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# **BMJ Open**

# Predictive Value of Burnout and Depression for Medically Certified Sickness Absence Among Physicians in Sweden: A one-year follow-up

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1	Predictive Value of Burnout and Depression for Medically Certified Sickness Absence Among
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25	29	This paper distinguishes burnout from depression, particularly in predicting future all-cause medically
26	30	certified sickness absence in physicians during the pandemic. It also highlights the importance of
27	50	certified sickness absence in physicians during the pandemic. It also highlights the importance of
28 29	31	cognitive impairment for future sickness absence, which aligns with the updated recommendation
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31	32	for clinical assessment of exhaustion disorders. This paper makes a timely contribution to the field of
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#### 

35	Abstract
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Background: Many studies show increasing levels of self-reported mental ill-health among
 physicians. This study aimed to explore the predictive value of symptoms of burnout and depression
 for subsequent all-cause medically certified sickness absence (ACMCSA) during the pandemic among
 physicians in Sweden.

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Method: Data from 1575 physicians in the Longitudinal Occupational Health Survey for HealthCare in Sweden (LOHHCS) were utilised, with baseline information collected in 2021 and follow-up in 2022. The Burnout Assessment Tool (BAT-23) was used to measure burnout, including a burnout total score and scores for the four symptom dimensions of exhaustion, mental distance, emotional impairment, and cognitive impairment. Depressive symptoms were assessed using the Symptom Checklist-core depression (SCL-CD6). ACMCSA data came from the Swedish Social Insurance Agency. Within and between-year associations were examined with Spearman's correlations, while associations between baseline burnout and depression and subsequent ACMCSA were estimated with logistic regression analyses.

49 Results: Correlations were found between burnout and symptom dimensions of burnout and
 50 depression. However, the strength of the correlation varied between different symptom dimensions
 51 and depression. Burnout and emotional impairment were associated with a higher likelihood of
 52 subsequent ACMCSA. Depression was not associated with ACMCSA when adjusted for severe
 53 burnout and other covariates.

54 Conclusion: This study demonstrates the distinction between burnout and depression, particularly in
 55 predicting future ACMCSA. Early intervention targeting exhaustion and burnout may mitigate
 56 symptom development and reduce the risk of ACMCSA.

**Keywords**: exhaustion disorders; healthcare; longitudinal; mental health; sickness absence; stress

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# 59 Introduction

60	The prevalence of burnout and depression among working physicians in Sweden in 2021 was high (1).
61	During this time, healthcare services were burdened by the COVID-19 pandemic with increased
62	exposure to several stressors (2–5). Longitudinal studies show that mental health problems have
63	increased (6), while others show no change (6,7) or even a decrease (8,9). The variation across
64	studies can result from many factors; for example, studies often focused on frontline single clinics or
65	physicians, leaving out a large share of physicians. Moreover, many previous studies were based on
66	small samples (9) and short follow-up times, often focusing on the initial phase of the pandemic (7).
67	However, physicians experienced extreme stress and high demands, no matter whether they worked
68	directly with COVID-19 patients or not (1,3,4,10,11), which likely contributed to an increase in
69	burnout and depression. Symptom of burnout and depression impairs workability (12,13) and
70	increase the risk of long-term sickness absence and turnover intention. Statistics from the Swedish
71	Social Insurance Agency show an increase in sickness absence due to mental health impairment
72	among physicians in recent years (14), and this amounts to enormous societal costs (15).
73	While there is an established diagnosis of burnout in Sweden, there is an ongoing scholarly and
74	clinical debate about the concept (16). A weakness in previous international research exploring
75	burnout is the need for a comprehensive measurement of burnout, resulting in prevalences between
76	0 and 80% among physicians (17). This has caused a debate about the mere existence of burnout as a
77	state (18). A significant issue raised in the discussion against the existence of burnout has been the
78	overlap between symptoms of burnout and symptoms of depression (18–21).
79	According to Schaufeli and Taris (22), burnout is not a condition but consists of symptoms that
80	develop continuously over time. Burnout results from chronic exposure to job stress that is not
81	successfully managed (22–25). This leads to extreme physical and mental fatigue, impairing cognitive

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82 and emotional regulation processes, and difficulties controlling one's emotions or feeling empathy

83 (22). To manage the situation, emotional distancing develops, which means that work no longer feels

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84	meaningful and that one becomes cynical and avoids contact with others. This becomes a
85	counterproductive and ineffective way of coping, leading to even more fatigue and reinforcing the
86	negative spiral (22). Based on this definition and robust theoretical foundation (24,26), the Burnout
87	Assessment Tool (BAT) was developed to measure burnout among workers. The BAT scale has many
88	strengths, one being the possibility of exploring both symptom dimensions of burnout occurring in
89	earlier phases of prolonged exposure to stress, i.e., (i) exhaustion (extreme tiredness, severe loss of
90	energy), (ii) mental distance (mental withdrawal and psychological detachment), (iii) cognitive
91	impairment (reduced functional capacity to regulate cognitive processes), and (iv) emotional
92	impairment (reduced functional capacity to regulate emotional processes), and burnout.
93	Depression, as classified in the International Classifications of Diseases (ICD) and Diagnostic and
94	Statistical Manual (DSM) of Mental Disorders IV, are based on a list of symptoms (Table 1), of which
95	some are necessary for a diagnosis (27).
96	Table 1.
97	Researchers have argued that burnout largely overlaps with depression and questioned whether
98	they can be explored as two distinct mental health issues (18,19). The opposite has also been
99	proposed, and although burnout and depression appear to share some common symptoms (e.g.,
100	fatigue), a recent meta-analysis shows that burnout and depression are associated but still constitute
101	two separate constructs (20,28).
102	In this study, we seek to gain more information on the symptom development of burnout and
103	depression in Swedish physicians. Specifically, we aim to explore the correlation between symptoms
104	of burnout and depression and whether severe burnout, symptom dimensions of burnout, and major
105	depression predict subsequent ACMCSA.
106	Method

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107 This study draws on data from the Longitudinal Occupational Health Survey for HealthCare workers 108 in Sweden (LOHHCS). A survey was distributed to a representative sample of physicians in the 109 Swedish occupational register. Baseline data were collected from February to May 2021 (baseline). 110 The follow-up survey was distributed from March to June 2022. A total of 6,699 physicians were 111 invited to participate in the baseline survey, and 34% answered (1). At follow-up, all 6699 received an 112 invitation to participate in the study. An additional sample (n=1209) was drawn among those newly 113 educated physicians. 7908 received the survey at follow-up, and 34.3% responded. In total, 1575 physicians answered the survey at both times. 114

115 An analysis of missing data showed that the share of men and women, hierarchical positions, work 116 hours, and frontline work or not was almost identical (only differentiated by up to three percentage 117 points) between those who responded two times and those who only responded in 2021. In the 118 sample, including both waves of data collection, there was a lower representation of physicians who 119 work in facilities other than primary care or hospitals (e.g., occupational health) compared with the 120 sample from 2021. Sickness absence in 2022 was 10.0% among those only responding in 2021, while 121 the corresponding figure among those in the sample, including both waves, was 9.3%.

122 The Swedish Ethical Review Authority reviewed and approved this study (Dnr: 2020-06613; 2021-

05574-02; 2022-03105-01).

124 Measurement

125 Outcomes

126 Data on ALMCSA is derived from the Swedish Social Insurance Agency register. The agency registers

- 127 ALMCSA after 14 days of sick leave. It thus covers the number of days of ALMCSA, exceeding 14 days
- 128 between June 2021 (i.e., after the baseline data collection) and June 2022. The variable was
- 129 dichotomised into 0 (no days of ACMCSA) and 1 (days of ACMCSA between baseline and follow-up).
- 130 9.3% of the physicians had ACMCSA between baseline and follow-up.

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#### 131 Exposures

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132	We assessed baseline burnout and symptom dimensions using the extended version of the BAT-23
133	(26). BAT-23 comprised 23 items divided into four sub-scales representing symptom dimensions of
134	burnout: exhaustion (8 items), mental distance (5 items), emotional impairment (5 items), and
135	cognitive impairment (5 items). By using all 23 items, we can assess burnout. Each item was rated on
136	a five-point scale from 1 (never) to 5 (always). A grand mean was constructed for each symptom
137	dimension and the entire 23-item compound, resulting in five scales ranging from 1 to 5. Each
138	dimension and the whole compound had high internal consistency. Table 2 presents Cronbach's
139	alpha for each dimension, the full compound, and respective cut-off values according to (25,26,29).
140	The cut-off values for the BAT scale follow a traffic-light system where the red cut-off, applied in this
141	study (Tabl1 shows all cut-off scores), marks severe symptoms of burnout (hereon severe burnout).
142	For the full compound scale, a value above the red cut-off ( $\geq$ 3.02) signifies severe burnout and
143	individuals scoring above this value would probably be diagnosed with clinical burnout if clinically
144	assessed (25).
145	Table 2
146	Symptoms of depression were assessed using the symptom checklist six core depression (SCL-6CD)
147	(30). It consists of six items, each representing a depressive symptom. An additive mean was created
148	ranging from 0 to 24, with a higher score representing more severe depressive symptoms. Following
149	the study of Magnusson Hanson et al. (30), we set the cut-off at ≥16, where a value above the cut-off
150	indicates major depression.

151 To research the association between burnout and depression, SCL-6CD was also computed for 2021.

152 Covariates

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3 4	153	Differences in mental health between individuals according to gender, hierarchical position, and
5 6	154	place of work during the pandemic have been identified in previous studies (1) and are included as
7 8 9	155	covariates.
10 11	156	Models were adjusted for baseline gender (men or women), working hours, healthcare facility
12 13 14	157	(primary and secondary healthcare facility), and hierarchical position (physicians in training,
15 16	158	specialists, and consultants). We also adjusted for self-reported difficult life events (e.g., divorce,
17 18	159	sickness in the family) during the study period. Sex and age in 2021 were added to LOHHCS data by
19 20	160	Statistics Sweden and derived from the Longitudinal Database on Education, Income, and Occupation
21 22 23	161	held by Statistics Sweden.
24 25 26	162	We also adjusted for frontline work during the COVID-19 pandemic in 2021 by asking the
20 27 28	163	respondents if they worked with COVID-19 patients most of the time, at some periods, or at no time.
29 30 31	164	Analytical strategy
32 33	165	Descriptive statistics were used to show mean values and prevalences for burnout and symptom
34 35 36	166	dimensions of burnout and depression in 2021 across all covariates. T-test and ANOVA tested
37 38 20	167	differences in mean value between groups.
40 41	168	To answer the first research question, linear associations were tested using the Spearman correlation
42 43	169	coefficient between burnout, symptom dimensions of burnout (exhaustion, mental distance,
44 45 46	170	emotional impairment, and cognitive impairment), and symptoms of depression in 2021 and 2022.
47 48	171	To answer the second research question, i.e., to estimate if burnout, each symptom dimension of
49 50 51	172	burnout (exhaustion, mental distance, emotional impairment, and cognitive impairment) and major
52 53	173	depression in 2021 had predicted the prevalence of ALMCSA the following year, we used logistic
54 55	174	regression analysis. First, crude analyses investigated each variable's association with the outcome
56 57	175	variable. After that, in Model A, baseline severe burnout and major depression were entered
58 59 60	176	simultaneously and adjusted for the abovementioned covariates. In Model B, severe burnout was

