





# BMJ Open Impact of burnout on turnover, medical errors, medical leave and a cross-sectional study of contributing factors among Chilean physicians

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## ABSTRACT

**Background** During the COVID-19 pandemic, many physicians experienced burnout, underscoring the need to identify factors associated with this condition to develop effective prevention and treatment strategies.

**Objective** To examine the relationship between physician burnout and individual factors, medical errors, medical leave and the work environment.

**Design** A cross-sectional online survey conducted from November 2020 to December 2020.

**Participants** Physicians registered with the Medical College of Chile.

**Setting** Registered physicians working in Chile across primary, secondary and tertiary levels of healthcare.

**Primary outcomes** Burnout was assessed using the Maslach Burnout Inventory for Human Services.

**Secondary outcomes** Self-reported medical errors, medical leave and turnover.

**Independent variables** Sociodemographic characteristics, personality factors, psychological well-being, mindfulness factors, self-compassion and work environment factors. Descriptive statistics, linear and logistic regressions and regression analyses with cross-validation using least absolute shrinkage and selection operator (LASSO) tests were applied.

**Results** Of the 23 481 registered physicians, 795 (3.4%) completed the survey. The sample included 64.1% women, with a mean age of 37.7 years (SD=11.3). The prevalence of burnout syndrome was 20.4% based on strict criteria and 68.9% based on lax criteria. Burnout scores predicted days of medical leave ( $\beta=0.086$ ,  $p<0.01$ ), turnover ( $\beta=0.012$ ,  $p<0.05$ ) and perceived medical errors ( $\beta=0.009$ ,  $p<0.001$ ). In contrast, burnout was inversely correlated with age ( $\beta=-0.125$ ,  $p<0.001$ ), agreeableness as a personality trait ( $\beta=-0.107$ ,  $p<0.001$ ), psychological well-being ( $\beta=-0.248$ ,  $p<0.001$ ) and the mindfulness factor awareness ( $\beta=-0.145$ ,  $p<0.001$ ). In the work environment, time pressure ( $\beta=0.167$ ,  $p<0.001$ ) was positively associated with burnout among others.

**Conclusion** Younger physicians may be prioritised for individual-level interventions, while addressing time pressure at the organisational level could help prevent burnout. However, longitudinal studies are needed to clarify the directionality of relationships with psychological factors.

**Trial registration number** NCT05013489; Results.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The study setting was a poorly resourced healthcare system in Latin America, the global south, a region strongly affected by the COVID-19 pandemic.
- ⇒ A large sample of physicians from across the national territory of Chile was included.
- ⇒ The response rate was low due to the sampling strategy through a national registry and the online format of the survey.
- ⇒ Prevalence estimates need to be interpreted with caution.
- ⇒ The cross-sectional nature of the study design limits causal inferences, especially regarding the direction of the relationship.

## BACKGROUND

The COVID-19 pandemic has severely impacted healthcare systems, with workers experiencing significant emotional exhaustion (EE) and psychological distress. A meta-analysis of 33 062 healthcare professionals reported high rates of anxiety (23.2%) and depression (22.8%), disproportionately affecting women.<sup>1</sup> In Chile, the global study, ‘*The COVID-19 Health Care Workers*’ documented a notable increase in depressive symptoms among healthcare workers between May and July 2020.<sup>2</sup> These findings emphasise the urgent need to assess mental health outcomes, understand their consequences and identify contributing factors.

Among the mental health challenges faced by healthcare workers, burnout syndrome is particularly concerning. It is characterised by EE, depersonalisation (DE) and a diminished sense of personal accomplishment (PA).<sup>3 4</sup> Burnout is associated with adverse outcomes such as decreased quality of care, increased medical errors, prolonged recovery times and reduced patient satisfaction.<sup>5 6</sup> At the health system level, it contributes to reduced productivity, higher turnover rates, diminished

accessibility and increased costs. In physicians, burnout has been linked to substance abuse, depression, suicide, poor self-care and even traffic accidents.<sup>5 7</sup> These wide-ranging consequences underscore the need for standardised measurement and targeted interventions.

The Maslach Burnout Inventory questionnaire – Human Services Survey (MBI-HSS)<sup>3</sup> is the most widely used tool for assessing burnout, applied in 85% of studies across 45 countries.<sup>8</sup> However, significant variability exists between countries in reported burnout prevalence. Before the pandemic, a systematic review reported burnout prevalence among physicians ranging from 6.2% (strict criteria) to 49% (lax criteria), with differences attributed to methodological inconsistencies.<sup>8</sup> In Chile, available studies have been limited to small, localised samples, reporting prevalence rates between 3.6% and 64.4%. These studies often include heterogeneous samples, such as medical students, residents and specialists from specific fields or institutions.<sup>9–13</sup> During the pandemic, a meta-analysis revealed extreme variability in burnout prevalence, ranging from 6.0% to 99.8%. This variability was largely attributed to differences in assessment tools, cut-off points, the timing of the study during the pandemic and geographic factors.<sup>14 15</sup> Postpandemic, studies have highlighted the persistence of elevated burnout levels, suggesting long-term consequences of the prolonged stress experienced during the pandemic.<sup>16</sup> Currently, no study has systematically explored burnout among physicians in Chile while directly addressing regional variations, which are essential for policymaking in Latin America—a region often under-represented in research. Additionally, methodological challenges arise when comparing different cut-off points for burnout, as no study has examined multiple criteria to provide a more nuanced interpretation of prevalence estimates.

