)
45 145 Cause of death register with data on date and cause of death, and 3) Micro-data for analyses
46 146 of social insurance (MiDAS) with information on the date, diagnoses (the main and secondary
47 147 DP diagnoses), duration, and grade of DP from the Social Insurance Agency. Data from these
48
49
50
51
52
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

148 registers were linked at individual level, using the unique personal identification number of all
149 residents in Sweden.

150

151 **The disability pension system in Sweden**

152

153 In 2005, the year of exposure, all residents in Sweden aged 19-64 years, who due to disease or
154 injury had a long-lasting or permanent reduction of their work capacity at least to an extent of
155 25% of ordinary working hours, could be granted temporary or permanent DP from the Social
156 Insurance Agency[3]. In Sweden, DP can be granted for 25, 50, 75, or 100% of ordinary
157 working hours. Since 2003, people aged 19-29 years can be granted temporary DP if the work
158 capacity is reduced for at least one year, also of their disability meant that they could not
159 complete compulsory or upper secondary school in due time[3]. DP amounts up to 65% of
160 lost income, up to a certain level. For those with no previous income, there is a minimum
161 sum.

162

163 **Risk factors**

164

165 **Main and secondary DP diagnoses**

166 All information on DP diagnoses was based on the corresponding codes of the International
167 Classification of Diseases, version 10 (ICD-10)[28]. Information on the main and secondary
168 DP diagnoses was available from MiDAS.

169

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 170 Main DP diagnoses were categorised into: ‘depressive disorders’ including ‘depressive
4
5 171 episode’ (F32) and ‘recurrent depressive disorder’ (F33), ‘anxiety disorders’ comprising
6
7 172 ‘phobic anxiety disorder’ (F40); ‘other anxiety disorder’ (F41); ‘obsessive-compulsive
8
9
10 173 disorder’ (F42); and ‘stress-related mental disorders’ including ‘reaction to severe stress, and
11
12 174 adjustment disorders, acute stress reaction and post-traumatic stress disorder’ (F43)[29, 30].

13
14
15 175

16
17
18 176 Secondary diagnoses were categorized as: ‘No secondary diagnosis’, ‘Substance abuse
19
20 177 disorders’ (F10-F19), ‘Personality disorders’ (F60-F69), ‘Other mental disorders’ (F00-F99
21
22 178 except F10-F19, F60-F69), ‘Musculoskeletal disorders’ (M00-M99), and ‘Other somatic
23
24 179 disorders’(all diagnoses except M00-M99 and F00-F99).

25
26
27 180

28
29
30 181 The excluded bipolar and schizophrenic spectrum disorders included the following ICD-10
31
32 182 codes: F20-F29 and F31.

33
34
35 183

36
37
38 184 **Duration**

39
40
41 185

42
43
44 186 DP duration was calculated by subtracting start date of DP from the end date of exposure
45
46 187 (31.12.2005) in gross days. Thereafter, the days were converted into years and were
47
48 188 categorized into: ‘1 year’, ‘2-3 years’, and ‘ ≥ 4 years’, respectively.

49
50
51 189

52
53
54 190 **Grade**

55
56
57 191

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

192 DP grade was categorized into part- and full-time. Part-time included grade of 25%, 50%, and
193 75%, and full-time was 100%. In case of change of grade, the grade during the exposure year
194 (2005) was considered.

195

196 **Confounders**

197

198 All socio-demographic characteristics were measured at baseline (31.12.2004): age, gender,
199 educational level, family situation, country of birth, and type of area of living. Age was
200 dichotomised into 19-44 and 45-64 years. Educational level was categorized into three groups
201 according to the total number of attended years of education at three levels: 'compulsory (0-9
202 years)', 'upper secondary (10-12 years)', 'university (≥ 13 years)'. Family situation was coded
203 into four groups: 'married/cohabiting with children at home', 'married/cohabiting with no
204 children at home', 'single without children living at home', and 'single with children living at
205 home'. Country of birth included 'Sweden', 'other Nordic countries', 'EU 25 (except Nordic
206 countries)', and 'rest of the world'. Type of area of living was divided into 'big cities',
207 'medium-sized cities', and 'small cities/villages'. Missing values were coded as separate
208 categories.

209 Health care factors, particularly previous suicide attempt, in- and outpatient care due to
210 mental diagnoses were measured from 2001 to 2005 and were dichotomised as 'yes' and 'no'.

211

212 **Outcome measures**

213

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

1
2
3 214 The outcome measure was defined as suicidal behaviour (suicide attempt from the inpatient-
4
5 215 care register and suicide according to the cause of death register) (ICD 10: X60-84 and Y10-
6
7 216 34) during 2006-2010. As suicide attempts and suicides are often underreported or reported as
8
9 217 “undetermined” causes[31, 32], "determined" (X60-84) and “undetermined” (Y10-34)
10
11 218 suicidal behaviour were combined to limit underreporting and to compensate for regional and
12
13 219 temporal variation in ascertainment methods. Combining these two outcome measures is a
14
15 220 common procedure in research on suicidal behaviour[33]. The combined outcome measures
16
17 221 are hereafter called suicide attempt and suicide, respectively, that is, also the undetermined
18
19 222 are included.
20
21
22
23
24
25

26 224 **Statistical analysis**

27
28
29 225
30
31
32 226 Chi-square statistics were used to test significant gender and age differences in the cohort.
33
34 227 Univariate hazard ratios (HR) and 95% confidence intervals (CI) for the risk factors with
35
36 228 regard to suicide attempt and suicide were estimated by Cox proportional hazard regression
37
38 229 models, after testing that the proportionate hazard assumption was met. All individuals were
39
40 230 followed up from 01.01.2006 until the event (suicide attempt; suicide), emigration, death (due
41
42 231 to causes other than X06-84 and Y10-34, in the analyses related to suicide as an outcome), or
43
44 232 end of follow up (31.12.2010), whichever occurred first. The partial likelihood ratio test was
45
46 233 used to test for possible interactions between the exposure variables (main and secondary DP
47
48 234 diagnoses, and duration and grade of DP) and age and gender in relation to the outcome.
49
50 235 Multivariate models were built with adjustment for socio-demographic and healthcare factors
51
52 236 and mutual adjustment for all other covariates. Sensitivity analyses were carried out by
53
54 237 calculating HRs and 95% CIs for all exposure measures in relation to determined and
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

238 undetermined suicide attempt and completed suicide both separately and after combining
239 them. After assuring that these estimates were comparable, the combined variables were
240 introduced into the model. All analyses were stratified by gender and age.

241 All analyses were performed in SPSS v.22.

242

243 **Ethical statement**

244 The project was evaluated and approved by the Regional Ethical Review Board of Stockholm,
245 Sweden.

246

247 **Results**

248

249 Of the 46 515 individuals on DP due to CMD during 2005, the majority (66.4%) were women
250 and 70% were aged between 45-64 years (Table 1). Nearly half of the women (48.3%) had
251 depressive disorders as main DP diagnosis while a large proportion of the men had anxiety
252 disorders as main DP diagnosis (31.7%). Depressive disorders as main DP diagnosis was
253 more common among the older individuals (51.5%) whereas anxiety disorders as main DP
254 diagnosis was more frequent among the younger people (43.1%). The two predominant
255 specific main DP diagnoses for the entire cohort were 'depressive episode' (36.8%) and
256 'stress-related mental disorder' (23.6%) (data not in table).

257

258 In the cohort, nearly half of the individuals did not have any secondary DP diagnosis (43.1%)
259 (Table 1). Substance abuse disorders as secondary diagnosis was more prevalent among men

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

260 and older individuals while personality disorders were more frequent among women and
261 younger individuals ($p<0.001$). The majority of the individuals had full-time DP (75.6%).
262 Part-time DP was more common among women (28%) than men (17.4%) and among older
263 (26.7%) than younger individuals (19.2%) ($p<0.001$).

265 Regarding the covariates, nearly half (47%) of the study population had been to high school,
266 most lived in big or medium sized cities (74%), and 75% were born in Sweden (data not in
267 table). Almost half of them (42%) lived without a partner and without children at home.

269 In the cohort, 1036 (2.2%) individuals were treated in inpatient care due to suicide attempt
270 and 207 (0.5%) committed suicide during the five-year follow up (2006-10) (table 2). Women
271 were somewhat more likely than men to attempt suicide (women: 2.4%, men: 2.0%, $p < 0.01$)
272 while a higher proportion of men completed suicide (women: 0.3%, men: 0.7%. $p < 0.001$).
273 Mean follow-up time for suicide attempt and suicide was 4.85 (standard deviation (SD): 0.70)
274 and 4.91 (SD: 0.52) years, respectively.

276 Table 2 and 3 show univariate HRs and Table 4 and 5 show multivariate HRs for suicide
277 attempt and suicide, stratified by gender and age with regard to main and secondary DP
278 diagnoses as well as duration and grade of DP.

280 In the univariate analyses, 'anxiety disorders' as main diagnosis was associated with a higher
281 risk for suicide attempt in both women and men (range of HRs 1.4 to 1.5) and suicide in the
282 younger age group (HR 1.9; 95% CI: 1.1-3.3) compared to 'depressive disorders' as main

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 283 diagnosis. These associations became insignificant after controlling for socio-demographic
4
5 284 variables in the multivariate models, except for suicide in individuals aged from 19-44 years
6
7 285 (HR 1.7; 95% CI: 1.0-3.0). Compared to 'depressive disorders', 'stress-related mental
8
9 286 disorders' as main diagnosis was associated with a lower risk for both suicide attempt and
10
11 287 suicide (except for women and the age group 19-44 years) in both crude and multivariate
12
13 288 adjusted models. There was a significant interaction between age and main diagnosis
14
15 289 (p=0.017) regarding suicide. Individuals aged 45-64 years with a main DP diagnosis of
16
17 290 'stress-related mental disorders' had a significantly lower risk for committing suicide during
18
19 291 the follow up compared to individuals with 'depressive disorder' as main DP diagnosis (HR
20
21 292 0.4; 95% CI: 0.2-0.6). This association was not observed in younger individuals.
22
23
24
25
26
27

28 294 In the univariate models, all analysed groups of mental secondary diagnoses were associated
29
30 295 with a higher risk for subsequent suicide attempt, regardless of gender and age (range of HRs
31
32 296 1.2 to 7.1). These associations remained significant (range of HRs 1.3 to 2.3) in the
33
34 297 multivariate models, except the association of 'other mental disorders' as secondary diagnosis
35
36 298 with subsequent suicide attempt in men and the age group 45-64 years. 'Substance abuse
37
38 299 disorders' and 'personality disorders' as secondary diagnosis were associated with higher
39
40 300 risks also for suicide (range of HRs 1.9 to 9.6) in women and in both age groups in the crude
41
42 301 analyses compared to their counterparts without a secondary diagnosis. However, in the
43
44 302 adjusted model, only 'substance abuse disorders' predicted suicide among women and
45
46 303 younger individuals (range of HRs 2.6 to 3.3). A statistically significant interaction between
47
48 304 gender and secondary diagnoses (p=0.029) in relation to subsequent suicide was found.
49
50 305 Women with 'substance abuse disorders' or 'personality disorders' as secondary DP diagnosis
51
52 306 were at a higher risk for subsequent suicide compared to women without a secondary
53
54 307 diagnosis. Such associations were not observed for men.
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

308

309 A DP duration of four years or more predicted suicide attempt among women and older
310 individuals (range of HRs 1.2 to 1.4) in the crude models, compared to individuals with a DP
311 duration of one year. These associations were not statistically significant in the adjusted
312 models. In the univariate analyses, full-time DP was associated with a higher risk for suicidal
313 behaviour in both genders and age categories (range of HRs 1.3 to 3.1) compared to
314 individuals on part-time DP. After multivariate adjustment, these associations remained
315 significant (range of HRs 1.4 to 1.7) except for suicide attempt and suicide among men, and
316 suicide in women and younger individuals. Statistically significant interaction was observed
317 between gender and DP grade ($p=0.001$) in relation to subsequent suicide attempt. Women on
318 full-time DP had a higher risk for future suicide attempt compared to women who were on
319 part-time DP. No such association was found for their male counterparts (table 4).

320

321 Discussion

322

323 In this nationwide prospective cohort study of people on DP due to CMD, we explored the
324 risk of suicidal behaviour related to DP diagnoses, duration, and grade. Stress-related mental
325 disorders as the main DP diagnosis was associated with a lower risk of subsequent suicidal
326 behaviour compared to depressive disorders as main DP diagnosis. Moreover, comorbid
327 substance abuse and personality disorders as well as full-time DP were associated with a
328 higher risk of suicide attempt and suicide during follow up. Some gender and age differences
329 in these associations emerged.