2		
3 4	177	exchanged with the four symptom dimension variables (exhaustion, mental distance, emotional
5 6	178	impairment, and cognitive impairment) and entered into the model along with depression and
7 8 0	179	covariates.
9 10 11	180	All analyses were conducted in SPSS version 28.
12 13 14	181	Results
15 16 17	182	Descriptives show that the sample has more women (56.1%) than men (43.9%) and that female
18 19	183	physicians experience significantly higher levels of mental ill-health, except for mental distance.
20 21	184	More than half of the physicians in the sample (55.3%) worked with COVID-19 patients. Those who
22 23 24	185	reported frontline work reported higher mean levels of burnout, exhaustion, and mental distance
25 26	186	than those who did not work at the frontline.
27 28 20	187	In the total sample, 4.7% had severe burnout, and 3.7% had major depression (Table 3). Across the
29 30 31	188	symptom dimensions, the prevalence ranged from 12% for exhaustion to 2.9% for emotional
32 33 34	189	impairment.
35 36	190	One-fifth (18.9%) of the sample had a difficult life event (Table 3) and reported higher mean values of
37 38 30	191	burnout, exhaustion, emotional impairment, and depression—moreover, 53.2% estimated working
40 41	192	between 36 and 45 hours per week. Most physicians worked in hospitals (53.2%) or primary care
42 43	193	(41.6%). Few worked in other facilities, and they also reported the lowest mean level of mental
44 45	194	health. The share of physicians-in-training was 30%, specialists 40.1%, and consultants 29.1%.
46 47	195	Physicians-in-training reported significantly higher levels of mental ill-health, except for cognitive
48 49 50	196	impairment.
51 52 53	197	Table 3 here
54 55	198	Table 4 shows correlations between burnout, symptom dimensions of burnout, and depression in
50 57 58	199	2021 and 2022. All correlations were statistically significant. The strength of the correlations varies
59 60	200	across variables and between years. In general, the within-year correlations are more robust than the

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2 3	201	between-year. The strongest associations are found between hurnout, exhaustion, and mental
4	201	between-year. The strongest associations are found between burnout, exhaustion, and mental
6 7	202	distance, respectively, and depression, while emotional impairment had the weakest association.
8 9 10	203	Table 4 here
11 12	204	In Table 5, associations between severe burnout, symptom dimensions of burnout, and major
13 14	205	depression in 2021 and ACMCSA the following year are shown. Crude analysis showed that all
15 16 17	206	exposure variables, except mental distance, were associated with ACMCSA the following year. Crude
18 19	207	results showed a higher likelihood of ACMCSA among those who had experienced a difficult life
20 21	208	event and female physicians. Those who had worked with COVID-19 patients throughout the first
22 23	209	phase of the pandemic had a reduced likelihood of ACMCSA the following year (OR: 0.60, 95%CI:
24 25 26	210	0.40-0.91).
27 28	211	In the adjusted models (Models A and B), major depression was no longer statistically significant.
29 30 31	212	Sensitivity analyses, running only major depression adjusting for the covariance and without severe
32 33	213	burnout, show significant results (OR=2.46; 95%CI=1.21-4.98). This suggests that it is foremost the
34 35	214	severe burnout or symptom dimensions of burnout that predict ACMCSA the following year rather
36 37	215	than depression. Severe burnout was associated with a two-and-a-half-time higher likelihood of
38 39 40	216	having an ACMCSA the following year (OR=2.57; 95%CI=1.27-5.23).
41 42 43	217	Among the symptom dimensions of burnout (Model B), emotional impairment and cognitive
43 44 45	218	impairment predicted ACMCSA the following year, while exhaustion and mental distance did not.
46 47	219	Those physicians who, in 2021, reported high levels of emotional impairment had almost two times
48 49	220	the odds of ACMCSA the following year (OR=1.80; 95%CI=1.03-3.15), while those reporting high
50 51	221	levels of cognitive impairment had two and a half times higher odds (OR=2.52; 95%CI=1.12-5.50). In
52 53 54	222	the sensitivity analyses, each symptom dimension of burnout was tested separately, and all
55 56	223	dimensions but the mental distance were significantly associated with subsequent ACMCSA (see
57 58 59 60	224	supplementary).

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Similar to Model A, having had a difficult life event in the last year, frontline work and being a woman
remained statistically significant in relation to ACMCSA. The same holds for age, where a one-year
increment increased the odds for ACMCSA by 4%.

228 Discussion

In this one-year follow-up study, during the COVID-19 pandemic, we aimed to explore the association between burnout, symptom dimensions of burnout (exhaustion, mental distance, emotional impairment, and cognitive impairment), and depression and whether severe burnout, symptom dimensions of burnout and major depression predicted subsequent ACMCSA among a sample of physicians working in Sweden. We made several noteworthy discoveries that contribute to current knowledge. Results show that correlations existed between depression and burnout and each of the symptom dimensions of burnout. However, the strength of correlations varied and was generally lower between years than within-year correlations. Also, severe burnout, exhaustion and cognitive impairment in 2021 predicted subsequent ACMCSA the following year. Major depression had no predictive value for ACMCSA the following year when we adjusted for severe burnout and symptom dimensions of burnout, respectively.

This study has methodologically both strengths and weaknesses. A significant strength is utilising a
longitudinal data set with about 1500 participants. However, more measure points may provide
additional insight in the future. In this study, we had no data on ACMCSA before the study period to
adjust the models. On the other hand, having repeated ACMCSA may be indicated by poor
rehabilitation and return to work, and having burnout and cognitive impairment, whether for the
first time or after returning to work, need targeted interventions.

53246This study confirms the correlations between burnout and depression and does not neglect that an5455247overlap of symptoms exists (16,18,20,21). Also, a recent meta-analysis supports that various5657248symptom dimensions of burnout correlate differently to depression and that instruments used to58249measure burnout and depression play a role in the overlap detected (20). Meanwhile, in this one-

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year follow-up, we show that the predictive value of major depression in relation to ACMCSA disappears when introduced together with severe burnout and the symptom dimensions of burnout. Moreover, the between-year correlation was lower compared to the within-year correlation. Our results are supported by a recent meta-analysis showing that overlap between burnout and depression tends to be more present in cross-section studies compared to longitudinal (20). All taken together, this indicates that burnout and depression are distinct phenomena that impact the risk of sickness absence differently. For future research, more longitudinal studies exploring mediation and accumulation effects between depression and symptom dimensions of burnout are recommended. A significant strength of this study is that we provide evidence that severe burnout indicated by an assessed global score and the individual exhaustion and cognitive impairment subcomponents of burnout can predict ACMCSA the following year. Our results align with the past findings by Peterson et al. (31), using medically certified sickness absence (>90 days) as the outcome. However, the association between mental health and sick leave established before mostly rests on self-rated data. At the same time, in this study, we utilised outcome data from the Swedish compulsory sickness insurance registers. Our study, therefore, makes an essential contribution to current knowledge. Also, it provides valuable knowledge on the predictive validity of the BAT on future sick leave. Cognitive impairment, i.e., memory problems, attention and concentration deficits, and poor cognitive performance, were found to predict subsequent ACMCSA when investigated in conjunction with all the symptom dimensions of burnout. This dimension of burnout was introduced in the conceptual framework developed by Schaufeli and Taris (21) and is not present in the definition of the ICD-11 by the World Health Organisation (32). A recent book (28) highlights the need for salient cognitive impairment in patients diagnosed with exhaustion disorders. It proposes that the main diagnostic distinction between depression and burnout is the presence of cognitive impairment. This study thus contributes to the empirical foundation that cognitive impairment is an essential dimension of burnout, and that the ICD-11 may need to review its definition. 

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Mental health problems in working physicians are serious problems that may cause reduced work ability (12,13) and negatively impact patient safety and quality of care (33,34). Research shows that burnout and depression are associated with an increased risk of several severe health and health-related outcomes, such as cardiovascular disease, musculoskeletal problems, psychotropic and antidepressant treatment, job dissatisfaction, absenteeism, and adverse work-related effects on job performance and productivity (35). It may also lead to turnover and, as we show in this study, sickness absence, resulting in staff shortages. This illuminates the need for immediate actions to prevent symptom development of burnout and promote worker wellbeing. This study was conducted during the COVID-19 pandemic and indicated an increase in mental health problems over time, even after adjusting for frontline work. Interestingly, those at the frontline in 2021 were less likely to have an ACMCSA in the following years. There are many reasons for this, i.e., it was those with poorer health who did not work at the frontline or those who could not work as usual, e.g., surgeons who might have been stressed about not being able to operate. Another reason could be that the follow-up was too short, the pandemic was still ongoing, and longer follow-ups are needed. Lessons from previous pandemics with a lesser impact on healthcare have demonstrated a long-term effect on the mental health of healthcare workers (36). The extremely high workload, in combination with other work environment challenges during the COVID-19 pandemic (3,37,38), is likely to contribute to an increase in shorter spells (less than 14 days) of sickness absences and may further be associated with a long-term escalation of ACMCSA (39). It is, therefore, essential to

continue valid assessment and following the development of mental ill-health of physicians overtime.

296 Key learning points

297 What is already known about this subject:

298 The prevalence of mental ill health among physicians is high and increasing sick days are anticipated.

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2 3 4	299	There is an ongoing discussion in science on the overlap between burnout and depression and
5 6 7	300	whether burnout exists.
, 8 9	301	What this study adds:
10 11 12	302	This study shows a distinction between burnout and depression.
15 14 15	303	Burnout predicts subsequent all-caused medically certified sickness absence among physicians, while
16 17 18	304	depression does not.
19 20	305	Cognitive impairment is an important symptom dimension in burnout, predicting subsequent all-
21 22 23	306	caused medically certified sickness absence.
23 24 25 26	307	What impact this may have on practice or policy:
20 27 28	308	It shows the necessity for early detection and prevention of symptom development of burnout.
29 30 31	309	There is a need to review the definition of burnout in the ICD-11, including cognitive impairment.
32 33 34	310	
35 36 37	311	Conflict of interest
38 39 40	312	The authors have none.
41 42 43	313	Funding
44 45 46	314	None to declare.
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	Depressive Diagnoses	Symptoms
	Major Depressive Episode:	1. Depressed Mood
	<ul> <li>- 5 or more depressive symptoms for ≥</li> <li>2 weeks</li> </ul>	<ol> <li>Markedly diminished interest or pleasure in most or all activities</li> </ol>
	<ul> <li>- Must have either depressed mood or loss of interest/pleasure</li> </ul>	<ol> <li>Significant weight loss (or poor appetite) or weight gain</li> </ol>
	<ul> <li>- Symptoms must cause significant distress or impairment</li> </ul>	4. Insomnia or hypersomnia
	- No manic or hypomanic behaviour	5. Psychomotor retardation
	Minor Depressive Episode:-	6. Fatigue or loss of energy
	<ul> <li>- 2–4 depressive symptoms for ≥2 weeks</li> </ul>	<ol> <li>Feelings of worthlessness or excessive or inappropriate guilt</li> </ol>
	<ul> <li>- Must have either depressed mood or loss of interest or pleasure</li> </ul>	8. Diminished ability to think or concentrate or indecisiveness
	<ul> <li>- Symptoms must cause significant distress or impairment</li> </ul>	<ol> <li>Recurrent thoughts of death (not just fear of dying), or suicidal ideation, pla or attempt</li> </ol>
	- No manic or hypomanic behaviour	of attempt
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430	Table 2. Cronbach's alpha and Cu	ut-off values for exposure measurements

	Cranbach's alpha	Cut off values
Purpout (22 itoms)		
Exhaustion (8 items)	0.95	>3 21
Mental distance (5 items)	0.52	>3 20
Emotional impairment (5 items)	0.34	>2.90
Cognitive impairment (5 items)	0.50	>3 10
Major depression 2021 (6 items)	0.91	>17
Major depression 2022 (6 items)	0.91	>17

