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BLOOD DONORS AND BLOOD COLLECTION

TRANSFUSION

Who donates? Patterns of blood donation and donor characteristics at a university-affiliated hospital-based donor center

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Abstract

Background: Blood donors are a crucial element of the blood supply chain. Optimal recruitment strategies built upon the robust understanding of local donor behavior and demographics—specifically, the donor characteristics of our university-affiliated hospital-based donor center—improve outreach and retention of donors.

Study design and methods: This retrospective study analyzed blood donors' genders, ethnicities, and donation frequencies at a university-affiliated hospital-based donor center from 2014–2019, stratified into seven age cohorts. Donor ethnicity demographics were compared to the reported student, employee, and LA County population.

Results: Female donors outnumbered male donors in all age cohorts. The majority of donors self-identified (SI) as White (36.7%), Hispanic/Latino (21.6%), or Asian (19.1%). Older donors (age > 25) donated more frequently (4.1 vs. 2.3 donations per donor) than younger donors (age ≤ 25). Repeat donors who donated in multiple years during the study period were more likely to donate multiple times each year than those donors who only donated during 1 year.

Discussion: Our donor demographics more closely reflect the university student and employee demographics than LA County demographics, demonstrating the broad local efforts of recruitment by student groups and donor center recruitment staff. However, non-White populations continue to be underrepresented. The majority of donors only donated once during the study period. Recruitment strategies to increase donor engagement among underrepresented populations and increase the proportion of repeat donors are likely to prove most beneficial.

KEYWORDS

donor characteristics, donor recruitment, donor retention

Mana Sheykhsoltan and Wesley Wu contributed equally to the work.

1 | INTRODUCTION

National Blood Collection and Utilization Survey (NBCUS) data reveal a pattern of decreasing red blood cell (RBC) collections alongside increasing RBC transfusions in the United States between 2017 and 2019.[1] Reduction of supply relative to demand creates concern that shortages will become more prevalent as population demographics shift, or when public health/natural disasters arise that further impact blood collection. For example, with the COVID-19 pandemic, many hospitals and major blood suppliers were forced to cancel their blood drives, leading to a large decrease in blood donations and a sweeping blood shortage across the country.[2] As society transitions to a more elderly population needing more complex surgical and pharmaceutical treatments, this group may also require more transfusion support. This increased need may be difficult to meet in the future, as older donors become ineligible or unable to donate.[1] Studying important factors in donor demographics may allow blood centers to recruit and retain donors better, a key element in maintaining a consistent and sufficient blood supply.

In order to deepen the understanding of the essential role that blood donors play in the blood supply chain, numerous studies have examined donor demographics. In 2017, Goldman et al. analyzed donor demographics from 17 blood centers in 12 countries in 2001 and 2011; many countries, especially the United States, were found to rely heavily on younger donors.[3] Furthermore, the 2013 NBCUS Report revealed that approximately 20% of US donations came from 16 to 24-year-old donors, with 16 to 18-year-old donors contributing to 9.9% of all donations.[4] A study by Yazer et al. examined donor demographics, specifically donor status, age, and race/ethnicity, from eight US blood collectors from the years 2006, 2009, 2012, and 2015. Self-identified (SI) White donors, both first-time donors (FTD) and repeat donors (RD), were the majority and donated the greatest proportion of RBC units when compared to donors of all other ethnicities combined.[5] Unlike these studies, which have examined the donor demographics from large US blood centers, no study, to our knowledge, has extensively analyzed the donor demographics of a university-affiliated hospital-based donor center (HBDC).

The University of California, Los Angeles (UCLA) Blood & Platelet Center is one of the few university-affiliated HBDCs in the United States. The center's operations focus on mobile collections and collections at two fixed sites: one site situated on the university campus in the student union and another site approximately one mile from campus. All collections are utilized at two academic medical centers. With over 50,000 students and faculty, the UCLA community creates a special opportunity to analyze donor demographics of a college and university employee donor population. This study examines donors' genders/age, ethnicities, and donation patterns. The primary aim of this study was to determine if HBDC donor demographics reflected the published donor characteristics of its campus population and the county population. Moreover, the findings from this study will help guide the UCLA blood donor center and other similar university-affiliated HBDCs in improving their donor education programs and recruitment strategies to gain new donors, retain donors, and meet patient needs.

