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Adherence to COVID-19 vaccination recommendations and vaccine hesitancy in US blood donors

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Abstract

Background—General vaccination rates have been falling globally despite unequivocal health benefits. Noncompliance can result from access barriers and/or hesitant attitudes. Few studies have investigated the prevalence and determinants of noncompliance with COVID-19 vaccination in blood donors.

Methods—We surveyed blood donors on COVID-19 infection and vaccination history, barriers and motivations for COVID-19 vaccination, and comorbidities. We estimate the prevalence of noncompliance, the prevalence of hesitancy towards COVID-19 vaccines, and investigate associated factors using multivariable models.

Results—From December/2021-December/2022, 33,610 survey respondents were included. Of those, 24% had not been vaccinated for COVID-19 or had missing vaccination information, and 99% of those who reported reasons for being unvaccinated declared at least one of three hesitant attitudes presented in the survey (safety concerns; personal/cultural/religious beliefs; being young and not worrying about being vaccinated). Among noncompliant donors, <2% reported access barriers. In the multivariable model addressing factors associated with vaccine noncompliance, younger age, male gender, White/Caucasian race, absence of comorbidities, residency in a State with less restrictive COVID-19 policies, and living in micropolitan or rural areas were identified as significant predictors. Younger age and White/Caucasian race were independently associated with vaccine hesitancy among noncompliant donors.

Conclusions—We found high rates of noncompliance with COVID-19 vaccination in blood donors, mostly driven by vaccine hesitancy. Understanding vaccine adherence among blood

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donors – a relatively highly educated and healthy population, with good healthcare access and usually motivated by altruism - could provide key information on determinants of vaccine noncompliance that may be harder to overcome.

Keywords

Vaccines; SARS-CoV-2; COVID-19; blood donors; vaccine hesitancy

Introduction

Adherence to general vaccination recommendations has been decreasing in several countries in the past years, with accelerated decline during the COVID-19 pandemic.[1,2] The expanding contingent of susceptible individuals facilitates the reemergence of infectious agents once considered controlled or eliminated, as verified in recent outbreaks of measles[3,4] and reemerging cases of poliomyelitis.[5,6] Noncompliance with vaccination recommendations can result from multiple factors, largely categorized into two main groups: those related to barriers in accessing vaccines, such as high cost or low availability of vaccines, scarcity of health services, and limited working hours of vaccination clinics;[7] and those related to hesitant attitudes despite the availability of vaccination services.[8,9]

In several countries where the COVID-19 vaccines became available, the adherence to vaccination recommendations was below targeted levels.[10] Factors associated with hesitancy towards the COVID-19 vaccines include fear of adverse events; skepticism about their efficacy; distrust in pharmaceutical companies and/or health institutions; beliefs that the COVID-19 vaccines are not necessary for young/healthy persons; and religious/cultural/ideological factors, including the prioritization of individual choices over the collective wellbeing.[11–13] Additionally, health policies and mitigation strategies implemented by local governments during the pandemic may also have influenced the overall perceptions and uptake of COVID-19 vaccines.[14–16]

Incomplete vaccination could increase the vulnerability of blood donors to preventable infections, compromising their ability to contribute to the blood supply. Additionally, vaccination for transfusion transmittable infections can enhance the safety of blood donations.[17] However, the prevalence and factors associated with vaccine hesitancy have been scarcely explored among blood donors. In a survey study addressing perceptions and attitudes of Greek blood donors towards COVID-19 vaccination in 2021, 48% of the unvaccinated donors were awaiting their appointment to receive the vaccine, but more than a third reported hesitant attitudes including fear of complications, skepticism about the vaccine efficacy, and belief that COVID-19 was a mild disease.[18]

Compared to the general population, blood donors are a selected subgroup with better access to healthcare, who are relatively highly educated and healthy,[19,20] and usually motivated by altruism and social responsibility.[21] Understanding the prevalence and reasons for noncompliance with COVID-19 vaccine recommendations among blood donors could provide valuable information on the relevance of this phenomenon in the blood donor population, as well as determinants that may be harder to overcome. In this study, we used responses obtained in a survey to investigate the prevalence of noncompliance

with COVID-19 vaccination recommendations among blood donors, the percentage of noncompliant blood donors reporting hesitant attitudes, and associated factors. We also investigated the motivations for getting the COVID-19 vaccine among vaccinated participants.