							BMJ O	pen			bmjopen-202 by copyrigh			
<b>Table 3.</b> Sample confounders at l	descrij baselin	otion ai e.	nd mean v	values o	f burnout, e	xhaustic	on, mental di	stance, e	emotional impair	ment, co	t, in 0990 impair oppoint 1996 oppoint or	ment and	depression	acı
	n	Share	Burnout	p- value	Exhaustion	p- value	Mental distance	p- value	Emotional impairment	p- value	ີ່ ເສຍາ ເອັ	p- value	Depression	v
Total Share (%)			4.7%		12.0%		3.0%		2.9%		es ja 1.4%	6	3.7%	
Women	883	56.1%	1.96	<0.001	2.43	<0.001	1.69	0.955	1.60	<0.001	elan 1.84	4 <0.001	5.66	<(
Men	692	43.9%	1.79		2.15		1.69		1.50			5	4.38	
Worked with CO	viD-19 µ	batients	I		1			<u> </u>		1	ont to t		<u> </u>	
all the time	867	55.3%	1.92	0.010	2.35	0.010	1.74	<0.001	1.55	0.200	Supa 1.7	7 0.340	5.16	(
part of the time	350	22.3%	1.89		2.31		1.69		1.53		and eried fr data	3	5.29	
at no time	352	22.4%	1.80		2.19	2	1.56		1.49		ABM 1.7	L	4.77	
Difficult life events	297	18.9%	1.95	0.041	2.40	0.038	1.72	0.464	1.58	0.127	ning, 1.80	5 0.008	6.00	<(
No difficult life events	1274	81.1%	1.87		2.29		1.68		1.52		Al tra	1	4.90	
Work hours											inin en.t			
less than 36 hours	271	17.2%	1.84	0.018	2.20	<0.001	1.67	0.387	1.51	0.274	g, and 1.72	0.489	4.64	
36-45 hours	837	53.2%	1.86		2.25		1.68		1.52		<b>Sin 2</b> 1.7	7	4.90	
More than 45 hours	465	29.6%	1.95		2.46		1.73		1.57	ろ	nilar te	3	5.75	
Healthcare facilit	ty	1									ie 5			_
Primary care	654	41.6%	1.90	0.039	2.34	0.022	1.73	0.043	1.51	0.069		3 0.064	4.84	(
Hospital care	837	53.2%	1.89		2.30		1.67		1.56		gie 25 1.70	5	5.40	
Other	81	5.2%	1.72		2.07		1.55		1.46		<b>s if</b> 1.60	)	4.26	
Hierarchical posi	tion	_									gen			
Physicians in training	477	30.8%	1.95	0.006	2.37	0.026	1.77	0.003	1.54	0.996	<b>Ce</b> 1.80	5 <0.001	5.79	<(
Specialists	620	40.1%	1.90		2.33		1.70		1.54			7	5.08	
Consultants	451	29.1%	1.82		2.23		1.62		1.54		ຍ ສ 1.6	7	4.59	

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dimension separately and symptoms of depression in 2021 and 2022 by Pearsons R. Depression 2021 **Depression 2022** 

Burnout	0.79*	0.60*
Exhaustion	0.75*	0.60*
Mental distance	0.64*	0.47*
Emotional impairment	0.58*	0.41*
Cognitive impairment	0.62*	0.46*

\* p<0.001

Table 4. Within and between years correlation between baseline for burnout and each symptom

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**Table 5.** Logistic regression analyses testing the association between baseline severe burnout,exhaustion, mental distance, emotional impairment, cognitive impairment and major depression andany all-cause medically certified sickness absence exceeding 14 days the following year.

		Crude			Model A			Model B	
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value
Ν					1465			1477	
Severe burnout	2.13	1.74- 5.63	<0.001	2.57	1.27- 5.23	0.009			
Exhaustion	2.48	1.62- 3.79	<0.001				1.80	1.03- 3.15	0.040
Mental distance	0.92	0.33- 2.61	0.382				0.40	0.12- 1.35	0.141
Emotional impairment	3.72	1.88- 7.36	<0.001				2.13	0.89- 5.08	0.090
Cognitive impairment	4.69	2.54- 8.67	<0.001				2.52	1.12- 5.50	0.025
Major depression	2.45	1.24- 4.84	0.010	1.62	0.70- 3.73	0.262	1.13	0.47- 2.73	0.790
Working with COVID	-19								
all the time	0.60	0.40- 0.91	0.017	0.59	0.37- 0.95	0.029	0.61	0.38- 0.99	0.047
part of the time	1.06	0.67- 1.69	0.793	0.97	0.59- 1.62	0.918	0.99	0.59- 1.66	0.971
No	1			1			1		
Work hours									
less than 35 h	1.14	0.72- 1.79	0.580	0.84	0.50- 1.42	0.512	0.88	0.52- 1.49	0.632
35-45 h	1			1			1		
More than 45 h	0.95	0.64- 1.42	0.818	1.02	0.66- 1.57	0.923	1.00	0.65- 1.56	0.986
Healthcare facility									
Primary care	1.15	0.51- 2.60	0.743	2.00	0.74- 5.42	0.175	1.80	0.66- 4.92	0.251
Hospital care	1.03	0.46- 2.31	0.952	1.56	0.59- 4.14	0.374	1.46	0.55- 3.90	0.451
Other	1			1			1		
Hierarchical position	1								
Physicians in training	1.01	0.66- 1.55	0.966	1.63	0.84- 3.19	0.117	1.80	0.66- 4.92	0.088
Specialists	0.81	0.53- 1.23	0.322	0.84	0.47- 1.48	0.551	0.85	0.48- 1.51	0.572
Consultants	1			1			1		
Difficult life events (ref no)	1.72	1.16- 2.53	0.006	1.73	1.13- 2.63	0.029	1.60	1.04- 2.44	0.031
Women (ref men)	2.31	1.58- 3.38	<0.001	2.34	1.55- 3.53	<0.001	2.14	1.41- 3.25	<0.001
Age	1.01	0.99- 1.03	0.086	1.03	1.01- 1.06	0.005	1.03	1.01- 1.06	0.004
Nagelkerke R						0.084			0.099

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# Supplementary material

Table 1. The association between severe burnout and major depression, respectively, and all-cause medically certified sickness absence adjusted for working with COVID-19 patients, difficult life events, work hours, healthcare facility, hierarchical position, sex and age

Exposure	OR	CI	p-value	Nagelkerk R <sup>2</sup>
Severe burnout	3.12	1.70-5.74	<0.001	0.076
Major Depression	2.46	1.21-4.98	0.012	0.075

Table 2. The association between exhaustion, mental distance, emotional impairment, and cognitive impairment, respectively, and all-cause medically certified sickness absence adjusted for depression, working with COVID-19 patients, difficult life events, work hours, healthcare facility, hierarchical position, sex and age

Exposure OR		CI	p-value	Nagelkerk R <sup>2</sup>
Exhaustion	2.07	1.26-3.41	0.004	0.086
Mental distance	0.84	0.27-2.57	0.754	0.075
Emotional	3.01	1.38-6.59	0.006	0.085
impairment				
Cognitive	3.62	1.79-7.31	<0.001	0.092
impairment				

# **BMJ Open**

# Predictive Value of Burnout and Depression for Medically Certified Sickness Absence Among Physicians in Sweden: A one-year follow-up

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Secondary Subject Heading:	Mental health, Epidemiology
Keywords:	COVID-19, MENTAL HEALTH, Burnout, Depression & mood disorders < PSYCHIATRY, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT





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1	Predictive Value of Burnout and Depression for Medically Certified Sickness Absence Among
2	Physicians in Sweden: A one year follow up observational study
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#### 29 Abstract

1 2

30 **Objective:** This study aimed to explore the predictive value of severe burnout complaints, symptom

- 31 dimension of burnout and major depression for subsequent all-cause medically certified sickness
- 32 absence (ACMCSA) during the pandemic among physicians in Sweden.
- 33 Design: A one-year follow-up panel cohort observational study the Longitudinal Occupational
- 34 Health Survey for HealthCare in Sweden (LOHHCS). At baseline (February-May 2021), a
- 35 representative sample of 6999 physicians were drawn from the Swedish occupational register and
- 36 invited to participate in the study. At follow-up (March-May 2022), the full sample (excluding those
- 37 who died, retired, stopped working as a physician or migrated, n=94) was invited to answer the
- 38 survey.
- 39 Setting: Swedish primary and specialist healthcare

40 Participants: At baseline, the response rate was 41.2% (n=2,761) of which 1575 also answered at
41 follow-up.

42 Primary and secondary outcome measures: ACMCSA data came from the Swedish Social Insurance 43 Agency. The Burnout Assessment Tool (BAT-23) was used to measure burnout, including a burnout 44 total score and scores for the four symptom dimensions of exhaustion, mental distance, emotional impairment, and cognitive impairment. Depressive symptoms were assessed using the Symptom 45 Checklist-core depression (SCL-CD6). Within and between-year associations were examined with 46 47 Spearman's correlations, while associations between baseline burnout and depression and 48 subsequent ACMCSA were estimated with logistic regression analyses. 49 Results: ACMCSA was found in 9% of the participating physicians. In the sample, 4.7% had severe

- 50 burnout, and 3.7% had major depression. Burnout (OR=2.57; 95%CI=1.27-5.23), and the burnout
- 51 symptom dimensions emotional impairment (OR=1.80; 95%CI=1.03-3.15) and cognitive impairment

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3 4	52	(OR=2.52; 95%CI=1.12-5.50) were associated with a higher likelihood of subsequent ACMCSA.
5 6 7	53	Depression was not associated with ACMCSA when adjusted for severe burnout and other covariates.
8 9	54	Conclusion: This study demonstrates the distinction between burnout and depression, particularly in
10 11	55	predicting future ACMCSA. Early intervention targeting exhaustion and burnout may mitigate
12 13 14	56	symptom development and reduce the risk of ACMCSA.
15 16 17	57	Keywords: exhaustion disorders; healthcare; longitudinal; mental health; sickness absence; stress
18 19 20	58	
20		
21	59	Strengths and limitations of this study
23		
24	60	<u>-</u>
25	60	The geographical and demographic spread represented in the sample is more likely to
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27	61	contribute to the generalisability of results.
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29	62	The use of data from the Swedich Social Incurance Agency on all source medically cartified
30	62	• The use of data from the Swedish Social insurance Agency on all-cause medically certified
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32	63	sickness absence contributes to the objectivity and generalisability of results.
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34	<b>C A</b>	The limitation of the study is the attrition
35	64	• The limitation of the study is the attrition.
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37	65	The work relies partly on self-reported data
38	05	• The work relies partly on sen reported data.
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#### 67 Introduction

The prevalence of burnout and depression among working physicians in Sweden in 2021 was high [1]. During this time, healthcare services were burdened by the COVID-19 pandemic with increased exposure to several stressors [2-5]. Longitudinal studies show that mental health problems have increased [6], while others show no change [6,7] or even a decrease [8,9]. The variation across studies can result from many factors; for example, studies often focused on frontline single clinics or physicians, leaving out a large share of physicians. Moreover, many previous studies were based on small samples [9] and short follow-up times, often focusing on the initial phase of the pandemic [7]. However, physicians experienced extreme stress and high demands, no matter whether they worked directly with COVID-19 patients or not [1,3,4,10,11], which likely contributed to an increase in burnout and depression. Symptom of burnout and depression impairs workability [12,13] and increase the risk of long-term sickness absence and turnover intention. Statistics from the Swedish Social Insurance Agency show an increase in sickness absence due to mental health impairment among physicians in recent years [14], and this amounts to enormous societal costs [15]. While there is an established diagnosis of burnout in Sweden, there is an ongoing scholarly and clinical debate about the concept [16]. A weakness in previous international research exploring burnout is the lack of a comprehensive measurement of burnout, resulting in prevalences between 0 and 80% among physicians [17]. This has caused a debate about the mere existence of burnout as a state [18]. A significant issue raised in the discussion against the existence of burnout has been the overlap between symptoms of burnout and symptoms of depression [18–21]. According to Schaufeli and Taris [22], burnout is not a condition but consists of symptoms that develop continuously over time. Burnout results from chronic exposure to job stress that is not successfully managed [22–25]. This leads to extreme physical and mental fatigue, impairing cognitive