Understanding the factors associated with burnout is crucial for developing interventions at the individual, group and organisational levels. Workplace-related factors include excessive workloads, long working hours, frequent shifts, extensive documentation requirements, time spent working from home, reduced autonomy and inefficient use of time due to administrative demands. Additionally, organisational factors such as poor leadership, limited multidisciplinary collaboration, lack of recognition, insufficient organisational support and restricted professional development opportunities exacerbate the risk of burnout.<sup>5 17</sup> Individual-level factors include sociodemographic variables (eg, gender, age, marital status) and psychological traits such as self-criticism, negative coping strategies, sleep deprivation, perfectionism, idealism, work-life imbalance and inadequate external support.<sup>5 7</sup>

Conversely, psychological well-being factors—such as self-acceptance, purpose in life, environmental mastery, personal growth, positive relationships and autonomy—have been associated with lower burnout levels.<sup>18</sup> Moreover, an inverse relationship has been observed between levels of mindfulness<sup>19</sup> and self-compassion with psychological symptoms.<sup>20</sup>

Despite extensive research, significant gaps persist in understanding the dynamics of burnout during the COVID-19 pandemic. Previous studies have identified occupational demands, increased workloads and sleep deprivation as key contributors to burnout. However, methodological heterogeneity and a limited focus on contextual factors have hindered comparability and the development of effective, targeted interventions.<sup>14 15</sup> While occupational demands have been identified as key contributors, no comprehensive study has integrated individual and organisational factors using standardised tools or predictive models that incorporate a broad range of psychological and work environment variables.<sup>21</sup> Additionally, a persistent methodological challenge is the selection of the most relevant predictors when comparing multiple variables, highlighting the need for robust analytical approaches.

This study aims to address these gaps by examining burnout prevalence using two commonly applied cut-off points and investigating the relationship between burnout among physicians and individual factors, medical errors, medical leave and workplace characteristics in Chile. By focusing on a region with limited prior research, this study seeks to provide a nuanced understanding of burnout and inform targeted interventions for healthcare professionals. Hypotheses to be tested: (1) the prevalence of burnout among physicians in Chile was high during the COVID-19 pandemic; (2) total burnout scores and its subdimensions predict the occurrence of medical errors, medical leave and physician turnover; (3) a predictive model incorporating individual factors, work environment characteristics and COVID-19-specific factors explains variations in total burnout scores and its subdimensions.

## METHODS

### Design and setting

A cross-sectional online survey was conducted through the Physicians College of Chile (Colegio Médico de Chile, COLMED) from November to December 2020. All registered members were invited to participate. Data were extracted from a clinical trial registered in clinicaltrial.gov, NCT05013489.

### Study population

The electronic survey was sent to all emails in the COLMED database, corresponding to 23 481 physicians. Weekly reminders were sent over 2 months, totalling eight reminders. A total of 5093 people opened the mail, and 1507 entered the survey link. Ultimately, 937 participants began the survey, and 796 completed the primary outcome, yielding a response rate of 3.4%. A total of 142 duplicates and incomplete surveys were excluded from the analysis. For the sample size, a burnout prevalence of 0.5 was expected, as previously reported by Rotenstein *et al*,<sup>8</sup> with an alpha error of 0.05 and a margin of error (d) of 0.05, resulting in a required sample size of 385.<sup>22</sup>

To ensure sample representativeness, we compared our sample distribution with the national physician database. Our sample closely reflects the national proportion of specialists (60%) and exhibits a similar regional distribution, with no statistically significant differences ( $p>0.05$ ).<sup>23</sup>

### Primary outcome

Burnout was assessed with the MBI-HSS,<sup>3</sup> validated in Chile,<sup>24</sup> which consists of 22 items that are grouped into three subdimensions: EE (9 items), DE (5 items) and PA (8 items). Each item is scored on a Likert scale from 0 to 6 to determine the frequency of symptoms, where 0 is never and 6 is daily. Following Rotenstein's recommendation, the most common cut-off points were used to assess the prevalence, and total score as continuous variables and subdimensions (EE, DE and PA) were used in the analyses. Burnout syndrome was defined as: (1) strict criteria: EE  $\geq 27$ , DE  $\geq 10$  and PA  $\leq 33$  (reference prevalence of 6.3%) or (2) lax criteria: EE  $\geq 27$  and/or DE  $\geq 10$  (reference prevalence of 49.1%).<sup>8</sup> These different criteria were used to examine how varying cut-off points or definitions might affect prevalence estimates.