2 | MATERIALS AND METHODS

This retrospective study was conducted at a university-affiliated HBDC. Data from donor history questionnaires were entered into the donor center laboratory information system (LIS) at the time of donation. Each donor was asked to self-identify their ethnicity (African American, Asian, Caucasian, Filipino, Hispanic/Latino, Indian, Middle Eastern, Native American, Pacific Islander, Other, Unknown/Unspecified, or Declined to give/Blank). Data, including donors' ages, genders, and ethnicities, was extracted from the donor center LIS (El Dorado Donor, Haemonetics, Boston, MA).

Blood donors, who presented to the campus donor center, the campus-adjacent donor center (within one mile of campus), or a campus mobile blood drive from January 2014 to December 2019 were included in the study. Data points include donor demographics (age, gender, ethnicity, frequency) and outcome of donation attempt. A successful donation was defined as one that resulted in a blood product that could be issued to a hospital blood bank for transfusion.

For analysis, donors were classified into seven cohorts based on age at the time of the donor's first donation with the donor center. The seven cohorts with their following ages were Cohort #1: 17–19, Cohort #2: 20–22, Cohort #3: 23–25, Cohort #4: 26–28, Cohort #5: 29–31, Cohort #6: 32–34, and Cohort #7: 35 and older. Each donor cohort spanned a 3-year age range, except Cohort #7, which included all donors age 35 and above. We calculated donation frequency by the proportion of donors by the average number of donations per year.

3 | RESULTS

From January 2014 to December 2019: 23,179 individuals presented to one of the fixed sites or a campus mobile blood drive. These donors made 124,073 donation

attempts and 104,386 successful donations. 5416 (23%) of the 23,179 individuals were deferred during the prescreening process. Of the 17,777 (77%) individuals who successfully donated, O+ was the most common blood type (43.4%), and AB- was the least common blood type (0.5%) (Table 1). Cohort #1 (age 17–19) had the highest deferral rate (26%), with each following cohort having a lower deferral rate, down to 12% in Cohort #7 (age 35+). Most deferrals were due to low hemoglobin levels (~90% for each cohort), with more female donors deferred than male donors in each cohort.

There was a greater percentage of female donors than male donors among all age cohorts, with the difference between the number of female and male donors decreasing in the older cohorts (Figure 1). For example, while the youngest cohort (17–19) is 64.9% female, the oldest cohort (35+) is only 50.7% female. There was also a decrease in the number of donors for each older cohort, except in Cohort #7, which comprised all donors above age 35.

In all age cohorts, the majority of donors SI as Caucasian, averaging around 35% of the donors in each age cohort, followed by Hispanic/Latino (23.8%) and Asian (18.4%) (Figure 2). The other ethnic groups each contributed less than 5% for each cohort (African American, 4%; Filipino, 3%; Indian, 2%; Middle Eastern, 4%; Native American, 0%; Pacific Islander, 0%; Unknown/Unspecified, 0%; and Declined to give/blank, 5%). Besides donors who SI as Caucasian and Asian, the other ethnicities maintained a similar percentage of donors in each age cohort. For SI Caucasian donors, there was an increase from 32% of donors in Cohort #1 (17–19) to 45% of donors in Cohort #7 (35+), and for SI Asian donors, there was a downward trend from 25% of donors in Cohort #1 (17–19) to 10% of donors in Cohort #7 (35+).

The frequency of repeat donations was greater in donors in the older cohorts when compared to donors in the younger cohorts. The average number of donations per donor for donors in Cohort #7 ranged from 1 to 21.5 per year during the study period. In both the youngest and the oldest cohorts, donors who donated in more than 1 year during the study period were more likely to donate at least two or more times per year (Figures 4 & 5).

TABLE 1 Successful donor blood type percentages

Blood type	Percentage (%)
O+	43.4
O−	4.5
A+	28.7
A−	3.0
B+	14.9
B−	1.0
AB+	4.0
AB−	0.5

4 | DISCUSSION

Understanding donor demographics (genders/age, ethnicities/races), as well as donation frequencies of FTD and RD blood donors, may be instrumental in aiding a donor center's recruitment strategy. Our results showed a greater percentage of female donors across all cohorts (Figure 1); however, the difference in the number of female and male donors was less pronounced in older cohorts. This decreasing difference with age could reflect the difference in the younger undergraduate population, which is approximately 57% female compared to the employee population, which is generally older and 40% female.

