

## Populations in Crisis: Migration Plans and Determinants Among Medical Students During the COVID-19 Pandemic

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### Abstract

*The recent pandemic has had a considerable impact on sociodemographic development and generated a new interest in human mobility. The current study aims to examine the effects of sociodemographic development and the push-pull of brain drain as well as COVID-19-related factors on Greek medical students' intentions to emigrate. A total of 531 undergraduate medical students completed an online survey during the second transmission wave of the pandemic in Greece (from October to December 2020). The results showed that many students were considering emigrating after their graduation. A multiple regression analysis revealed that males and younger students presented a higher likelihood of emigration. The low absorption rate of physicians in Greece, lack of career prospects, low earnings, general frustration with the governance, and the cultural mindset of the Greek population were predictors of the medical brain drain. In many cases, COVID-19 strengthened the resolve to emigrate as most medical students did not consider the pandemic to be a deterrent to seeking better luck abroad.*

**Keywords:** Medical students; migration; brain drain; COVID-19 crisis; population; social demography

### Introduction

The ongoing COVID-19 pandemic has reshaped migration characteristics (European Commission, 2020), and altered migration dynamics and the future of migration (Rajan, 2020). The pandemic is controlling, to a large extent, the route of migratory flows, either by altering or postponing emigration plans or by bringing to the fore new types of mobility. Despite the fact that highly skilled emigration and especially the topic of medical brain drain have been widely addressed in the literature, the research on highly skilled population mobility during the COVID-19 period is limited.

Physicians are the most mobile highly skilled professionals in Europe (Teney, 2019) and Greece is considered a physician exporter, as it is among the top 20 countries with the highest emigration stock (10,240 physicians in 2014) (Adovor et al., 2021). Therefore, the need has emerged to shed light both on the intentions of the medical labor force in Greece to emigrate and the determinants supporting that decision during the COVID-19 pandemic.

This paper will review the factors shaping the intentions of Greek medical students to emigrate and consider the contribution of the pandemic to this decision. Investigating young physicians' emigration plans is imperative due to their important role in the response to the pandemic. This paper will contribute by filling a gap in the literature on the impact of COVID-19 on population mobility and especially on medical brain drain. Moreover, the findings of this paper could be harnessed by interested parties to address this pivotal issue in its social

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and health contexts, to develop policies and strategies to discourage these young physicians' massive outflow.

## Literature review

A history of medical brain drain has mainly been identified in less developed and economically stunted countries (Ighobor, 2017; Zhang and Lucey, 2019), as medical emigrants seek to find a better life to that of their country of origin. Brain drain to or in Europe, and especially emigration of physicians, is characterized either by flows originating from Asian (El Saghir et al., 2020) or African countries (Capuano and Marfouk, 2013; Chimenya and Qi, 2015), or from intra-European flows (WHO, 2014).

Regarding the latter, the southern and eastern European countries are considered to be the source countries. In particular, Italy, Poland (WHO, 2014), Romania (Botezat and Moraru, 2020), Greece (Sidiropoulos et al., 2017), Hungary (Pogátsa, 2015), Lithuania, and Estonia (Zhang and Lucey, 2019) have experienced a high physician outflow over the last decades. The most active European countries recruiting physicians are Germany (Teney, 2019), Belgium, the Netherlands (WHO, 2014), Switzerland, Sweden, and the UK (da Costa et al., 2017). Medical migration changes form over time, depending on the conditions determined by the external environment (Peppler, 2018). The migratory route of physicians highly depends on their specialties (Holmes and Fraher, 2017), as the more specialized medics prefer stronger economies (Ricketts, 2010). Furthermore, the policies of the receiving countries (Andriescu, 2018; Ribeiro, 2018), such as tax cuts for immigrants and pathways to permanent residency, are crucial in attracting a highly skilled labor force (Adovor et al., 2021).

