



# Unveiling the impact of the COVID-19 pandemic on blood donation patterns: A Greek perspective

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## ARTICLE INFO

### Keywords:

Blood collection  
Donor motivation  
Donor recruitment  
Blood donors  
Pandemic

## ABSTRACT

**Background:** Since the SARS-CoV-2 pandemic has been shown to negatively affect blood donation worldwide, the purpose of this study was to assess its impact on voluntary blood donation in Greece from March 2020 to October 2021.

**Methods:** A cross-sectional study was conducted on 764 prospective blood donors (37.3 % men, 62.7 % women). The study utilized a specially developed questionnaire, and the results were statistically analyzed using a two-sided significance level set at 0.05.

**Results:** Most donors had been informed about blood donation from family/friends (29.5 %). While 83.6 % of the respondents had given blood in the past, only 39.8 % were regular voluntary donors. During the pandemic, 52.2 % of respondents did not donate blood, while 29.3 % cited a relative/friend needing blood. Notably, 95.2 % expressed their willingness to donate if a friend/relative required blood during this period. Donors who had given blood in the past avoided donation during the pandemic ( $p < 0.001$ ), but voluntary blood donors had a lower degree of re-duction in contrast to family blood donors ( $p < 0.001$ ). Specifically, family blood donors, who would have donated blood before the pandemic, reduced blood donations ( $p = 0.027$ ). Finally, blood donors whose lives were affected by the pandemic reported a greater degree of reduction in blood donations.

**Conclusion:** The study underscores the significant impact of the SARS-CoV-2 pandemic on the frequency of blood donation. Despite a reduction in donations, the findings reveal that volunteer blood donors would positively respond to familial needs during the challenging circumstances of the pandemic.

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<https://doi.org/10.1016/j.transci.2025.104122>

Received 25 July 2024; Received in revised form 16 April 2025; Accepted 22 April 2025

Available online 24 April 2025

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## 1. Introduction

The COVID-19 pandemic has significantly influenced both blood transfusion practices in patients and blood procurement from donors. A notable decline in national blood reserves has been observed, affecting both supply and demand dynamics. Despite heightened security measures and widespread public appeals aimed at bolstering blood donation rates across Europe [1–3], hospitals have faced critical challenges in securing adequate blood supplies.

Research conducted in Hong Kong and China suggests that concerns surrounding COVID-19 transmission have deterred potential blood donors [4], align with earlier findings from studies on SARS and avian influenza [5,6]. Consequently, blood donation rates have decreased, leading to the cancellation of numerous surgical procedures in hospitals due to reduced blood stocks. Surgeons have been compelled to prioritize surgeries in light of decreased availability of blood components (red blood cells, platelets, and fresh frozen plasma), exacerbating the strain on healthcare resources. The future trajectory of blood stocks demand remains unpredictable and contingent upon the evolution of the pandemic [7].

Maintaining sufficient national blood reserves emerges as a critical public health imperative amidst the pandemic. Historically, donors had responded robustly to urgent public calls for blood donation during crises of global significance, such as the September 11 attacks, mass shootings in the United States, and bushfires in Australia [8]. Similar mobilizations of donors have been witnessed across Europe and Brazil in response to appeals for blood donation [9,10]. However, sustained motivation among blood donors, particularly first-time donors who constitute a crucial segment of the donor pool, may wane over time [8].

Moreover, substantial disruptions in blood donation patterns have profound ramifications for the National Healthcare System. Individual hospital Blood Donation Departments must devise contingency plans to secure adequate blood reserves, necessitating vigilant monitoring of blood derivative supplies and demand dynamics, especially during crisis situations (e.g., economic downturns, social upheavals). Therefore, it is imperative to investigate the impact of the COVID-19 pandemic on donor's behavior and, consequently, blood reserves. This study aims to elucidate the effects of the COVID-19 pandemic on blood and derivative supplies in Greece, with a focus on volunteerism among donors and the emergence of novel motivations for blood donation in crisis scenarios.