90 and emotional regulation processes, and difficulties controlling one's emotions or feeling empathy

9 91 [22]. To manage the situation, emotional distancing develops, meaning that work no longer feels

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	92	meaningful and that one becomes cynical and avoids contact with others. This becomes a
	93	counterproductive and ineffective way of coping, leading to even more fatigue and reinforcing the
	94	negative spiral [22]. Based on this definition and robust theoretical foundation [24,26], the Burnout
)	95	Assessment Tool (BAT) was developed to measure burnout among workers. The BAT scale has many
1 2 3	96	strengths, one being the possibility of exploring both symptom dimensions of burnout occurring in
4 5	97	earlier phases of prolonged exposure to stress, i.e., (i) exhaustion (extreme tiredness, severe loss of
5 7	98	energy), (ii) mental distance (mental withdrawal and psychological detachment), (iii) cognitive
3 9	99	impairment (reduced functional capacity to regulate cognitive processes), and (iv) emotional
)   <u>2</u>	100	impairment (reduced functional capacity to regulate emotional processes), and burnout.
3 4 5	101	Depression, as classified in the International Classifications of Diseases (ICD) and Diagnostic and
5 5 7	102	Statistical Manual (DSM) of Mental Disorders IV, are based on a list of symptoms (Table 1), of which
3	103	some are necessary for a diagnosis [27]. Researchers have argued that burnout largely overlaps with
)	104	depression and questioned whether they can be explored as two distinct mental health issues
2 3 1	105	[18,19]. The opposite has also been proposed, and although burnout and depression appear to share
5	106	some common symptoms (e.g., fatigue), a recent meta-analysis shows that burnout and depression
7 3	107	are associated but still constitute two separate constructs [20,28].
) ) 	108	Table 1.
2 3 4	109	In this study, we seek to gain more information on the symptom development of burnout and
5	110	depression in Swedish physicians. Specifically, we aim to investigate the predictive value of severe
7 3	111	burnout, symptom dimension of burnout and major depression for subsequent all-cause medically
€ ) I	112	certified sickness absence (ACMCSA) during the pandemic among physicians in Sweden.
2 3 4	113	Method
5	114	This study draws on data from the Longitudinal Occupational Health Survey for HealthCare in Sweden
/ 3 2	115	(LOHHCS), which is an open panel cohort. At baseline, a representative sample of physicians was
)	116	drawn from the Swedish occupational register based on SSYK-codes. Baseline data were collected

2 3	117	from February to May 2021. A total of 6.699 physicians were invited to participate in the baseline
4 5	11,	
6 7	118	survey, and 34% answered [1]. At follow-up (March to May 2022), all 6699, except those who died,
/ 8 0	119	retired, stopped working as a physician or migrated (n=94), received an invitation to participate in
9 10 11	120	the study. In total, 1575 physicians answered the survey at both baseline and follow-up.
12 13 14	121	An analysis of missing data showed that the share of men and women, hierarchical positions, work
15 16	122	hours, and frontline work or not was almost identical (only differentiated by up to three percentage
17 18	123	points) between those who responded two times and those who only responded in 2021 (Table S1 in
19 20	124	the supplementary material). In the sample reporting to both the 2021 and the 2022 surveys, there
21 22	125	was a lower representation of physicians who work in facilities other than primary care or hospitals
23 24 25	126	(e.g., occupational health). Sickness absence in 2022 was 11.8% among those only responding in
26 27 28	127	2021, while the corresponding figure among those in the sample, including both waves, was 9.3%.
28 29 30	128	The Swedish Ethical Review Authority reviewed and approved this study (Dnr: 2020-06613; 2021-
31 32 33	129	05574-02; 2022-03105-01).
34 35 36	130	Patient and Public Involvement
37 38	131	The LOHHCS survey was drafted in dialogue with physicians. It was then piloted with a group of
39 40 41	132	physicians before being distributed.
42 43 44	133	Measurement
45 46 47	134	Outcomes
48 49	135	Data on ALMCSA is derived from the Swedish Social Insurance Agency register. The agency registers
50 51	136	ALMCSA after 14 days of sick leave. Thus, it covers the number of days of ALMCSA exceeding 14
52 53	137	between June 2021 (i.e., after the baseline data collection) and June 2022. The variable was
54 55 56	138	dichotomised into 0 (no days of ACMCSA) and 1 ( $\geq$ 1 day of ACMCSA between baseline and follow-
57 58	139	up).
59 60	140	Exposures

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We assessed baseline burnout and symptom dimensions using the extended version of the BAT-23 [26]. BAT-23 comprised 23 items divided into four sub-scales representing symptom dimensions of burnout: exhaustion (8 items), mental distance (5 items), emotional impairment (5 items), and cognitive impairment (5 items). By using all 23 items, we can assess burnout. Each item was rated on a five-point scale from 1 (never) to 5 (always). A grand mean was constructed for each symptom dimension and the entire 23-item compound, resulting in five scales ranging from 1 to 5. Each dimension and the whole compound had high internal consistency. Table 2 presents Cronbach's alpha for each dimension, the full compound, and respective cut-off values according to [25,26,29]. The cut-off values for the BAT scale follow a traffic-light system where the red cut-off, applied in this study (Tabl1 shows all cut-off scores), marks severe symptoms of burnout (hereon severe burnout). For the full compound scale, a value above the red cut-off (≥3.02) signifies severe burnout, and individuals scoring above this value would probably be diagnosed with clinical burnout if clinically assessed [25]. Table 2 Symptoms of depression were assessed using the symptom checklist six core depression (SCL-6CD) [30,31]. It consists of six items, each representing a depressive symptom during the last week, and was rated on a five-point Likert scale ranging from 'Not at allo(') to 'very much4('). A sum score was calculated ranging from 0 to 24, with a higher score representing more severe depressive symptoms. Following the study of Magnusson Hanson et al. [30], we set the cut-off at ≥16, where a value above the cut-off indicates major depression. To research the association between burnout and depression, SCL-6CD was also computed for 2021. **Covariates** 

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Differences in mental health between individuals according to gender, hierarchical position, and
 place of work during the pandemic have been identified in previous studies [1] and are included as
 covariates.

Models were adjusted for baseline gender (men or women), working hours, healthcare facility
(primary and secondary healthcare facility), and hierarchical position (physicians in training,
specialists, and consultants). Sex and age in 2021 were added to LOHHCS data by Statistics Sweden
and derived from the Longitudinal Database on Education, Income, and Occupation held by Statistics
Sweden.

We adjusted for self-reported adverse life events (e.g., divorce, sickness or death in the family,
exposure to crime) during the follow-up period, i.e., the physicians responded in 2022 if any adverse
life event had occurred during the last year. We also adjusted for frontline work during the COVID-19
pandemic 2021 by asking the respondents if they worked with COVID-19 patients most of the time,
at some periods, or at no time.

176 Analytical strategy

7 177 Descriptive statistics show mean values and prevalences for burnout, symptom dimensions of

178 burnout and depression in 2021 across all covariates.

Next, to estimate if burnout, each symptom dimension of burnout (exhaustion, mental distance, emotional impairment, and cognitive impairment) and major depression in 2021 had predicted the prevalence of ALMCSA the following year, we used logistic regression analysis. First, univariate analyses investigated each variable's association with the outcome variable. After that, in Model A, baseline severe burnout and major depression were entered simultaneously and adjusted for the abovementioned covariates. In Model B, severe burnout was exchanged with the four symptom dimension variables (exhaustion, mental distance, emotional impairment, and cognitive impairment) and entered into the model along with depression and covariates.

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3	187	All analyses were conducted in SPSS version 28.
4 5		
6 7	188	Results
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9 10	189	The study sample consists of 1575 Swedish physicians. Descriptives show that the sample has more
11 12	190	women (56.1%) than men (43.9%) and that female physicians experience significantly higher levels of
13 14 15	191	mental ill-health, except for mental distance. More than half of the physicians in the sample (55.3%)
15 16 17	192	worked with COVID-19 patients. Those who reported frontline work reported higher mean levels of
18 19 20	193	burnout, exhaustion, and mental distance than those who did not work at the frontline.
20 21 22	194	In the total sample, 4.7% had severe burnout, and 3.7% had major depression (Table 3). Across the
23 24	195	symptom dimensions, the prevalence ranged from 12% for exhaustion to 2.9% for emotional
25 26 27	196	impairment. 9.3% of the physicians had ACMCSA between baseline and follow-up.
28 29	197	One-fifth (18.9%) of the sample had an adverse life event (Table 3) and reported higher mean values
30 31 22	198	of burnout, exhaustion, emotional impairment, and depression—moreover, 53.2% estimated
32 33 34	199	working between 36 and 45 hours per week. Most physicians worked in hospitals (53.2%) or primary
35 36	200	care (41.6%). Few worked in other facilities, and they also reported the lowest mean level of mental
37 38	201	health. The share of physicians-in-training was 30%, specialists 40.1%, and consultants 29.1%.
39 40 41	202	Physicians-in-training reported significantly higher levels of mental ill-health, except for cognitive
42 43	203	impairment.
44 45 46	204	Table 3 here
47 48 40	205	In Table 4 (Full table can be found in supplementary table S2), associations between severe burnout,
49 50 51	206	symptom dimensions of burnout, and major depression in 2021 and ACMCSA the following year are
52 53	207	shown. Univariate analysis showed that all exposure variables, except mental distance, were
54 55 56	208	associated with ACMCSA the following year. Univariate results showed a higher likelihood of
57 58 59 60	209	ACMCSA among those who had experienced an adverse life event and female physicians. Those who

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had worked with COVID-19 patients throughout the first phase of the pandemic had a reduced likelihood of ACMCSA the following year (OR=0.60, 95%CI=0.40-0.91). In the adjusted models (Models A and B), major depression was no longer statistically significant. Sensitivity analyses, running only major depression adjusting for the covariance and without severe burnout, show significant results (OR=2.46; 95%CI=1.21-4.98). This suggests that it is foremost the severe burnout or symptom dimensions of burnout that predict ACMCSA the following year rather than depression. Severe burnout was associated with a two-and-a-half-time higher likelihood of having an ACMCSA the following year (OR=2.57; 95%CI=1.27-5.23). Among the symptom dimensions of burnout (Model B), emotional impairment and cognitive impairment predicted ACMCSA the following year, while exhaustion and mental distance did not. Those physicians who, in 2021, reported high levels of emotional impairment had almost two times the odds of ACMCSA the following year (OR=1.80; 95%CI=1.03-3.15), while those reporting high levels of cognitive impairment had two and a half times higher odds (OR=2.52; 95%CI=1.12-5.50). In the sensitivity analyses, each symptom dimension of burnout was tested separately, and all dimensions but the mental distance were significantly associated with subsequent ACMCSA (see Tables S4 and S3 supplementary). Sensitivity analysis, including logistic regressions with continuous measures of burnout and depression, showed a similar significance level (burnout p=0.002 and depression p=0.945). Similar to Model A, having had an adverse life event in the last year, frontline work and being a woman remained statistically significant in relation to ACMCSA. The same holds for age, where a one-year increment increased the odds for ACMCSA by 4%. Discussion In this one-year follow-up study, during the COVID-19 pandemic, we aimed to explore the association

233 between burnout, symptom dimensions of burnout (exhaustion, mental distance, emotional

234 impairment, and cognitive impairment), and depression and whether severe burnout, symptom

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dimensions of burnout and major depression predicted subsequent ACMCSA among a sample of physicians working in Sweden. We made several noteworthy discoveries that contribute to current knowledge. Results show that correlations existed between depression and burnout and each of the symptom dimensions of burnout. However, the strength of correlations varied and was generally lower between years than within-year correlations. Also, severe burnout, exhaustion and cognitive impairment in 2021 predicted subsequent ACMCSA the following year. Major depression had no predictive value for ACMCSA the following year when we adjusted for severe burnout and symptom dimensions of burnout, respectively. 