Methods

Study participants and survey

Between June 2020 and July 2021, Vitalant implemented a blood donor surveillance program with universal testing of all blood donations for SARS-CoV-2 antibodies.[22,23] People who donated blood during the period of universal testing were invited to respond to a survey using the Qualtrics survey tool (Qualtrics, Provo, UT), addressing COVID-19 infection history; COVID-19 vaccination status; barriers, and motivations for vaccination; comorbidities; and health rating (fully described in the supplementary materials). Invitations for survey participation were sent by email and postal mail to blood donors who had not opted out of contact. We extracted deidentified demographic characteristics of study participants from the donation databases.

Ascertainment of compliance with COVID-19 vaccination recommendations

The study survey asked whether the participant had ever been vaccinated for COVID-19. Since the collection of survey responses started approximately one year after COVID-19 vaccines became available, and several months after eligibility for vaccination included all the adult population regardless of health conditions in the U.S., we categorized participants who reported not being vaccinated as noncompliant with vaccination recommendations. Those who reported at least one vaccine dose were categorized as compliant.

Vaccine hesitancy ascertainment

We asked noncompliant participants to provide the reasons for not getting the COVID-19 vaccine. Among the response options, three indicated hesitancy-related reasons: 1. unsure vaccine are safe; 2. personal, cultural, or religious beliefs against vaccination; 3. I am young and do not need to worry about being vaccinated. Participants who selected one or more of these reasons were categorized as having hesitant attitudes.

Rural-urban classification of areas of residency and state-level COVID-19 policies

Using the participantś residential zip code and the rural-urban commuting area (RUCA) codes (https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes), which classify US census tracts using measures of urbanization, population density, and daily commuting to urbanized areas, we categorized the area of residency for each participant into metropolitan (codes 1–3; urbanized areas and areas with >10% primary flow to a urbanized area), micropolitan (codes 4–6; large urban clusters [10,000 – 49,999 people] and areas with >10% primary flow to a large urban cluster), and rural (codes 7–10; small urban clusters [2,500 – 9,000 people], areas with >10% primary flow to a small urban cluster, and areas with primary flow to a tract outside a urbanized area or urban cluster). We also obtained information regarding COVID-19 policies implemented in US States[24] to identify those with no implementation of face mask mandate in public spaces; no policies for stay at home/

shelter in place; and/or no closure of non-essential businesses. Based on these criteria, 18 US States (listed in the supplemental materials) were categorized as having less restrictive COVID-19 policies.

Statistical analysis

We used counts, percentages, medians, and interquartile ranges (IQRs) to present demographic and clinical characteristics of study participants. We describe the percentages and 95% confidence intervals (CIs) of participants categorized as noncompliant with vaccination recommendations as well as those having hesitant attitudes. Factors associated with vaccination noncompliance and with hesitant attitudes were investigated using univariable and multivariable modified Poisson regression models, estimating prevalence ratios. We included age (<30, 30–39, 40–49, 50–59, 60–69, and ≥70 years old), gender, race (White/non-White), ethnicity (Hispanic/non-Hispanic), number of comorbidities (none; one; two or more), and classifications of the area of residency (State with less restrictive COVID-19 policies, yes/no; and metropolitan/micropolitan/rural area) as independent variables in the multivariable models. For all analysis, we used Stata version 17 (StataCorp College Station, TX: StataCorp LP) with a two-sided 0.05 significance level.

Ethics and informed consent

The protocol for the COVID-19 survey was reviewed and approved by an independent review board (Advarra protocol Pro00056783); all survey participants provided informed consent prior to inclusion. As part of consenting to donate, all Vitalant donors provide written and voluntary informed consent for the use of their deidentified data for research purpose (Advarra protocol Pro00030878).