## 2. Materials and methods

### 2.1. Research program design

This study, approved by the Research Ethics Committee of the University of West Attica (UniWA) (approval number: 104582/22–11–2021), focused on investigating the motivations of blood donors amidst the COVID-19 pandemic, including altruistic incentives and responses to the crisis. The research program had dual objectives: (1) to analyze demographic characteristics and motivations for blood donation before and during the pandemic, and (2) to assess the willingness of blood donors to donate blood either to hospital Blood Donation Centers or through mobile facilities (e.g., mobile units, metro stations). Statistical analyses were employed to establish correlations between pre-pandemic and pandemic-era blood donation patterns, facilitating informed conclusions regarding donor motivation.

### 2.2. Utilization of questionnaire

A comprehensive questionnaire (Supplementary Material 1) was meticulously designed to ensure completeness, clarity, coherence, and structural integrity. It incorporated control questions and was kept concise. Respondents had the option to complete the questionnaire anonymously either through a designated form or by handwritten submission after appropriate information dissemination.

### 2.3. Statistical analysis and sample size determination

Statistical analyses were conducted using IBM SPSS Statistics (version 22.0). Hypotheses were initially evaluated for normality using graphical tests such as histograms and P-P plots. Subsequently, a range of statistical tests including Mann-Whitney U, Spearman's correlation coefficient, Kruskal-Wallis, and Chi-square tests were performed. Pearson and Spearman tests were utilized based on the distribution normality of parameters. The reduction score in blood donation variable (ranging from 1 = not at all to 3 = a lot) was used as the dependent variable for the bivariate analyses (mean = 1.8, SD = 0.8). Results were deemed statistically significant at  $P < 0.05$  or  $P < 0.01$ . Descriptive statistical measures, frequency tables, and graphical representations (e.g., bar graphs, histograms) were employed for data presentation.

### 2.4. Sample size justification

The sample size of 764 respondents was determined to ensure a maximum estimation error at a 95 % significance level. Probability sampling methods were employed to obtain a sample that could be generalized to the entire Greek population. Power and significance level calculations justified the chosen sample size, facilitating robust conclusions drawn from the research findings.

### 2.5. Inclusion and exclusion criteria

Sampling selection adhered to the principles of probability sampling, ensuring results could be generalized to the broader population. There were no exclusion criteria for participation in the research program.

## 3. Results

### 3.1. Demographics

The study encompassed 764 blood donors, with women constituting the majority (62.7 %) of the enrolled participants. A significant proportion of donors (41.9 %) were below the age of 25. The majority of participants resided in Athens (74.2 %). In terms of educational attainment, over half of the donors (51.5 %) held higher education qualifications, including university degrees, postgraduate studies, or master's and PhD degrees. Detailed demographic data are presented in Table 1.

**Table 1**  
Demographics characteristics of participants.

Feature	N	%
<b>Gender</b>		
Male	285	37.3
Female	479	62.7
<b>Age</b>		
< 25	320	41.9
25–40	215	28.1
41–55	186	24.3
> 55	43	5.6
<b>Residency</b>		
Athens	567	74.2
Thessaloniki	30	3.9
Province	167	21.9
<b>Educational Qualifications</b>		
Primary school leaving certificate	2	0.3
High school diploma	7	0.9
High school leaving certificate	88	11.5
Undergraduate student	274	35.9
University Graduate	115	15.1
Postgraduate student	101	13.2
Master's degree holder	112	14.7
PhD candidate	24	3.1
PhD thesis holder	41	5.4

The values are expressed as absolute number (N) and relative frequency (%).

### 3.2. Blood donation - blood donor profile

The second part of the questionnaire delved into the characteristics of the individual subjects regarding their blood donation behavior (Table 2). Respondents reported various sources of information about blood donation, including family and friends (29.5 %), the internet (16.2 %), television/radio (4.6 %), and the Ministry of Health (1.3 %).