In the literature, the motives for physician emigration are comprised of a complex mixture of personal (Klein et al., 2009; Sheikh et al., 2012), economic (Ifanti et al., 2014; Ricketts, 2010), social (Akl et al., 2007; Arah et al., 2008), and educational determinants (Benamer et al., 2009; Hagander et al., 2013; Sidiropoulos et al., 2017). In many cases, the main reason for physician emigration has been the hunt for better pay (Adovor et al., 2021). Insufficient wages in their motherlands force young physicians to transfer their knowledge and skills to the destination countries. As long as this wage gap is observed between home and destination countries, brain drain will remain an issue (Dulam and Franses, 2015). In addition to the above, living standards also motivate brain drain (Sidiropoulos et al., 2017). Young physicians are likely to move abroad in pursuit of a better quality of life and a higher standard of living.

Despite the shortages in the medical workforce (Pogátsa, 2015; Van der Ende et al., 2014) the absorption of physicians in Greece has remained low, forcing them to seek either work or better working conditions through emigration (Chatziprodromidou et al., 2018). The role of the working environment is another important factor in explaining the movement of physicians. Shortages of medical equipment or outdated equipment (Mance et al., 2019), health service reforms (Snezhanka, 2013), and low job satisfaction (Moris et al., 2017), especially in the early career stage (Dubas-Jakóbczyk et al., 2020), all encourage emigration.

Human rights factors play their own role in the emigration function. The lack of peace and poor political climates of some countries push medical workers to seek peaceful working conditions in other countries (Botezat & Moraru, 2020). In line with this, corruption in the country of origin is also a driving force for emigration (Poprawe, 2015). Many young physicians are dissatisfied with their country's governance, favoritism, and nepotism. These



problematic conditions are barriers to the career development of the newly skilled workforce and further fuel their willingness to move (Anastasiou et al., 2020; Duquenne and Metaxas, 2017; ICAP, 2015; Tsekeris et al., 2015).

Other factors driving medical brain drain include limited funding for medical research in the source country (Ifanti et al., 2014), and better training (Karan et al., 2016) and educational opportunities in the host countries. Especially in developing countries, research faces many constraints as funding is low (Jacob, 2013). Many young doctors look for favorable resources in other countries to pursue their higher degrees, such as postgraduate and doctoral studies (Gouda et al., 2015), and then get absorbed into the workforce in the location of study (Chatziprodromidou et al., 2018).

Finally, and to a lesser extent, family expectations influence the motivations for emigration (Paylab, 2016). This is based on the aspiration to raise a family in a favorable environment (Bazoukis et al., 2020) and, consequently, physicians choose an ideal setting for both career and family establishment (Teney, 2019).

The current health crisis (COVID-19 pandemic) has made it essential to understand medical brain drain and the driving forces of it since it is characterized by complex parameters and it is driven by insecurities at points of origin and destination. Travel insecurity takes a new meaning and becomes a new reality during pandemic (Cohen, 2020). The health workforce has played a crucial role in the management and control of the pandemic, but restrictions on population mobility have made it difficult to support the more defenseless healthcare systems. It is a fact however that there is a strong relationship between migration and travel intensity that can explain the spread of COVID-19 (Sirkeci and Yucesahin, 2020). This correlation varies from country to country while at the same time each country is, to a different degree, ready to meet the new demands stemming from pandemics or crises (Manika, 2021). The governments attempt to balance public health and mobility in the context of COVID-19 (Zard and Lau, 2020). In the USA, restrictions were applied in order to tackle the spread of the coronavirus. As a result, the influx of international medical graduates and students that could potentially serve the American healthcare system has been disrupted (Park and Rhim, 2020). On the contrary, European and OECD (Organisation for Economic Co-operation and Development) countries applied exemptions to travel regarding medical professionals (OECD, 2020).

The medical brain drain during the COVID-19 period is unexplored territory. So far, only limited research has highlighted the extensive psychological impact of the pandemic on medical students' confidence and wellbeing (Dhahri et al., 2020). As the recovery from the current crisis will take time, the literature has focused on the strategies that each country must implement to provide high-quality training to future physicians (Jodheea-Jutton, 2021).

## **Data and Methods**

### **Study Design and Sample**

From October to December 2020, an online survey was conducted on 531 undergraduate students from the Faculty of Medicine at the University of Thessaly in Larissa, Greece. During the study period, the second wave of the pandemic was in progress and the normal flow of the course of studies had been disrupted, with distance learning replacing on-site teaching.