The large decrease in the number of donors for each older cohort, except for the oldest cohort (35+), showed an unstable donor population (Figure 1). The large decrease in the number of donors between Cohort #2 (20–22 years of age) and Cohort #3 (23–25 years of age) could be due to undergraduate students graduating and leaving UCLA. It was important to note that the oldest cohort had the largest age range (35+), which could explain the high number of donors. Nevertheless, new recruitment techniques need to be implemented to encourage younger donors to continue donating throughout their undergraduate career and after graduation.

According to UCLA's Equity, Diversity, and Inclusion website, UCLA's employee population's (Academic and Nonacademic staff) three largest SI ethnicities in 2019 were White (30%), Asian or Pacific Islander (23%), and Hispanic/Latino (27%).[6,7] Based on the 2019–2020 undergraduate profile, available to the public on UCLA's website, the three largest ethnicities represented in the undergraduate population were Asian or Pacific Islander (28%), White (26%), and Hispanics/Latino (22%) (Table 2).[8]

For the LA County population in 2020, the census split the races into the following eight categories: Hispanic or Latino, White alone, Black or African-American alone, American Indian and Alaska Native alone, Asian alone, Native Hawaiian and other Pacific Islander alone, some other race alone, and two or more races. The three largest races were Hispanic or Latino (48.5%), White (26.2%), and Asian (14.4%) (Table 2).[9]

For comparing the UCLA population and the LA County population demographics with the donor demographics, this study equated White with Caucasian and