330

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 331 To the best of our knowledge, this is the first study to investigate different measures of DP as
4
5 332 risk factors for suicidal behaviour in individuals on DP due to CMD. Main strengths of our
6
7 333 study are that we have used high quality population-based Swedish nationwide register
8
9 334 data[34, 35] and the prospective cohort design with several years of follow up. We included
10
11 335 register data from different sources on the whole working age population of Sweden and
12
13 336 thereby avoided selection and recall bias. Moreover, there was no loss to follow up and all
14
15 337 data were register based, including physician-based diagnoses, that is, not based on self-
16
17 338 reports. The study group was large and the statistical power was sufficient even with regard to
18
19 339 such infrequent outcomes as suicide attempt and suicide. This study had also the opportunity
20
21 340 to include a wide range of potential confounders like educational level, family situation,
22
23 341 country of birth, type of area of living, and previous health care.
24
25
26
27 342

28
29
30 343 There are some limitations of the study. In spite of the long follow up, there were only 207
31
32 344 suicides, leading to wide CIs. Another limitation is that only the main, and when given, the
33
34 345 secondary DP diagnoses, could be included. Other diagnoses contributing to the patients'
35
36 346 work incapacity were not listed in the MiDAS register. Having such information might have
37
38 347 improved the analyses, however, most studies on DP only have access to the main diagnosis.
39
40 348 A topic of frequent discussions in this research field is the validity of DP diagnoses. There are
41
42 349 no studies on this. A study, conducted in Sweden in 1991, showed high validity of sick-leave
43
44 350 diagnoses when compared to diagnoses from medical records[36]. Additionally, DP in most
45
46 351 cases is preceded by long-term sickness absence and is granted after a long process of medical
47
48 352 evaluation and work capacity assessments, as DP benefits are often paid for several years[3].
49
50 353 Moreover, due to the stigma around mental diagnoses[37, 38], the validity of mental DP
51
52 354 diagnoses can be assumed to be good, meaning that people with a mental DP diagnosis are
53
54 355 likely to have a mental disorder. On the other hand, this also means that some individuals with
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

1
2
3 356 mental disorders might not have been given a mental diagnosis as the main DP diagnosis, but
4
5 357 as a secondary diagnosis to a somatic main DP diagnosis. Thus, they would not be included in
6
7 358 this study. This can also be seen as a strength, as our cohort of CMD is more strictly defined
8
9 359 then when using also secondary diagnoses for inclusion, or as a limitation as we do not know
10
11 360 if including them would have affected the results. Further studies are required regarding these
12
13 361 issues.

14
15
16
17 362 Moreover, stigma of mental disorders might have led to underreporting of some mental
18
19 363 disorders as secondary diagnoses. The reported secondary diagnoses might therefore reflect
20
21 364 higher medical severity. It should also be mentioned, that we have considered suicide attempts
22
23 365 leading to inpatient care, thus the results mainly are valid for suicide attempts of higher
24
25 366 medical severity. Additionally, it is important to keep in mind that DP not only reflects to
26
27 367 what extent the disease affects an individual's work capacity, but also factors at other
28
29 368 structural levels such as possibilities and demands at the labour market, adjustment policies,
30
31 369 attitudes, and the economic situation of a country[39]. Such factors may influence not only
32
33 370 the level of DP in a country[39, 40] but also the level of suicidal behaviour[41, 42], which
34
35 371 thus may have affected the results of this study.

36
37
38
39
40 372

41
42 373 In this study, the risk of subsequent suicidal behaviour related to a main DP diagnosis of
43
44 374 anxiety did not differ from that of a main DP diagnosis of depressive disorder, while those
45
46 375 with stress-related mental disorders as main DP diagnosis had a lower risk for future suicidal
47
48 376 behaviour. This is in line with a recent study on diagnosis-specific sickness absence,
49
50 377 suggesting higher risk estimates for subsequent suicide among people on sickness absence
51
52 378 due to depressive and anxiety disorders than due to stress-related mental disorders, after
53
54 379 adjustment for socio-demographic factors[43].
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

380

381 There was a significant interaction with age and main DP diagnoses in relation to suicide.

382 While there was a significantly lower risk for suicide in the older age group (45-64 years)

383 with a main DP diagnosis of 'stress-related mental disorders' compared to 'depressive

384 disorders', this association was not found in the younger individuals. On the other hand,

385 'anxiety disorders' as main diagnoses were associated with a higher risk of subsequent suicide

386 in the individuals aged 19-44 years, compared to the similar age group with main DP

387 diagnosis as 'depressive disorders' in the multivariate analyses. One likely explanation of

388 such findings includes age differences in the association of mental disorders with suicide risk

389 [14, 44]. Anxiety disorders often have an early onset, and younger individuals may tend to

390 have higher impulsivity, which might have contributed to suicidal behaviour[45]. Moreover,

391 early onset anxiety disorders leading to DP might be more difficult to treat and probably are

392 associated with a high degree of comorbidity. Anxiety disorders are highly comorbid with

393 depressive or personality disorders[14, 15, 46], and also might have contributed to suicidal

394 behaviour among these young individuals. Early detection and adequate treatment of anxiety

395 disorders for prevention of suicidal behaviour might be of particular importance[15, 16]

396 especially in younger individuals. These associations warrant further investigations.

397

398 Our analyses showed that having a mental secondary DP diagnosis was associated with a

399 higher risk of suicide attempt and suicide compared to not having a secondary diagnosis. This

400 is in line with previous research regarding the general population[14, 47] or individuals with a

401 diagnosed mental disorder[17, 18, 48]. Moreover, we found that substance abuse disorder was

402 the strongest predictor of subsequent suicide attempt. These findings are consistent with

403 previous studies showing that substance abuse is a strong risk factor for suicidal

404 behaviour[19, 47, 49].

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

1
2
3 405 A significant interaction was observed between gender and substance abuse as secondary DP
4
5 406 diagnosis in relation to subsequent suicide. Substance abuse might be less prevalent and less
6
7 407 frequently diagnosed in women compared to in men. Therefore, it can be hypothesised that
8
9 408 having such a DP diagnosis might be a reflection of a severe medical condition, particularly in
10
11 409 women, which in turn might be a reason for their higher suicide risk[14, 19, 49]. It is,
12
13 410 therefore, possible that health consequences of substance abuse disorders might be worse in
14
15 411 women compared to men[50]. Moreover, substance abuse disorders may aggravate an existing
16
17 412 comorbid depression, which itself is a risk factor for suicidal behaviour [50-53].
18
19
20

21 413 Personality disorder as secondary DP diagnosis was strongly associated with a higher risk of
22
23 414 suicide attempt compared to those who did not have any secondary DP diagnosis. Current
24
25 415 literature suggests that personality disorder, comorbid with depression or by itself, involves a
26
27 416 higher risk of suicide attempt[54, 55].
28
29
30

31 417
32
33 418 Full-time DP was associated with a higher risk of suicidal behaviour compared to part-time
34
35 419 DP. This is in line with a previous study reporting a higher risk of suicidal behaviour
36
37 420 concerning full-time compared to part-time sickness absence[56]. Full-time DP might here be
38
39 421 associated with a higher severity of the underlying disorder. On the other hand, full-time DP
40
41 422 might be related to an alteration in health behaviour (regarding alcohol consumption,
42
43 423 smoking, physical activity, diet, etc.) or to social isolation[8, 57], which might be associated
44
45 424 with total exclusion from the labour market [9]. More knowledge is warranted on such
46
47 425 associations[8].
48
49
50

51 426
52
53
54

55 427
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 428 Statistically significant interaction was observed between gender and DP grade, women with
4
5 429 full-time DP had a higher risk for subsequent suicide attempt than women with part-time DP.
6
7 430 The proportion of women on part-time DP tends to be much higher compared to among men
8
9 431 in Sweden [3]. It might be anticipated that if women are granted full-time DP they might have
10
11 432 a higher severity of the underlying mental disorder and, therefore, they might have a higher
12
13 433 risk of subsequent suicide attempt[56]. Further studies are warranted to investigate pathways
14
15 434 to suicidal behaviour related to DP grade.
16
17
18
19 435

436 **Conclusion**

20
21
22
23
24
25
26 437
27
28
29 438 This first study of associations between measures of DP due to CMD with subsequent risk of
30
31 439 suicidal behavior among individuals on such DP found several such associations. In general,
32
33 440 depressive disorders as main and substance use or personality disorder as secondary DP
34
35 441 diagnosis were risk markers for subsequent suicidal behaviour in such individuals. Some
36
37 442 gender and age differences in these associations emerged. Approaches for intervention in this
38
39 443 group of disability pensioners should, therefore, consider the individual variation in risk
40
41 444 factors with regard to gender and age. Particular attention should be given to younger
42
43 445 individuals on DP due to anxiety disorders due to subsequent risk of suicide.
44
45
46
47
48 446

49
50
51 447 **Competing interests:** none.

52
53
54 448 **Authors' contributions:**

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 449 EMR is responsible for the core idea and all authors contributed in the study design. SR and
4
5 450 EMR carried out the data analyses and drafted the manuscripts. SR, KA, JJ, and EMR
6
7 451 participated in interpretation of results, critically revised the manuscript for important
8
9 452 intellectual content, contributed to successive drafts, and agreed on the final version. All
10
11 453 authors read and approved the final manuscript.
12
13
14 454

15
16
17 455 **Acknowledgement:** none.
18
19 456

20
21 457 **Data Sharing Statement**
22
23

24 458 No additional data available.
25
26 459
27
28
29 460
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

References

1. Sickness, Disability and Work: Breaking the Barriers. A synthesis of findings across OECD countries. Paris: OECD, 2010 ISBN 978-92-64-08884-9; ISBN 978-92-64-08885-6.
2. Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 1. Aim, background, key concepts, regulations, and current statistics. Scandinavian journal of public health Supplement. 2004;63:12-30.
3. Social Insurance Agency (*försäkringskassan*). Social Insurance in Figures 2013. Sweden: The Social Insurance Agency, 2014 ISBN: 978-91-7500-376-4; ISSN: 2000-1703.
4. Henderson M, Harvey SB, Overland S, Mykletun A, Hotopf M. Work and common psychiatric disorders. Journal of the Royal Society of Medicine. 2011;104(5):198-207.
5. Mykletun A, Overland S, Dahl AA, Krokstad S, Bjerkset O, Glozier N, et al. A population-based cohort study of the effect of common mental disorders on disability pension awards. The American journal of psychiatry. 2006;163(8):1412-8.
6. Järvisalo J, Anderson B, Boedeker W, Houtman I, editors. Mental disorders as a major challenge in prevention of work disability: experiences in Finland, Germany, the Netherlands and Sweden. Helsinki: Kela; 2005.
7. Kupfer DJ, Frank E, Phillips ML. Major depressive disorder: new clinical, neurobiological, and treatment perspectives. Lancet. 2012;379(9820):1045-55.
8. Vingard E, Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 9. Consequences of being on sick leave. Scandinavian journal of public health Supplement. 2004;63:207-15.
9. Waddell G, Burton K. Is working good for your health and well-being? . UK: Published by TSO (The Stationery Office) 2006.
10. Bryngelson A, Asberg M, Nygren A, Jensen I, Mittendorfer-Rutz E. All-Cause and Cause-Specific Mortality after Long-Term Sickness Absence for Psychiatric Disorders: A Prospective Cohort Study. PloS one. 2013;8(6):e67887.
11. Karlsson NE, Carstensen JM, Gjesdal S, Alexanderson KA. Mortality in relation to disability pension: findings from a 12-year prospective population-based cohort study in Sweden. Scandinavian journal of public health. 2007;35(4):341-7.
12. Johansson AE, Johansson U. Disability pension and everyday life: a period of transition and subjective aspects of future occupational life. Work (Reading, Mass). 2011;40(4):375-84.
13. Rahman S, Alexanderson K, Jokinen J, Mittendorfer-Rutz E. Risk factors for suicidal behaviour in individuals on disability pension due to common mental disorders - a nationwide register-based prospective cohort study in Sweden. PloS one. 2014;9(5):e98497.
14. Hawton K, van Heeringen K. Suicide. Lancet. 2009;373(9672):1372-81.
15. Fawcett J. The detection and consequences of anxiety in clinical depression. The Journal of clinical psychiatry. 1997;58 Suppl 8:35-40.
16. Fawcett J. Targeting treatment in patients with mixed symptoms of anxiety and depression. The Journal of clinical psychiatry. 1990;51 Suppl:40-3.
17. Hawton K, Casanas ICC, Haw C, Saunders K. Risk factors for suicide in individuals with depression: a systematic review. Journal of affective disorders. 2013;147(1-3):17-28.
18. Kanwar A, Malik S, Prokop LJ, Sim LA, Feldstein D, Wang Z, et al. The association between anxiety disorders and suicidal behaviors: a systematic review and meta-analysis. Depression and anxiety. 2013;30(10):917-29.
19. Cavanagh JTO, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. Psychological Medicine. 2003;33(3):395-405.
20. Crump C, Sundquist K, Sundquist J, Winkleby MA. Sociodemographic, psychiatric and somatic risk factors for suicide: a Swedish national cohort study. Psychological Medicine. 2013:1-11.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