This study has methodologically both strengths and weaknesses. A significant strength is utilising a
longitudinal data set with about 1575 participants. However, we must also consider attrition over
time, which may impact generalisability. Also, more measure points may provide additional insight in
the future. In this study, we had no data on ACMCSA before the study period to adjust the models.
On the other hand, having repeated ACMCSA may be indicative of poor rehabilitation and return to
work. Burnout and cognitive impairment, whether for the first time or after returning to work, need
targeted interventions.

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This study does not neglect that an overlap of symptoms exists [16,18,20,21]. Also, a recent meta-analysis supports that various symptom dimensions of burnout correlate differently to depression and that instruments used to measure burnout and depression play a role in the overlap detected [20]. Meanwhile, in this one-year follow-up, we show that the predictive value of major depression in relation to ACMCSA disappears when introduced together with severe burnout and the symptom dimensions of burnout. Our results are supported by a recent meta-analysis showing that overlap between burnout and depression tends to be more present in cross-section studies compared to longitudinal [20]. For future research, more longitudinal studies exploring mediation and accumulation effects between depression and symptom dimensions of burnout are recommended.

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A significant strength of this study is that we provide evidence that severe burnout indicated by a validated scale with an assessed global score and the individual exhaustion and cognitive impairment subcomponents of burnout can predict ACMCSA the following year. Our results align with the past findings by Peterson et al. [32], using medically certified sickness absence (>90 days) as the outcome. Previous knowledge of the association between mental health and sick leave mostly rests on self-rated data. In this study, we utilised outcome data from the Swedish compulsory sickness insurance registers. Our study, therefore, makes an essential contribution to current knowledge. Also, it provides valuable knowledge on the predictive validity of the BAT on future sick leave. Cognitive impairment, i.e., memory problems, attention and concentration deficits, and poor cognitive performance, were found to predict subsequent ACMCSA when investigated in conjunction with all the symptom dimensions of burnout. This dimension of burnout was introduced in the conceptual framework developed by Schaufeli and Taris (21) and is not present in the definition of the ICD-11 by the World Health Organisation [33]. A recent book [28] highlights the need for salient cognitive impairment in patients diagnosed with exhaustion disorders. It proposes that the main diagnostic distinction between depression and burnout is the presence of cognitive impairment. This study thus contributes to the empirical foundation that cognitive impairment is an essential dimension of burnout, and that the ICD-11 may need to review its definition. Mental health problems in working physicians are serious problems that may cause reduced work ability [12,13] and negatively impact patient safety and quality of care [34,35]. Research shows that burnout and depression are associated with an increased risk of several severe health and health-related outcomes, such as cardiovascular disease, musculoskeletal problems, psychotropic and antidepressant treatment, job dissatisfaction, absenteeism, and adverse work-related effects on job performance and productivity [36]. It may also lead to turnover and, as we show in this study, sickness absence, resulting in staff shortages. This illuminates the need for immediate actions to prevent symptom development of burnout and promote worker wellbeing. 

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284	This study was conducted during the COVID-19 pandemic and indicated an increase in mental health
285	problems over time, even after adjusting for frontline work. Interestingly, those at the frontline in
286	2021 were less likely to have an ACMCSA in the following years. There are many reasons for this, i.e.,
287	it was those with poorer health who did not work at the frontline or those who could not work as
288	usual, e.g., surgeons who might have been stressed about not being able to operate. Another reason
289	could be that the follow-up was too short, the pandemic was still ongoing, and longer follow-ups are
290	needed. Lessons from previous pandemics with a lesser impact on healthcare have demonstrated a
291	long-term effect on the mental health of healthcare workers [37]. The extremely high workload, in
292	combination with other work environment challenges during the COVID-19 pandemic [3,38,39], is
293	likely to contribute to an increase in shorter spells (less than 14 days) of sickness absences and may
294	further be associated with a long-term escalation of ACMCSA [40]. It is, therefore, essential to
295	continue valid assessment and following the development of mental ill-health of physicians over
296	time.
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298	and critical revision of the manuscript: all authors. Critical revision of the manuscript: all authors.
299	Final approval: all authors. Guarantor: EB.
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Depressive Diagnoses	Symptoms
Major Depressive Episode:	1. Depressed Mood
<ul> <li>- 5 or more depressive symptoms for ≥</li> <li>2 weeks</li> </ul>	<ol> <li>Markedly diminished interest or pleasure in most or all activities</li> </ol>
<ul> <li>- Must have either depressed mood or loss of interest/pleasure</li> </ul>	<ol> <li>Significant weight loss (or poor appetite) or weight gain</li> </ol>
<ul> <li>- Symptoms must cause significant distress or impairment</li> </ul>	4. Insomnia or hypersomnia
- No manic or hypomanic behaviour	5. Psychomotor retardation
Minor Depressive Episode:-	6. Fatigue or loss of energy
<ul> <li>- 2–4 depressive symptoms for ≥2 weeks</li> </ul>	7. Feelings of worthlessness or excess or inappropriate guilt
<ul> <li>- Must have either depressed mood or loss of interest or pleasure</li> </ul>	8. Diminished ability to think or concentrate or indecisiveness
<ul> <li>- Symptoms must cause significant distress or impairment</li> </ul>	<ol> <li>Recurrent thoughts of death (not jufe fear of dying), or suicidal ideation, par attempt</li> </ol>
- No manic or hypomanic behaviour	oractempt
Ċ	2.2
	<ul> <li>Depressive Diagnoses</li> <li>Major Depressive Episode: <ul> <li>- 5 or more depressive symptoms for ≥ 2 weeks</li> <li>- Must have either depressed mood or loss of interest/pleasure</li> <li>- Symptoms must cause significant distress or impairment</li> <li>- No manic or hypomanic behaviour</li> </ul> </li> <li>Minor Depressive Episode: <ul> <li>- 2–4 depressive symptoms for ≥2 weeks</li> <li>- Must have either depressed mood or loss of interest or pleasure</li> <li>- Symptoms must cause significant distress or impairment</li> <li>- No manic or hypomanic behaviour</li> </ul> </li> </ul>

		Cronbach's alpha	Cut-off values
	Burnout (23 items)	0.95	≥3.02
	Exhaustion (8 items)	0.92	≥3.31
	Mental distance (5 items)	0.84	≥3.30
	Emotional impairment (5 items)	0.90	≥2.90
	Cognitive impairment (5 items)	0.85	≥3.10
	Major depression 2021 (6 items)	0.91	≥17
	Major depression 2022 (6 items)	0.91	≥17
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Table 3. Sample description and mean values of burnout, exhaustion, me	ntal distance, emotional impairment, c		b it we impairment and depression across
confounders at baseline.		ling	6 0

	n	%	Burnout	Exhaustion	Mental distance	Emotional impairment	Cognitive impairmen	Desip	ression
Total Share (%)			4.7%	12.0%	3.0%	2.9%	3.4	Apr	3.7%
Women	883	56.1%	1.96	2.43	1.69	1.60	1.84	ii 2 Seig	5.66
Men	692	43.9%	1.79	2.15	1.69	1.50	1.6	025. Jner	4.38
Working with Covid-19	patient	ts					d to	Do	
all the time	867	55.3%	1.92	2.35	1.74	1.55	1.夜	t Su	5.16
part of the time	350	22.3%	1.89	2.31	1.69	1.53	1. <b>7</b> 3	bade peri	5.29
at no time	352	22.4%	1.80	2.19	1.56	1.49	1.74	eur eur	4.77
Adverse life events	297	18.9%	1.95	2.40	1.72	1.58	1.85	(AB	6.00
No adverse life events	1274	81.1%	1.87	2.29	1.68	1.52	1.72	ES P	4.90
Working hours		1	1	1			, bu	·//br	
less than 36 hours	271	17.2%	1.84	2.20	1.67	1.51	1.74	njop	4.64
36-45 hours	837	53.2%	1.86	2.25	1.68	1.52	1.72.	P.	4.90
More than 45 hours	465	29.6%	1.95	2.46	1.73	1.57	1.18	bm	5.75
Healthcare facility							and		
Primary care	654	41.6%	1.90	2.34	1.73	1.51	1.7	<b>n/</b> o	4.84
Hospital care	837	53.2%	1.89	2.30	1.67	1.56	1.76	ر ر	5.40
Other	81	5.2%	1.72	2.07	1.55	1.46	1.67	une	4.26
Hierarchical position							hno	ى. بى	
Physicians in training	477	30.8%	1.95	2.37	1.77	1.54	1.85	202	5.79
Specialists	620	40.1%	1.90	2.33	1.70	1.54	1.7	at	5.08
Consultants	451	29.1%	1.82	2.23	1.62	1.54	1.67	Ag	4.59
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59 60 **Table 4**. Logistic regression analyses testing the association between baseline severe burnout,exhaustion, mental distance, emotional impairment, cognitive impairment and major depression andany all-cause medically certified sickness absence exceeding 14 days the following year.

	Univariate			Model A			Model B			
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value	
N					1465			1477		
Severe hurnout	2 1 2	1.74-	<0.001	2 5 7	1.27-	0 009				
Severe Sumout	2.15	5.63	\$0.001	2.57	5.23	0.005				
Exhaustion	2 40	1.62-	<0.001				1 00	1.03-	0.040	
Exhlaustion	2.48	3.79	<0.001				1.00	3.15		
Montal distance	0.02	0.33-	0.382				0.40	0.12-	0.141	
Mental distance	0.92	2.61					0.40	1.35		
Emotional	2.72	1.88-	-0.001				2 1 2	0.89-	0.000	
impairment	3.72	7.36	<0.001				2.13	5.08	0.090	
Cognitive	4.60	2.54-	<0.001				2 5 2	1.12-	0.025	
impairment	4.69	8.67	<0.001				2.52	5.50	0.025	
Major depression	2.45	1.24-	0.010	1.62	0.70-	0.262	1 1 2	0.47-	0 700	
wajor depression	2.45	4.84	0.010	1.02	3.73	0.262	. 1.13	2.73	0.790	
Nagelkerke R						0.084			0.099	
Log LL						838.746			835.092	

Model A: Burnout and depression adjusted for working with COVID-19 patients, adverse life events, work hours, healthcare facility, hierarchical position, sex and age.

Model B: Symptom dimensions of burnout adjusted for working with COVID-19 patients, adverse life events, work hours, healthcare facility, hierarchical position, sex and age.

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# Supplementary

# Table S1 Analysis of missing data, including the percentages of respondents who responded only in 2021 to those responding in both 2021 and 2022. Data for 2021.

	Only responded in 2021 (%)	Responded in both 2021 and 2022 (%)
Total Share (%)	12.9	17.9
Women	54.0	56.1
Men	46.0	43.9
Working with Covid-19	patients	
all the time	48.9	55.3
part of the time	23.0	22.3
at no time	28.1	22.4
Adverse life events	20.5	18.2
No adverse life events	79.5	81.1
Working hours		
less than 36 hours	47.4	53.2
36-45 hours	23.0	17.2
More than 45 hours	29.6	29.6
Healthcare facility		
Primary care	38.5	41.6
Hospital care	49.2	53.2
Other	12.3	5.2
Hierarchical position		
Physicians in training	29.4	30.8
Specialists	39.7	40.1
Consultants	30.8	29.1
Burnout in 2021	5.8	4.7
Depression in 2021	4.5	3.7
ACMCSA	11.8	9.3

Table S2. Logistic regression analyses testing the association between baseline severe burnout, exhaustion, mental distance, emotional impairment, cognitive impairment and major depression and any all-cause medically certified sickness absence exceeding 14 days the following year.