Before the survey was carried out, informed consent was obtained from all participants and they were made aware that their participation was voluntary.

The measurement instrument (self-administered questionnaire) was constructed through an online tool (Google Forms) and distributed to the participants via their institutional email. Emails were sent to 849 registered medical students. A total sample of 531 students responded to the survey (a 63% response rate), corresponding approximately to a 99% confidence interval and a 3% margin of error. As there were no incomplete responses, the total sample of the study was 531 students.

## **Variables**

### **Socio-demographics**

In the first part of the questionnaire, the medical students provided sociodemographic information, such as age, gender, academic year (1 to 6), hours of classes attended per week (< 10 hours, 10 to 25 hours, > 25 hours), study hours per week (< 10 hours, 10 to 15 hours, > 15 hours), employment status (not employed, employed) and their perceptions regarding their financial support from parents (insufficient, neutral, sufficient). Students were also asked about the distance from the family home to the place of study (< 75 km, 75 to 150 km, > 150 km) and the housing options they had (family home, shared ownership, renting privately). To complete the socio-demographic profile, students reported both the occupation (unemployed, pensioner, public or private sector employee, self-employed) and the educational attainment (primary, secondary, graduate degree, postgraduate degree/doctorate) of their parents.

### **Dependent variable**

Medical students' intentions to emigrate were assessed by their response to the following direct statement: "I intend to migrate abroad after my graduation." This basic question was based on previous work (Anastasiou et al., 2020) examining the intentions of undergraduate students and young physicians to search for work abroad. The answer options corresponded to a 5-point Likert scale from 1 (totally disagree) to 5 (totally agree).

### **Covariates**

Apart from the socio-demographic variables, covariates related to push-pull migration factors (15 items) (Anastasiou et al., 2020) were considered in the analysis. Students rated their perceptions of potential reasons to emigrate on a Likert scale from 1 (totally disagree) to 5 (totally agree). Among the push factors were limited medical research in Greece, unfavorable conditions in which to establish a family, a lack of career prospects, poor salaries in Greece, the low absorption rate of doctors, high living costs, dissatisfaction with the governance, criminality, and the mentality of the Greek people. Pull factors included postgraduate and doctoral studies, quality of life abroad, and the desire to gain experience. The above scale was tested for internal consistency, showing good reliability ( $\alpha = 0.802$ ).

As mentioned, special emphasis was given to the impact of the pandemic on the intention to emigrate. In line with that, the COVID-19 Worry Scale (Ahmed et al., 2020) was included in the questionnaire. Each question from the 7-item rating instrument for worries posed by COVID-19 ranged from 1 (not worried) to 4 (highly worried) and presented high internal consistency ( $\alpha = 0.881$ ).



## Statistical Analysis

Descriptive statistics were used to explore students' sociodemographic profiles. A contingency table analysis was performed to identify statistical differences between demographic variables (age, gender, academic year, hours of classes attended per week, hours of study per week, employment status, and parents' occupation and educational attainment) in the intention to emigrate after graduation. The Chi-square analysis was first conducted to examine the overall relationship between the demographic variables. The adjusted z-values associated with each cell were then transformed into p-values and compared against the Bonferroni corrected p-value to examine the associations among subgroups (Beasley and Schumacher, 1995). Kruskal-Wallis tests (non-parametric approach) were performed to explore statistical significance between intentions to emigrate, push-pull factors, and COVID-related factors.