- 1
- 2
- 3 510 21. Laaksonen M, Gould R. The effect of municipality characteristics on disability retirement.
- 4 511 European journal of public health. 2014;24(1):116-21.
- 5 512 22. Leinonen T, Martikainen P, Lahelma E. Interrelationships between education, occupational
- 6 513 social class, and income as determinants of disability retirement. Scand J Public Health.
- 7 514 2012;40(2):157-66.
- 8 515 23. Osterberg T, Gustafsson B. Disability pension among immigrants in Sweden. Social science &
- 9 516 medicine (1982). 2006;63(3):805-16.
- 10 517 24. Pompili M, Innamorati M, Szanto K, Di Vittorio C, Conwell Y, Lester D, et al. Life events as
- 11 518 precipitants of suicide attempts among first-time suicide attempters, repeaters, and non-attempters.
- 12 519 Psychiatry research. 2011;186(2-3):300-5.
- 13 520 25. Leinonen T, Martikainen P, Laaksonen M, Lahelma E. Excess mortality after disability
- 14 521 retirement due to mental disorders: variations by socio-demographic factors and causes of death.
- 15 522 Social psychiatry and psychiatric epidemiology. 2013.
- 16 523 26. Bjorkenstam C, Alexanderson K, Bjorkenstam E, Lindholm C, Mittendorfer-Rutz E. Diagnosis-
- 17 524 specific disability pension and risk of all-cause and cause-specific mortality—a cohort study of 4.9
- 18 525 million inhabitants in Sweden. BMC Public Health. 2014;14:1247.
- 19 526 27. Jonsson U, Alexanderson K, Kjeldgard L, Westerlund H, Mittendorfer-Rutz E. Diagnosis-
- 20 527 specific disability pension predicts suicidal behaviour and mortality in young adults: a nationwide
- 21 528 prospective cohort study. BMJ Open. 2013;3(2).
- 22 529 28. WHO. International Statistical Classification of Diseases and Related Health Problems, 10
- 23 530 revision (ICD 10). 2010.
- 24 531 29. Koopmans PC, Bultmann U, Roelen CA, Hoedeman R, van der Klink JJ, Groothoff JW.
- 25 532 Recurrence of sickness absence due to common mental disorders. International Archives of
- 26 533 Occupational and Environmental Health. 2011;84(2):193-201.
- 27 534 30. Deverill C KM. Common Mental Disorders. In: McManus S MH, Brugha T, Bebbington P, R J,
- 28 535 editors. Adult psychiatric morbidity in England. London: The NHS Information Centre for health and
- 29 536 social care; 2009. p. 25-7.
- 30 537 31. Rutz EM, Wasserman D. Trends in adolescent suicide mortality in the WHO European Region.
- 31 538 European child & adolescent psychiatry. 2004;13(5):321-31.
- 32 539 32. Allebeck P, Allgulander C, Henningsohn L, Jakobsson S. Causes of death in a cohort of 50465
- 33 540 young men—validity of recorded suicide as underlying cause of death. Scandinavian Journal of Social
- 34 541 Medicine. 1991;19:242-47.
- 35 542 33. Mittendorfer-Rutz E, Rasmussen F, Wasserman D. Restricted fetal growth and adverse
- 36 543 maternal psychosocial and socioeconomic conditions as risk factors for suicidal behaviour of
- 37 544 offspring: a cohort study. Lancet. 2004;364(9440):1135-40.
- 38 545 34. Ludvigsson JF, Andersson E, Ekblom A, Feychting M, Kim JL, Reuterwall C, et al. External
- 39 546 review and validation of the Swedish national inpatient register. BMC Public Health. 2011;11:450.
- 40 547 35. Socialstyrelsen. The Cause of Death register. Stockholm, Sweden: National Board of Health
- 41 548 and Welfare, 2013 August 2013. Report No.: ISSN 1400-3511; ISBN 978-91-7555-090-9; Report no.
- 42 549 2013-8-6.
- 43 550 36. Ljungdahl LO, Bjurulf P. The accordance of diagnoses in a computerized sick-leave register
- 44 551 with doctor's certificates and medical records. Scand J Soc Med. 1991;19(3):148-53.
- 45 552 37. Shrivastava A, Johnston M, Bureau Y. Stigma of Mental Illness-1: Clinical reflections. Mens
- 46 553 sana monographs. 2012;10(1):70-84.
- 47 554 38. Lauber C. Stigma and discrimination against people with mental illness: a critical appraisal.
- 48 555 Epidemiologia e Psichiatria Sociale. 2008;17(1):10-3.
- 49 556 39. Allebeck P, Mastekaasa A. Swedish Council on Technology Assessment in Health Care (SBU).
- 50 557 Chapter 3. Causes of sickness absence: research approaches and explanatory models. Scandinavian
- 51 558 journal of public health Supplement. 2004;63:36-43.
- 52 559 40. Gustafsson K, Aronsson G, Marklund S, Wikman A, Floderus B. Peripheral labour market
- 53 560 position and risk of disability pension: a prospective population-based study. BMJ Open.
- 54 561 2014;4(8):e005230.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

- 562 41. Turecki G, Brent DA. Suicide and suicidal behaviour. *Lancet*. 2015.
- 563 42. Haw C, Hawton K, Gunnell D, Platt S. Economic recession and suicidal behaviour: Possible
564 mechanisms and ameliorating factors. *The International journal of social psychiatry*. 2015;61(1):73-
565 81.
- 566 43. Mittendorfer-Rutz E, Kjeldgard L, Runeson B, Perski A, Melchior M, Head J, et al. Sickness
567 absence due to specific mental diagnoses and all-cause and cause-specific mortality: a cohort study
568 of 4.9 million inhabitants of Sweden. *PLoS one*. 2012;7(9):e45788.
- 569 44. Conwell Y, Duberstein PR, Cox C, Herrmann JH, Forbes NT, Caine ED. Relationships of age and
570 axis I diagnoses in victims of completed suicide: a psychological autopsy study. *Am J Psychiatry*.
571 1996;153(8):1001-8.
- 572 45. McGirr A, Renaud J, Bureau A, Seguin M, Lesage A, Turecki G. Impulsive-aggressive
573 behaviours and completed suicide across the life cycle: a predisposition for younger age of suicide.
574 *Psychol Med*. 2008;38(3):407-17.
- 575 46. Jylha P, Rosenstrom T, Mantere O, Suominen K, Melartin T, Vuorilehto M, et al. Personality
576 disorders and suicide attempts in unipolar and bipolar mood disorders. *Journal of affective disorders*.
577 2015;190:632-9.
- 578 47. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts
579 in the National Comorbidity Survey. *Archives of general psychiatry*. 1999;56(7):617-26.
- 580 48. Isometsa E. Suicidal behaviour in mood disorders--who, when, and why? *Canadian journal of*
581 *psychiatry Revue canadienne de psychiatrie*. 2014;59(3):120-30.
- 582 49. Vijayakumar L, Kumar MS, Vijayakumar V. Substance use and suicide. *Current opinion in*
583 *psychiatry*. 2011;24(3):197-202.
- 584 50. Erol A, Karpyak VM. Sex and gender-related differences in alcohol use and its consequences:
585 Contemporary knowledge and future research considerations. *Drug Alcohol Depend*. 2015;156:1-13.
- 586 51. Boykoff N, Schneekloth TD, Hall-Flavin D, Loukianova L, Karpyak VM, Stevens SR, et al.
587 Gender differences in the relationship between depressive symptoms and cravings in alcoholism. *Am*
588 *J Addict*. 2010;19(4):352-6.
- 589 52. Goldstein RB, Dawson DA, Chou SP, Grant BF. Sex differences in prevalence and comorbidity
590 of alcohol and drug use disorders: results from wave 2 of the National Epidemiologic Survey on
591 Alcohol and Related Conditions. *J Stud Alcohol Drugs*. 2012;73(6):938-50.
- 592 53. Moscato BS, Russell M, Zielezny M, Bromet E, Egri G, Mudar P, et al. Gender differences in
593 the relation between depressive symptoms and alcohol problems: a longitudinal perspective. *Am J*
594 *Epidemiol*. 1997;146(11):966-74.
- 595 54. Amore M, Innamorati M, Vittorio CD, Weinberg I, Turecki G, Sher L, et al. Suicide attempts in
596 major depressed patients with personality disorder. *Suicide & life-threatening behavior*.
597 2014;44(2):155-66.
- 598 55. Paris J. Chronic suicidality among patients with borderline personality disorder. *Psychiatric*
599 *services (Washington, DC)*. 2002;53(6):738-42.
- 600 56. Ishtiak-Ahmed K, Perski A, Mittendorfer-Rutz E. Predictors of suicidal behaviour in 36,304
601 individuals sickness absent due to stress-related mental disorders -- a Swedish register linkage cohort
602 study. *BMC Public Health*. 2013;13.
- 603 57. Floderus B, Goransson S, Alexanderson K, Aronsson G. Self-estimated life situation in patients
604 on long-term sick leave. *Journal of rehabilitation medicine*. 2005;37(5):291-9.

605

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 1. Descriptive statistics with regard to main and secondary disability pension (DP) diagnoses, duration, and grade of DP in the cohort of 46 515 women and men, aged 19-64 years, living in Sweden on 31.12.2004, and in 2005 on DP due to common mental disorders.

Characteristics	All		Women		Men		Age 19-44 years		Age 45-64 years		P value for difference by Chi ²
	N	%	n	%	n	%	n	%	n	%	
Total	46 515	100	30 883	100	15 632	100	13 931	100	32 584	100	
Main DP diagnosis											
Depressive disorders	22 032	47.4	14 907	48.3	7 125	45.6	5 242	37.6	16 790	51.5	p <0.001
Anxiety disorders	13 516	29.1	8 558	27.7	4 958	31.7	6 007	43.1	7 509	23.0	
Stress-related mental disorders	10 967	23.6	7 418	24.0	3 549	22.7	2 682	19.3	8 285	25.4	
Secondary DP diagnosis											
No secondary diagnosis	20 042	43.1	13 254	42.9	6 788	43.4	5 217	37.4	14 825	45.5	p <0.001
Substance abuse disorders	950	2.0	378	1.2	572	3.7	344	2.5	606	1.9	
Personality disorders	2 313	5.0	1 294	4.2	1 019	6.5	1 232	8.8	1 081	3.3	
Other mental disorders	12 329	26.5	8 237	26.7	4 092	26.2	4 924	35.3	7 405	22.7	
Musculoskeletal disorders	4 911	10.5	3 716	12.0	1 195	7.6	980	7.0	3 931	12.1	
Other somatic disorders	5 970	12.8	4 004	13.0	1 966	12.6	1 234	8.9	4 736	14.5	
Number of years on DP in 2005											
1 year	5 994	12.5	4 168	13.5	1 826	11.7	2 280	16.4	3 714	11.4	p >0.01
2-3 years	20 846	44.8	14 162	45.9	6 684	42.8	6 726	48.3	14 120	43.3	
≥4 years	19 675	42.3	12 553	40.6	7 122	45.6	4 925	35.4	14 750	45.3	
DP grade in 2005											
Part-time	11 371	24.4	8 651	28.0	2 720	17.4	2 671	19.2	8 700	26.7	p <0.001
Full-time	35 144	75.6	22 232	72.0	12 912	82.6	11 260	80.8	23 884	73.3	

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 2. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (in 2006-10), in 46 515 individuals, aged 19-64 years, living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by gender.

Characteristics	Suicide attempt						Suicide					
	Women			Men			Women			Men		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95%CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	355	34.3	1	139	13.4	1	53	25.6	1	50	24.2	1
Anxiety disorders	278	26.8	1.4 (1.2-1.6)	140	13.5	1.5 (1.1-1.8)	32	15.5	1.1 (0.7-1.6)	47	22.7	1.3 (0.9-2.0)
Stress-related mental disorders	99	9.6	0.6 (0.5-0.7)	25	2.4	0.4 (0.2-0.5)	17	8.2	0.6 (0.4-1.1)	8	3.9	0.3 (0.2-0.7)
Secondary DP diagnosis												
No secondary diagnosis	232	22.4	1	100	9.7	1	34	16.4	1	45	21.7	1
Substance abuse disorders	43	4.2	7.1 (5.1-9.8)	34	3.3	4.3 (2.9-6.3)	9	4.3	9.6 (4.6-20.1)	7	3.4	1.9 (0.9-4.3)
Personality disorders	83	8.0	3.8 (2.9-4.8)	39	3.8	2.7 (1.8-3.8)	12	5.8	3.6 (1.9-7.0)	9	4.4	1.3 (0.7-2.8)
Other mental disorders	253	24.4	1.8 (1.5-2.1)	95	9.2	1.6 (1.2-2.1)	27	13.0	1.3 (0.8-2.1)	29	14.0	1.1 (0.7-1.7)
Musculoskeletal disorders	56	5.4	0.9 (0.6-1.2)	10	1.0	0.6 (0.3-1.1)	<7	2.9	0.6 (0.3-1.5)	<7	2.4	0.6 (0.3-1.6)
Other somatic disorders	65	6.3	0.9 (0.7-1.2)	26	2.5	0.9 (0.6-1.4)	14	6.8	1.4 (0.7-2.5)	10	4.8	0.8 (0.4-1.5)
Number of years on DP in 2005												
1 year	100	13.7	1	42	13.8	1	13	12.7	1	14	13.3	1
2-3 years	308	42.1	0.9 (0.7-1.1)	137	45.1	0.9 (0.6-1.3)	46	45.1	1.0 (0.6-1.9)	51	48.6	1.0 (0.6-1.8)
≥4 years	324	44.3	1.1 (0.9-1.4)	125	41.1	0.8 (0.5-1.1)	43	42.2	1.1 (0.6-2.1)	40	38.1	0.7 (0.4-1.4)
DP grade												
Part-time	84	8.1	1	42	4.1	1	16	7.7	1	10	4.8	1
Full-time	648	62.8	3.1 (2.4-3.8)	262	25.4	1.3 (1.0-1.9)	86	41.6	2.1 (1.2-3.6)	95	45.9	2.0 (1.1-3.9)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 3. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age.