### Secondary outcomes

The potential consequences of burnout were evaluated through several measures. Medical leave was assessed as a dichotomous variable (Yes/No), along with its duration in days over the past 3 months. Additionally, turnover was recorded as a dichotomous variable (Yes/No) within the same timeframe. The perception of medical errors was evaluated using a Likert-scale adapted version of the previously validated Medical Error Checklist - General (MECG). This instrument comprises 18 items distributed across six dimensions: errors in inquiry and clinical history, diagnostics, information transmission, treatment, documentation and interpersonal communication conflicts.<sup>25</sup> Each dimension demonstrated a Cronbach's alpha exceeding 0.7, except for the communication conflict dimension ( $\alpha=0.58$ ). Additionally, exploratory factor analysis revealed the anticipated factorial structure, reinforcing the validity of the six-dimensional framework.

### Independent variables

The following individual factors were measured: mindfulness, self-compassion, personality traits and well-being.

The 15-item version of the Five Facets of Mindfulness questionnaire (FFMQ) validated in Chile was used.<sup>26</sup> The items evaluate the level of certainty of a statement on a Likert scale ranging from 1 (never or very rarely true) to 5 (very often or always true). This questionnaire assesses five dimensions or factors of the mindfulness construct: (1) observe: understood as noting internal or external experiences as sensations, thoughts, emotions, sounds, and smells; (2) describe: naming the internal experience; (3) act with attention/awareness: paying attention to the activity of the moment, in contrast to having the attention elsewhere; (4) non-judgement of the internal experience: the non-evaluative position towards thoughts or

emotions; and (5) non-reactivity to internal experience: the tendency to allow thoughts and emotions to flow without getting caught or carried away by them.

The 12-item Self Compassion Scale (SCS-12) validated in Chile was used. The items evaluate the frequency with which the participant presents an attitude or behaviour using a Likert scale from 1 (almost never) to 5 (almost always). This questionnaire assesses six dimensions: (1) kindness towards oneself: being kind and understanding oneself with warmth and acceptance; (2) low self-judgement: absence of judging yourself harshly for defects; (3) common humanity: recognising the shared human experience, understanding that all humans make mistakes and adopting a broader and more connected perspective on personal deficiencies and individual difficulties; (4) low isolation: absence of feeling isolated or presenting the egocentric feeling as if I was the only one who has failed or I am suffering; (5) full attention or mindfulness: being aware of one's own suffering in the present moment with clarity and balance, without running away from the experience; and (6) low overidentification: absence of immersion in the subjective emotional reaction to negative aspects of oneself or one's own life experience, preventing a perspective or objective vision of the situation.<sup>27</sup>

The Mental Health Continuum Short Form-14 (MHC-14) was used to assess emotional, social and psychological well-being, which is understood as how individuals see themselves thriving in their personal life.<sup>25</sup> The items use a Likert scale from 0 to 6, and they are grouped into the three subdimensions: emotional (three items), psychological (five items) and social (six items) well-being. The scale was translated and validated in Chilean adults.<sup>28</sup>

The Big Five Inventory-2 Short form was used to assess personality. The 30 items use a Likert scale from 0 to 1, grouped in five dimensions: openness, conscientiousness, extraversion, agreeableness and neuroticism. This scale is validated in the USA and was translated for this study. The scale showed adequate internal consistency.<sup>29</sup>

Work environment demands were assessed using an adapted version of the previously validated Psychosocial Factors Questionnaire 75.<sup>30</sup> A total of 62 items were selected to assess three levels of psychosocial factors at work. For the job level demands (job, 25 items), the dimensions were role demands, workload, time pressure, cognitive demands and emotional demands. Furthermore, dimensions from an unpublished version were added, representing unstable work conditions, hours and shifts at work, responsibility and administrative obstacles. At the group level demands (group, 18 items), the following dimensions were included: unfair distribution of workload, interpersonal conflict, interpersonal violence and authoritarian supervision. Also, dimensions from an unpublished version were added for passive supervision and destructive supervision. At the organisational level demands (organisation, 19 items), the dimensions were unfairness or imbalance between effort and reward, politics for promotion based on political behaviour or



favouritism and insecurity or uncertainty about retaining the job. Also, a dimension from an unpublished version was added for work-family imbalance, organisational communication problems and coordination between group problems.

Demographic characteristics were age, gender and region of residence.

## Analyses

Burnout levels and the prevalence of strict and lax burnout syndrome were analysed using mean values, SD, absolute numbers and proportions. To minimise bias, broad sample coverage was ensured by employing validated instruments to assess primary outcomes, secondary outcomes and independent variables. Additionally, cross-validation least absolute shrinkage and selection operator (LASSO) estimations were used to mitigate model overfitting. Missing data were handled by case-wise deletion, as the number of missing cases was minimal and did not significantly impact the analysis.