Multivariable logistic regression models were used to assess the associations of sociodemographic variables, push-pull migration factors, and COVID-19-related worries with medical students' intentions to emigrate. Not all covariates were considered in the final model due to their correlation with other independent variables, whereas all the effects contributing to the final model were statistically significant (Appendix A). The general econometric model based on 531 medical students was as follows:

$$\begin{aligned} \text{prob}(Y = \text{MigrInt}) \\ = \alpha_0 + \beta_1 \text{SEX} + \beta_2 \text{AGE} + \beta_3 \text{WRK} + \beta_4 \text{EDUF} + \beta_5 \text{BD1} + \beta_6 \text{BD4} \\ + \beta_7 \text{BD7} + \beta_8 \text{BD8} + \beta_9 \text{BD10} + \beta_{10} \text{BDCOV} + \beta_{11} \text{COV6} + \varepsilon \end{aligned}$$

where  $\text{prob}(Y = \text{MigrInt})$  represented the probability that the medical students intended to emigrate after graduation during COVID-19—whether moderate, high, rather than not at all. The reference category was “Do not intend to migrate” and  $\varepsilon$  stood for the disturbance term. The above statement was identified as the category of comparison for the other two categories: “Moderate intention to migrate” and “High intention to migrate.” Furthermore, WRK = students' employment status, EDUF = fathers' educational attainment, BD1 = postgraduate studies, BD4 = quality of life, BD7 = frustration from the general mood during COVID-19, BD8 = seeking better luck, BD10 = low salaries in Greece, BDCOV = COVID-19 is a deterrent to seeking a job abroad, and COV6 = death-related concerns due to COVID-19.

Logistic regression coefficients were presented as odds ratios (ORs) with 95% CI. The final logistic model presented estimates the effect of the individual variables on the probability of medical students emigrating abroad after graduation.

## Results

### Socio-demographic profile of the medical students

The population profile of the data (Table 2) summarizes the personal and demographic characteristics of the medical students at the University of Thessaly. Of the 531 students, 41.1% were males. The mean age was 21.9 years (SD = 0.15), with a range from 18 to 40 years old. A total of 243 participants (45.8%) originated from areas with a distance greater than 150 kilometers from the city of study. Most of the students lived alone (71.9%), although a significant portion lived at their family residence (18.5%). Their fathers' and mothers'

educational attainment was at least a graduate degree in 67.6% and 64.9% of cases, respectively, and the majority of parents were employed as public or private sector employees (47.2% and 59.8%, respectively). A total of 67 students (12.8%) were currently employed, whereas 72.7% stated that their parents provided sufficient financial support. Finally, one out of three students spent more than 25 hours per week attending classes, while almost 50% spent less than 10 hours per week in study.

**Table 2.** Demographic profile of the sample

	n	%		n	%
<b>Gender</b>			<b>Father's educational attainment</b>		
Male	215	41.1%	Primary	29	5.5%
Female	308	58.9%	Secondary	143	26.9%
<b>Distance from the family home (km)</b>			Graduate degree	282	53.1%
< 75	205	38.6%	Postgraduate / Doctorate	77	14.5%
75-150	83	15.6%	<b>Mother's educational attainment</b>		
> 150	243	45.8%	Primary	27	5.1%
<b>Housing options</b>			Secondary	159	29.9%
Family home	98	18.5%	Graduate degree	263	49.5%
Shared ownership (roommate)	51	9.6%	Postgraduate / Doctorate	82	15.4%
Renting privately (living alone)	382	71.9%	<b>Father's occupation</b>		
<b>Employment status</b>			Unemployed	9	1.7%
Not employed	456	87.2%	Pensioner	85	16.1%
Employed	67	12.8%	Public or private sector employees	249	47.2%
<b>Financial support from parents</b>			Self-employed	185	35.0%
Insufficient	22	4.1%	<b>Mother's occupation</b>		
Neutral	123	23.2%	Unemployed	109	20.6%
Sufficient	386	72.7%	Pensioner	36	6.80%
<b>Attend classes (weekly)</b>			Public or private sector employees	317	59.8%
< 10 hours	96	18.1%	Self-employed	68	12.8%
10-25 hours	256	48.2%	<b>Parents doctor(s)</b>		
> 25 hours	179	33.7%	No	469	88.3%
<b>Study (weekly)</b>			Yes	62	11.7%
< 10 hours	264	49.7%			
10-15 hours	187	35.2%			
> 15 hours	80	15.1%			

### Push-pull factors determining emigration intentions

The results showed that 42.7% ( $n = 227$ ) of the medical students expressed the wish to emigrate after their graduation and 14.5% ( $n = 77$ ) stated that they did not intend to go abroad. There was also a notable portion of the students (42.7%,  $n = 227$ ) that were unsure of after-graduation plans. Of the medical students who intended to emigrate, 20% declared that the COVID-19 crisis was a deterrent, whereas 58% stated that the pandemic did not act as an obstacle to that decision ( $\chi^2 = 23.000$ ,  $df = 4$ ,  $p = 0.000$ ).