A majority of participants had prior experience with blood donation (83.6 %), and a significant portion identified as volunteer blood donors (76.8 %), primarily motivated by altruism and volunteering (74.9 %). However, only 39.8 % of donors reported regular blood donation practices. Additionally, a considerable proportion of donors (44.4 %) preferred donating blood within hospital facilities, with a minority (7.6 %) opting for external donation services.

### 3.3. Blood donation during the COVID-19 pandemic

Participants were questioned about their blood donation experiences amid the COVID-19 pandemic (Table 3). Notably, a majority of donors (52.2 %) refrained from donating blood altogether during the pandemic period (specifically between March 2020 and October 2021). Among those who did donate, voluntary motivations predominated (38.4 % of the total participants). However, the vast majority of respondents expressed willingness to donate blood if a friend or relative required transfusion, both before (97.4 %) and after (95.2 %) the pandemic.

**Table 2**  
Blood donation – donor profiles.

Feature	N	%
<b>Source of information on blood donation</b>		
TV/radio	35	4.6
Internet	124	16.2
Social networks	85	11.1
School	122	16.0
Family/friends	225	29.5
National Blood Donation Center	96	12.6
Ministry of Health	10	1.3
Hospital	67	8.8
<b>Have you donated blood before?</b>		
Yes	639	83.6
No	125	16.4
<b>Reasons for blood donation</b>		
Voluntarily (I am a blood donor)	587	76.8
Need for a relative/friend	177	23.2
<b>Why do you donate blood?</b>		
Voluntary/Altruistic reasons	572	74.9
Need for blood of a friend/relative	128	16.8
Leave/Erase Absences	19	2.5
Other	45	5.9
<b>Where do you usually donate blood?</b>		
Outside the hospital environment/Blood collection room	83	10.9
Mobile blood donation unit	95	12.4
Blood donation in hospital	339	44.4
Outside the hospital environment/in various areas	58	7.6
All of the above	189	24.7
<b>Are you a regular blood donor? (i.e do you give blood at least 2 times a year?)</b>		
Yes	304	39.8
No	460	60.2
<b>How many times do you donate blood a year or so?</b>		
0	169	22.1
1	296	38.7
2	193	25.3
3	89	11.6
4	17	2.2
<b>Where do you prefer to donate blood?</b>		
Outside the hospital environment/Blood collection room	87	11.4
Mobile blood donation unit	77	10.1
Blood donation in hospital	330	43.2
Outside the hospital environment/in various areas	56	7.3
All of the above	214	28.0

Values are expressed as absolute number (N) and relative frequency (%).