Demographic factors—including sex, age, region, healthcare level and institutional covariates—were considered in the analysis. To assess the predictive capacity of burnout on turnover, medical errors and medical leave, regression models were employed. Two models were tested: one using the total burnout score as the independent variable and another incorporating its three dimensions (EE, PA and DE). Both models were adjusted for age, sex, institution and region.

Linear regression models were employed for medical errors and the number of medical leave days, both treated as continuous variables. Logistic regression models using Nagelkerke's  $R^2$  were applied to turnover and medical leave, as these were treated as dichotomous variables. Additionally, as an ad hoc analysis, both models were tested separately for each of the six subdimensions of the medical error checklist scale.

To evaluate the relationship between independent variables and burnout and considering the potential inflation of false positives due to multiple testing, a LASSO regression analysis incorporating regional and institutional covariates as effects was conducted. Cross-validation LASSO estimation<sup>31</sup> was used to determine whether the independent variables were correlated with burnout total score or each of the three dimension scores. LASSO applies an  $l_1$  regularisation penalty, shrinking some coefficients towards zero and setting others to exactly zero, which simplifies the model and aids in selecting the most relevant predictors. Only the marginal effect of the two categories of burnout was presented. The  $p$  values were calculated by using double-selection LASSO regression.<sup>32</sup>

All analyses were performed in R software V.4.1.1 and Stata V.17 with the package LASSOPACK.<sup>33</sup> All variables are presented with  $p$  value  $<0.10$  in a 2-sided null test. Nonetheless, only variables at  $p$  value  $<0.05$  were considered statistically significant.

## Patient and public involvement

No patients or members of the public were involved in this research. Patients and the public did not participate in the design or conduct of the study, the choice of outcome measures or the recruitment process.

## RESULTS

### Participants

Of 23 481 registered physicians in the email database of the Medical College in Chile,  $n=795$  (3.4%) completed the survey. Demographic data such as gender, age, region, healthcare level and specialties are reported in table 1.

The prevalence of burnout syndrome was 20.4% using strict criteria and 68.9% using lax criteria. The mean burnout scores were for the total instrument 52.5 (SD 20.5), EE 29.8 (SD 11.1), DE 9.1 (SD 6.8) and PA 35.4 (SD 6.9). Burnout levels and prevalence, disaggregated by gender, region, level of care, type of service (private or public) and medical specialty, are presented in online supplemental table 1.

Two regression models were conducted to examine the association between burnout and medical leave days: one incorporating total burnout and covariates and another including its three dimensions (EE, DE and PA). In the first model, burnout significantly predicted medical leave days ( $F(20, 760) = 2.26$ ,  $p=0.0013$ ,  $R^2 = 0.056$ ), explaining 5.63% of its variance. The second model, which included the three burnout dimensions, also showed a significant association ( $F(22, 758) = 2.36$ ,  $p<0.001$ ,  $R^2 = 0.064$ ), with a slightly higher explained variance (6.42%).

The same models were applied to MECC (Total). Burnout was significantly associated with MECC total score ( $F(19, 693) = 9.21$ ,  $p<0.0001$ ,  $R^2 = 0.202$ ), explaining 20.16% of its variance. When considering the three burnout dimensions, the model remained significant ( $F(21, 691) = 9.93$ ,  $p<0.001$ ,  $R^2 = 0.232$ ), with a greater proportion of explained variance (23.18%).

An ad hoc exploratory analysis assessed the six MECC dimensions separately. All models were statistically significant ( $p<0.05$ ), confirming a consistent association between burnout and medical errors. Among these, the strongest associations were observed for MECC Indication and MECC Communication. The model including burnout dimensions explained 17.52% of the variance in MECC Indication ( $F(21, 693) = 7.01$ ,  $p<0.0001$ ,  $R^2 = 0.175$ ), and 17.44% in MECC Communication ( $F(21, 691) = 6.95$ ,  $p<0.0001$ ,  $R^2 = 0.174$ ).

Logistic regression models examined the relationship between burnout and the likelihood of turnover and medical leave. For turnover, the total burnout model was statistically significant ( $X^2(20, n=775) = 38.20$ ,  $p=0.008$ ) and explained 9.31% of the variance (Nagelkerke  $R^2$ ). Including burnout dimensions yielded similar results ( $X^2(22, n=775) = 38.33$ ,  $p=0.017$ , Nagelkerke  $R^2 = 9.35\%$ ). For medical leave, total burnout significantly predicted its likelihood ( $X^2(20, n=775) = 48.93$ ,  $p<0.001$ , Nagelkerke  $R^2 = 4.63\%$ ). Incorporating burnout dimensions slightly