Significant differences were observed between the genders in terms of intention to emigrate ( $\chi^2 = 9.020$ ,  $df = 2$ ,  $p = 0.011$ ). The adjusted standardized residuals indicated a statistically significant difference between males (9.3%) and females (18.2%) not intending to emigrate after graduation ( $p = 0.001$ ). Educational attainment of students' fathers was another factor contributing to their emigration intentions ( $\chi^2 = 15.138$ ,  $df = 6$ ,  $p = 0.019$ ). Specifically, the





fathers of 32% of the undecided students had completed secondary education ( $p = 0.036$ ), and the fathers of 10.6% of the undecided students held a postgraduate university degree or a doctorate ( $p = 0.028$ ). On the other hand, the fathers of 20.7% of those who intended to emigrate had completed secondary education ( $p = 0.012$ ), while the fathers of 16% held a postgraduate university degree or a doctorate ( $p = 0.041$ ). The hours that medical students devoted to attending courses ( $\chi^2 = 12.480$ ,  $df = 4$ ,  $p = 0.014$ ) and studying ( $\chi^2 = 11.335$ ,  $df = 4$ ,  $p = 0.023$ ) presented an association with the intention to emigrate. Of those spending more than 15 hours per week attending classes, 20.1% ( $p = 0.010$ ) did not intend to emigrate, while 46.4% of those spending more than 10 hours per week attending classes ( $p = 0.053$ ) were planning to emigrate. Among the students spending less than 10 hours per week studying, 18.6% did not intend to emigrate ( $p = 0.009$ ), while 39.4% had decided to emigrate ( $p = 0.011$ ).

The Kruskal-Wallis test yielded statistically significant effects of various factors on the intention to emigrate (Table 3). Post hoc tests showed that the intention to emigrate was greater for students who wished to take up postgraduate studies than those who were unsure. Higher means were observed in medical students who agreed that poor quality of life in Greece, lack of career prospects, and the desire to gain experience were push factors, both when compared with those who disagreed and the undecided. The mean scores for the unfavorable conditions in which to establish a family, frustration from the general mood, dissatisfaction with the governance, seeking better luck, poor salaries in Greece, and the low absorption rate of doctors in the private and public sector in Greece were also significantly higher than the “Disagree” condition.

**Table 3.** Factors affecting intent of medical students to migration

Factors affecting intention to emigrate	Mean (SD)	Disagree	Unsure	Agree
Postgraduate studies	2.24(0.03)**	2.23	2.15 c*	2.35 c*
Doctoral studies	2.24(0.34)*	2.17	2.22	2.35
Limited medical research in Greece	2.21(0.39)	2.17	2.21	2.34
Quality of life	2.27(0.03)**	2.02 a**, b**	2.23a**, c**	2.49 b**, c**
Gaining experience	1.99(0.06)**	1.59 a*, b**	2.04 a*, c**	2.34 b**, c**
Unfavorable conditions to establish a family	2.30(0.03)**	2.11 a**, b**	2.35 a**	2.45 b**
Frustration from the general mood in Greece	2.16(0.03)**	1.92 b**	2.11 c**	2.46 b**, c**
Seek better luck	2.07(0.04)**	1.74 b**	2.05 c**	2.41 b**, c**
Lack of career perspectives	2.14(0.04)**	1.87 a*, b**	2.19 a*, c*	2.38 b**, c*
Earnings in Greece	2.12(0.04)**	1.86 b**	2.13 c*	2.37 b**, c*
Low absorption rate of doctors	2.23(0.04)*	2.06 b*	2.31	2.32 b*
High living costs	2.30(0.03)	2.22	2.37	2.32
Dissatisfaction with the Governance	2.20(0.04)**	2.03 b**	2.18 c**	2.39 b**, c**
Criminality	2.30(0.04)	2.27	2.27	2.36
Cultural mindset of the Greek people	2.30(0.03)**	2.15 b**	2.31	2.43 b**