Characteristics	Suicide attempt						Suicide					
	Age 19-44 years			Age 45-64 years			Age 19-44 years			Age 45-64 years		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	217	21.0	1	277	26.7	1	20	9.7	1	83	43.0	1
Anxiety disorders	278	26.8	1.1 (0.9-1.3)	140	13.5	1.1 (0.9-1.4)	44	21.3	1.9 (1.1-3.3)	35	16.9	0.9 (0.6-1.4)
Stress-related mental disorders	62	6.0	0.6 (0.4-0.7)	62	6.0	0.5 (0.3-0.6)	12	5.8	1.2 (0.6-2.4)	13	6.3	0.3 (0.2-0.6)
Secondary DP diagnosis												
No secondary diagnosis	140	13.5	1	192	18.5	1	20	9.7	1	59	28.5	1
Substance abuse disorders	40	3.9	4.7 (3.3-6.7)	37	3.6	5.0 (3.5-7.2)	8	3.9	6.3 (2.8-14.3)	8	3.9	3.5 (1.7-7.3)
Personality disorders	85	8.2	2.6 (2.0-3.5)	37	3.6	2.7 (1.9-3.8)	13	6.3	2.8 (1.4-5.6)	8	3.9	1.9 (1.0-3.9)
Other mental disorders	233	22.5	1.8 (1.5-2.2)	115	11.1	1.2 (1.0-1.5)	30	14.5	1.6 (0.9-2.7)	27	13.0	0.9 (0.6-1.4)
Musculoskeletal disorders	23	2.2	0.9 (0.6-1.4)	43	4.2	0.8 (0.6-1.2)	<7	1.9	1.1 (0.4-3.1)	7	3.4	0.5 (0.2-1.0)
Other somatic disorders	36	3.5	1.1 (0.8-1.6)	55	5.3	0.9 (0.7-1.2)	<7	1.0	0.4 (0.1-1.8)	22	10.6	1.2 (0.7-1.9)
Number of years on DP in 2005												
1 year	95	17.1	1	47	9.8	1	7	9.2	1	20	15.3	1
2-3 years	254	45.6	0.9 (0.7-1.1)	191	39.9	1.1 (0.8-1.5)	39	51.3	1.9 (0.9-4.2)	58	44.3	0.8 (0.5-1.3)
≥4 years	208	37.3	1.0 (0.8-1.3)	241	50.3	1.3 (1.0-1.8)	30	39.5	2.0 (0.9-4.5)	53	40.5	0.7 (0.4-1.1)
DP grade												
Part-time	56	5.4	1	70	6.8	1	7	3.4	1	19	9.2	1
Full-time	501	48.6	2.2 (1.6-2.9)	409	39.6	2.2 (1.7-2.8)	69	33.3	2.4 (1.1-5.1)	112	54.1	2.2 (1.3-3.6)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 4. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by gender[□].

Characteristics	Suicide attempt		Suicide	
	Women	Men	Women	Men
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.0 (0.9-1.2)	1.0 (0.8-1.2)	0.9 (0.6-1.4)	1.3 (0.8-2.0)
Stress-related mental disorders	0.8 (0.6-1.0)	0.6 (0.4-0.9)	0.9 (0.5-1.6)	0.4 (0.2-0.9)
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.1 (1.5-2.9)*	1.6 (1.0-2.4)	3.3 (1.5-7.1)*	0.8 (0.3-1.7)
Personality disorders	1.4 (1.1-1.8)*	1.4 (1.0-2.1)	1.8 (0.9-3.5)	0.9 (0.4-1.8)
Other mental disorders	1.3 (1.1-1.5)*	1.2 (0.9-1.6)	1.1 (0.6-1.8)	0.9 (0.6-1.5)
Musculoskeletal disorders	1.1 (0.8-1.5)	0.7 (0.4-1.4)	0.8 (0.3-2.0)	0.7 (0.3-1.9)
Other somatic disorders	1.1 (0.9-1.5)	1.0 (0.7-1.6)	1.6 (0.9-3.0)	0.8 (0.4-1.7)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.9 (0.7-1.1)	1.0 (0.7-1.4)	1.0 (0.5-1.8)	1.0 (0.6-1.8)
≥ 4 years	1.0 (0.8-1.2)	0.9 (0.6-1.3)	1.0 (0.5-1.8)	0.7 (0.4-1.3)
DP grade				
Part-time	1	1	1	1
Full-time	1.7 (1.4-2.2)*	0.9 (0.6-1.3)	1.5 (0.8-2.6)	1.7 (0.9-3.3)

□Adjusted for: Age, Educational level, Family situation, Country of birth, Type of living area, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 5. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age[□].

Characteristics	Suicide attempt		Suicide	
	Age 19-44 years	Age 45-64 years	Age 19-44 years	Age 45-64 years
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.1 (0.9-1.3)	0.9 (0.8-1.2)	1.7 (1.0-3.0)	0.9 (0.6-1.3)
Stress-related mental disorders	0.8 (0.6-1.1)	0.7 (0.5-0.9)	1.7 (0.8-3.6)	0.4 (0.2-0.8)*
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.3 (1.6-3.3)*	1.5 (1.1-2.2)*	2.6 (1.1-6.1)	1.0 (0.5-2.3)
Personality disorders	1.5 (1.1-2.0)*	1.6 (1.1-2.2)*	1.7 (0.8-3.4)	1.1 (0.5-2.3)
Other mental disorders	1.5 (1.2-1.9)*	1.0 (0.8-1.3)	1.3 (0.8-2.4)	0.8 (0.5-1.3)
Musculoskeletal disorders	1.1 (0.7-1.8)	0.9 (0.7-1.3)	1.7 (0.6-4.9)	0.6 (0.3-1.3)
Other somatic disorders	1.2 (0.8-1.8)	1.1 (0.8-1.4)	0.5 (0.1-2.1)	1.3 (0.8-2.2)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.8 (0.7-1.1)	1.0 (0.7-1.3)	1.8 (0.8-4.0)	0.7 (0.4-1.2)
≥4 years	0.9 (0.7-1.4)	1.0 (0.7-1.4)	1.7 (0.7-3.8)	0.6 (0.3-0.9)
DP grade				
Part-time	1	1	1	1
Full-time	1.4 (1.1-1.9)*	1.5 (1.1-1.9)*	1.3 (0.6-3.0)	1.7 (1.0-2.8)

□Adjusted for: Gender, Educational level, Family situation, Country of birth, Type of living area, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Disability pension (DP) due to common mental disorders (CMD) and subsequent suicidal behaviour; a population-based prospective cohort study	1
		(b) See Abstract	3-4
Introduction			
Background/rationale	2	See Background	5-6
Objectives	3	To examine 1) how different DP measures (main diagnosis, secondary diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these associations with regard to sex and age. See Aim	6
Methods			
Study design	4	Prospective cohort design. See Methods and Materials: Design	7
Setting	5	See Methods and Materials: Design, Risk factors	7, 8, 9
Participants	6	(a) See Methods and Materials: Design, Disability pension, Statistical analyses, Table 1	7, 8, 11
		(b) N/A	
Variables	7	See Methods and Materials: Risk factors, Confounders, Outcome measures	8-10
Data sources/ measurement	8*	See Methods and Materials: Design, Statistical Analyses	7,11
Bias	9	The bias is limited by using a population based study population based on data with nation-wide coverage and information on a large number of confounders. See Methods and Materials: Design	7
Study size	10	See Methods and Materials: Design	7
Quantitative variables	11	See Methods and Materials: Risk factors, Confounders, Outcome measures, Statistical analyses	8-11
Statistical methods	12	(a) Uni- and multivariate hazard ratios and 95% confidence intervals (CI) for the risk factors with regard to suicide attempt and suicide were estimated by Cox proportional hazard regression models, after testing that the proportionate hazard assumption was met. See Methods and Materials: Statistical Analyses	11
		(b) Chi-square statistics were used to test significant sex and age differences in the. See Methods and Materials: Statistical	11

		Analyses	
		(c) Missing values were coded as separate categories. See Methods and Materials: Confounders	10
		(d) There was practically no loss to follow-up	
		(e) Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Materials: Statistical Analyses	11
Results			
Participants	13*	(a) See Methods and Materials: Design, Results, Table 1	7, 12
		(b) This is a register based and population based study with data on individuals on disability pension covering information from the whole country	11
		(c) --	
Descriptive data	14*	(a) See Results, Table 1, Table 2, Table 3	12,13
		(b) Only the confounder 'Education level in years' had missing for 504 (1.1%) individuals and was categorized as a separate category. See Methods and Materials: Confounders	10
		(c) See Results	13
Outcome data	15*	See Methods and Materials: Outcome measures, Results	10, 12-14
Main results	16	(a) See Results, Table 2-5	12-14
		(b) See Table 1 for categories of 'Number of years on DP in 2005'. Analyses were stratified for age, age was dichotomised. See Methods and Materials: Confounders	10
		(c) --	
Other analyses	17	-All analyses were stratified for age and sex. See Table 1-5. -Partial likelihood ratio test was used to test interactions with sex and age. See Methods and Materials: Statistical analyses -Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Material: Statistical analyses	11 11
Discussion			
Key results	18	See Discussion	15
Limitations		See Discussion	16
Interpretation	20	See Discussion, Conclusion	15-19
Generalisability	21	The findings are generalisable to countries with comparable health care and social insurance systems.	

Other information			
Funding	22	See Title page: Financial support	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

For peer review only

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

BMJ Open

Disability pension due to common mental disorders and subsequent suicidal behaviour; a population-based prospective cohort study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2015-010152.R3
Article Type:	Research
Date Submitted by the Author:	11-Mar-2016
Complete List of Authors:	Rahman, Syed; Karolinska Institutet, Clinical Neuroscience; syed rahman, Alexanderson, Kristina; karolinska institutet, Department of Clinical Neuroscience Jokinen, Jussi; Karolinska Institute, Clinical Neuroscience Mittendorfer-Rutz, Ellenor; Karolinska Institutet, Department of Clinical Neuroscience, Division of Insurance Medicine
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Occupational and environmental medicine, Public health, Epidemiology
Keywords:	common mental disorder, suicide, suicide attempt, MENTAL HEALTH, disability pension, Sick leave

SCHOLARONE™
Manuscripts

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 1 Disability pension due to common mental disorders and subsequent suicidal behaviour; a
4 2 population-based prospective cohort study
5 3

6
7 4 Rahman S,^{1*} Alexanderson K,¹ Jokinen J,^{2,3} Mittendorfer-Rutz E.¹
8
9 5

10
11
12 6 ¹ Department of Clinical Neuroscience, Division of Insurance Medicine, Karolinska Institutet,
13
14 7 Stockholm, Sweden.

15
16 8 ² Department of Clinical Neuroscience, Division of Psychiatry, Karolinska Institutet,
17
18 9 Karolinska University Hospital, Stockholm, Sweden.

19
20
21 10 ³ Department of Clinical Sciences, Division of Psychiatry, Umeå University, Umeå, Sweden.
22
23

24 11 Kristina Alexanderson, Professor

25
26 12 Kristina.Alexanderson@ki.se
27

28
29 13 Jussi Jokinen, Professor

30
31 14 Jussi.Jokinen@ki.se
32

33 15 Ellenor Mittendorfer-Rutz, Associate professor

34
35 16 Ellenor.Mittendorfer-Rutz@ki.se
36

37
38 17 *Corresponding author:

39
40
41 18 Syed Ghulam Rahman; MBBS, MMSc

42
43
44 19 Division of Insurance Medicine, Department of Clinical Neuroscience,

45
46 20 Karolinska Institutet, SE-171 77 Stockholm, Sweden
47

48
49 21 Tel +46 8-524 832 05
50

51
52 22 Email: syed.rahman@ki.se
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

23 Financial support: the Swedish Research Council for Health, Working Life and Welfare, the
24 Swedish Research Council (Project numbers: K2009-61P-21304-04-4; K2009-61X-21305-01-
25 1; K2011-80P-21782-01-4), and the Karolinska Institutet's funding for doctoral students.

26 Abstract (with subheadings): 296 words

27 Main text (with headings and subheadings): 3950 words

28

For peer review only

Abstract

Objective: Adverse health outcomes, including suicide, among individuals on disability pension (DP) due to mental diagnoses have been reported previously. Nevertheless, the scientific knowledge on possible risk factors for suicidal behaviour (suicide attempt and suicide) in this group, such as age, gender, underlying DP diagnoses, comorbidity, DP duration and grade, is surprisingly sparse. This study aimed to investigate the associations of different measures (main and secondary diagnoses, duration, and grade) of DP due to common mental disorders (CMD) with subsequent suicidal behaviour, considering gender and age differences.

Design: Population-based prospective cohort study based on Swedish nationwide registers.

Methods: A cohort of the 46 515 individuals aged 19-64 years and on DP due to CMD throughout 2005 was followed up for five years. In relation to different measures of DP, univariate and multivariate hazard ratios (HR) and 95% confidence intervals (CI) for suicidal behaviour were estimated by Cox regression. All analyses were stratified by gender and age.

Results: During 2006-2010, 1036 (2.2%) individuals attempted and 207 (0.5%) completed suicide. Multivariate analyses showed that a main DP diagnosis of 'stress-related mental disorders' was associated with a lower risk of subsequent suicidal behaviour than 'depressive disorders' (HR range 0.4-0.7). Substance abuse or personality disorders as secondary DP diagnosis predicted suicide attempt in all sub groups (HR range 1.8-4.6) and suicide in women and younger individuals (HR range 2.2-7.7). Fulltime DP was associated with a higher risk of suicide attempt and suicide compared to part-time DP in women (HR range 1.8-2.3).

Conclusions: Depressive disorders as main and substance use or personality disorders as secondary DP diagnosis were risk markers for subsequent suicidal behaviour in individuals on

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

53 DP due to CMD. Particular attention should be given to younger individuals on DP due to
54 anxiety disorders due to the higher suicide risk.

55

56 **Keywords:** Sick leave, disability pension, mental health, suicide attempt, suicide, common
57 mental disorder

58

59 **Strengths:**

- 60 • This population-based, prospective cohort study used data of high quality.
- 61 • The study did not suffer from any loss to follow up.
- 62 • Considered diagnoses were not self-reported, but derived from administrative registers
63 and provided by physicians.

64 **Limitations:**

- 65 • Some analyses were based on few suicide cases.
- 66 • We have considered suicide attempts leading to inpatient care, thus, the results mainly
67 are valid for suicide attempts of higher medical severity.