**Table 3**  
Blood donation – donor profiles.

Feature	N	%
<b>How many times did you donate blood during the pandemic (March 2020–October 2021)?</b>		
0	399	52.2
1	159	20.8
2	117	15.3
3	51	6.7
4	24	3.1
> 4	14	1.8
<b>What was the reason for donating blood during the COVID–19 pandemic?</b>		
Voluntarily (I am a blood donor)	293	38.4
Need for a relative/friend	72	9.4
I did not donate blood	399	52.2
<b>Did a relative/friend need blood during COVID–19?</b>		
Yes	224	29.3
No	540	70.7
<b>Has the COVID–19 pandemic affected your blood donations?</b>		
Negative	276	36.1
At all	448	58.6
Positive	40	5.2
<b>Did your blood donations decrease during the COVID–19 pandemic?</b>		
At all	374	49.0
Moderate	160	20.9
Very	230	30.1
<b>If blood donations decreased during the COVID–19 pandemic, what was the reason?</b>		
Indifference	23	3.0
There were not many mobile units	28	3.7
Difficult access to hospitals	120	15.7
Fear of contracting coronavirus after visiting a hospital	123	16.1
Fear of transferring the virus to my family environment	77	10.1
None of the above	393	51.4
<b>During the COVID–19 pandemic you donated blood to:</b>		
Outside the hospital environment/Blood collection room	48	6.3
Mobile blood donation unit	57	7.5
Blood donation in hospital	192	25.1
Outside the hospital environment/in various areas	51	6.7
All of the above	24	3.1
None of the above	392	51.3
<b>If you could choose where to donate blood during the COVID–19 pandemic, would you choose?</b>		
Outside the hospital environment/Blood collection room	141	18.5
Mobile blood donation unit	144	18.8
Blood donation in hospital	153	20.0
Outside the hospital environment/in various areas	130	17.0
All of the above	156	20.4
None of the above	40	5.2
<b>If a friend/relative needed blood, would you donate blood before the COVID–19 pandemic?</b>		
Yes	744	97.4
No	20	2.6
<b>If a friend/relative needed blood during the COVID–19 pandemic, would you donate blood?</b>		
Yes	727	95.2
No	37	4.8
<b>Has the COVID–19 pandemic affected your life?</b>		
At all	22	2.9
Moderate	303	39.7
Very	439	57.5
<b>After the end of the COVID–19 pandemic will you donate blood again?</b>		
Definitely not	27	3.5
Probably not	49	6.4
Probably yes	168	22.0
Definitely yes	520	68.1
<b>If there were material incentives (a gift as a reward) would you donate blood more easily?</b>		
No	374	49.0
Probably not	203	26.6
Probably yes	122	16.0
Yes	65	8.5
<b>Have you been vaccinated against the SARS-CoV–2 virus?</b>		
Yes	679	88.9

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**Table 3** (continued)

Feature	N	%
No	85	11.1
<b>Would it be an incentive for you if during blood donation there was a free antibody test against SARS-CoV-2?</b>		
Yes	507	66.4
No	257	33.6

Values are expressed as absolute number (N) and relative frequency (%).

More than half of the participants (57.5 %) reported a tangible impact of the COVID-19 pandemic on their lives. Of these, 36.1 % noted a negative impact on their blood donation practices, while 5.2 % reported a positive impact, with 58.6 % experiencing no discernible effect. Notably, 30.2 % significantly reduced their blood donations during the COVID-19 pandemic, with an additional 20.9 % moderating their donation frequency. Key reasons raised for decreased blood donations included fear of hospitalization (16.1 %), limited or restricted access to hospitals (15.7 %), concerns about SARS-CoV-2 transmission within family circles (10.1 %) and scarcity of mobile blood units (3.7 %).

Distribution of blood donations during the pandemic varied, with 25.1 % donating within hospital blood units, 7.5 % at mobile blood donation units, 6.3 % outside the hospital settings in dedicated blood collection rooms, 6.7 % in various external locations, 3.1 % in all of the above, and the remaining 51.3 % in any of the above. When given the choice, 20.0 % would preferred donating within a hospital, 18.8 % favored mobile blood donation units, 18.5 % outside the hospital environment in a blood sampling room, 17.0 % preferred donating in various external locations, 20.4 % indicated a preference for all mentioned options and the remaining 5.2 % had no specific preference.

In the post-pandemic era, 90.1 % of participants expressed intent to resume blood donation, with 24.5 % stating that material incentives, such as bonuses, would facilitate their decision to donate. Additionally, 66.4 % identified free antibody testing for SARS-CoV-2 as a potential incentive for donation, particularly noteworthy given that 88.9 % of donors had received the COVID-19 vaccine.

### 3.4. Correlations

Bivariate analyses examining associations between demographic characteristics and other factors with the extent of reduction in blood donations during the COVID-19 pandemic are detailed in Table 4.

Bivariate analyses revealed statistical relationships at the 0.05 level ( $p < 0.05$ ) between the extent of decrease in blood donations during the COVID-19 pandemic and several factors, including: previous blood donated ( $p < 0.001$ ), frequency of blood donation per year ( $p = 0.011$ ), the reason for donating blood during the COVID-19 pandemic ( $p < 0.001$ ), blood donation before the COVID-19 pandemic if a friend/relative needed blood ( $p = 0.027$ ), blood donation during the COVID-19 pandemic if a friend/relative needed blood ( $p = 0.050$ ), impact of the COVID-19 pandemic on individuals' lives ( $p < 0.001$ ), and blood donation intentions after the end of the COVID-19 pandemic ( $p < 0.001$ ).