Dependent Variable: Intention to emigrate

Confidence Interval: \* 95%, \*\* 99%

Pairwise comparisons: a=Disagree vs Unsure, b=Disagree vs Agree, c=Unsure vs Agree

Various factors related to COVID-19 were observed to statistically significantly impact the intention of people to emigrate (Table 4). Students concerned with dying from COVID-19 presented moderate intention to emigrate. Post hoc tests showed that the intention to emigrate was greater for students who disagreed that they were concerned about getting hospitalized due to infection than those who were unsure. Furthermore, higher mean values

were observed on medical students who agreed that they were concerned about their social circle dying from COVID-19 when compared with the undecided.

**Table 4.** COVID-19 related factors affecting intent of medical students to migration

<b>COVID-19 related factors affecting intention to emigrate</b>	<b>Mean (SD)</b>	<b>Disagree</b>	<b>Unsure</b>	<b>Agree</b>
Concerns about being affected	2.44(0.73)	2.52	2.38	2.48
Concerns about my family being affected	3.20(0.72)**	3.23	3.13	3.26
Concerns about my close relatives being affected	2.95(0.82)**	3.05	2.85	3.00
Concerns about my friends being affected	2.53(0.75)	2.56	2.48	2.57
Concerns about getting hospitalized due to infection	2.40(0.99)**	2.55 a*	2.27 a*, c**	2.49 c**
Concerns about dying from COVID-19	2.10(0.34)***	2.39 a***	1.93 a***, c**	2.17 c**
Concerns about social circle dying from COVID-19	3.26(0.83)***	3.22	3.14 c***	3.39 c***

Dependent Variable: Intention to emigrate  
 Confidence Interval: \*90%, \*\* 95%, \*\*\* 99%  
 Pairwise comparisons: a=Disagree vs Unsure, b=Disagree vs Agree, c=Unsure vs Agree

#### Emigration intentions of the medical students

Based on Goodness of fit ( $p = 0.314$ ), (AIC = 958.693) and model fitting information ( $\chi^2 = 213.511$ ;  $p < 0.000$ ), the model fit the data well and predicted the intention to emigrate better than the intercept-only model alone. Cox and Snell, Nagelkerke, and McFadden pseudo  $R^2$  measures also contributed to the validation of the model fit (0.356, 0.412, and 0.221, respectively). The percentage of well-predicted classification (64.7%) was higher by the Proportional by Chance Accuracy Rate (49.0%), confirming the strong explanatory power of the model. All the effects contributing to the final model were statistically significant (Appendix A).

Results showed a differentiation in demographic and social variables between moderate and high intentions to emigrate, compared to medical students who stated no such intentions (Table 5).

**Table 5.** Multinomial logistic regression models predicting the intention of medical students to migrate during COVID-19

Ref. Do not intend to migrate	<b>Moderate intention to emigrate</b>		<b>High intention to emigrate</b>	
	OR	95% CI	OR	95% CI
Intercept				
Age	0.873***	0.750-0.925	0.854***	0.770-0.946
Gender (ref. Female)				
Male	2.905***	1.337-6.313	4.190**	1.903-9.227
Employment status (ref. Employed)				
Not employed	2.657*	0.900-7.840	1.297	0.450-3.742
Father's educational attainment (ref. MSc/PhD)				
Primary	2.912	0.519-16.355	2.310	0.435-12.252
Secondary	1.656	0.589-4.654	0.789	0.279-2.227
Graduate degree	3.738***	1.435-9.738	2.499**	0.975-6.402
COVID-19 is a deterrent to seeking a job abroad (ref. Agree)				
Disagree	2.376**	1.020-5.535	3.784***	1.606-8.919
Maybe	2.007	0.844-4.777	1.550	0.628-3.825
Death-related concerns from COVID (ref. Yes)				
No	3.380***	1.405-8.135	3.396***	1.371-8.412
Some	1.579	0.676-3.688	2.261*	0.958-5.336