68

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

69 **Background**

70
71 Disability pension (DP) is a major public health issue in many European countries,[1, 2] and
72 increasingly so regarding mental DP diagnoses,[1, 3-5]. In Sweden in 2012, mental diagnoses
73 accounted for 40% of the DPs granted to individuals aged 30-64 years and for 84% among
74 those aged 19-29 years,[3]. The absolute majority of the mental DP diagnoses are common
75 mental disorders (CMD), i.e., depressive, anxiety, or stress-related mental disorders,[1, 6].
76 These are diagnoses for which treatment and rehabilitation measures are available, however
77 inactivity, e.g., in terms of long-term or permanent exclusion from the working life due to DP
78 may have adverse effects,[7]. DP itself may imply alteration of health behaviour (e.g.,
79 regarding alcohol and tobacco use, exercise, diet) or social isolation,[8]. This can be due to
80 lack of ties to the labour market and eventually lack of the potential positive effects of paid
81 work, including social contacts with colleagues, prospects of career and income development,
82 sense of meaning, or even daily routines and structures,[9]. Possibly, individuals who have
83 been on DP for a shorter period might experience less adverse effects of being excluded from
84 the labour market than individuals on DP for longer time,[10]. Similarly, part-time DP might
85 be more protective concerning such adverse health or social outcomes than full-time DP,[11,
86 12].

87
88 Adverse health outcomes, including suicide, among disability pensioners, especially among
89 those granted DP early in adult life due to mental diagnoses, have been shown previously,[8,
90 13]. Still, to date little is known about specific risk factors related to eventual worse outcomes
91 in individuals on DP,[8], such as suicide attempt or suicide. Suicidal behaviour can be
92 considered as the utmost consequence of mental disorders, particularly of depressive disorders

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 93 or depression comorbid with anxiety,[14-16]. Patients with a depressive disorder have a
4
5 94 higher risk of subsequent suicidal behaviour in case of comorbidity with another mental or
6
7 95 with a somatic disorder, than patients with depressive disorders without such comorbidity,[17-
8
9
10 96 19]. To date, knowledge is lacking regarding associations between DP due to different
11
12 97 diagnoses with and without comorbidity with regard to subsequent suicidal behaviour.
13

14
15 98
16
17 99 There are well documented gender and age differences with regard to both DP and suicidal
18
19 100 behaviour,[13, 14, 20]. However, there is a lack of studies investigating if gender and age are
20
21 101 associated with suicidal behaviour among recipients of DP due to CMD, and across different
22
23 102 measures of DP (such as main diagnosis, secondary diagnosis, duration, and grade). Previous
24
25 103 studies have found that socio-demographic factors, such as educational level, family situation,
26
27 104 country of birth, type of area of living, are associated with morbidity (defined as previous
28
29 105 suicide attempt or in- or outpatient care due to mental diagnoses) and subsequent suicidal
30
31 106 behaviour,[14, 17, 21-24]. Additionally, excess mortality including suicide among DP
32
33 107 recipients due to mental diagnoses compared to the general population not on DP has been
34
35 108 reported,[25-27]. Therefore, it is relevant to take account of socio-demographic factors and
36
37 109 health factors in analyses of the association between DP and subsequent suicidal behaviour.
38
39
40
41
42

43 110

44 45 46 111 **Aim**

47
48
49 112

50
51 113 This study aimed to examine 1) how different measures of DP (main diagnosis, secondary
52
53 114 diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide
54
55 115 attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these
56
57 116 associations with regard to gender and age.
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 117
4
5
6

118 **Methods and materials**

7
8
9 119
10

120 **Design**

11
12
13 121
14

15
16
17 122 A nationwide population-based prospective cohort study based on Swedish register data was

18
19 123 conducted. The cohort comprised all individuals aged 19-64 years, living in Sweden on

20
21 124 31.12.2004, who were on full- or part-time DP due to CMD throughout 2005 (n=48 803).

22
23 125 Individuals treated in in- or specialised outpatient health care with schizophrenic spectrum or

24
25 126 bipolar disorders or having this as a secondary DP diagnosis in 2001-05 (n=1886) and people

26
27 127 on old-age pension during 2005 (n=402) were excluded. The final cohort hence included

28
29 128 46 515 individuals. They were followed up for five years (2006-2010).

30
31
32
33 129

34
35 130 Annual data covering 2001 to 2010 were obtained from the following four nationwide

36
37 131 registers: 1) Longitudinal integration database for health insurance and labour market studies

38
39 132 (LISA) held by Statistics Sweden: including socio-demographic information on gender, age,

40
41 133 educational level, type of area of living, country of birth, family situation; 2) Two registers

42
43 134 held by the National Board of Health and Welfare, namely; (i) National patient register

44
45 135 including information on date and diagnosis of inpatient and specialised outpatient care, (ii)

46
47 136 Cause of death register with data on date and cause of death, and 3) Micro-data for analyses

48
49 137 of social insurance (MiDAS) with information on the date, diagnoses (the main and secondary

50
51 138 DP diagnoses), duration, and grade of DP from the National Social Insurance Agency. Data

52
53 139 from these registers were linked at individual level, using the unique personal identification

54
55 140 number of all residents in Sweden.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 141
4
5
6 142

The disability pension system in Sweden

7
8
9 143
10

11 144 All residents in Sweden aged 19-64 years, who due to disease or injury had a long-lasting or
12 permanent reduction of their work capacity, can be granted temporary or permanent DP from
13 the Social Insurance Agency for 25, 50, 75, or 100% of ordinary working hours.,[3]. Since
14 145
15 146
16 147 2003, individuals aged 19-29 years can be granted temporary DP also if health reasons lead to
17 failure to complete compulsory or upper secondary school in due time,[3]. DP amounts to
18 148
19 149 65% of lost income, up to a certain level. For those with no previous income, there is a
20 minimum sum.
21 150
22 151

23
24
25
26
27 152

Risk factors

28
29
30 153
31
32
33 154

Main and secondary DP diagnoses

34 155 All information on DP diagnoses was based on the corresponding codes of the International
35 Classification of Diseases, version 10 (ICD-10),[28]. Information on the main and secondary
36 156
37 157 DP diagnoses was available from MiDAS.
38

39
40
41
42
43
44 158

45 159 Main DP diagnoses were categorised into: ‘depressive disorders’ including ‘depressive
46 episode’ (F32) and ‘recurrent depressive disorder’ (F33), ‘anxiety disorders’ comprising
47 160
48 161 ‘phobic anxiety disorder’ (F40); ‘other anxiety disorder’ (F41); ‘obsessive-compulsive

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

162 disorder' (F42); and 'stress-related mental disorders' including 'reaction to severe stress,
163 adjustment disorders, acute stress reaction and post-traumatic stress disorder' (F43),[29, 30].

164

165 Secondary diagnoses were categorized as: 'no secondary diagnosis', 'substance abuse
166 disorders' (F10-F19), 'personality disorders' (F60-F69), 'other mental disorders' (F00-F99
167 except F10-F19, F60-F69), 'Musculoskeletal disorders' (M00-M99), and 'Other somatic
168 disorders' (all diagnoses except M00-M99 and F00-F99).

169

170 The excluded bipolar and schizophrenic spectrum disorders included the following ICD-10
171 codes: F20-F29 and F31.

172

173 **Duration**

174

175 DP duration was calculated by subtracting start date of DP from the end date of exposure
176 (31.12.2005) in gross days. Thereafter, the days were converted into years and were
177 categorized into: '1 year', '2-3 years', and '≥4 years', respectively.

178

179 **Grade**

180

181 Grade of DP, in 2005, was categorized into full-time (100%) or part-time. (25%, 50%,
182 or75%).

183

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

184 **Confounders**

185

186 All socio-demographic characteristics were measured at baseline (31.12.2004): age, gender,
187 educational level, family situation, country of birth, and type of area of living. Age was
188 dichotomised into 19-44 and 45-64 years. Educational level was categorized into three groups
189 according to the total number of attended years of education at three levels: 'compulsory (0-9
190 years)', 'upper secondary (10-12 years)', and 'university (≥ 13 years)'. Family situation was
191 coded into four groups: 'married/cohabiting with children living at home', 'married/
192 cohabiting with no children living at home', 'single without children living at home', and
193 'single with children living at home'. Country of birth included 'Sweden', 'other Nordic
194 countries', 'EU 25 (except Nordic countries)', and 'rest of the world'. Type of area of living
195 was divided into 'big cities', 'medium-sized cities', and 'small cities/villages'. Missing values
196 were coded as separate categories. Health care factors, i.e., previous suicide attempt, in- and
197 specialised outpatient care due to mental diagnoses were measured from 2001 to 2005 and
198 were dichotomised as 'yes' and 'no'.

199

200 **Outcome measures**

201 The outcome was suicidal behaviour in terms of suicide attempt or completed suicide.
202 Information on suicide attempt and suicide in 2006-2010 was obtained from the inpatient-care
203 and cause of death register, respectively. As suicides are often underreported or reported as
204 "undetermined" causes,[31, 32], information on "determined" (X60-84) and "undetermined"
205 (Y10-34) suicide was combined to limit underreporting and to compensate for regional and
206 temporal variation in ascertainment methods. A similar procedure was performed for suicide

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

207 attempt. This is a common procedure in research on suicidal behaviour,[33]. The combined
208 outcome measures are hereafter called suicide attempt and suicide, respectively.

209

210 **Statistical analysis**

211

212 Chi-square statistics were used to test significant gender and age differences in the cohort.

213 Univariate hazard ratios (HR) and 95% confidence intervals (CI) for the risk factors with

214 regard to suicide attempt and suicide were estimated by Cox proportional hazard regression

215 models, after testing that the proportionate hazard assumption was met. All individuals were

216 followed up from 01.01.2006 until the event (suicide attempt; suicide), emigration, death (due

217 to causes other than X06-84 and Y10-34, in the analyses related to suicide as an outcome), or

218 end of follow up (31.12.2010), whichever occurred first. The partial likelihood ratio test was

219 used to test for possible interactions between the exposure variables (main and secondary DP

220 diagnoses, and duration and grade of DP) and age and gender in relation to the outcome

221 measures. Multivariate models were built with adjustment for socio-demographic and

222 healthcare factors and mutual adjustment for all other covariates. Before combining the

223 outcome measures, sensitivity analyses were carried out by calculating HRs and 95% CIs for

224 all exposure measures in relation to determined and undetermined suicide both separately and

225 after combining them. After assuring that these estimates were comparable, the combined

226 variable was introduced into the model. Similar tests were performed for determined and

227 undetermined suicide attempt. All analyses were stratified by gender and age and performed

228 using SPSS v.22.

229

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

230 **Ethical statement**

231 The project was evaluated and approved by the Regional Ethical Review Board of Stockholm,
232 Sweden.

233

234 **Results**

235

236 Of the 46 515 individuals on DP due to CMD during 2005, the majority (66.4%) were women
237 and 70% were aged between 45-64 years (Table 1). Nearly half of the women (48.3%) had
238 depressive disorders as main DP diagnosis while a large proportion of the men had anxiety
239 disorders as main DP diagnosis (31.7%). Depressive disorders as main DP diagnosis was
240 more common among the older individuals (51.5%) whereas anxiety disorders as main DP
241 diagnosis was more frequent among the younger people (43.1%). The two predominant main
242 DP diagnoses for the entire cohort were 'depressive episode' (36.8%) and 'stress-related
243 mental disorder' (23.6%) (data not in table).

244

245 In the cohort, nearly half of the individuals did not have any secondary DP diagnosis (43.1%)
246 (Table 1). Substance abuse disorders as secondary diagnosis was more prevalent among men
247 and older individuals while personality disorders were more frequent among women and
248 younger individuals ($p<0.001$). The majority of the individuals had full-time DP (75.6%).
249 Part-time DP was more common among women (28%) than men (17.4%) and among older
250 (26.7%) than younger individuals (19.2%) ($p<0.001$).

251

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

252 Regarding the covariates, nearly half (47%) of the study population had been to upper
253 secondary education, most lived in big or medium sized cities (74%), and 75% were born in
254 Sweden (data not in table). Almost half of them (42%) lived without a partner and without
255 children at home.

256

257 In the cohort, 1036 (2.2%) individuals were treated in inpatient care due to suicide attempt
258 and 207 (0.5%) committed suicide during the five-year follow up (2006-10) (table 2). Women
259 were somewhat more likely than men to attempt suicide (women: 2.4%, men: 2.0%, $p < 0.01$)
260 while a higher proportion of men completed suicide (women: 0.3%, men: 0.7%. $p < 0.001$).
261 Mean follow-up time for suicide attempt and suicide was 4.85 (standard deviation (SD): 0.70)
262 and 4.91 (SD: 0.52) years, respectively.

263

264 Table 2 and 3 show univariate HRs and Table 4 and 5 show multivariate HRs for suicide
265 attempt and suicide, stratified by gender and age with regard to main and secondary DP
266 diagnoses as well as duration and grade of DP.

267

268 In the univariate analyses, 'anxiety disorders' as main diagnosis was associated with a higher
269 risk for suicide attempt in both women and men (range of HRs 1.4 to 1.5) and suicide in the
270 younger age group (HR 1.9; 95% CI: 1.1-3.3) compared to 'depressive disorders' as main
271 diagnosis. These associations became insignificant after controlling for socio-demographic
272 variables in the multivariate models, except for suicide in individuals aged 19-44 years (HR
273 1.7; 95% CI: 1.0-3.0). Compared to 'depressive disorders', 'stress-related mental disorders' as
274 main diagnosis was associated with a lower risk for both suicide attempt and suicide (except
275 for women and the age group 19-44 years) in both crude and multivariate adjusted models.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

276 There was a significant interaction between age and main diagnosis ($p=0.017$) regarding
277 suicide. Individuals aged 45-64 years with a main DP diagnosis of ‘stress-related mental
278 disorders’ had a significantly lower risk for committing suicide during the follow up
279 compared to individuals with ‘depressive disorder’ as main DP diagnosis (HR 0.4; 95% CI:
280 0.2-0.6). This association was not observed in younger individuals.