Results

Study population and noncompliance with COVID-19 vaccination recommendations

Between December 2021 and December 2022, 311,031 email and 51,451 letter invitations for survey participation were sent to 294,408 unique blood donors who had at least one donation in the universal testing period; of those, 33,610 (11.4%) consenting donors who provided responses to the survey were included in the study. A total of 7,944 participants (24%; 95% CI 23–24%) reported not being vaccinated or had missing information on vaccination status and were categorized as noncompliant with COVID-19 vaccination recommendations (supplementary Figure 1). Table 1 describes demographic characteristics of study participants, overall and by COVID-19 vaccination compliance group. The median age of study participants was 60 years old, 44% were males, and most (92%) were White/Caucasian. Donors who were noncompliant with COVID-19 vaccination recommendations were younger, more likely males, and less likely to report most of the comorbidities solicited in the survey; self-reported health rating was higher in this group. Noncompliant donors were more likely to live in U.S. States with less restrictive COVID-19 policies, and more likely to live in rural or micropolitan areas compared to compliant donors.

Barriers for vaccination and vaccine hesitancy

Of 7,944 blood donors who were categorized as noncompliant with COVID-19 vaccination recommendations, 3,251 (41%) informed at least one reason for not receiving the vaccine among those displayed in the survey (supplementary Figure 1); these participants were more likely to be White, non-Hispanic, live in States with less restrictive COVID-19 policies, and live in Micropolitan/Rural areas compared to donors who did not inform any reason. Table 2 shows the frequencies and percentages of barriers for vaccination or reasons for noncompliance with COVID-19 vaccination. The most frequently reported reason, indicated by 34% of noncompliant donors, was “unsure vaccines are safe”. Personal, cultural, or religious beliefs against vaccination were reported by 19%, and the belief that vaccination was not needed due to young age was reported by 6%. A total of 3,210 donors reported at least one hesitancy-related reason, corresponding to 40% of all noncompliant donors and 99% of noncompliant donors who reported at least one reason for not being vaccinated (95% CI 98–99%). Only 50 donors (1.5%, 95% CI 1.1–2.0) reported any access-related reasons for not getting the COVID-19 vaccine.

Factors associated with noncompliance with COVID-19 vaccination recommendations

Table 3 shows the results of univariable and multivariable analyses of factors associated with noncompliance with COVID-19 vaccination recommendations. Younger age, male gender, absence of comorbidities, residency in States with less restrictive COVID-19 policies, and residency in rural or micropolitan areas had statistically significant association with noncompliance in both univariable and multivariable models; White/Caucasian race was significantly associated with noncompliance in the multivariable model, whereas ethnicity had no statistically significant association with the outcome.

Factors associated with vaccine hesitancy among noncompliant blood donors

The results of univariable and multivariable analyses of factors associated with vaccine hesitancy among blood donors who were noncompliant with COVID-19 vaccination recommendations are described in Table 4. In the univariable models, we found statistically significant associations with age (40–49 and 60–69 compared to ≥70 years old), White/Caucasian race, non-Hispanic ethnicity, residency in States with less restrictive COVID-19 policies, and residency in rural or micropolitan areas. Age <30 years old and White/Caucasian race retained remained significantly associated with vaccine hesitancy among blood donors in the multivariable model.

Motivations for COVID-19 vaccination among compliant blood donors

Participants who reported having received at least one dose of the COVID-19 vaccine were asked about their motivations for getting the COVID-19 vaccine (Table 5). The most frequently reported motivations were to protect my health (86%), to protect the health of family/friends (87%), and to protect the health of co-workers/community (70%). Resuming social activities and resuming travel were indicated as motivations for 46 and 45%, respectively.

Discussion

In this cross-sectional study including more than 33,000 persons who donated blood during the COVID-19 pandemic, we found that one in four were noncompliant with COVID-19 vaccination recommendations, and 99% of them reported at least one hesitancy-related reason. Factors associated with noncompliance included younger age, male gender, White/Caucasian race, absence of comorbidities, residency in States with less restrictive COVID-19 policies, and residency in rural or micropolitan areas. Age <30 years old (compared to ≥70) and White/Caucasian race were associated with hesitant attitudes among noncompliant blood donors after adjustment for covariates in the multivariable model. Finally, we found that protecting onés own health and the health of family/friends and co-workers/community were the most frequently reported motivations for getting the COVID-19 vaccine among vaccinated participants.