Quality of life (ref. Agree)				
Disagree	2.361*	0.908-6.140	0.634	0.243-1.654
Maybe	5.696***	1.973-16.444	2.108	0.734-6.058
Frustration from the general mood (ref. Agree)				
Disagree	0.201***	0.069-0.585	0.191***	0.065-0.562
Maybe	0.467	0.182-1.248	0.405*	0.152-1.083
Seek better luck abroad (ref. Agree)				
Disagree	0.194***	0.069-0.544	0.117***	0.038-0.365
Maybe	0.648	0.260-1.612	0.365**	0.140-0.950
Low earnings in Greece (ref. Agree)				
Disagree	0.602	0.206-1.757	0.330*	0.098-1.115
Maybe	0.284***	0.110-0.734	0.392**	0.152-1.010

\*, \*\*, \*\*\* indicate significance at the 90%, 95% and 99% level, respectively.

Age was negatively associated with the medical students' intentions to emigrate, decreasing the odds of that decision by 15% for each additional year of age (OR = 0.873,  $p < 0.01$ ). Gender was also associated with emigration intentions, with males having 2.9 ( $p < 0.01$ , CI: 1.337-6.313) and 4.2 times ( $p < 0.05$ , CI: 1.903-9.227) the odds of thinking to leave or absolutely intending to leave, respectively, compared to females. The working students were considering going abroad 2.7 times more than those who were not working ( $p < 0.10$ , CI: 0.900-7.840). It was also more likely that a student intended to emigrate if their father held a graduate degree, rather than a postgraduate or doctorate (OR: 2.499,  $p < 0.05$ , CI: 0.975-6.402).

Furthermore, students were more likely to go abroad than stay in Greece if they agreed rather than disagreed that they were seeking a better quality of life abroad (OR: 2.361,  $p < 0.05$ , CI: 0.908-6.140). Seeking better luck was considered a very important factor, associated with higher odds of emigration compared to those who stated the opposite (OR: 0.117,  $p < 0.01$ , CI: 0.038-0.365). Low physicians pay in Greece was associated with higher odds of thinking about (OR: 0.284,  $p < 0.01$ , CI: 0.110-0.734) or intending (OR: 0.330,  $p < 0.10$ , CI: 0.098-1.115) to leave.

Finally, COVID-19-related factors were associated with the medical students' decisions to emigrate. Those determined to emigrate disagreed that COVID-19 was a deterrent to seeking work abroad (OR: 3.784,  $p < 0.01$ , CI: 1.606-8.919). These students also had no death-related concerns (OR: 3.396,  $p < 0.01$ , CI: 1.371-8.412), whereas it was five times more likely that they would go abroad due to their overall frustration with the situation in Greece (OR: 0.191,  $p < 0.01$ , CI: 0.065-0.562).

## Discussion

The aim of this study was to examine the emigration plans of medical students in a Greek regional university during the COVID-19. Furthermore, the determinants of their emigration decisions were explored. Among the most important findings were that only one out of three medical students was opposed to leaving Greece after graduation, supporting previous studies reporting the high intention of young Greek doctors to emigrate (Anastasiou et al., 2020; Bazoukis et al., 2020; Labiris et al., 2014).

Significant differences were identified in the push-pull factors between students who intended to emigrate and those who opposed it. The former strongly agreed that the low absorption rate of physicians in Greece, the lack of career prospects, and the low pay of physicians were

motives to search for a job abroad. Greece is among the top countries in Europe producing physicians (WHO Regional Office for Europe, 2018), but at the same time, there is understaffing in its public healthcare (Simou et al., 2015). During the economic crisis, the health workforce in hospitals decreased by 15% (Economou et al., 2017). Furthermore, Greece is among the countries with the lowest earnings for physicians, both for specialists and general practitioners (OECD, 2016). The above reasonably creates dissatisfaction and encourages the search for alternative vocational rehabilitation and career development opportunities. In line with that, the decision by physicians to emigrate is also facilitated by more favorable possibilities for conducting research and postgraduate education abroad.