## 4. Discussion

The study highlights the significant impact of the SARS-CoV-2 pandemic on the frequency of blood donation. Despite a reduction in donations, the findings reveal that volunteer blood donors would positively respond to familial needs during the challenging circumstances of the pandemic.

Firstly, consistent with trends across Europe, Greek blood donors who had previously donated blood reported a higher rate of decline in blood donations during the COVID-19 pandemic [11]. Furthermore, the frequency of blood donation per year was generally associated with a decrease in donation levels during the COVID-19 pandemic, although a

**Table 4**

Bivariate analyses between demographic and other characteristics and the reduction score in blood donations during the COVID-19 pandemic.

Feature	Degree of decrease in blood donations during the COVID-19 pandemic		P value
	Mean value	Standard deviation	
<b>Gender</b>			0.403 <sup>α</sup>
Male	1.7	0.9	
Female	1.9	0.9	
<b>Age<sup>b</sup></b>	0.049 <sup>β</sup>		0.177 <sup>β</sup>
<b>Place of residence</b>			0.155 <sup>γ</sup>
Athens	1.4	0.8	
Thessaloniki	1.5	0.9	
Province	1.5	0.8	
<b>Educational level b</b>	0.051 <sup>β</sup>		0.158 <sup>β</sup>
<b>Source of information on blood donation</b>			0.71 <sup>γ</sup>
TV/radio	1.6	0.9	
Internet	2.0	0.9	
Social networks	1.8	0.9	
School	1.7	0.9	
Family/friends	1.8	0.9	
National Blood Donation Center	1.8	0.8	
Ministry of Health	2.3	0.8	
Hospital	1.7	0.8	
<b>Have you donated blood before?</b>			< 0.001 <sup>α</sup>
Yes	1.9	0.9	
No	1.4	0.8	
<b>Reasons for blood donation</b>			0.225 <sup>α</sup>
Voluntarily (I am a blood donor)	1.8	0.9	
Need for a relative/friend	1.7	0.9	
<b>Where do you usually donate blood?</b>			0.503 <sup>γ</sup>
Outside the hospital environment/Blood collection room	1.8	0.9	
Mobile blood donation unit	1.9	0.9	
Blood donation in hospital	1.8	0.9	
Outside the hospital environment/in various areas	1.9	0.9	
All of the above	1.7	0.8	
<b>Are you a regular blood donor? (do you give blood at least 2 times a year?)</b>			0.897 <sup>α</sup>
Yes	1.8	0.8	
No	1.8	0.9	
<b>How many times do you donate blood a year or so?</b>	0.092 <sup>β</sup>		0.011 <sup>β</sup>
<b>What was the reason for donating blood during the COVID-19 pandemic?</b>			< 0.001 <sup>γ</sup>
Voluntarily (I am a blood donor)	1.6	0.7	
Need for a relative/friend	1.9	0.9	
I did not donate blood	2.0	0.9	
<b>Did a relative/friend need blood during COVID-19?</b>			0.515 <sup>α</sup>
Yes	1.8	0.8	
No	1.8	0.9	
<b>If a friend/relative needed blood, would you donate blood before the COVID-19 pandemic?</b>			0.027 <sup>α</sup>
Yes	1.8	0.9	
No	1.4	0.8	
<b>If a friend/relative needed blood during the COVID-19 pandemic, would you donate blood?</b>			0.050 <sup>α</sup>
Yes	1.8	0.9	
No	2.1	1.0	
<b>Has the COVID-19 pandemic affected your life?</b>			< 0.001 <sup>γ</sup>
At all	1.4	0.7	
Moderate	1.6	0.8	
Very	2.0	0.9	
<b>After the end of the COVID-19 pandemic will you donate blood again?</b>			< 0.001 <sup>γ</sup>
Definitely not	1.2	0.6	
Probably not	1.5	0.8	