The rates of vaccine-preventable infections dropped dramatically throughout the 20th and 21st centuries, following the implementation of vaccines as a public health policy.[25,26] However, vaccination coverage has been falling in many countries[1], with several documented outbreaks of vaccine-preventable diseases in the past years.[3–6,27] Although distrust and refusal have continuously accompanied the history of vaccines,[28] some studies suggest that the relevance of hesitant attitudes as drivers of noncompliance with vaccination recommendations may be increasing.[29] Potential reasons include the rising influence of unreliable information sources and social media in health communication;[30,31] the perception that vaccines are not needed for diseases that became very rare; beliefs that vaccines can cause long-term complications while most vaccine-preventable diseases are mild; preference for a natural lifestyle, avoiding medical interventions;[32,33] and the prioritization of individual-centered practices over population-level interventions.[34] Additionally, during the COVID-19 pandemic, the rapid development of vaccines using novel platforms has prompted skepticism, and ideological considerations became a key aspect in the decision to get the vaccine.[35–37] Importantly, studies have suggested that hesitant views concerning the COVID-19 vaccines may have also triggered or exacerbated hesitancies towards other vaccines.[15,38]

The 76% prevalence of blood donors who were compliant with COVID-19 vaccination recommendations in our study was only moderately higher than the 63% vaccine coverage reported in the general adult population in the U.S. in December 2021,[39] when we began collecting survey responses. This is remarkable since blood donors are a selected group who are presumably not afraid of needles, are relatively highly educated, and usually have better access to healthcare compared to the overall population.[19,20] Accordingly, it was not a surprise that access-related reasons were a minor driver of noncompliance with COVID-19 vaccination, whereas the prevalence of hesitant attitudes was high in our study. Of note, vaccine hesitancy has been acknowledged as the primary reason for noncompliance with COVID-19 vaccination recommendations also in the general U.S. population.[12]

We found multiple factors associated with noncompliance with COVID-19 vaccination recommendations after adjustment for multiple covariates. Residency in non-metropolitan areas and in States with less restrictive COVID-19 policies were associated with vaccine

hesitancy among noncompliant blood donors in univariable models, whereas White race and younger age were associated with vaccine hesitancy even after adjustment for gender, ethnicity, number of comorbidities, and residency area. Studies addressing factors associated with noncompliance with COVID-19 vaccination recommendations show conflicting results, potentially stemming from differences in study populations, dates when studies were conducted, and data collection strategy. A population-based study conducted in the U.S. showed that, by the end of April 2021, non-Hispanic Whites had higher rates of COVID-19 vaccination coverage (59%) than Hispanic (47%) and non-Hispanic Black participants (46%); by the end of 2021, vaccination coverage with ≥1 dose ranged between 76 and 79% for all three groups.[40] An ecologic study including U.S. counties found a strong association between the proportion of votes for the Republican candidate in 2020 and lower COVID-19 vaccination rates; lower COVID-19 vaccination rates were also associated with higher percentage of Black residents, lower percentage of Latin residents, lower median household income, lower schooling, younger median age, and lower non-COVID-19 childhood vaccination coverage.[35] Among U.S. veterans, a study identified that older age, Asian or Black race, Hispanic ethnicity, and residency in urban areas were associated with higher likelihood of being vaccinated.[41] In a more recent study including members of Kaiser Permanente Southern California, Hispanic and non-Hispanic Black race/ethnicity, higher neighborhood deprivation index, and prior history of SARS-CoV-2 infection were associated with lower likelihood of vaccination with the bivalent COVID-19 vaccine.[42] Younger age, female gender, non-White ethnicity, lower education, lower self-perceived risk of COVID-19, residency in rural areas, absence of chronic medical conditions, and right-wing political inclinations were associated with higher likelihood of COVID-19 vaccine hesitancy in a review study.[43] Messages emphasizing the higher risk of COVID-19 for older adults likely influenced risk perception, uptake of non-pharmaceutical preventive measures, and adherence to COVID-19 vaccine recommendations among younger persons.[44,45] Structural barriers, negative experiences with the healthcare system, and mistrust have been associated with vaccine hesitancy among race and ethnic minorities.[46–48] It is likely that both evidence-based and misleading health messages have unequal impact on different demographic subgroups and regions, influencing the prevalence of vaccine hesitancy and rates of vaccine uptake.