281

282 In the univariate models, all analysed mental secondary diagnoses were associated with a
283 higher risk for subsequent suicide attempt, regardless of gender and age (range of HRs 1.2 to
284 7.1). These associations remained significant (range of HRs 1.3 to 2.3) in the multivariate
285 models, except the association of ‘other mental disorders’ as secondary diagnosis with
286 subsequent suicide attempt in men and the age group 45-64 years. ‘Substance abuse disorders’
287 and ‘personality disorders’ as secondary diagnosis were associated with higher risks also for
288 suicide (range of HRs 1.9 to 9.6) in women and in both age groups in the crude analyses
289 compared to their counterparts without a secondary diagnosis. However, in the adjusted
290 model, only ‘substance abuse disorders’ predicted suicide among women and younger
291 individuals (range of HRs 2.6 to 3.3). A statistically significant interaction between gender
292 and secondary diagnoses ($p=0.029$) in relation to subsequent suicide was found. Women with
293 ‘substance abuse disorders’ or ‘personality disorders’ as secondary DP diagnosis were at a
294 higher risk for subsequent suicide compared to women without a secondary diagnosis. Such
295 associations were not observed among men.

296

297 A DP duration of four years or more predicted suicide attempt among women and older
298 individuals (range of HRs 1.2 to 1.4) in the crude models, compared to individuals with a DP
299 duration of one year. These associations were not statistically significant in the adjusted

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

300 models. In the univariate analyses, full-time DP was associated with a higher risk for suicidal
301 behaviour in both genders and age categories (range of HRs 1.3 to 3.1) compared to
302 individuals on part-time DP. After multivariate adjustment, these associations remained
303 significant (range of HRs 1.4 to 1.7) except for suicide attempt and suicide among men, and
304 suicide in women and younger individuals. Statistically significant interaction was observed
305 between gender and DP grade ($p=0.001$) in relation to subsequent suicide attempt. Women on
306 full-time DP had a higher risk for future suicide attempt compared to women who were on
307 part-time DP. No such association was found for their male counterparts (table 4).

308

309 Discussion

310

311 In this nationwide prospective cohort study of people on DP due to CMD, we explored the
312 risk of suicidal behaviour related to DP diagnoses, duration, and grade. Stress-related mental
313 disorders as the main DP diagnosis was associated with a lower risk of subsequent suicidal
314 behaviour compared to depressive disorders as main DP diagnosis. Moreover, comorbid
315 substance abuse disorders and personality disorders as well as full-time DP were associated
316 with a higher risk of suicide attempt and suicide during follow up. Some gender and age
317 differences in these associations emerged.

318

319 To the best of our knowledge, this is the first study to investigate different measures of DP as
320 risk factors for suicidal behaviour in individuals on DP due to CMD. Main strengths of our
321 study are that we have used high quality population-based Swedish nationwide register
322 data,[34, 35] and the prospective cohort design with several years of follow up. We included

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 323 register data from different sources on the whole working age population of Sweden and
4
5 324 thereby avoided selection and recall bias. Moreover, there was no loss to follow up and all
6
7 325 data were register based, including physician-based diagnoses, that is, not based on self-
8
9 326 reports. The study group was large and the statistical power was sufficient even with regard to
10
11 327 such infrequent outcomes as suicide attempt and suicide. This study also had the opportunity
12
13 328 to include a wide range of potential confounders like educational level, family situation,
14
15 329 country of birth, type of area of living, and previous health care.
16
17
18
19 330

20
21 331 There are some limitations of the study. In spite of the long follow up, there were only 207
22
23 332 suicides, leading to wide CIs. Another limitation is that only the main, and when given, the
24
25 333 secondary DP diagnoses, could be included. Additional diagnoses that might have been stated
26
27 334 in the sickness certificate as contributing to the patients' work incapacity were not included in
28
29 335 the MiDAS register. Having such information might have improved the analyses, however,
30
31 336 most studies on DP only have access to the main diagnosis. A topic of frequent discussions in
32
33 337 this research field is the validity of DP diagnoses. There are no studies on this, so far. A study
34
35 338 conducted in Sweden in 1991, showed high validity of sick-leave diagnoses when compared
36
37 339 to diagnoses from medical records,[36]. Additionally, DP in most cases is preceded by long-
38
39 340 term sickness absence and is granted after a long process of medical evaluation and work
40
41 341 capacity assessments, as DP benefits are often paid for several years,[3]. Moreover, due to the
42
43 342 stigma around mental diagnoses,[37, 38], the validity of mental DP diagnoses can be assumed
44
45 343 to be good, meaning that people with a mental DP diagnosis are likely to have a mental
46
47 344 disorder. On the other hand, this also means that some individuals with mental disorders
48
49 345 might not have been given a mental diagnosis as the main DP diagnosis, but as a secondary
50
51 346 diagnosis to a somatic main DP diagnosis. Thus, they would not be included in this study.
52
53
54
55 347 This can also be seen as a strength, as our cohort of CMD is more strictly defined than when
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

1
2
3 348 using also secondary diagnoses for inclusion, or as a limitation, as we do not know if
4
5 349 including them would have affected the results. Further studies are required regarding these
6
7 350 issues.
8
9
10 351 Moreover, stigma of mental disorders might have led to underreporting of some mental
11
12 352 disorders as secondary diagnoses. The reported secondary diagnoses might, therefore, reflect
13
14 353 higher medical severity. It should also be mentioned, that we have considered suicide attempts
15
16 354 leading to inpatient care, thus, the results mainly are valid for suicide attempts of higher
17
18 355 medical severity. Additionally, it is important to keep in mind that DP not only reflects to
19
20 356 what extent the disease affects an individual's work capacity, but also factors at other
21
22 357 structural levels such as possibilities and demands at the labour market, adjustment policies,
23
24 358 attitudes, and the economic situation of a country,[39]. Such factors may influence not only
25
26 359 the level of DP in a country,[39, 40] but also the level of suicidal behaviour,[41, 42], which
27
28 360 thus may have affected the results of this study.
29
30
31
32
33
34
35

36 362 In this study, the risk of subsequent suicidal behaviour related to a main DP diagnosis of
37
38 363 anxiety did not differ from that of a main DP diagnosis of depressive disorder, while those
39
40 364 with stress-related mental disorders as main DP diagnosis had a lower risk for future suicidal
41
42 365 behaviour. This is in line with a recent study on diagnosis-specific sickness absence,
43
44 366 suggesting higher risk estimates for subsequent suicide among people on sickness absence
45
46 367 due to depressive and anxiety disorders than due to stress-related mental disorders, after
47
48 368 adjustment for socio-demographic factors,[43].
49
50
51
52
53
54

55 370 There was a significant interaction with age and main DP diagnoses in relation to suicide.

56
57 371 While there was a significantly lower risk for suicide in the older age group (45-64 years)
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3 372 with a main DP diagnosis of ‘stress-related mental disorders’ compared to ‘depressive
4
5 373 disorders’, this association was not found in the younger individuals. On the other hand,
6
7 374 ‘anxiety disorders’ as main diagnoses were associated with a higher risk of subsequent suicide
8
9 375 in the individuals aged 19-44 years, compared to the similar age group with main DP
10
11 376 diagnosis as ‘depressive disorders’ in the multivariate analyses. One likely explanation of
12
13 377 such findings includes age differences in the association of mental disorders with suicide risk,
14
15 378 [14, 44]. Anxiety disorders often have an early onset, and younger individuals may tend to
16
17 379 have higher impulsivity, which might have contributed to suicidal behaviour,[45]. Moreover,
18
19 380 early onset anxiety disorders leading to DP might be more difficult to treat and probably are
20
21 381 associated with a high degree of comorbidity. Anxiety disorders are highly comorbid with
22
23 382 depressive or personality disorders,[14, 15, 46], and also might have contributed to suicidal
24
25 383 behaviour among these young individuals. Early detection and adequate treatment of anxiety
26
27 384 disorders for prevention of suicidal behaviour might be of particular importance,[15, 16]
28
29 385 especially in younger individuals. These associations warrant further investigations.
30
31
32
33
34
35
36

37 387 Our analyses showed that having a mental secondary DP diagnosis was associated with a
38
39 388 higher risk of suicide attempt and suicide compared to not having a secondary diagnosis. This
40
41 389 is in line with previous research regarding the general population,[14, 47] or individuals with
42
43 390 a diagnosed mental disorder,[17, 18, 48]. Moreover, we found that substance abuse disorder
44
45 391 was the strongest predictor of subsequent suicide attempt. These findings are consistent with
46
47 392 previous studies showing that substance abuse is a strong risk factor for suicidal
48
49 393 behaviour,[19, 47, 49].
50

51
52
53 394 A significant interaction was observed between gender and substance abuse as secondary DP
54
55 395 diagnosis in relation to subsequent suicide. Substance abuse might be less prevalent and less
56
57 396 frequently diagnosed in women compared to in men. Therefore, it can be hypothesised that
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

1
2
3 397 having such a DP diagnosis might be a reflection of a severe medical condition, particularly in
4
5 398 women, which in turn might be a reason for their higher suicide risk,[14, 19, 49]. It is
6
7 399 therefore possible that health consequences of substance abuse disorders might be worse in
8
9
10 400 women compared to in men,[50]. Moreover, substance abuse disorders may aggravate an
11
12 401 existing comorbid depression, which itself is a risk factor for suicidal behaviour,[50-53].

13
14 402 Personality disorder as secondary DP diagnosis was strongly associated with a higher risk of
15
16
17 403 suicide attempt compared to those who did not have any secondary DP diagnosis. Current
18
19 404 literature suggests that personality disorder, comorbid with depression or by itself, involves a
20
21 405 higher risk of suicide attempt,[54, 55].
22
23

24 406

25
26
27 407 Full-time DP was associated with a higher risk of suicidal behaviour compared to part-time
28
29 408 DP. This is in line with a previous study reporting a higher risk of suicidal behaviour
30
31 409 concerning full-time compared to part-time sickness absence,[56]. Full-time DP might here be
32
33 410 associated with a higher severity of the underlying disorder. On the other hand, full-time DP
34
35 411 might be related to an alteration in health behaviour (regarding alcohol consumption,
36
37 412 smoking, physical activity, diet, etc.) or to social isolation,[8, 57], which might be associated
38
39 413 with total exclusion from the labour market,[9]. More knowledge is warranted on such
40
41 414 associations,[8].
42
43
44

45 415

46
47 416

48
49
50
51 417 Statistically significant interaction was observed between gender and DP grade, women with
52
53 418 full-time DP had a higher risk for subsequent suicide attempt than women with part-time DP.
54
55 419 The proportion of women on part-time DP tends to be much higher compared to among men
56
57 420 in Sweden,[3]. It might be anticipated that if women are granted full-time DP they might have
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

421 a higher severity of the underlying mental disorder and, therefore, they might have a higher
422 risk of subsequent suicide attempt,[56]. Further studies are warranted to investigate pathways
423 to suicidal behaviour related to DP grade.

424

425 **Conclusion**

426

427 This first study of associations between measures of DP due to CMD with subsequent risk of
428 suicidal behaviour among individuals on such DP found several such associations. In general,
429 depressive disorders as main and substance use or personality disorder as secondary DP
430 diagnosis were risk markers for subsequent suicidal behaviour in such individuals. Some
431 gender and age differences in these associations emerged. Approaches for intervention in this
432 group of disability pensioners should, therefore, consider the individual variation in risk
433 factors with regard to gender and age. Particular attention should be given to younger
434 individuals on DP due to anxiety disorders due to the higher suicide risk.

435

436 **Competing interests:** none.

437 **Authors' contributions:**

438 EMR is responsible for the core idea and all authors contributed in the study design. SR and
439 EMR carried out the data analyses and drafted the manuscripts. SR, KA, JJ, and EMR
440 participated in interpretation of results, critically revised the manuscript for important
441 intellectual content, contributed to successive drafts, and agreed on the final version. All
442 authors read and approved the final manuscript.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

443

444 **Acknowledgement:** none.