	Univariate			Model A			Model B		
	OR	95%C I	p- value	OR	95%C I	p- value	OR	95%C I	p- value
Ν					1465			1477	
Severe burnout	2.13	1.74- 5.63	<0.00 1	2.57	1.27- 5.23	0.009			
Exhaustion	2.48	1.62- 3.79	<0.00 1				1.80	1.03- 3.15	0.040
Mental distance	0.92	0.33- 2.61	0.382				0.40	0.12- 1.35	0.141
Emotional impairment	3.72	1.88- 7.36	<0.00 1				2.13	0.89- 5.08	0.090
Cognitive impairment	4.69	2.54- 8.67	<0.00 1				2.52	1.12- 5.50	0.025
Major depression	2.45	1.24- 4.84	0.010	1.62	0.70- 3.73	0.262	1.13	0.47- 2.73	0.790
Working with COV	'ID-19								
all the time	0.60	0.40- 0.91	0.017	0.59	0.37- 0.95	0.029	0.61	0.38- 0.99	0.047
part of the time	1.06	0.67- 1.69	0.793	0.97	0.59- 1.62	0.918	0.99	0.59- 1.66	0.971
No	1			1			1		
Work hours									
less than 35 h	1.14	0.72- 1.79	0.580	0.84	0.50- 1.42	0.512	0.88	0.52- 1.49	0.632
35-45 h	1			1			1		
More than 45 h	0.95	0.64- 1.42	0.818	1.02	0.66- 1.57	0.923	1.00	0.65- 1.56	0.986
Healthcare facility									
Primary care	1.15	0.51- 2.60	0.743	2.00	0.74- 5.42	0.175	1.80	0.66- 4.92	0.251
Hospital care	1.03	0.46- 2.31	0.952	1.56	0.59- 4.14	0.374	1.46	0.55- 3.90	0.451
Other	1			1			1		
Hierarchical position	on								
Physicians in training	1.01	0.66- 1.55	0.966	1.63	0.84- 3.19	0.117	1.80	0.66- 4.92	0.088
Specialists	0.81	0.53- 1.23	0.322	0.84	0.47- 1.48	0.551	0.85	0.48- 1.51	0.572
Consultants	1			1			1		
Adverse life events (ref no)	1.72	1.16- 2.53	0.006	1.73	1.13- 2.63	0.029	1.60	1.04- 2.44	0.031
Women (ref men)	2.31	1.58- 3.38	<0.00 1	2.34	1.55- 3.53	<0.00	2.14	1.41- 3.25	<0.00
Age	1.01	0.99- 1.03	0.086	1.03	1.01- 1.06	0.005	1.03	1.01- 1.06	0.004
Nagelkerke R						0.084			0.099

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Log LL	838.746	835.09

Table S3. The association between severe burnout and major depression, respectively, and all-cause medically certified sickness absence adjusted for working with COVID-19 patients, difficult life events, work hours, healthcare facility, hierarchical position, sex and age

Exposure	OR	CI	p-value	Nagelkerk R <sup>2</sup>
Severe burnout	3.12	1.70-5.74	<0.001	0.076
Major Depression	2.46	1.21-4.98	0.012	0.075

Table S4. The association between exhaustion, mental distance, emotional impairment, and cognitive impairment, respectively, and all-cause medically certified sickness absence adjusted for depression, working with COVID-19 patients, difficult life events, work hours, healthcare facility, hierarchical position, sex and age

Exposure	OR	CI	p-value	Nagelkerk R <sup>2</sup>
Expection	2 07	1 26-3 41	0.004	0.086
Mental distance	0.84	0 27-2 57	0.754	0.075
Emotional	3.01	1 38-6 59	0.006	0.085
impairment		1.00 0.00	0.000	0.000
Cognitive	3.62	1 79_7 31	<0.001	0.002
impairment	5.02	1.79-7.51	<b>~0.001</b>	0.092
impairment				

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# **BMJ Open**

# Predictive Value of Burnout and Depresive symptoms for Medically Certified Sickness Absence Among Physicians in Sweden: A one-year follow-up

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2 3 4	1	Predictive Value of Burnout and Depressive symptoms for Medically Certified Sickness Absence
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# 29 Abstract

1 2

Objective: This study aimed to explore the predictive value of severe burnout complaints, symptom
 dimension of burnout and depressive symptoms for subsequent all-cause medically certified sickness
 absence (ACMCSA) during the pandemic among physicians in Sweden.

33 **Design**: A one-year follow-up panel cohort observational study - the Longitudinal Occupational

34 Health Survey for HealthCare in Sweden (LOHHCS). At baseline (February-May 2021), a

35 representative sample of 6999 physicians was drawn from the Swedish occupational register and

36 invited to participate in the study. At follow-up (March-May 2022), the full sample (excluding those

37 who died, retired, stopped working as a physician or migrated, n=94) was invited to answer the

38 survey.

39 Setting: Swedish primary and specialist healthcare

40 Participants: At baseline, the response rate was 41.2% (n=2,761) of which 1575 also answered at
41 follow-up.

42 Primary and secondary outcome measures: ACMCSA data came from the Swedish Social Insurance 43 Agency. The Burnout Assessment Tool (BAT-23) was used to measure burnout, including a burnout 44 total score and scores for the four symptom dimensions of exhaustion, mental distance, emotional impairment, and cognitive impairment. Depressive symptoms were assessed using the Symptom 45 Checklist-core depression (SCL-CD6). Within and between-year associations were examined with 46 47 Spearman's correlations, while associations between baseline burnout and depressive symptoms and 48 subsequent ACMCSA were estimated with logistic regression analyses. 49 Results: ACMCSA was found in 9% of the participating physicians. In the sample, 4.7% had severe

50 burnout, and 3.7% had depressive symptoms. Burnout (OR=2.57; 95%CI=1.27-5.23), and the burnout

5 51 symptom dimensions emotional impairment (OR=1.80; 95%CI=1.03-3.15) and cognitive impairment

52 (OR=2.52; 95%CI=1.12-5.50) were associated with a higher likelihood of subsequent ACMCSA.

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2 3 4	53	Depressive symptoms was not associated with ACMCSA when adjusted for severe burnout and other
5 6 7	54	covariates.
8 9	55	Conclusion: This study demonstrates the distinction between burnout and depressive symptoms,
10 11 12	56	particularly in predicting future ACMCSA. Early intervention targeting exhaustion and burnout may
12 13 14	57	mitigate symptom development and reduce the risk of ACMCSA.
15 16 17	58	<b>Keywords</b> : exhaustion disorders; healthcare; longitudinal; mental health; sickness absence; stress
18 19 20	59	
20 21 22 23	60	Strengths and limitations of this study
23 24 25	61	• The geographical and demographic spread represented in the sample is more likely to
26 27 28	62	contribute to the generalisability of results.
29 30 31	63	The use of data from the Swedish Social Insurance Agency on all-cause medically certified
32 33	64	sickness absence contributes to the objectivity and generalisability of results.
34 35 36	65	The limitation of the study is the attrition.
37 38 39	66	The work relies partly on self-reported data.
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# 68 Introduction

69	The prevalence of burnout and depressive symptoms among working physicians in Sweden in 2021
70	was high [1]. During this time, healthcare services were burdened by the COVID-19 pandemic with
71	increased exposure to several stressors [2–5]. Longitudinal studies show that mental health problems
72	have increased [6], while others show no change [6,7] or even a decrease [8,9]. The variation across
73	studies can result from many factors; for example, studies often focused on frontline single clinics or
74	physicians, leaving out a large share of physicians. Moreover, many previous studies were based on
75	small samples [9] and short follow-up times, often focusing on the initial phase of the pandemic [7].
76	However, physicians experienced extreme stress and high demands, no matter whether they worked
77	directly with COVID-19 patients or not [1,3,4,10,11], which likely contributed to an increase in
78	burnout and depressive symptoms. Symptoms of burnout and depression impair workability [12,13]
79	and increase the risk of long-term sickness absence and turnover intention. Statistics from the
80	Swedish Social Insurance Agency show an increase in sickness absence due to mental health
81	impairment among physicians in recent years [14], and this amounts to enormous societal costs [15].
82	While there is an established diagnosis of burnout in Sweden, there is an ongoing scholarly and
83	clinical debate about the concept [16]. A weakness in previous international research exploring
84	burnout is the lack of a comprehensive measurement of burnout, resulting in prevalences between 0
85	and 80% among physicians [17]. This has caused a debate about the mere existence of burnout as a
86	state [18]. A significant issue raised in the discussion against the existence of burnout has been the
87	overlap between symptoms of burnout and symptoms of depressive symptoms [18–21].
88	According to Schaufeli and Taris [22], burnout is not a condition but consists of symptoms that
89	develop continuously over time. Burnout results from chronic exposure to job stress that is not
90	successfully managed [22–25]. This leads to extreme physical and mental fatigue, impairing cognitive
91	and emotional regulation processes, and difficulties controlling one's emotions or feeling empathy
92	[22]. To manage the situation, emotional distancing develops, meaning that work no longer feels

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meaningful and that one becomes cynical and avoids contact with others. This becomes a counterproductive and ineffective way of coping, leading to even more fatigue and reinforcing the negative spiral [22]. Based on this definition and robust theoretical foundation [24,26], the Burnout Assessment Tool (BAT) was developed to measure burnout among workers. The BAT scale has many strengths, one being the possibility of exploring both symptom dimensions of burnout occurring in earlier phases of prolonged exposure to stress, i.e., (i) exhaustion (extreme tiredness, severe loss of energy), (ii) mental distance (mental withdrawal and psychological detachment), (iii) cognitive impairment (reduced functional capacity to regulate cognitive processes), and (iv) emotional impairment (reduced functional capacity to regulate emotional processes), and burnout. Depressive symptoms, as classified in the International Classifications of Diseases (ICD) and Diagnostic and Statistical Manual (DSM) of Mental Disorders IV, are based on a list of symptoms (Table 1), of which some are necessary for a diagnosis [27]. Researchers have argued that burnout largely overlaps with depressive symptoms and questioned whether they can be explored as two distinct mental health issues [18,19]. The opposite has also been proposed, and although burnout and depressive symptoms appear to share some common symptoms (e.g., fatigue), a recent meta-analysis shows that burnout and depressive symptoms are associated but still constitute two separate constructs [20,28]. Table 1. In this study, we seek to gain more information on the symptom development of burnout and depressive symptoms in Swedish physicians. Specifically, we aim to investigate the predictive value of severe burnout, symptom dimension of burnout and depressive symptoms for subsequent all-cause medically certified sickness absence (ACMCSA) during the pandemic among physicians in Sweden.

116 Method

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This study draws on data from the Longitudinal Occupational Health Survey for HealthCare in Sweden
(LOHHCS), which is an open panel cohort. At baseline, a representative sample of physicians was
drawn from the Swedish occupational register based on SSYK-codes. Baseline data were collected
from February to May 2021. A total of 6,699 physicians were invited to participate in the baseline
survey, and 34% answered [1]. At follow-up (March to May 2022), all 6699, except those who died,
retired, stopped working as a physician or migrated (n=94), received an invitation to participate in
the study. In total, 1575 physicians answered the survey at both baseline and follow-up.

An analysis of missing data showed that the share of men and women, hierarchical positions, work hours, and frontline work or not was almost identical (only differentiated by up to three percentage points) between those who responded two times and those who only responded in 2021 (Table S1 in the supplementary material). In the sample reporting to both the 2021 and the 2022 surveys, there was a lower representation of physicians who work in facilities other than primary care or hospitals (e.g., occupational health). Sickness absence in 2022 was 11.8% among those only responding in 2021, while the corresponding figure among those in the sample, including both waves, was 9.3%. The Swedish Ethical Review Authority reviewed and approved this study (Dnr: 2020-06613; 2021-05574-02; 2022-03105-01).