Given the characteristics of our study population, one additional aspect deserves consideration. While voluntary blood donation is presumably motivated by altruism,[21] altruistic messaging and motivations have been shown to enhance vaccination intentions.[49–51] Our findings highlight that, even among individuals who engage in selfless actions and are therefore less likely to be influenced by individualist arguments against mass vaccination, vaccine hesitancy is a prevalent issue with important individual and public health consequences.

Our study had limitations. Invitations for participation in the survey were sent only to persons who donated blood during the COVID-19 universal testing period between June 2020 and July 2021. This strategy may have failed to include potential donors who were more compliant with mobility restrictions, and presumably more compliant with vaccination recommendations. On the other hand, donors who voluntarily consented with participation in the survey may be more likely to comply with healthcare and prevention

strategies. Vitalantś donation facilities are unequally distributed across the U.S., and our study population had higher representation of donors from California (28%), Colorado (21%), and Arizona (14%), which may have biased our results relative to the complete population of U.S. blood donors. We included a description of frequencies and percentages of study participants by State of residency, overall and by vaccination and hesitancy status, in the supplementary materials. Vaccination status was defined according with survey responses, with no verification of vaccination records. The survey did not include questions on adherence to other vaccines, precluding our ability to investigate associations with COVID-19 vaccination status. Almost 60% of noncompliant donors failed to inform barriers for COVID-19 vaccination, resulting in potential biases to the prevalence of hesitant attitudes estimated in our study. Finally, the list of reasons for noncompliance with COVID-19 vaccination contained a limited number of hesitancy-related items, and we were unable to explore the prevalence and factors associated with specific aspects of vaccine hesitancy.

Despite these limitations, this study shows that noncompliance with COVID-19 vaccination recommendations and hesitant attitudes are frequent among blood donors, highlighting the pervasiveness and relevance of this public health issue. In the context of infectious diseases with epidemic or pandemic patterns of occurrence, vaccination can help preserve the blood supply by reducing the vulnerability of blood donors to vaccine-preventable infections. Strategies to improve vaccination coverage should be developed according with the barriers and motivations for each population.[52,53] For blood donors, our study suggests vaccine hesitancy should be urgently addressed; studies investigating specific aspects of vaccine hesitancy in this population could be used to inform the factors that may be harder to overcome in the general population in different settings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Disclaimer:

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Table 1:

Demographic and clinical characteristics of study participants, overall and according to compliance with COVID-19 vaccination recommendations