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Table 4 (continued)

Feature	Degree of decrease in blood donations during the COVID-19 pandemic		P value
	Mean value	Standard deviation	
Probably yes	2.0	0.9	0.124 <sup>†</sup>
Definitely yes	1.8	0.9	
If there were material incentives (a gift as a reward) would you donate blood more easily?			
No	1.8	0.9	0.562 <sup>α</sup>
Probably not	1.9	0.9	
Probably yes	1.7	0.8	
Yes	1.9	0.9	0.236 <sup>α</sup>
Have you been vaccinated against the SARS-CoV-2 virus?			
Yes	1.8	0.9	
No	1.9	0.9	0.236 <sup>α</sup>
Would it be an incentive for you if during blood donation there was a free antibody test against SARS-CoV-2?			
Yes	1.8	0.9	
No	1.8	0.8	

\* Values are expressed as mean (standard deviation) unless otherwise stated.

<sup>α</sup> Mann-Whitney test,

<sup>†</sup> Spearman's correlation coefficient, <sup>‡</sup> Kruskal-Wallis test.

minority of donors exhibited increased donation frequency, possibly in response to public appeals [11].

Regarding donor motivation, voluntary blood donors experienced a reduction in donations during the COVID-19 pandemic, despite making concerted efforts to donate, largely driven by altruistic motives [1,12]. This underscores the importance of leveraging the altruistic nature of donors during public health crises, as successfully demonstrated in past crises [7,8].

Furthermore, our analysis revealed that blood donors who would have donated blood before the COVID-19 pandemic if a friend/relative needed experienced a greater reduction in blood donations during the pandemic. Conversely, those who expressed willingness to donate blood during the COVID-19 pandemic if a friend/relative needed blood exhibited a lower degree of reduction in blood donations. This underlines the significance of intrinsic donor motivation, as individuals with a strong inclination to help others were more resilient in overcoming potential fears associated with the pandemic [11].

The impact of the COVID-19 pandemic on donors' lives correlated with a greater reduction in blood donations, reflecting the deterrent effect of stress and fear associated with the pandemic. This finding aligns with research from Hong Kong and China, highlighting the deterrent effect of stress and fear of COVID-19 transmission on blood donors [4], similar to observations during previous health crises such as SARS and avian influenza [5,6]. It emphasizes the importance of implementing stringent safety measures in blood donation centers to alleviate donor concerns and maintain confidence in the safety of blood donation services. Measures such as promoting hand hygiene, face coverings, and social distancing have been successfully implemented in countries like Italy [13] and further advanced with measures like 'immunity passports' in countries like Finland, Germany, and the United Kingdom, utilizing COVID-19 antibody tests [14–16]. Moreover, donors expressing intent to donate again post-pandemic reported a greater reduction in donations during the COVID-19 pandemic, highlighting the need for reassurance regarding safety measures and the absence of risk to loved ones and communities [17,18].

It's noteworthy that while the COVID-19 epidemic did not result in increased blood demand in Greece, as observed in other countries, blood supplies were affected due to donor unavailability [3,19–22]. To address this issue, transfusion decision-makers can explore strategies to broaden

donor sources and optimize blood use scientifically. This includes informing citizens about scientific precautions for donor attendance and utilizing targeted blood donor registration systems. Additionally, strategies such as increasing autologous transfusions, postponing elective surgical procedures, and implementing more restrictive transfusion strategies can help manage blood supply during acute shortages [23–25].

During major public health crises like the COVID-19 epidemic or the SARS outbreak in Beijing (April–June 2003), similar objectives can be observed, such as the postponement of elective surgical procedures by governments due to hospital closures, resulting in a decreased need for blood or its derivatives for clinical use [5]. While it's impossible to create a specific plan for every public health crisis, establishing emergency plans with mandatory elements, like building infrastructure for collaboration and implementing central mechanisms for communication and coordination, can enable rapid response and constant monitoring of blood need and supply status [5,11].