133 Patient and Public Involvement

The public (i.e., physicians) was included in all steps of the study. The LOHHCS survey content was
drafted in dialogue with physicians along with the labour union for physicians. The survey was then
piloted with a group of physicians before being distributed to the full sample. One of the authors is a
physician and has contributed to the design of the study. Results will be disseminated through social
media and to the labour union for physicians.

- 5 139 Measurement
- <sub>9</sub> 140 Outcomes

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Data on ALMCSA is derived from the Swedish Social Insurance Agency register. The agency registers
ALMCSA after 14 days of sick leave. Thus, it covers the number of days of ALMCSA exceeding 14
between June 2021 (i.e., after the baseline data collection) and June 2022. The variable was
dichotomised into 0 (no days of ACMCSA) and 1 (≥1 day of ACMCSA between baseline and followup).

146 Exposures

147 We assessed baseline burnout and symptom dimensions using the extended version of the BAT-23 148 [26]. BAT-23 comprised 23 items divided into four sub-scales representing symptom dimensions of 149 burnout: exhaustion (8 items), mental distance (5 items), emotional impairment (5 items), and 150 cognitive impairment (5 items). By using all 23 items, we can assess burnout. Each item was rated on 151 a five-point scale from 1 (never) to 5 (always). A grand mean was constructed for each symptom 152 dimension and the entire 23-item compound, resulting in five scales ranging from 1 to 5. Each 153 dimension and the whole compound had high internal consistency. Table 2 presents Cronbach's 154 alpha for each dimension, the full compound, and respective cut-off values according to [25,26,29]. 155 The cut-off values for the BAT scale follow a traffic-light system where the red cut-off, applied in this 156 study (Tabl1 shows all cut-off scores), marks severe symptoms of burnout (hereon severe burnout). 157 For the full compound scale, a value above the red cut-off ( $\geq$ 3.02) signifies severe burnout 158 complaints, and individuals scoring above this value would probably be diagnosed with clinical 159 burnout if clinically assessed [25]. 160 Table 2

161 Depressive symptoms were assessed using the symptom checklist six core depression (SCL-6CD)
 162 [30,31]. It consists of six items, each representing a depressive symptom during the last week, and
 163 was rated on a five-point Likert scale ranging from 'Not at all0( ') to 'very much4( '). A sum score was
 164 calculated ranging from 0 to 24, with a higher score representing more severe depressive symptoms.

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Following the study of Magnusson Hanson et al. [30], we set the cut-off at ≥16, where a value above the cut-off indicates depressive symptoms. To research the association between burnout and depressive symptoms, SCL-6CD was also computed for 2021. **Covariates** Differences in mental health between individuals according to gender, hierarchical position, and place of work during the pandemic have been identified in previous studies [1] and are included as covariates. Models were adjusted for baseline gender (men or women), working hours, healthcare facility (primary and secondary healthcare facility), and hierarchical position (physicians in training, specialists, and consultants). Sex and age in 2021 were added to LOHHCS data by Statistics Sweden and derived from the Longitudinal Database on Education, Income, and Occupation held by Statistics Sweden. We adjusted for self-reported adverse life events (e.g., divorce, sickness or death in the family, exposure to crime) during the follow-up period, i.e., the physicians responded in 2022 if any adverse life event had occurred during the last year. We also adjusted for frontline work during the COVID-19 pandemic 2021 by asking the respondents if they worked with COVID-19 patients most of the time, at some periods, or at no time. Analytical strategy Descriptive statistics show mean values and prevalences for burnout, symptom dimensions of burnout and depressive symptoms in 2021 across all covariates. Next, to estimate if burnout, each symptom dimension of burnout (exhaustion, mental distance, emotional impairment, and cognitive impairment) and depressive symptoms in 2021 had predicted the prevalence of ALMCSA the following year, we used logistic regression analysis. First, univariate

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3 4	189	analyses investigated each variable's association with the outcome variable. After that, in Model A,
5 6	190	baseline severe burnout and depressive symptoms were entered simultaneously and adjusted for the
7 8	191	abovementioned covariates. In Model B, severe burnout was exchanged with the four symptom
9 10 11	192	dimension variables (exhaustion, mental distance, emotional impairment, and cognitive impairment)
12 13	193	and entered into the model along with depressive symptoms and covariates.
14 15 16	194	All analyses were conducted in SPSS version 28.
17 18 19	195	Results
20 21 22	196	The study sample consists of 1575 Swedish physicians. Descriptives show that the sample has more
23 24	197	women (56.1%) than men (43.9%) and that female physicians experience significantly higher levels of
25 26 27	198	mental ill-health, except for mental distance. More than half of the physicians in the sample (55.3%)
27 28 29	199	worked with COVID-19 patients. Those who reported frontline work reported higher mean levels of
30 31	200	burnout, exhaustion, and mental distance than those who did not work at the frontline.
32 33 34	201	In the total sample, 4.7% had severe burnout, and 3.7% had depressive symptoms (Table 3). Across
35 36	202	the symptom dimensions, the prevalence ranged from 12% for exhaustion to 2.9% for emotional
37 38 20	203	impairment. 9.3% of the physicians had ACMCSA between baseline and follow-up.
40 41	204	One-fifth (18.9%) of the sample had an adverse life event (Table 3) and reported higher mean values
42 43	205	of burnout, exhaustion, emotional impairment, and depressive symptoms—moreover, 53.2%
44 45 46	206	estimated working between 36 and 45 hours per week. Most physicians worked in hospitals (53.2%)
40 47 48	207	or primary care (41.6%). Few worked in other facilities, and they also reported the lowest mean level
49 50	208	of mental health. The share of physicians-in-training was 30%, specialists 40.1%, and consultants
51 52	209	29.1%. Physicians-in-training reported significantly higher levels of mental ill-health, except for
53 54 55	210	cognitive impairment.
55 56 57 58 59 60	211	Table 3 here

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In Table 4 (Full table can be found in supplementary table S2), associations between severe burnout, symptom dimensions of burnout, and depressive symptoms in 2021 and ACMCSA the following year are shown. Univariate analysis showed that all exposure variables, except mental distance, were associated with ACMCSA the following year. Univariate results showed a higher likelihood of ACMCSA among those who had experienced an adverse life event and female physicians. Those who had worked with COVID-19 patients throughout the first phase of the pandemic had a reduced likelihood of ACMCSA the following year (OR=0.60, 95%CI=0.40-0.91). In the adjusted models (Models A and B), depressive symptoms were no longer statistically significant. Sensitivity analyses, running only depressive symptoms adjusting for the covariance and without severe burnout, show significant results (OR=2.46; 95%CI=1.21-4.98). This suggests that it is foremost the severe burnout or symptom dimensions of burnout that predict ACMCSA the following year rather than depressive symptoms. Severe burnout was associated with a two-and-a-half-time higher likelihood of having an ACMCSA the following year (OR=2.57; 95%CI=1.27-5.23). Among the symptom dimensions of burnout (Model B), emotional impairment and cognitive impairment predicted ACMCSA the following year, while exhaustion and mental distance did not. Those physicians who, in 2021, reported high levels of emotional impairment had almost two times the odds of ACMCSA the following year (OR=1.80; 95%CI=1.03-3.15), while those reporting high levels of cognitive impairment had two and a half times higher odds (OR=2.52; 95%CI=1.12-5.50). In the sensitivity analyses, each symptom dimension of burnout was tested separately, and all dimensions but the mental distance were significantly associated with subsequent ACMCSA (see Tables S4 and S3 supplementary). Sensitivity analysis, including logistic regressions with continuous measures of burnout and depressive symptoms, showed a similar significance level (burnout p=0.002 and depressive symptoms p=0.945).

Discussion

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In this one-year follow-up study, during the COVID-19 pandemic, we aimed to explore the association

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Similar to Model A, having had an adverse life event in the last year, frontline work and being a
woman remained statistically significant in relation to ACMCSA. The same holds for age, where a
one-year increment increased the odds for ACMCSA by 4%.

between burnout, symptom dimensions of burnout (exhaustion, mental distance, emotional impairment, and cognitive impairment), and depressive symptoms and whether severe burnout, symptom dimensions of burnout and depressive symptoms predicted subsequent ACMCSA among a sample of physicians working in Sweden. We made several noteworthy discoveries that contribute to current knowledge. Results show that correlations existed between depressive symptoms and burnout and each of the symptom dimensions of burnout. However, the strength of correlations varied and was generally lower between years than within-year correlations. Also, severe burnout, exhaustion and cognitive impairment in 2021 predicted subsequent ACMCSA the following year.

248 Depression had no predictive value for ACMCSA the following year when we adjusted for severe

burnout and symptom dimensions of burnout, respectively.

This study has methodologically both strengths and weaknesses. A significant strength is utilising a
longitudinal data set with about 1575 participants. However, we must also consider attrition over
time, which may impact generalisability. Also, more measure points may provide additional insight in
the future. In this study, we had no data on ACMCSA before the study period to adjust the models.
On the other hand, having repeated ACMCSA may be indicative of poor rehabilitation and return to
work. Burnout and cognitive impairment, whether for the first time or after returning to work, need
targeted interventions.

This study does not neglect that an overlap of symptoms exists [16,18,20,21]. Also, a recent metaanalysis supports that various symptom dimensions of burnout correlate differently to depressive symptoms and that instruments used to measure burnout and depressive symptoms play a role in

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the overlap detected [20]. Meanwhile, in this one-year follow-up, we show that the predictive value of depressive symptoms in relation to ACMCSA disappears when introduced together with severe burnout and the symptom dimensions of burnout. Our results are supported by a recent meta-analysis showing that overlap between burnout and depressive symptoms tends to be more present in cross-section studies compared to longitudinal [20]. For future research, more longitudinal studies exploring mediation and accumulation effects between depressive symptoms and symptom dimensions of burnout are recommended.

A significant strength of this study is that we provide evidence that severe burnout indicated by a validated scale with an assessed global score and the individual exhaustion and cognitive impairment subcomponents of burnout can predict ACMCSA the following year. Our results align with the past findings by Peterson et al. [32], using medically certified sickness absence (>90 days) as the outcome. Previous knowledge of the association between mental health and sick leave mostly rests on self-rated data. In this study, we utilised outcome data from the Swedish compulsory sickness insurance registers. Our study, therefore, makes an essential contribution to current knowledge. Also, it provides valuable knowledge on the predictive validity of the BAT on future sick leave. Cognitive impairment, i.e., memory problems, attention and concentration deficits, and poor cognitive performance, were found to predict subsequent ACMCSA when investigated in conjunction with all the symptom dimensions of burnout. This dimension of burnout was introduced in the conceptual framework developed by Schaufeli and Taris (21) and is not present in the definition of the ICD-11 by the World Health Organisation [33]. A recent book [28] highlights the need for salient cognitive impairment in patients diagnosed with exhaustion disorders. It proposes that the main diagnostic distinction between depressive symptoms and burnout is the presence of cognitive impairment. This study thus contributes to the empirical foundation that cognitive impairment is an essential dimension of burnout, and that the ICD-11 may need to review its definition. 

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Mental health problems in working physicians are serious problems that may cause reduced work ability [12,13] and negatively impact patient safety and quality of care [34,35]. Research shows that burnout and depressive symptoms are associated with an increased risk of several severe health and health-related outcomes, such as cardiovascular disease, musculoskeletal problems, psychotropic and antidepressant treatment, job dissatisfaction, absenteeism, and adverse work-related effects on job performance and productivity [36]. It may also lead to turnover and, as we show in this study, sickness absence, resulting in staff shortages. This illuminates the need for immediate actions to prevent symptom development of burnout and promote worker wellbeing. 