**Table 1** Sample characteristics

Characteristics	
Age, mean (SD)	37.7 (11.3)
Sex, No. (%)	
Male	286 (35,9)
Female	505 (63,4)
Institution type, No. (%)	
Public	647 (81,3)
Private	143 (18)
Healthcare level, No. (%)	
Primary	299 (37,6)
Secondary	134 (16,8)
Tertiary	357 (44,8)
Professional state, No. (%)	
General physician	323 (40,6)
Specialty resident	81 (10,2)
Specialist	294 (36,9)
Sub-specialist	90 (11,3)
N/R	8 (1)
Region, No. (%)	
Metropolitan	339 (42,6)
Valparaíso	70 (8,8)
Biobío	70 (8,8)
La Araucanía	50 (6,3)
Los Lagos	48 (6)
Others	164 (20,5)
N/R	55 (7)
Specialty, No. (%)	
General	305 (38,3)
Internal medicine	97 (12,2)
Paediatrics	86 (10,8)
Psychiatry	50 (6,3)
Anaesthesiology	45 (5,7)
Family medicine	44 (5,5)
Surgery	40 (5)
Others	129 (16,2)
Burnout, Mean (SD)	
Overall	52,53 (21)
Emotional exhaustion	30 (11)
Depersonalisation	9 (7)
Perceived accomplishment	35 (7)
Burnout syndrome, No. (%)	
Lax criteria	545 (68.9%)
Strict criteria	161 (20.4%)
Demographic and professional characteristics of the study participants, including age, sex, institution type, healthcare level, professional status, region, specialty and burnout levels.	

improved the explained variance (6.22%,  $X^2$  (22,  $n=775$ ) = 61.43,  $p<0.001$ ).

Standardised coefficients for significant variables in each model are presented in [table 2](#).

To evaluate independent variables related to burnout and their dimensions, a LASSO regression was conducted, including region and institution as covariates. In the cross-validation LASSO estimation, including demographic and individual factors and characteristics of the work environment, the following variables were correlated with the overall burnout score ([table 3](#)): demographic factors—Chilean nationality ( $\beta=0.138$ ,  $p<0.001$ ), younger age ( $\beta=-0.125$ ,  $p<0.001$ ) and region (Nuble) ( $\beta=-0.051$ ,  $p<0.001$ ).

1. Individual factors: personality (agreeableness) ( $\beta=-0.107$ ,  $p<0.001$ ), psychological well-being ( $\beta=-0.248$ ,  $p<0.001$ ), FFMQ (observation) ( $\beta=-0.055$ ,  $p=0.022$ ) and FFMQ (awareness) ( $\beta=-0.145$ ,  $p=0.001$ ).
2. Work environment: job (time pressure) ( $\beta=0.167$ ,  $p<0.001$ ), job (administrative problems) ( $\beta=0.070$ ,  $p=0.010$ ), group (authoritarian supervision) ( $\beta=0.091$ ,  $p<0.001$ ) and organisation (family-work imbalance) ( $\beta=0.092$ ,  $p=0.001$ ).
3. COVID-19 context factor: exposure to risk of COVID-19 infection ( $\beta=0.069$ ,  $p=0.035$ ) and mental health support of the organisation ( $\beta=0.063$ ,  $p=0.009$ ) ([figure 1](#)).

## DISCUSSION

### Main findings

Burnout syndrome was highly prevalent among medical doctors in Chile, with significant variations depending on the definition of burnout and the cut-off points used for the MBI-HSS. As anticipated, burnout was directly associated with perceived medical errors, turnover and medical leave. Additionally, associations were identified between burnout and a range of demographic, individual and work-related factors, as well as specific challenges related to the COVID-19 pandemic. These factors included Chilean nationality, younger age, time pressure, administrative burdens, authoritarian supervision, family-work imbalance, exposure to COVID-19 infection risk and the availability of organisational mental health support. Conversely, individual characteristics such as psychological well-being, social well-being, FFMQ awareness and agreeableness as a personality trait were inversely associated with burnout.

### Strengths and limitations

The study was conducted in a resource-limited health-care system in Latin America, a region in the Global South significantly impacted by the COVID-19 pandemic. A large and diverse sample of physicians across Chile was included, encompassing various practice settings, levels of care, medical specialties, geographic regions and nationalities. The study compared two widely used cut-off points for defining burnout syndrome and incorporated a comprehensive model that accounted for

**Table 2** Significant ORs and coefficients from regression models

Logistic, OR (CI 95%)	Total	EE	PA	DE
Turnover	1.012 (1.001 to 1.024)			
Medical leave	1.009 (1.001 to 1.017)	1.032 (1.014 to 1.051)	1.033 (1.006 to 1.061)	
Lineal, $\beta$ (CI 95%)	Total	EE	PA	DE
Medical leave days	0.086 (0.025 to 0.147)	0.193 (0.056 to 0.330)		
MECG (total)	0.009 (0.007 to 0.011)	0.005 (0.001 to 0.010)		0.027 (0.020 to 0.034)
MECG (indication)	0.010 (0.007 to 0.013)			0.034 (0.022 to 0.045)
MECG (diagnosis)	0.007 (0.004 to 0.010)			0.023 (0.013 to 0.033)
MECG (information)	0.010 (0.007 to 0.013)			0.028 (0.018 to 0.038)
MECG (treatment)	0.008 (0.005 to 0.010)	0.009 (0.003 to 0.014)		0.017 (0.008 to 0.026)
MECG (register)	0.009 (0.006 to 0.012)			0.033 (0.021 to 0.045)
MECG (communication)	0.010 (0.008 to 0.013)	0.008 (0.004 to 0.013)		0.026 (0.018 to 0.034)