Additionally, our study highlights a promising trend where women, young people, and students are increasingly likely to donate blood, consistent with findings from similar studies [8]. However, more attention is needed to reach underrepresented groups such as the unemployed and those with low to medium educational qualifications. Providing practical opportunities and information about the necessity of blood donation to these groups can help broaden the donor pool and ensure a stable blood supply [8,11].

In the face of the unknown, it's crucial to continue learning from past experiences and collectively improve preparedness for future public health crises. The unpredictable nature of newly emerging viruses underscores the importance of developing emergency blood sharing plans with detailed operational procedures to minimize errors during crises and standardize blood product collection and management practices across blood centers. Many countries are already taking steps in this direction [1, 12, 13].

These findings emphasize the critical role of blood banks in providing life-saving blood products during public health crises. While their primary function is to supply blood for standard therapeutic use, they also serve as vital resources during pandemics, natural disasters, and other emergencies. Stored blood products can be swiftly accessed to address increased demand resulting from significant casualties, ensuring prompt transfusions for patients facing medical emergencies, particularly those requiring specialized blood products.

## 5. Conclusions

In conclusion, the insights from our study can inform strategies for the National Blood Donation Center and Hospital Blood Donation Services to motivate blood donors during pandemics like COVID-19. Understanding the factors that influence donors' behaviour can guide the planning and implementation of campaigns to attract voluntary blood donors. It may be necessary to devise new blood donation policies to appeal to "first-time" blood donors during pandemics, with a focus on altruistic motivations. Designing specialized campaigns that highlight the altruistic nature of blood donation during crises can also be effective in encouraging donation.

## CRedit authorship contribution statement

**Fortis Sotirios P.:** Writing – original draft, Visualization, Methodology, Data curation. **Dryllis Georgios:** Writing – original draft, Visualization, Methodology, Data curation. **Anastasiadi Alkmini T.:** Writing – original draft, Visualization. **Tzounakas Vassilis L.:** Writing – original draft, Visualization. **Konstantakopoulou Olympia:** Software. **Georgatzakou Hara T.:** Methodology, Data curation. **Pavlou Efthymia G.:** Methodology, Data curation. **Tsantes Andreas G.:** Data curation. **Theodorogianni Vasiliki:** Data curation. **Kosma Maria-Aspasia:** Data curation. **Papageorgiou Effie G.:** Writing – review & editing, Software,

Methodology. **Stamoulis Konstantinos E:** Writing – review & editing, Validation, Investigation, Conceptualization. **Beloukas Apostolos:** Writing – review & editing. **Politou Marianna:** Writing – review & editing, Validation, Investigation, Conceptualization. **Valsami Serena:** Writing – review & editing, Validation, Project administration, Investigation, Conceptualization. **Kriebardis Anastasios G.:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

### Institutional review board statement

This study, approved by the Research Ethics Committee of the University of West Attica (UniWA) (approval number: 104582/22-11-2021).

### Funding

The authors received no specific funding for this work.

### Declaration of Competing Interest

The authors declare no conflicts of interest.

### Acknowledgements

We would like to thank all the participants of this study.

### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.transci.2025.104122](https://doi.org/10.1016/j.transci.2025.104122).

### Data availability

Data presented in this study are available upon request from the corresponding author.