This study was conducted during the COVID-19 pandemic and indicated an increase in mental health problems over time, even after adjusting for frontline work. Interestingly, those at the frontline in 2021 were less likely to have an ACMCSA in the following years. There are many reasons for this, i.e., it was those with poorer health who did not work at the frontline or those who could not work as usual, e.g., surgeons who might have been stressed about not being able to operate. Another reason could be that the follow-up was too short, the pandemic was still ongoing, and longer follow-ups are needed. Lessons from previous pandemics with a lesser impact on healthcare have demonstrated a long-term effect on the mental health of healthcare workers [37]. The extremely high workload, in combination with other work environment challenges during the COVID-19 pandemic [3,38,39], is likely to contribute to an increase in shorter spells (less than 14 days) of sickness absences and may further be associated with a long-term escalation of ACMCSA [40]. It is, therefore, essential to continue valid assessment and following the development of mental ill-health of physicians over time.

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306 and critical revision of the manuscript: all authors. Critical revision of the manuscript: all authors.
307 Final approval: all authors. Guarantor: EB.

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Depressive Diagnoses	Symptoms
Major Depressive Episode:	1. Depressed Mood
<ul> <li>- 5 or more depressive symptoms for ≥ 2 weeks</li> </ul>	2. Markedly diminished interest or pleasure in most or all activities
<ul> <li>- Must have either depressed mood or loss of interest/pleasure</li> </ul>	<ol> <li>Significant weight loss (or poor appetite) or weight gain</li> </ol>
<ul> <li>Symptoms must cause significant distress or impairment</li> </ul>	<ol> <li>Insomnia or hypersomnia</li> </ol>
- No manic or hypomanic behaviour	5. Psychomotor retardation
Minor Depressive Episode:*	6. Fatigue or loss of energy
<ul> <li>- 2–4 depressive symptoms for ≥2 weeks</li> </ul>	<ol><li>Feelings of worthlessness or excess or inappropriate guilt</li></ol>
<ul> <li>- Must have either depressed mood or loss of interest or pleasure</li> </ul>	8. Diminished ability to think or concentrate or indecisiveness
<ul> <li>- Symptoms must cause significant distress or impairment</li> </ul>	<ol> <li>Recurrent thoughts of death (not fear of dying), or suicidal ideation, or attempt</li> </ol>
- No manic or hypomanic behaviour	or attempt

4	25	Table 2. Cronbach's alpha and Cut	-off values for expos	sure measurements
			Cronbach's alpha	Cut-off values
		Burnout (23 items)	0.95	≥3.02
		Exhaustion (8 items)	0.92	≥3.31
		Mental distance (5 items)	0.84	≥3.30
		Emotional impairment (5 items)	0.90	≥2.90
		Cognitive impairment (5 items)	0.85	≥3.10
		Depression 2021 (6 items)	0.91	≥17
		Depression 2022 (6 items)	0.91	≥17
4	26	<u>·</u> ·	I	
4	27			

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Table 3. Sample description and mean values of burnout, exhaustion, mean	ntal distance, emotional impairment,	cogen	tige impairment and depression across
confounders at baseline.		ding	ගි ර

r									
	ר ו	%	Burnout	Exhaustion	Mental distance	Emotional impairment	Cognitive impairment	Desip	ression
Total Share (%)			4.7%	12.0%	3.0%	2.9%	3.4	E P	3.7%
Women 8	83	56.1%	1.96	2.43	1.69	1.60	1.84	ii 2	5.66
Men 6	92	43.9%	1.79	2.15	1.69	1.50	1.6	)25. Ner	4.38
Working with Covid-19 pat	ient	s					to	Do	
all the time 8	67	55.3%	1.92	2.35	1.74	1.55	1.夜	wnk Su	5.16
part of the time 3	50	22.3%	1.89	2.31	1.69	1.53	1.733	bade	5.29
at no time 3	52	22.4%	1.80	2.19	1.56	1.49	1.74	ed fr	4.77
Adverse life events 2	97	18.9%	1.95	2.40	1.72	1.58	1.85		6.00
No adverse life events 12	74	81.1%	1.87	2.29	1.68	1.52	1.72	ES)	4.90
Working hours	·						Ģ. A	://br	
less than 36 hours 2	71	17.2%	1.84	2.20	1.67	1.51	1.74	njop	4.64
36-45 hours 8	37	53.2%	1.86	2.25	1.68	1.52	1.72.	en.	4.90
More than 45 hours 4	65	29.6%	1.95	2.46	1.73	1.57	1.78	bmj	5.75
Healthcare facility	•						and		
Primary care 6	54	41.6%	1.90	2.34	1.73	1.51	1.換	m/ c	4.84
Hospital care 8	37	53.2%	1.89	2.30	1.67	1.56	1.78	ل n	5.40
Other	81	5.2%	1.72	2.07	1.55	1.46	1.670	une	4.26
Hierarchical position							hnc	Ů.	
Physicians in training 4	77	30.8%	1.95	2.37	1.77	1.54	1.80	202	5.79
Specialists 6	20	40.1%	1.90	2.33	1.70	1.54	1.737	at	5.08
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**Table 4**. Logistic regression analyses testing the association between baseline severe burnout,exhaustion, mental distance, emotional impairment, cognitive impairment and depression and anyall-cause medically certified sickness absence exceeding 14 days the following year.

		Univariat	e	Model A			Model B			
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value	
Ν					1465			1477		
Severe hurnout	2 1 3	1.74-	<0.001	2 57	1.27-	0 009				
Severe burnout	2.15	5.63	10.001	2.57	5.23	0.005				
Exhaustion	2.40	1.62-	<0.001				1 00	1.03-	0.040	
EXIIdUSUOII	2.48	3.79	<0.001				1.60	3.15	0.040	
Montal distance	0.92	0.03-		0 202				0.40	0.12-	0 1 4 1
wental distance		2.61	0.382				0.40	1.35	0.141	
Emotional	2.72	1.88-	-0.001				2 1 2	0.89-	0.000	
impairment	3.72	7.36	<0.001				2.13	5.08	0.090	
Cognitive	4.60	2.54-	<0.001				2 5 2	1.12-	0.025	
impairment	4.69	8.67	<0.001				2.52	5.50	0.025	
Depression	2.45	1.24-	0.010	1.60	0.70-	0.262	1 1 2	0.47-	0 700	
Depression	2.45	4.84	0.010	1.02	3.73	0.262	1.15	2.73	0.790	
Nagelkerke R						0.084			0.099	
Log LL						838.746			835.092	

Model A: Burnout and depression adjusted for working with COVID-19 patients, adverse life events, work hours, healthcare facility, hierarchical position, sex and age.

Model B: Symptom dimensions of burnout adjusted for working with COVID-19 patients, adverse life events, work hours, healthcare facility, hierarchical position, sex and age.

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## Supplementary

## Table S1 Analysis of missing data, including the percentages of respondents who responded only in 2021 to those responding in both 2021 and 2022. Data for 2021.

	Only responded in 2021 (%)	Responded in both 2021 and 2022 (%)
Total Share (%)	12.9	17.9
Women	54.0	56.1
Men	46.0	43.9
Working with Covid-19	patients	
all the time	48.9	55.3
part of the time	23.0	22.3
at no time	28.1	22.4
Adverse life events	20.5	18.2
No adverse life events	79.5	81.1
Working hours		
less than 36 hours	47.4	53.2
36-45 hours	23.0	17.2
More than 45 hours	29.6	29.6
Healthcare facility		
Primary care	38.5	41.6
Hospital care	49.2	53.2
Other	12.3	5.2
Hierarchical position		
Physicians in training	29.4	30.8
Specialists	39.7	40.1
Consultants	30.8	29.1
Burnout in 2021	5.8	4.7
Depression in 2021	4.5	3.7
ACMCSA	11.8	9.3

Table S2. Logistic regression analyses testing the association between baseline severe burnout, exhaustion, mental distance, emotional impairment, cognitive impairment and major depression and any all-cause medically certified sickness absence exceeding 14 days the following year.

		Univaria	te	Model A			Model B		
	OR	95%C I	p- value	OR	95%C I	p- value	OR	95%C I	p- value
Ν					1465			1477	
Severe burnout	2.13	1.74- 5.63	<0.00 1	2.57	1.27- 5.23	0.009			
Exhaustion	2.48	1.62- 3.79	<0.00 1				1.80	1.03- 3.15	0.040
Mental distance	0.92	0.33- 2.61	0.382				0.40	0.12- 1.35	0.141
Emotional impairment	3.72	1.88- 7.36	<0.00 1				2.13	0.89- 5.08	0.090
Cognitive impairment	4.69	2.54- 8.67	<0.00 1				2.52	1.12- 5.50	0.025
Major depression	2.45	1.24- 4.84	0.010	1.62	0.70- 3.73	0.262	1.13	0.47- 2.73	0.790
Working with COV	'ID-19								
all the time	0.60	0.40- 0.91	0.017	0.59	0.37- 0.95	0.029	0.61	0.38- 0.99	0.047
part of the time	1.06	0.67- 1.69	0.793	0.97	0.59- 1.62	0.918	0.99	0.59- 1.66	0.971
No	1			1			1		
Work hours									
less than 35 h	1.14	0.72- 1.79	0.580	0.84	0.50- 1.42	0.512	0.88	0.52- 1.49	0.632
35-45 h	1			1			1		
More than 45 h	0.95	0.64- 1.42	0.818	1.02	0.66- 1.57	0.923	1.00	0.65- 1.56	0.986
Healthcare facility									
Primary care	1.15	0.51- 2.60	0.743	2.00	0.74- 5.42	0.175	1.80	0.66- 4.92	0.251
Hospital care	1.03	0.46- 2.31	0.952	1.56	0.59- 4.14	0.374	1.46	0.55- 3.90	0.451
Other	1			1			1		
Hierarchical position	on								
Physicians in training	1.01	0.66- 1.55	0.966	1.63	0.84- 3.19	0.117	1.80	0.66- 4.92	0.088
Specialists	0.81	0.53- 1.23	0.322	0.84	0.47- 1.48	0.551	0.85	0.48- 1.51	0.572
Consultants	1			1			1		
Adverse life events (ref no)	1.72	1.16- 2.53	0.006	1.73	1.13- 2.63	0.029	1.60	1.04- 2.44	0.031
Women (ref men)	2.31	1.58- 3.38	<0.00 1	2.34	1.55- 3.53	<0.00	2.14	1.41- 3.25	<0.00
Age	1.01	0.99- 1.03	0.086	1.03	1.01- 1.06	0.005	1.03	1.01- 1.06	0.004
Nagelkerke R						0.084			0.099

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Log LL	838.746	835.09

Table S3. The association between severe burnout and major depression, respectively, and all-cause medically certified sickness absence adjusted for working with COVID-19 patients, difficult life events, work hours, healthcare facility, hierarchical position, sex and age

Exposure	OR	CI	p-value	Nagelkerk R <sup>2</sup>
Severe burnout	3.12	1.70-5.74	<0.001	0.076
Major Depression	2.46	1.21-4.98	0.012	0.075

Table S4. The association between exhaustion, mental distance, emotional impairment, and cognitive impairment, respectively, and all-cause medically certified sickness absence adjusted for depression, working with COVID-19 patients, difficult life events, work hours, healthcare facility, hierarchical position, sex and age

Exposure	OR	CI	p-value	Nagelkerk R <sup>2</sup>				
Exhaustion	2.07	1.26-3.41	0.004	0.086				
Mental distance	0.84	0.27-2.57	0.754	0.075				
Emotional	3.01	1.38-6.59	0.006	0.085				
impairment								
Cognitive	3.62	1.79-7.31	<0.001	0.092				
impairment		4						