This table presents the ORs from logistic regression models and the standardised coefficients ( $\beta$ ) from linear regression models, along with their 95% CI. The models assess the association between burnout (as the independent variable) and several outcomes: turnover, medical leave, number of medical leave days and subdimensions of the MECG. Burnout variables include total (overall burnout score), EE, PA and DE. For example, an OR of 1.012 for total burnout indicates that each one-point increase in the burnout score is associated with a 1.2% increase in the odds of turnover. A standardised  $\beta$  of 0.086 implies that each one-point increase in the burnout score corresponds to an additional 0.086 days of medical leave. Therefore, an increase of 11.63 points in the total burnout score would be associated with approximately one additional day of medical leave. Only statistically significant results ( $p < 0.05$ ) are reported.

DE, depersonalisation; EE, emotional exhaustion; MECG, Medical Error Checklist - General; PA, personal accomplishment.

individual factors, such as personality traits and organisational factors, using validated instruments. To address the influence of multiple variables, LASSO regression was applied to penalise less relevant predictors, enhancing the model's focus on key determinants. The study has several limitations. First, the response rate was low, likely influenced by the sampling strategy, which relied on national registry and an online survey format, as well as the extensive battery of questionnaires. Consequently, prevalence estimates should be interpreted with caution, as the sample may not be representative of other countries. Second, the cross-sectional design limits the ability to draw causal inferences, particularly regarding the directionality of observed relationships. Finally, the self-reported nature of the data may introduce recall bias and social desirability bias, potentially leading to an overestimation of prevalence rates.

### Interpretation and implications

Comparing the prevalence of burnout syndrome in this sample with other studies requires caution, as different scales and cut-off points may have been used. Prior to the COVID-19 pandemic, the global prevalence of burnout syndrome assessed with the MBI-HSS scale varied widely, with strict criteria yielding an average prevalence of 6.3% and lax criteria reporting up to 49.1%.<sup>8</sup> In Chile, studies involving heterogeneous samples of students, residents and specialists across different institutions reported prevalence rates ranging from 3.6% to 64.4%.<sup>9–13</sup> For instance, using criteria similar to our lax definition, a prepandemic study on Chilean residents reported a burnout prevalence of 38.3%.<sup>11</sup> A recent meta-analysis showed a wide range of prevalence during the pandemic, from 6.0%

to 99.8%, influenced by variability in assessment tools and definitions.<sup>14</sup> Studies using the MBI-HSS generally adopted lax burnout criteria, defining burnout as either EE scores of  $\geq 27$ –30 or DE scores of  $\geq 10$ –13, with either dimension alone considered indicative of burnout, irrespective of reduced PA. Using these criteria, prevalence rates ranged from 37.4% to 80% across various settings, including psychiatry residents, paediatricians and other physicians.<sup>34–36</sup> Importantly, no study to date has employed strict criteria incorporating all three dimensions of burnout—EE, DE and reduced PA—as originally defined.<sup>3</sup>

As reported in the international literature prior to the pandemic,<sup>5 7</sup> the present study, conducted during the pandemic, confirmed a direct association between burnout and medical errors, as well as the duration of medical leave and turnover. A previous study in Japan reported a prevalence of 31.4% and identified similar associations with medical leave, intention to leave clinical practice and team-related issues.<sup>37</sup> These findings underscore significant implications for healthcare quality and system costs, emphasising the critical need for preventive strategies to address burnout and its adverse consequences.

The regression highlights the association of burnout with work factors described prior to COVID-19, which could exacerbate during the pandemic under a more challenging work environment.<sup>5 7</sup> In particular, a higher effect of time pressure in the job was observed; there was an increased workload for the available time, which could be a key factor when planning the distribution of the workload. This can also lead to extra working hours with

**Table 3** Standardised  $\beta$  values from LASSO regression between independent variables and burnout overall score and subdimensions EE, PA and DE.