	All participants N=33,610	Noncompliant N=7,944	Compliant N=25,666	p-value
Median age (IQR)	60 (47–67)	56 (44–65)	61 (48–68)	<0.001
Age category, years (%)				<0.001
<30	1,421 (4)	423 (5)	998 (4)	
30–39	3,323 (10)	943 (12)	2,380 (9)	
40–49	5,159 (15)	1,481 (19)	3,678 (14)	
50–59	7,251 (22)	1,949 (25)	5,302 (21)	
60–69	10,599 (32)	2,192 (28)	8,407 (33)	
70+	5,857 (17)	956 (12)	4,901 (19)	
Gender (%)				<0.001
Male	14,683 (44)	3,632 (46)	11,051 (43)	
Female	18,927 (56)	4,312 (54)	14,615 (57)	
Race (%)				0.389
White/Caucasian	29,864 (92)	7,099 (93)	22,765 (92)	
Non-white	2,482 (8)	571 (7)	1,911 (8)	
Ethnicity (%)				0.209
Hispanic	2,646 (8)	655 (9)	1,991 (8)	
Non-Hispanic				
Comorbidities (%)				
Asthma	3,375 (12)	400 (10)	2,975 (12)	0.001
Other respiratory disease	603 (2)	69 (2)	534 (2)	0.098
Hearth disease	986 (3)	110 (3)	876 (3)	0.017
High blood pressure	7,381 (25)	800 (20)	6,581 (26)	<0.001
Diabetes	1,714 (6)	199 (5)	1,515 (6)	0.008
Any immune disorder	1,331 (5)	179 (4)	1,152 (5)	0.756
Kidney disease	318 (1)	26 (1)	292 (1)	0.004
Liver disease	137 (<1)	21 (1)	116 (<1)	0.587
Neurological disease	399 (1)	45 (1)	354 (1)	0.151
Cancer	1,798 (6)	178 (4)	1,620 (6)	<0.001
None of the above	16,205 (55)	2,506 (62)	13,699 (54)	<0.001
Median number of comorbidities (IQR)	0 (0–1)	0 (0–1)	0 (0–1)	<0.001
		Range 0–6	Range 0–10	
Median self-reported health rating (IQR)	9 (8–9)	9 (8–9)	8 (8–9)	<0.001
Residency in a State with less restrictive COVID-19 policies (%) *				<0.001
Yes	9,498 (28)	2,826 (36)	6,672 (26)	
No	24,106 (72)	5,117 (64)	18,989 (74)	
Residency area (%)				<0.001
Metropolitan	27,592 (82)	5,996 (75)	21,592 (84)	

	All participants N=33,610	Noncompliant N=7,944	Compliant N=25,666	p-value
Micropolitan	3,200 (10)	990 (12)	2,210 (9)	
Rural	2,812 (8)	957 (12)	1,855 (7)	

IQR, interquartile range

* Missing for 6 participants

Table 2:

Barriers for COVID-19 vaccination reported by noncompliant blood donors*

	N (%)	95% CI
Hesitancy-related reasons		
Unsure vaccines are safe	2,725 (34)	33–35
Personal, cultural, or religious beliefs against vaccination	1,474 (19)	18–19
I am young and do not need to worry about being vaccinated	498 (6)	6–7
Any hesitant attitude	3,210 (40)	39–41
Access-related reasons		
I can't go on my own (I have a physical or other limitation) or don't have transportation	3 (<1)	0–0
I don't know where to go to get vaccinated	9 (<1)	0–0
The vaccination clinic is too far away or the hours of operation are inconvenient	3 (<1)	0–0
The waiting time is too long. It is difficult to find or make an appointment	6 (<1)	0–0
I am too busy to get vaccinated	37 (<1)	0–1
It is difficult to arrange for childcare	2 (<1)	0–0
I don't have time off work	18 (<1)	0–0
Any access related reason	50 (1)	0–1
Other reasons		
I'm worried about being exposed to SARS-CoV-2 when I am at the vaccination location	37 (<1)	0–1
I'm not eligible to get a COVID-19 vaccine or have a medical reason that makes me ineligible to get vaccinated (e.g., I have had a severe allergy to vaccines in the past).	129 (2)	1–2

CI, confidence interval

*Denominator includes all noncompliant donors, including those who did not report any reason

Table 3:

Factors associated with noncompliance with COVID-19 vaccination recommendations among blood donors