445

446 **Data Sharing Statement**

447 No additional data available.

448

449

For peer review only

BMJ Open: first published as 10.1136/bmjopen-2015-010152 on 4 April 2016. Downloaded from <http://bmjopen.bmj.com/> on April 19, 2024 by guest. Protected by copyright.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

References

1. Sickness, Disability and Work: Breaking the Barriers. A synthesis of findings across OECD countries. Paris: OECD, 2010 ISBN 978-92-64-08884-9; ISBN 978-92-64-08885-6.
2. Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 1. Aim, background, key concepts, regulations, and current statistics. *Scand J Public Health Suppl.* 2004;63:12-30.
3. Social Insurance Agency (*försäkringskassan*). Social Insurance in Figures 2013. Sweden: The Social Insurance Agency, 2014 ISBN: 978-91-7500-376-4; ISSN: 2000-1703.
4. Henderson M, Harvey SB, Overland S, Mykletun A, Hotopf M. Work and common psychiatric disorders. *J R Soc Med.* 2011;104(5):198-207.
5. Mykletun A, Overland S, Dahl AA, et al. A population-based cohort study of the effect of common mental disorders on disability pension awards. *The American journal of psychiatry.* 2006;163(8):1412-8.
6. Järvisalo J, Anderson B, Boedeker W, Houtman I, editors. Mental disorders as a major challenge in prevention of work disability: experiences in Finland, Germany, the Netherlands and Sweden. Helsinki: Kela; 2005.
7. Kupfer DJ, Frank E, Phillips ML. Major depressive disorder: new clinical, neurobiological, and treatment perspectives. *Lancet.* 2012;379(9820):1045-55.
8. Vingard E, Alexanderson K, Norlund A. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 9. Consequences of being on sick leave. *Scand J Public Health Suppl.* 2004;63:207-15.
9. Waddell G, Burton K. Is working good for your health and well-being? . UK: Published by TSO (The Stationery Office) 2006.
10. Bryngelson A, Asberg M, Nygren A, Jensen I, Mittendorfer-Rutz E. All-Cause and Cause-Specific Mortality after Long-Term Sickness Absence for Psychiatric Disorders: A Prospective Cohort Study. *PLoS One.* 2013;8(6):e67887.
11. Karlsson NE, Carstensen JM, Gjesdal S, Alexanderson KA. Mortality in relation to disability pension: findings from a 12-year prospective population-based cohort study in Sweden. *Scandinavian journal of public health.* 2007;35(4):341-7.
12. Johansson AE, Johansson U. Disability pension and everyday life: a period of transition and subjective aspects of future occupational life. *Work.* 2011;40(4):375-84.
13. Rahman S, Alexanderson K, Jokinen J, Mittendorfer-Rutz E. Risk factors for suicidal behaviour in individuals on disability pension due to common mental disorders - a nationwide register-based prospective cohort study in Sweden. *PLoS One.* 2014;9(5):e98497.
14. Hawton K, van Heeringen K. Suicide. *Lancet.* 2009;373(9672):1372-81.
15. Fawcett J. The detection and consequences of anxiety in clinical depression. *J Clin Psychiatry.* 1997;58 Suppl 8:35-40.
16. Fawcett J. Targeting treatment in patients with mixed symptoms of anxiety and depression. *J Clin Psychiatry.* 1990;51 Suppl:40-3.
17. Hawton K, Casanas ICC, Haw C, Saunders K. Risk factors for suicide in individuals with depression: a systematic review. *Journal of Affective Disorders.* 2013;147(1-3):17-28.
18. Kanwar A, Malik S, Prokop LJ, et al. The association between anxiety disorders and suicidal behaviours: a systematic review and meta-analysis. *Depress Anxiety.* 2013;30(10):917-29.
19. Cavanagh JTO, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. *Psychological Medicine.* 2003;33(3):395-405.
20. Crump C, Sundquist K, Sundquist J, Winkleby MA. Sociodemographic, psychiatric and somatic risk factors for suicide: a Swedish national cohort study. *Psychological Medicine.* 2013:1-11.

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_ NOT TO BE CITED

- 1
- 2
- 3 498 21. Laaksonen M, Gould R. The effect of municipality characteristics on disability
- 4 499 retirement. *Eur J Public Health*. 2014;24(1):116-21.
- 5 500 22. Leinonen T, Martikainen P, Lahelma E. Interrelationships between education,
- 6 501 occupational social class, and income as determinants of disability retirement. *Scand J Public Health*.
- 7 502 2012;40(2):157-66.
- 8 503 23. Osterberg T, Gustafsson B. Disability pension among immigrants in Sweden. *Soc Sci*
- 9 504 *Med*. 2006;63(3):805-16.
- 10 505 24. Pompili M, Innamorati M, Szanto K, et al. Life events as precipitants of suicide
- 11 506 attempts among first-time suicide attempters, repeaters, and non-attempters. *Psychiatry Res*.
- 12 507 2011;186(2-3):300-5.
- 13 508 25. Leinonen T, Martikainen P, Laaksonen M, Lahelma E. Excess mortality after disability
- 14 509 retirement due to mental disorders: variations by socio-demographic factors and causes of death.
- 15 510 *Soc Psychiatry Psychiatr Epidemiol*. 2013.
- 16 511 26. Bjorkenstam C, Alexanderson K, Bjorkenstam E, Lindholm C, Mittendorfer-Rutz E.
- 17 512 Diagnosis-specific disability pension and risk of all-cause and cause-specific mortality--a cohort study
- 18 513 of 4.9 million inhabitants in Sweden. *BMC Public Health*. 2014;14:1247.
- 19 514 27. Jonsson U, Alexanderson K, Kjeldgard L, Westerlund H, Mittendorfer-Rutz E. Diagnosis-
- 20 515 specific disability pension predicts suicidal behaviour and mortality in young adults: a nationwide
- 21 516 prospective cohort study. *BMJ Open*. 2013;3(2).
- 22 517 28. WHO. International Statistical Classification of Diseases and Related Health Problems,
- 23 518 10 revision (ICD 10). 2010.
- 24 519 29. Koopmans PC, Bultmann U, Roelen CA, Hoedeman R, van der Klink JJ, Groothoff JW.
- 25 520 Recurrence of sickness absence due to common mental disorders. *International Archives of*
- 26 521 *Occupational and Environmental Health*. 2011;84(2):193-201.
- 27 522 30. Deverill C KM. Common Mental Disorders. In: McManus S MH, Brugha T, Bebbington
- 28 523 P,, R J, editors. Adult psychiatric morbidity in England. London: The NHS Information Centre for
- 29 524 health and social care; 2009. p. 25-7.
- 30 525 31. Rutz EM, Wasserman D. Trends in adolescent suicide mortality in the WHO European
- 31 526 Region. *European child & adolescent psychiatry*. 2004;13(5):321-31.
- 32 527 32. Allebeck P, Allgulander C, Henningsohn L, Jakobsson S. Causes of death in a cohort of
- 33 528 50465 young men—validity of recorded suicide as underlying cause of death. *Scandinavian Journal of*
- 34 529 *Social Medicine*. 1991;19:242-47.
- 35 530 33. Mittendorfer-Rutz E, Rasmussen F, Wasserman D. Restricted fetal growth and adverse
- 36 531 maternal psychosocial and socioeconomic conditions as risk factors for suicidal behaviour of
- 37 532 offspring: a cohort study. *Lancet*. 2004;364(9440):1135-40.
- 38 533 34. Ludvigsson JF, Andersson E, Ekblom A, et al. External review and validation of the
- 39 534 Swedish national inpatient register. *BMC Public Health*. 2011;11:450.
- 40 535 35. Socialstyrelsen. The Cause of Death register. Stockholm, Sweden: National Board of
- 41 536 Health and Welfare, 2013 August 2013. Report No.: ISSN 1400-3511; ISBN 978-91-7555-090-9; Report
- 42 537 no. 2013-8-6.
- 43 538 36. Ljungdahl LO, Bjurulf P. The accordance of diagnoses in a computerized sick-leave
- 44 539 register with doctor's certificates and medical records. *Scand J Soc Med*. 1991;19(3):148-53.
- 45 540 37. Shrivastava A, Johnston M, Bureau Y. Stigma of Mental Illness-1: Clinical reflections.
- 46 541 *Mens Sana Monogr*. 2012;10(1):70-84.
- 47 542 38. Lauber C. Stigma and discrimination against people with mental illness: a critical
- 48 543 appraisal. *Epidemiologia e Psichiatria Sociale*. 2008;17(1):10-3.
- 49 544 39. Allebeck P, Mastekaasa A. Swedish Council on Technology Assessment in Health Care
- 50 545 (SBU). Chapter 3. Causes of sickness absence: research approaches and explanatory models. *Scand J*
- 51 546 *Public Health Suppl*. 2004;63:36-43.
- 52 547 40. Gustafsson K, Aronsson G, Marklund S, Wikman A, Floderus B. Peripheral labour
- 53 548 market position and risk of disability pension: a prospective population-based study. *BMJ Open*.
- 54 549 2014;4(8):e005230.
- 55
- 56
- 57
- 58
- 59
- 60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2015_NOT TO BE CITED

- 1
2
3 550 41. Turecki G, Brent DA. Suicide and suicidal behaviour. *Lancet*. 2015.
4 551 42. Haw C, Hawton K, Gunnell D, Platt S. Economic recession and suicidal behaviour:
5 552 Possible mechanisms and ameliorating factors. *Int J Soc Psychiatry*. 2015;61(1):73-81.
6 553 43. Mittendorfer-Rutz E, Kjeldgard L, Runeson B, et al. Sickness absence due to specific
7 554 mental diagnoses and all-cause and cause-specific mortality: a cohort study of 4.9 million inhabitants
8 555 of Sweden. *PLoS One*. 2012;7(9):e45788.
9 556 44. Conwell Y, Duberstein PR, Cox C, Herrmann JH, Forbes NT, Caine ED. Relationships of
10 557 age and axis I diagnoses in victims of completed suicide: a psychological autopsy study. *Am J*
11 558 *Psychiatry*. 1996;153(8):1001-8.
12 559 45. McGirr A, Renaud J, Bureau A, Seguin M, Lesage A, Turecki G. Impulsive-aggressive
13 560 behaviours and completed suicide across the life cycle: a predisposition for younger age of suicide.
14 561 *Psychol Med*. 2008;38(3):407-17.
15 562 46. Jylha P, Rosenstrom T, Mantere O, et al. Personality disorders and suicide attempts in
16 563 unipolar and bipolar mood disorders. *J Affect Disord*. 2015;190:632-9.
17 564 47. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide
18 565 attempts in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1999;56(7):617-26.
19 566 48. Isometsa E. Suicidal behaviour in mood disorders--who, when, and why? *Can J*
20 567 *Psychiatry*. 2014;59(3):120-30.
21 568 49. Vijayakumar L, Kumar MS, Vijayakumar V. Substance use and suicide. *Curr Opin*
22 569 *Psychiatry*. 2011;24(3):197-202.
23 570 50. Erol A, Karpyak VM. Sex and gender-related differences in alcohol use and its
24 571 consequences: Contemporary knowledge and future research considerations. *Drug Alcohol Depend*.
25 572 2015;156:1-13.
26 573 51. Boykoff N, Schneekloth TD, Hall-Flavin D, et al. Gender differences in the relationship
27 574 between depressive symptoms and cravings in alcoholism. *Am J Addict*. 2010;19(4):352-6.
28 575 52. Goldstein RB, Dawson DA, Chou SP, Grant BF. Sex differences in prevalence and
29 576 comorbidity of alcohol and drug use disorders: results from wave 2 of the National Epidemiologic
30 577 Survey on Alcohol and Related Conditions. *J Stud Alcohol Drugs*. 2012;73(6):938-50.
31 578 53. Moscato BS, Russell M, Zielesny M, et al. Gender differences in the relation between
32 579 depressive symptoms and alcohol problems: a longitudinal perspective. *Am J Epidemiol*.
33 580 1997;146(11):966-74.
34 581 54. Amore M, Innamorati M, Vittorio CD, et al. Suicide attempts in major depressed
35 582 patients with personality disorder. *Suicide Life Threat Behav*. 2014;44(2):155-66.
36 583 55. Paris J. Chronic suicidality among patients with borderline personality disorder.
37 584 *Psychiatr Serv*. 2002;53(6):738-42.
38 585 56. Ishtiak-Ahmed K, Perski A, Mittendorfer-Rutz E. Predictors of suicidal behaviour in
39 586 36,304 individuals sickness absent due to stress-related mental disorders -- a Swedish register linkage
40 587 cohort study. *BMC Public Health*. 2013;13.
41 588 57. Floderus B, Goransson S, Alexanderson K, Aronsson G. Self-estimated life situation in
42 589 patients on long-term sick leave. *J Rehabil Med*. 2005;37(5):291-9.

43
44
45
46
47 590
48
49
50
51
52
53
54
55
56
57
58
59
60

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 1. Descriptive statistics with regard to main and secondary disability pension (DP) diagnoses, duration, and grade of DP in the cohort of 46 515 women and men, aged 19-64 years, living in Sweden on 31.12.2004, and in 2005 on DP due to common mental disorders.

Characteristics	All		Women		Men		Age 19-44 years		Age 45-64 years		P value for difference by Chi ²
	N	%	n	%	n	%	n	%	n	%	
Total	46 515	100	30 883	100	15 632	100	13 931	100	32 584	100	
Main DP diagnosis											
Depressive disorders	22 032	47.4	14 907	48.3	7 125	45.6	5 242	37.6	16 790	51.5	p <0.001
Anxiety disorders	13 516	29.1	8 558	27.7	4 958	31.7	6 007	43.1	7 509	23.0	
Stress-related mental disorders	10 967	23.6	7 418	24.0	3 549	22.7	2 682	19.3	8 285	25.4	
Secondary DP diagnosis											
No secondary diagnosis	20 042	43.1	13 254	42.9	6 788	43.4	5 217	37.4	14 825	45.5	p <0.001
Substance abuse disorders	950	2.0	378	1.2	572	3.7	344	2.5	606	1.9	
Personality disorders	2 313	5.0	1 294	4.2	1 019	6.5	1 232	8.8	1 081	3.3	
Other mental disorders	12 329	26.5	8 237	26.7	4 092	26.2	4 924	35.3	7 405	22.7	
Musculoskeletal disorders	4 911	10.5	3 716	12.0	1 195	7.6	980	7.0	3 931	12.1	
Other somatic disorders	5 970	12.8	4 004	13.0	1 966	12.6	1 234	8.9	4 736	14.5	
Number of years on DP in 2005											
1 year	5 994	12.5	4 168	13.5	1 826	11.7	2 280	16.4	3 714	11.4	p >0.01
2-3 years	20 846	44.8	14 162	45.9	6 684	42.8	6 726	48.3	14 120	43.3	
≥4 years	19 675	42.3	12 553	40.6	7 122	45.6	4 925	35.4	14 750	45.3	
DP grade in 2005											
Part-time	11 371	24.4	8 651	28.0	2 720	17.4	2 671	19.2	8 700	26.7	p <0.001
Full-time	35 144	75.6	22 232	72.0	12 912	82.6	11 260	80.8	23 884	73.3	

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 2. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (in 2006-10), in 46 515 individuals, aged 19-64 years, living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by gender.