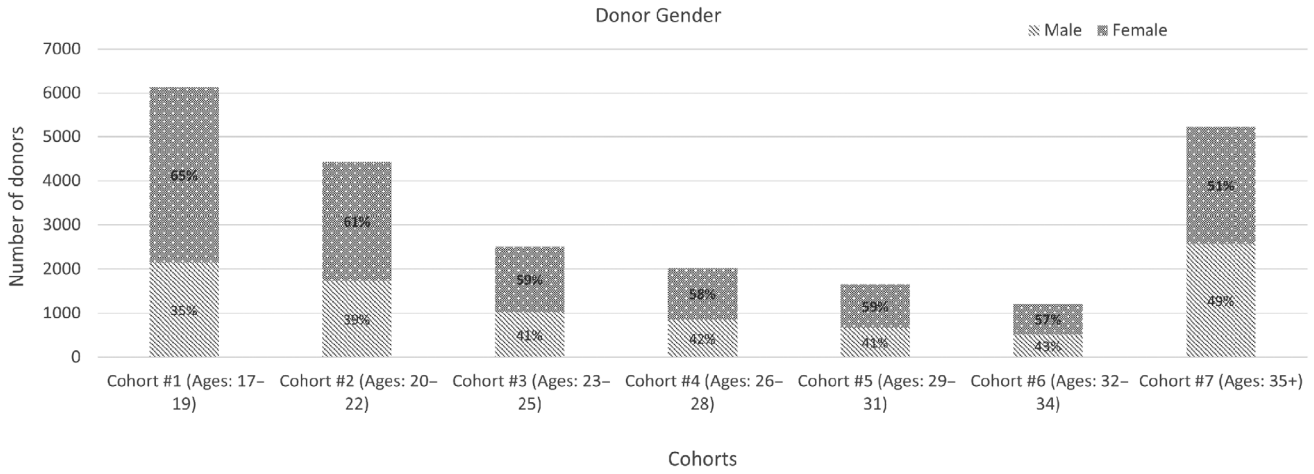

FIGURE 1 Donor gender percentages for seven cohorts, January 2014–2019

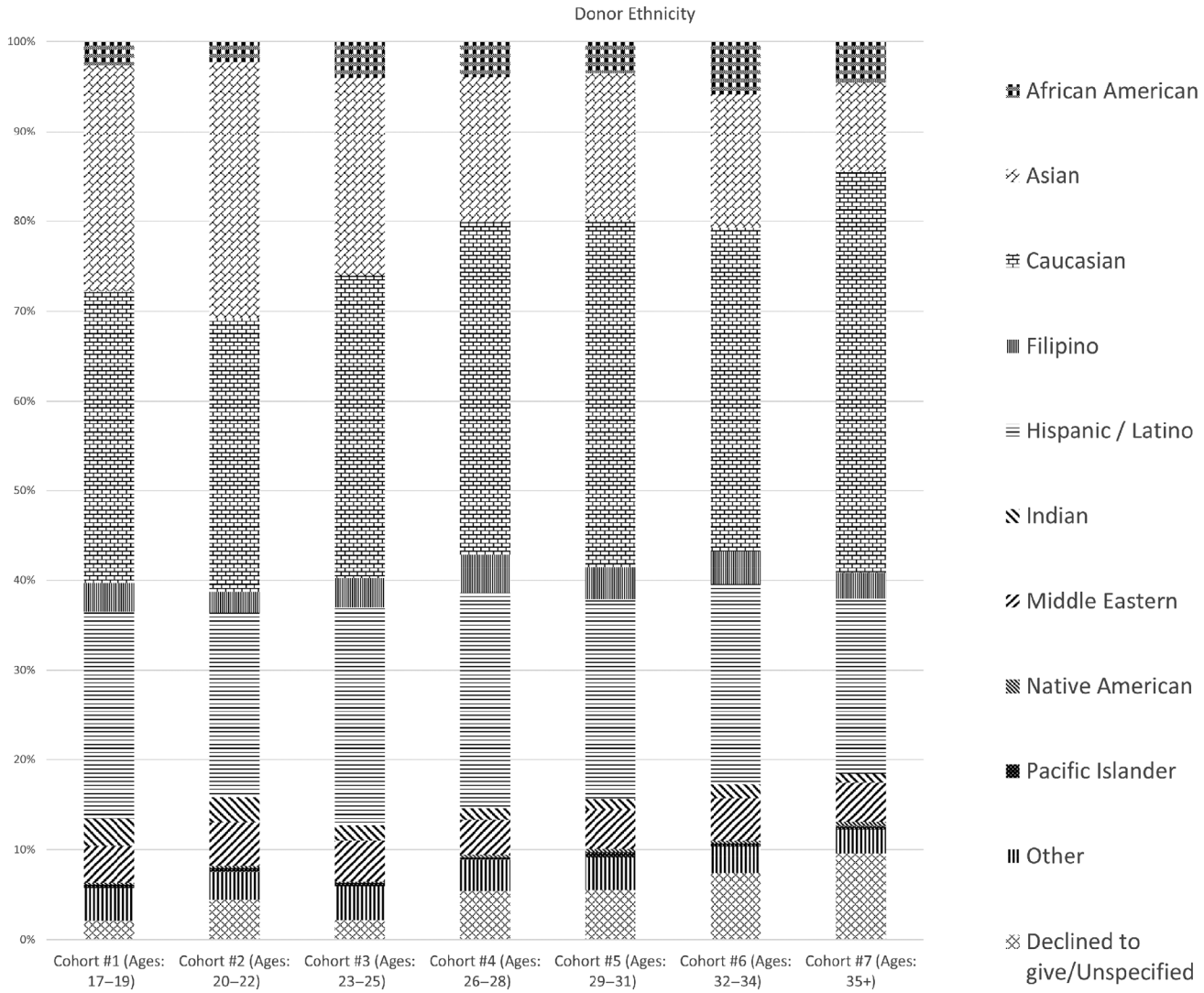

FIGURE 2 Donor ethnicity percentages for seven cohorts, January 2014–2019

Black with African American and grouped SI Asians with SI Pacific Islanders. In addition, only the donor questionnaire included the ethnicities Filipino, Indian, and Middle Eastern for donors to identify with, so for any comparisons between populations, we grouped the SI Indian, SI Middle Eastern, and SI Filipino donors into

TABLE 2 Race/ethnicity of the UCLA undergraduate students and employees (fall 2019) and the Los Angeles County (2020 census)