	Unadjusted PR (95% CI)	p-value	Adjusted PR (95% CI)	p-value
Age category, years				
<30	1.82 (1.65–2.01)	**<0.001**	1.78 (1.50–2.11)	**<0.001**
30–39	1.74 (1.61–1.88)	**<0.001**	2.03 (1.79–2.31)	**<0.001**
40–49	1.76 (1.64–1.89)	**<0.001**	2.34 (2.09–2.63)	**<0.001**
50–59	1.65 (1.54–1.76)	**<0.001**	1.97 (1.76–2.20)	**<0.001**
60–69	1.27 (1.18–1.36)	**<0.001**	1.45 (1.30–1.62)	**<0.001**
70+	Reference	-	Reference	-
Gender				
Male	1.09 (1.04–1.13)	**<0.001**	1.21 (1.14–1.28)	**<0.001**
Female	Reference	-	Reference	-
Race				
White/Caucasian	1.03 (0.96–1.11)	0.391	1.38 (1.20–1.59)	**<0.001**
Non-White	Reference	-	Reference	-
Ethnicity				
Hispanic	1.05 (0.98–1.12)	0.206	0.91 (0.80–1.04)	0.154
Non-hispanic	Reference	-	Reference	-
Number of comorbidities				
None	1.45 (1.31–1.60)	**<0.001**	1.27 (1.15–1.40)	**<0.001**
One	1.12 (1.01–1.25)	**0.036**	1.05 (0.94–1.17)	0.393
Two or more	Reference	-	Reference	-
Residency in a State with less restrictive COVID-19 policies				
Yes	1.40 (1.35–1.46)	**<0.001**	1.61 (1.52–1.71)	**<0.001**
No	Reference	-	Reference	-
Residency area				
Metropolitan	Reference	-	Reference	-
Micropolitan	1.42 (1.35–1.51)	**<0.001**	1.81 (1.67–1.96)	**<0.001**
Rural	1.57 (1.48–1.66)	**<0.001**	2.06 (1.91–2.23)	**<0.001**

PR, prevalence ratio; CI, confidence interval

Table 4:

Factors associated with vaccine hesitancy among donors who were noncompliant with COVID-19 vaccination recommendations

	Unadjusted PR (95% CI)	p-value	Adjusted PR (95% CI)	p-value
Age category, years				
<30	0.94 (0.80–1.10)	0.423	1.12 (1.03–1.21)	**0.008**
30–39	1.11 (0.99–1.27)	0.073	1.05 (0.98–1.13)	0.139
40–49	1.24 (1.12–1.37)	**<0.001**	1.01 (0.95–1.08)	0.783
50–59	1.10 (0.99–1.21)	0.074	0.99 (0.94–1.06)	0.867
60–69	1.13 (1.02–1.24)	**0.017**	1.01 (0.95–1.07)	0.81
70+	Reference	-	Reference	-
Gender				
Male	1.03 (0.98–1.09)	0.244	1.01 (0.97–1.04)	0.687
Female	Reference	-	Reference	-
Race				
White	1.60 (1.39–1.84)	**<0.001**	1.12 (1.01–1.24)	**0.027**
Non-White	Reference	-	Reference	-
Ethnicity				
Hispanic	0.72 (0.64–0.81)	**<0.001**	0.95 (0.87–1.03)	0.237
Non-hispanic	Reference	-	Reference	-
Number of comorbidities				
None	1.01 (0.96–1.07)	0.672	1.00 (0.95–1.06)	0.871
One	1.01 (0.95–1.07)	0.79	1.01 (0.95–1.07)	0.758
Two or more	Reference	-	Reference	-
Residency in a State with less restrictive COVID-19 policies				
Yes	1.27 (1.20–1.34)	**<0.001**	1.01 (0.97–1.04)	0.639
No	Reference	-	Reference	-
Residency area				
Metropolitan	Reference	-	Reference	-
Micropolitan	1.36 (1.27–1.46)	**<0.001**	1.00 (0.96–1.05)	0.85
Rural	1.44 (1.35–1.54)	**<0.001**	1.00 (0.95–1.05)	0.949

PR, prevalence ratio; CI, confidence interval

Table 5:

Motivations for getting the COVID-19 vaccine among compliant blood donors

Motivations	Frequency (%)	95% CI
Protect my health	22,005 (86)	85–86
Protect health of family/friends	22,245 (87)	86–87
Protect health of co-workers/community	18,076 (70)	70–71
To get back to work/school	5,325 (21)	20–21
To resume social activities	11,752 (46)	45–46
To resume travel	11,655 (45)	45–46
Because others encouraged me to get vaccinated	2,768 (11)	10–11

CI, confidence interval