Burnout	Overall	EE	PA	DE
Chilean	0.138***	0.107**		0.165***
Female				−0.116**
Age	−0.125***	−0.112**		−0.164***
Region				
Ñuble	0.051***			0.054***
Aysen			−0.059***	
Tarapacá			−0.070**	
Metropolitana				0.087***
Biobio				−0.041*
Job				
Time Pressure	0.167***	0.231***		0.087*
Administrative obstacles	0.070**		−0.077*	0.057+
Emotional Demands	0.057+			
Unstable conditions				0.088*
Group				
Authoritarian supervision	0.091***			
Organisation (coordination)	0.065+			
Imbalance between effort and reward	0.061+	0.087**		
Work-family imbalance	0.092***	0.149***		
Personality				
Extraversion	−0.028+			−0.028
Agreeableness	−0.107***		0.119***	−0.185***
Neuroticism		0.157*		
Openness		0.044*		
Conscientiousness			0.041*	
COVID-19				
Exposure to risk situations	0.069*	0.132***		
Organisation's support	0.063**		−0.059+	
Mental Health Continuum				
Emotional well-being			0.123**	
Social well-being	−0.059+	−0.059+	0.164***	
Psychological well-being	−0.248***	−0.113**	0.317***	−0.235***
FFMQ				
Awareness	−0.145**		0.082**	−0.144***
Observation	−0.055*	−0.129*		−0.083*
Self-compassion (over-identification)		−0.066*		
Number of work places		−0.065*	0.042*	

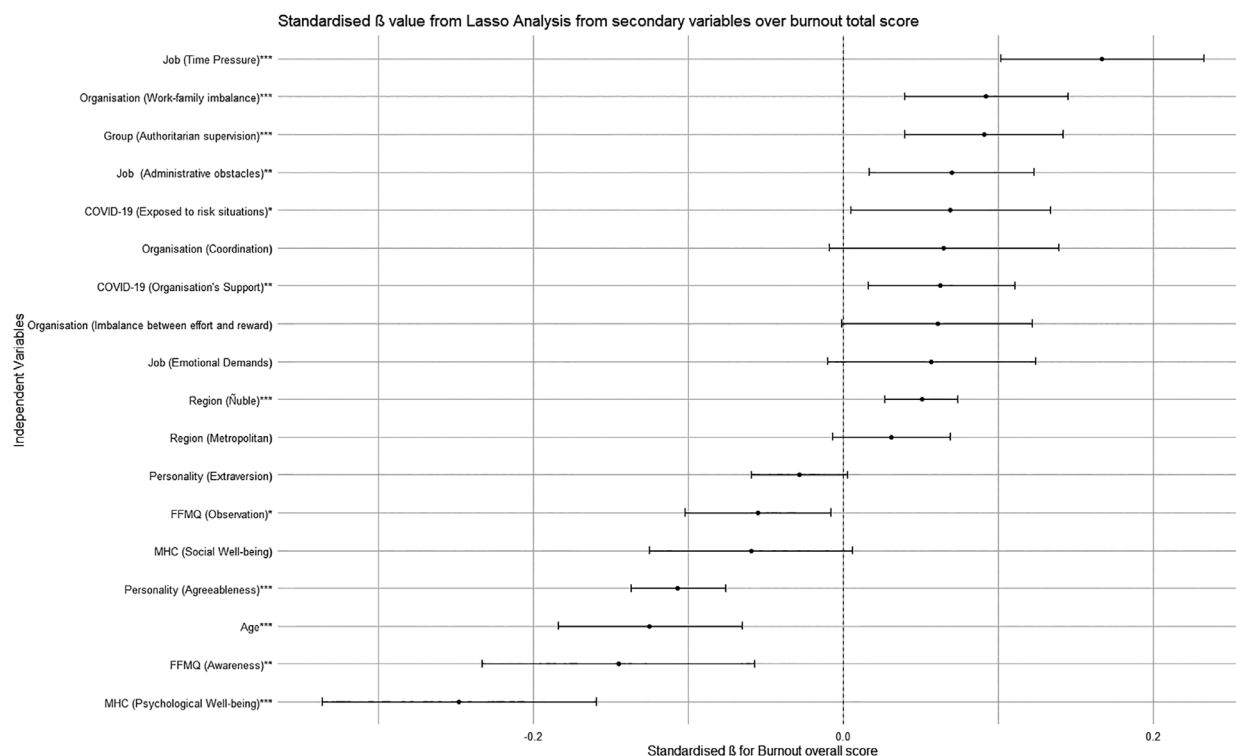
+ $p < 0.1$ , \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

DE, depersonalisation; EE, emotional exhaustion; FFMQ, Five Facets of Mindfulness Questionnaire; PA, perceived decrease in achievement.

an imbalance between work and family, with less time for personal life, working at home or being connected with work during free time. Another aspect to consider when designing the work environments is the instability of work conditions with changes in tasks, schedules or positions of the professionals, which can be related to

loss of autonomy.<sup>7</sup> Furthermore, work profiles can be related to administrative obstacles such as bureaucracy and filling in forms, among those the requirements for electronic health records. There are opportunities for change in the workflow and reductions or simplifications in this area. Interestingly, mental health support of the





**Figure 1** The points represent standardised  $\beta$  values from the LASSO regression analysis between independent variables and the total burnout score, along with their CIs. Only variables with  $p < 0.1$  are displayed. Significance levels are indicated as follows: \* $p < 0.05$ , \*\* $p < 0.01$  and \*\*\* $p < 0.001$ . FFMQ, Five Facets of Mindfulness Questionnaire; MHC, Mental Health Continuum.

organisation was positively correlated with burnout symptoms. Although the directionality of the effect cannot be known with this study, a possible explanation is that the teams with higher burnout received more support from the organisation. Our findings align with a previous meta-analysis reporting that leadership significantly influences burnout and workplace violence.<sup>38</sup> Other studies also emphasise the importance of effective leadership. For instance, higher composite scores for leadership qualities, including recognition, coaching and treating employees with respect and dignity, have been shown to inversely correlate with burnout.<sup>39 40</sup> Similarly, our results highlight that authoritarian leadership, as an opposing style, is a direct positive predictor of burnout, underscoring the role of leadership style in either mitigating or exacerbating burnout among healthcare professionals.