Race/ethnicity	Student undergraduate (nontransfer) (%)	Employee (academic and nonacademic staff) (%)	Los Angeles County, California (2020) (%)
African American	3	10.3	7.8
Asian or Pacific Islander	28	23.2	14.6
White	26	30.5	26.2
Hispanic/Latino	22	26.7	48.5
American Indian/ Alaska Native	<1	0.3	0.2
Two or more races	6	5.9	2.3
Unknown	14	3.1	NA

the "Other" category. Our findings showed that, overall, the diversity in the donor population more closely reflected the diversity of UCLA undergraduate students and UCLA employees than the LA County population. The percentage of donors that SI with a certain ethnicity/race remained relatively consistent among the seven different age cohorts. Latino/Hispanic, White (Caucasian), and Asian or Pacific Islander donors comprised the majority of the donor population and were the most represented in the undergraduate and employee populations. The average percentage of donors who SI as Latino/Hispanic in each age cohort was very similar to their representation in the student population (22% in the donor population vs. 24% in the undergraduate population) but less similar to their representation in the employee population (22% in the donor population vs. 27% in the employee population). However, for donors who SI as Caucasian, the average percentage in each age cohort outweighed their representation in the student and employee population (35% in the donor population vs. 26% in the undergraduate population and 30% in the employee population). The average percentage of donors who SI as Asian or Pacific Islander was less similar to their representation in the undergraduate population compared to their representation in the employee population (18.4% in the donor population vs. 28% in the undergraduate population and 23% in the employee population). However, if the analysis was limited to Cohorts #1–3, which represent the common ages for the majority of undergraduate students (ages 17–25), the average percentage of donors who SI as Asian or Pacific Islander more closely reflected the student representation in the undergraduate population (24% in the donor population vs. 28% in the undergraduate population).

The similarity between the diversity of the donor population and the diversity of the UCLA population (undergraduates and employees) can be explained by the different recruitment efforts by the UCLA HBDC and UCLA on-campus student-run organizations. The UCLA HBDC holds department drives for employees and monthly mobile blood drives for students at their residence halls, bringing awareness to the constant need for donations and allowing students to donate close to their housing. In addition, the center works directly with UCLA's on-campus student-run organizations to sponsor week-long blood drives during the school year, and the center's Campus Liaison provides in class announcements to remind students of the importance of donating. Other UCLA on-campus student-run organizations, such as the Bruin Blood Initiative, and University Blood Initiative, promote blood drives through flyers, booths, and social media and organize educational panels with UCLA pathologists, nurses from the center, and recipients of blood donations to answer questions and explain the urgent need for blood donations. The UCLA HBDC offers extra incentives for students and employees to donate, such as gift cards, hospital meal vouchers, or paid time, but many still donate and choose instead to donate their gifts to charitable groups such as Swipe Out for Hunger.

When we compared the diversity of the donor population to the LA County 2020 census, the three largest ethnicities (Hispanics/Latino, White, and Asian or Pacific Islander) in LA County comprised the majority of the donor population; however, Hispanic/Latino people were the most underrepresented in the donor population compared to their representation in LA County (Figure 3). Since UCLA accepts students throughout the state, as well as across the country and worldwide, and the UCLA HBDC reach only covers a portion of LA County, one of the largest counties in the United States., it is not surprising to see these differences between the diversity of the donor population and the diversity of the LA County population. In addition, this disparity could possibly be explained by socioeconomic factors, such as commuting to school or working off-campus. Undergraduate students who live on campus and have fewer obligations away