Characteristics	Suicide attempt						Suicide					
	Women			Men			Women			Men		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95%CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	355	34.3	1	139	13.4	1	53	25.6	1	50	24.2	1
Anxiety disorders	278	26.8	1.4 (1.2-1.6)	140	13.5	1.5 (1.1-1.8)	32	15.5	1.1 (0.7-1.6)	47	22.7	1.3 (0.9-2.0)
Stress-related mental disorders	99	9.6	0.6 (0.5-0.7)	25	2.4	0.4 (0.2-0.5)	17	8.2	0.6 (0.4-1.1)	8	3.9	0.3 (0.2-0.7)
Secondary DP diagnosis												
No secondary diagnosis	232	22.4	1	100	9.7	1	34	16.4	1	45	21.7	1
Substance abuse disorders	43	4.2	7.1 (5.1-9.8)	34	3.3	4.3 (2.9-6.3)	9	4.3	9.6 (4.6-20.1)	7	3.4	1.9 (0.9-4.3)
Personality disorders	83	8.0	3.8 (2.9-4.8)	39	3.8	2.7 (1.8-3.8)	12	5.8	3.6 (1.9-7.0)	9	4.4	1.3 (0.7-2.8)
Other mental disorders	253	24.4	1.8 (1.5-2.1)	95	9.2	1.6 (1.2-2.1)	27	13.0	1.3 (0.8-2.1)	29	14.0	1.1 (0.7-1.7)
Musculoskeletal disorders	56	5.4	0.9 (0.6-1.2)	10	1.0	0.6 (0.3-1.1)	<7	2.9	0.6 (0.3-1.5)	<7	2.4	0.6 (0.3-1.6)
Other somatic disorders	65	6.3	0.9 (0.7-1.2)	26	2.5	0.9 (0.6-1.4)	14	6.8	1.4 (0.7-2.5)	10	4.8	0.8 (0.4-1.5)
Number of years on DP in 2005												
1 year	100	13.7	1	42	13.8	1	13	12.7	1	14	13.3	1
2-3 years	308	42.1	0.9 (0.7-1.1)	137	45.1	0.9 (0.6-1.3)	46	45.1	1.0 (0.6-1.9)	51	48.6	1.0 (0.6-1.8)
≥4 years	324	44.3	1.1 (0.9-1.4)	125	41.1	0.8 (0.5-1.1)	43	42.2	1.1 (0.6-2.1)	40	38.1	0.7 (0.4-1.4)
DP grade												
Part-time	84	8.1	1	42	4.1	1	16	7.7	1	10	4.8	1
Full-time	648	62.8	3.1 (2.4-3.8)	262	25.4	1.3 (1.0-1.9)	86	41.6	2.1 (1.2-3.6)	95	45.9	2.0 (1.1-3.9)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 3. Univariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age.

Characteristics	Suicide attempt						Suicide					
	Age 19-44 years			Age 45-64 years			Age 19-44 years			Age 45-64 years		
	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)	n	%	HR (95% CI)
Main DP diagnosis												
Depressive disorders	217	21.0	1	277	26.7	1	20	9.7	1	83	43.0	1
Anxiety disorders	278	26.8	1.1 (0.9-1.3)	140	13.5	1.1 (0.9-1.4)	44	21.3	1.9 (1.1-3.3)	35	16.9	0.9 (0.6-1.4)
Stress-related mental disorders	62	6.0	0.6 (0.4-0.7)	62	6.0	0.5 (0.3-0.6)	12	5.8	1.2 (0.6-2.4)	13	6.3	0.3 (0.2-0.6)
Secondary DP diagnosis												
No secondary diagnosis	140	13.5	1	192	18.5	1	20	9.7	1	59	28.5	1
Substance abuse disorders	40	3.9	4.7 (3.3-6.7)	37	3.6	5.0 (3.5-7.2)	8	3.9	6.3 (2.8-14.3)	8	3.9	3.5 (1.7-7.3)
Personality disorders	85	8.2	2.6 (2.0-3.5)	37	3.6	2.7 (1.9-3.8)	13	6.3	2.8 (1.4-5.6)	8	3.9	1.9 (1.0-3.9)
Other mental disorders	233	22.5	1.8 (1.5-2.2)	115	11.1	1.2 (1.0-1.5)	30	14.5	1.6 (0.9-2.7)	27	13.0	0.9 (0.6-1.4)
Musculoskeletal disorders	23	2.2	0.9 (0.6-1.4)	43	4.2	0.8 (0.6-1.2)	<7	1.9	1.1 (0.4-3.1)	7	3.4	0.5 (0.2-1.0)
Other somatic disorders	36	3.5	1.1 (0.8-1.6)	55	5.3	0.9 (0.7-1.2)	<7	1.0	0.4 (0.1-1.8)	22	10.6	1.2 (0.7-1.9)
Number of years on DP in 2005												
1 year	95	17.1	1	47	9.8	1	7	9.2	1	20	15.3	1
2-3 years	254	45.6	0.9 (0.7-1.1)	191	39.9	1.1 (0.8-1.5)	39	51.3	1.9 (0.9-4.2)	58	44.3	0.8 (0.5-1.3)
≥4 years	208	37.3	1.0 (0.8-1.3)	241	50.3	1.3 (1.0-1.8)	30	39.5	2.0 (0.9-4.5)	53	40.5	0.7 (0.4-1.1)
DP grade												
Part-time	56	5.4	1	70	6.8	1	7	3.4	1	19	9.2	1
Full-time	501	48.6	2.2 (1.6-2.9)	409	39.6	2.2 (1.7-2.8)	69	33.3	2.4 (1.1-5.1)	112	54.1	2.2 (1.3-3.6)

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_NOT TO BE CITED

Table 4. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by gender[□].

Characteristics	Suicide attempt		Suicide	
	Women	Men	Women	Men
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.0 (0.9-1.2)	1.0 (0.8-1.2)	0.9 (0.6-1.4)	1.3 (0.8-2.0)
Stress-related mental disorders	0.8 (0.6-1.0)	0.6 (0.4-0.9)	0.9 (0.5-1.6)	0.4 (0.2-0.9)
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.1 (1.5-2.9)*	1.6 (1.0-2.4)	3.3 (1.5-7.1)*	0.8 (0.3-1.7)
Personality disorders	1.4 (1.1-1.8)*	1.4 (1.0-2.1)	1.8 (0.9-3.5)	0.9 (0.4-1.8)
Other mental disorders	1.3 (1.1-1.5)*	1.2 (0.9-1.6)	1.1 (0.6-1.8)	0.9 (0.6-1.5)
Musculoskeletal disorders	1.1 (0.8-1.5)	0.7 (0.4-1.4)	0.8 (0.3-2.0)	0.7 (0.3-1.9)
Other somatic disorders	1.1 (0.9-1.5)	1.0 (0.7-1.6)	1.6 (0.9-3.0)	0.8 (0.4-1.7)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.9 (0.7-1.1)	1.0 (0.7-1.4)	1.0 (0.5-1.8)	1.0 (0.6-1.8)
≥ 4 years	1.0 (0.8-1.2)	0.9 (0.6-1.3)	1.0 (0.5-1.8)	0.7 (0.4-1.3)
DP grade				
Part-time	1	1	1	1
Full-time	1.7 (1.4-2.2)*	0.9 (0.6-1.3)	1.5 (0.8-2.6)	1.7 (0.9-3.3)

□Adjusted for: Age, Educational level, Family situation, Country of birth, Type of area of living, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

Measures of DP and suicidality in individuals on DP due to CMD_Rahman et al_2014_ NOT TO BE CITED

Table 5. Multivariate hazard ratios (HR) with 95% confidence interval (CI) for suicide attempt and suicide (2006-10), in 46 515 individuals, aged 19-64 years and living in Sweden on 31.12.2004, and on disability pension (DP) due to common mental disorders in 2005, stratified by age[□].

Characteristics	Suicide attempt		Suicide	
	Age 19-44 years	Age 45-64 years	Age 19-44 years	Age 45-64 years
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Main DP diagnosis				
Depressive disorders	1	1	1	1
Anxiety disorders	1.1 (0.9-1.3)	0.9 (0.8-1.2)	1.7 (1.0-3.0)	0.9 (0.6-1.3)
Stress-related mental disorders	0.8 (0.6-1.1)	0.7 (0.5-0.9)	1.7 (0.8-3.6)	0.4 (0.2-0.8)*
Secondary DP diagnosis				
No secondary diagnosis	1	1	1	1
Substance abuse disorders	2.3 (1.6-3.3)*	1.5 (1.1-2.2)*	2.6 (1.1-6.1)	1.0 (0.5-2.3)
Personality disorders	1.5 (1.1-2.0)*	1.6 (1.1-2.2)*	1.7 (0.8-3.4)	1.1 (0.5-2.3)
Other mental disorders	1.5 (1.2-1.9)*	1.0 (0.8-1.3)	1.3 (0.8-2.4)	0.8 (0.5-1.3)
Musculoskeletal disorders	1.1 (0.7-1.8)	0.9 (0.7-1.3)	1.7 (0.6-4.9)	0.6 (0.3-1.3)
Other somatic disorders	1.2 (0.8-1.8)	1.1 (0.8-1.4)	0.5 (0.1-2.1)	1.3 (0.8-2.2)
Number of years on DP in 2005				
1 year	1	1	1	1
2-3 years	0.8 (0.7-1.1)	1.0 (0.7-1.3)	1.8 (0.8-4.0)	0.7 (0.4-1.2)
≥4 years	0.9 (0.7-1.4)	1.0 (0.7-1.4)	1.7 (0.7-3.8)	0.6 (0.3-0.9)
DP grade				
Part-time	1	1	1	1
Full-time	1.4 (1.1-1.9)*	1.5 (1.1-1.9)*	1.3 (0.6-3.0)	1.7 (1.0-2.8)

□Adjusted for: Gender, Educational level, Family situation, Country of birth, Type of area of living, Previous suicide attempt, Inpatient care due to mental diagnoses, Specialized outpatient care due to mental diagnoses.

*significant also with 99% CI (p<0.01).

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Disability pension (DP) due to common mental disorders (CMD) and subsequent suicidal behaviour; a population-based prospective cohort study	1
		(b) See Abstract	3-4
Introduction			
Background/rationale	2	See Background	5-6
Objectives	3	To examine 1) how different DP measures (main diagnosis, secondary diagnosis, duration, and grade) were associated with subsequent suicidal behaviour (suicide attempt and suicide) in individuals on DP due to CMD and 2) possible differences in these associations with regard to sex and age. See Aim	6
Methods			
Study design	4	Prospective cohort design. See Methods and Materials: Design	7
Setting	5	See Methods and Materials: Design, Risk factors	7, 8, 9
Participants	6	(a) See Methods and Materials: Design, Disability pension, Statistical analyses, Table 1	7, 8, 11
		(b) N/A	
Variables	7	See Methods and Materials: Risk factors, Confounders, Outcome measures	8-10
Data sources/ measurement	8*	See Methods and Materials: Design, Statistical Analyses	7,11
Bias	9	The bias is limited by using a population based study population based on data with nation-wide coverage and information on a large number of confounders. See Methods and Materials: Design	7
Study size	10	See Methods and Materials: Design	7
Quantitative variables	11	See Methods and Materials: Risk factors, Confounders, Outcome measures, Statistical analyses	8-11
Statistical methods	12	(a) Uni- and multivariate hazard ratios and 95% confidence intervals (CI) for the risk factors with regard to suicide attempt and suicide were estimated by Cox proportional hazard regression models, after testing that the proportionate hazard assumption was met. See Methods and Materials: Statistical Analyses	11
		(b) Chi-square statistics were used to test significant sex and age differences in the. See Methods and Materials: Statistical	11

		Analyses	
		(c) Missing values were coded as separate categories. See Methods and Materials: Confounders	10
		(d) There was practically no loss to follow-up	
		(e) Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Materials: Statistical Analyses	11
Results			
Participants	13*	(a) See Methods and Materials: Design, Results, Table 1	7, 12
		(b) This is a register based and population based study with data on individuals on disability pension covering information from the whole country	11
		(c) --	
Descriptive data	14*	(a) See Results, Table 1, Table 2, Table 3	12,13
		(b) Only the confounder 'Education level in years' had missing for 504 (1.1%) individuals and was categorized as a separate category. See Methods and Materials: Confounders	10
		(c) See Results	13
Outcome data	15*	See Methods and Materials: Outcome measures, Results	10, 12-14
Main results	16	(a) See Results, Table 2-5	12-14
		(b) See Table 1 for categories of 'Number of years on DP in 2005'. Analyses were stratified for age, age was dichotomised. See Methods and Materials: Confounders	10
		(c) --	
Other analyses	17	-All analyses were stratified for age and sex. See Table 1-5. -Partial likelihood ratio test was used to test interactions with sex and age. See Methods and Materials: Statistical analyses -Sensitivity analyses were carried out by calculating HRs and 95% CIs for all exposure measures in relation to determined and undetermined suicide attempt and completed suicide separately and after combining them. See Methods and Material: Statistical analyses	11 11
Discussion			
Key results	18	See Discussion	15
Limitations		See Discussion	16
Interpretation	20	See Discussion, Conclusion	15-19
Generalisability	21	The findings are generalisable to countries with comparable health care and social insurance systems.	

Other information			
Funding	22	See Title page: Financial support	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

For peer review only

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>