An intriguing finding of our study is that Chilean physicians exhibited higher levels of burnout compared with migrant background physicians. This contrasts with previous reports suggesting that a migration background is associated with worse burnout levels, potentially due to factors such as acculturation challenges and social integration difficulties, although no differences were observed in work-life balance.<sup>41</sup> However, given the sample characteristics, these results should be interpreted with caution, and further research is needed to explore this issue. Another notable finding is that physicians in the Ñuble region of Chile reported higher burnout scores compared with other regions. While this may be attributed to the predominance of rural areas, the

explanation remains controversial. Previous studies have shown mixed results, with some indicating no regional differences in burnout,<sup>42</sup> and others suggesting that geographic isolation could increase burnout risk.<sup>43</sup> It is noteworthy that Ñuble had the highest vaccination rates and the lowest COVID-19 mortality rates in Chile during the study period.<sup>44</sup>

The identification of possible protective factors facilitates the implementation of interventions to strengthen those factors in the short and medium term. This can be achieved with psychological well-being, using interventions aimed at promoting self-acceptance, purpose in life, environmental mastery, personal growth, positive relationships and autonomy.<sup>28</sup> Previously, similar results were reported, and positive psychology interventions were proposed to improve physicians' wellness.<sup>18</sup> Mindfulness-based interventions may especially target the awareness part of the construct since it was associated with burnout. A meta-analysis of mindfulness-based interventions for healthcare professionals showed a reduction in burnout and an increase in mindfulness that was sustained at follow-up.<sup>45</sup> Also, the act with awareness subdimension of the FFMQ scale was proposed as an intervention target for promoting mindfulness<sup>46</sup> and a possible mediator for burnout reduction.<sup>47</sup> Finally, it can be argued that age was a protective factor, possibly due to more work experience of older doctors or harder work conditions, such as more frontline duties, for more junior doctors.



## Conclusions

The present study identifies key intervention targets to prioritise for preventing or reducing burnout symptoms. The findings, contextualised within previous evidence, provide actionable insights for mitigating burnout and adverse consequences, such as medical errors, medical leave and workforce turnover.

At the organisational level, strengthening mental health support systems emerges as a critical need. These systems must be both accessible and effective for physicians experiencing burnout. Incorporating leadership training into these programmes can address the harmful effects of authoritarian supervision. Evidence underscores the value of leadership qualities such as recognition, coaching and treating employees with respect and dignity, all of which are inversely associated with burnout.<sup>40</sup> Additionally, prioritising early screening and timely interventions is essential to identify at-risk individuals and address their needs before burnout escalates, ultimately promoting better outcomes for both healthcare professionals and the systems in which they operate.

Efforts to improve the work environment should focus on reducing time pressures by optimising time management and workload distribution. Simplifying administrative processes, including electronic health record systems and bureaucratic workflows, can significantly alleviate non-clinical burdens and enhance operational efficiency. Policies promoting work-life balance—such as flexible scheduling, reduced after-hours demands and enhanced work-from-home options—are equally essential. In resource-limited settings, priority should be given to at-risk groups, such as younger physicians and those in regions severely impacted by health crises.

Another critical area of intervention involves strategies to promote psychological well-being. Programmes fostering self-acceptance, purpose in life, environmental mastery and personal growth are particularly valuable. Mindfulness-based interventions have demonstrated sustained efficacy in reducing burnout among physicians and medical students, making them a vital tool for enhancing resilience and emotional health.<sup>48 49</sup>

Future research should prioritise longitudinal studies to better understand the directionality and causal relationships of factors contributing to burnout. Evaluating the effectiveness of organisational and individual interventions, ideally through controlled trials, is essential. These studies should also assess the cost-effectiveness of interventions to inform scalable and sustainable implementation strategies in healthcare systems.

Standardising survey tools and cut-off points is crucial to improve the comparability of burnout research. Longitudinal designs are particularly valuable for distinguishing between risk factors and consequences of burnout. Improved sampling strategies are also necessary to enhance representativeness and provide more accurate prevalence estimates. Additionally, scalable interventions should be developed to strengthen healthcare systems during and beyond pandemic scenarios.

Addressing these priorities will enable healthcare organisations and researchers to build resilient systems that support

physician well-being while improving the quality of patient care.

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