### References

- [1] Haw J, Holloway K, Masser BM, Merz EM, Thorpe R. Blood donation and the global COVID-19 pandemic: areas for social science research. *Vox Sang* 2021;116:363–5.
- [2] Yahia AIO. Management of blood supply and demand during the COVID-19 pandemic in King Abdullah Hospital, Bisha, Saudi Arabia. *Transfus Apher Sci* 2020;59:102836.
- [3] Wang Y, Han W, Pan L, Wang C, Liu Y, Hu W, et al. Impact of COVID-19 on blood centres in Zhejiang province China. *Vox Sang* 2020;115:502–6.
- [4] Leung JNS, Lee C-K. Impact of the COVID-19 – a regional blood centre's perspective 2020;15:362–4.
- [5] Masser BM, White KM, Hamilton K, McKimmie BM. An examination of the predictors of blood donors' intentions to donate during two phases of an avian influenza outbreak. *Transfusion* 2011;51:548–57.
- [6] Shan H, Zhang P. Viral attacks on the blood supply: the impact of severe acute respiratory syndrome in Beijing. *Transfusion* 2004;44:467–9.
- [7] Stanworth SJ, New HV, Apolseth TO, Brunskill S, Cardigan R, Doree C, et al. Effects of the COVID-19 pandemic on supply and use of blood for transfusion. *Lancet Haematol* 2020;7:e756–64.
- [8] Lilley MaS, Robert. Gender differences in altruism: responses to a natural disaster. IZA discussion paper No 9657; 2016.
- [9] Langi Sasongko P, van den Hurk K, Thijssen-Timmer DC. Blood supply milestones in the Netherlands in the first weeks of COVID-19 2020;15:393–4.
- [10] Barjas-Castro MdL, Baumgartner JE, Sales LNM, Santos RA, Pereira FB, Castro V. Blood supply strategies facing a reference blood centre in Brazil during the COVID-19 pandemic 2020;15:374–7.
- [11] Chandler T, Neumann-Bohme S, Sabat I, Barros PP, Brouwer W, van Exel J, et al. Blood donation in times of crisis: early insight into the impact of COVID-19 on blood donors and their motivation to donate across European countries. *Vox Sang* 2021;116:1031–41.
- [12] Masser BM, Hyde MK, Ferguson E. Exploring predictors of Australian community members' blood donation intentions and blood donation-related behavior during the COVID-19 pandemic. *Transfusion* 2020;60:2907–17.
- [13] Flaxman S, Mishra S, Gandy A, Unwin HJT, Mellan TA, Coupland H, et al. Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe. *Nature* 2020;584:257–61.
- [14] Day J. Coronavirus breakthrough: Germany roll outs promising antibody test to end lockdown; 2020.
- [15] Meneguzzi J. Will you need an 'immunity passport' to travel? 2020.
- [16] Reuters. Britain looking at virus immunity certificates but more research needed; 2020.
- [17] Leipnitz S, de Vries M, Clement M, Mazar N. Providing health checks as incentives to retain blood donors — evidence from two field experiments. *Int J Res Mark* 2018;35:628–40.
- [18] Goette L, Stutzer A, Yavuzcan G, Frey BM. Free cholesterol testing as a motivation device in blood donations: evidence from field experiments. *Transfusion* 2009;49:524–31.
- [19] Blood.co.uk. Extra safety measures after coronavirus uncertainty causes drop in donations; 2020.
- [20] Germany T.L. Blood reserves in Germany run critically short due to corona crisis; 2020.
- [21] Karin Magnussen C.N., Vincenzo De Angelis, Flemming Bøgh-Sørensen. How do we secure a safe blood supply during the current Corona Crisis?: ISBT Webinar Series: COVID-19 Transfusion Education; 2020.
- [22] POLITICO. European blood supplies squeezed by coronavirus crisis; 2020.
- [23] Carson JL, Carless PA, Hébert PC. Outcomes using lower vs higher hemoglobin thresholds for red blood cell transfusion. *Jama* 2013;309:83–4.
- [24] Carson JL, Stanworth SJ, Roubinian N, Fergusson DA, Triulzi D, Doree C, et al. Transfusion thresholds and other strategies for guiding allogeneic red blood cell transfusion. *Cochrane Database Syst Rev* 2016;10:Cd002042.
- [25] Jin Y-H, Cai L, Cheng Z-S, Cheng H, Deng T, Fan Y-P, et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). *Mil Med Res* 2020;7:4.