The medical students realized both the magnitude of the structural crisis in Greece through their dissatisfaction with the governance, and the crisis in social values and the cultural mindset of the Greek people. These perceptions constituted a strong repulsive scenario, supporting the emigration decision. Social justice and recognition of all human rights seemed to be of high concern to the medical students (Panagiotakopoulos, 2020) and constituted a driving force of the Greek brain drain (Duquenne and Metaxas, 2017; ICAP, 2015; Marinakou et al., 2016). This finding is particularly important because it highlights severe pathogens in the Greek culture, society, and governance.

Demographic factors were predictors of emigration intentions among medical students during the pandemic. The intention to move abroad was more intense in males and decreased significantly the older the student was. Furthermore, the likelihood that a student would go abroad decreased if their father held a postgraduate degree or a doctorate. Apparently, the more educated fathers in Greece are opposed to their children's emigration and this is supported by previous research on the brain drain phenomenon (Theodoropoulos et al., 2014). On the other hand, some literature suggests that the more educated fathers develop strategies for their children's emigration in order to allow them to gain experience (Ivlevs, 2014).

This paper also provided new insights into the relationship between COVID-19 and emigration intentions. The results proposed that COVID-19 has positively impacted the intention to go abroad. In particular, many students developed high aspirations to emigrate during the pandemic, especially those not concerned about their health. The most insightful aspect of the study was that the ongoing pandemic of COVID-19 was not a deterrent for going abroad, but actually added value and strengthened the resolve of the medical students to emigrate and may lead to detrimental effects on the country's society, economy, and health provision.

The present study, however, introduces a caveat. The social background of the students during social distancing was not known. Research on life satisfaction in Greece during COVID-19 has indicated a psychological vulnerability in people aged 15-24 years old (Anastasiou and Duquenne, 2021), while the psychological impact of the outbreak on medical students globally has already been addressed (Mahase, 2020; Saraswathi et al., 2020; Torun and Torun, 2020).

Further research to establish the impact of COVID-19 on the medical brain drain is needed. In future studies, the relationship between the intention to emigrate during the COVID-19 period and other COVID-related factors, such as physical contact with COVID cases, cases in the place of residence, and quarantine in the place of residence, should be explored.



## Conclusions

The COVID-19 outbreak has had several implications on population mobility. The present paper aimed to shed light both on the intentions of the medical students in Greece to emigrate and the determinants supporting that decision during the COVID-19 pandemic period.

A multinomial logistic regression analysis was implemented to explore the association between the emigration intentions of medical students and demographic, socio-economic, and COVID-19-related factors. The findings showed that demographic factors, frustration with the governance and the cultural mentality of the Greek people, and low earnings were significant predictors of the intention to emigrate, while the COVID-19 pandemic strengthened the emigration decision.

The Greek medical brain drain should be urgently put on the public social and health agendas to evaluate the social, economic, and health costs. A coherent policy response is needed to tackle the trend of the medical exodus and, on a secondary level, to turn brain drain into brain gain.

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## Appendix A

**Table.** Likelihood Ratio Tests

Effect	Model Fitting Criteria		Likelihood Ratio Tests			
	AIC of Reduced Model	BIC of Reduced Model	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	825,182	1000,916	741,182 <sup>a</sup>	,000	0	.
Age	834,614	1001,980	754,614	13,432	2	,001
Sex	835,610	1002,976	755,610	14,429	2	,001
Employment status	826,101	993,467	746,101	4,919	2	,045
Father’s educational attainment	826,424	977,053	754,424	13,242	6	,039
COVID-19 is a deterrent to seeking a job abroad	832,118	991,116	756,118	14,936	4	,005
Death-related concerns about COVID-19	827,770	986,768	751,770	10,588	4	,032
Postgraduate studies	827,491	986,489	751,491	10,309	4	,036
Quality of life	846,513	1005,511	770,513	29,331	4	,000
Frustration from the general mood in Greece	827,907	986,905	751,907	10,725	4	,030
Seek better luck	834,748	993,746	758,748	17,566	4	,001
Earnings in Greece	826,502	985,500	750,502	9,320	4	,049