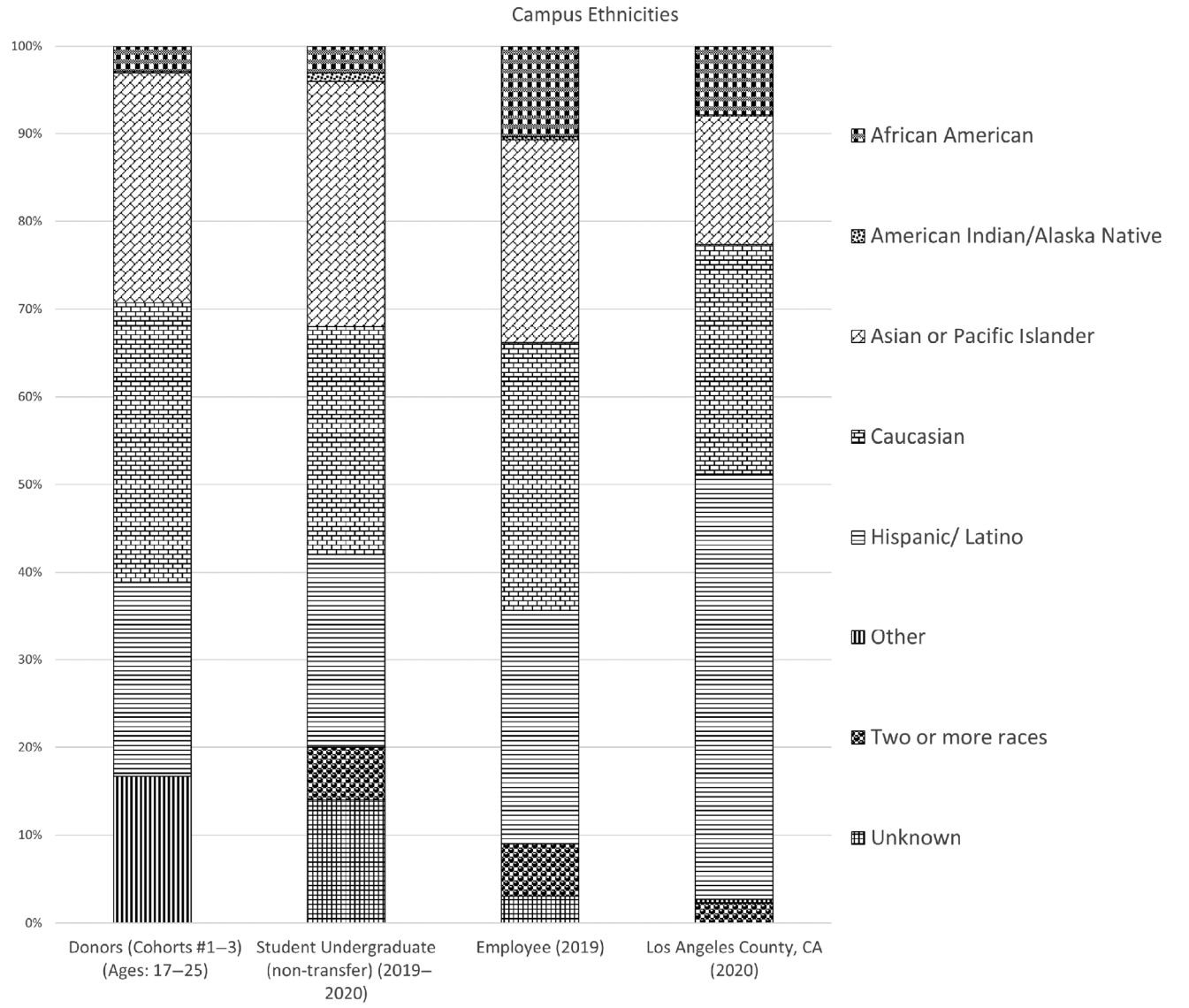

FIGURE 3 Ethnicities of campus and LA County population

from UCLA might have more available time to donate blood at one of the centers or a mobile blood drive.

Our findings at a university-affiliated HBDC contrast with the results of previous works that analyzed the donor ethnicities across the United States. In Yazer's study, which analyzed eight donor centers in 17 states from 2006–2015, the diversity of the donors never reflected the diversity in the country, with every ethnicity, besides White people, being underrepresented in the donor population. For example, in 2010, donors who SI as Hispanic/Latino and Asian, who were the second-largest and fourth-largest donor groups, comprised 8.5% and 4.9% of the donor population but represented 16.3% and 12.6%, respectively, of the US population.[10] This large underrepresentation in minority groups was not seen in the donor population at UCLA's HBDC. This may be attributed to the strong recruitment efforts mentioned earlier, such as the center working with student-run organizations to sponsor week-long blood drives and educational panels that target UCLA students and employees. The close proximity of UCLA's HBDC also increases the ease with which UCLA students and employees can donate on campus.

Our results showed that older cohorts donate more often than younger cohorts. This trend supports past studies' data, such as the study by Ritter et al. that collected data from all blood and plasma donation facilities in Germany from 2006 to 2010. In this large study, Ritter and colleagues reported the correlation between increasing age and increasing donation frequency in blood donors.[11] Shaz and colleagues who studied blood donors in Atlanta also concluded that younger donors donated

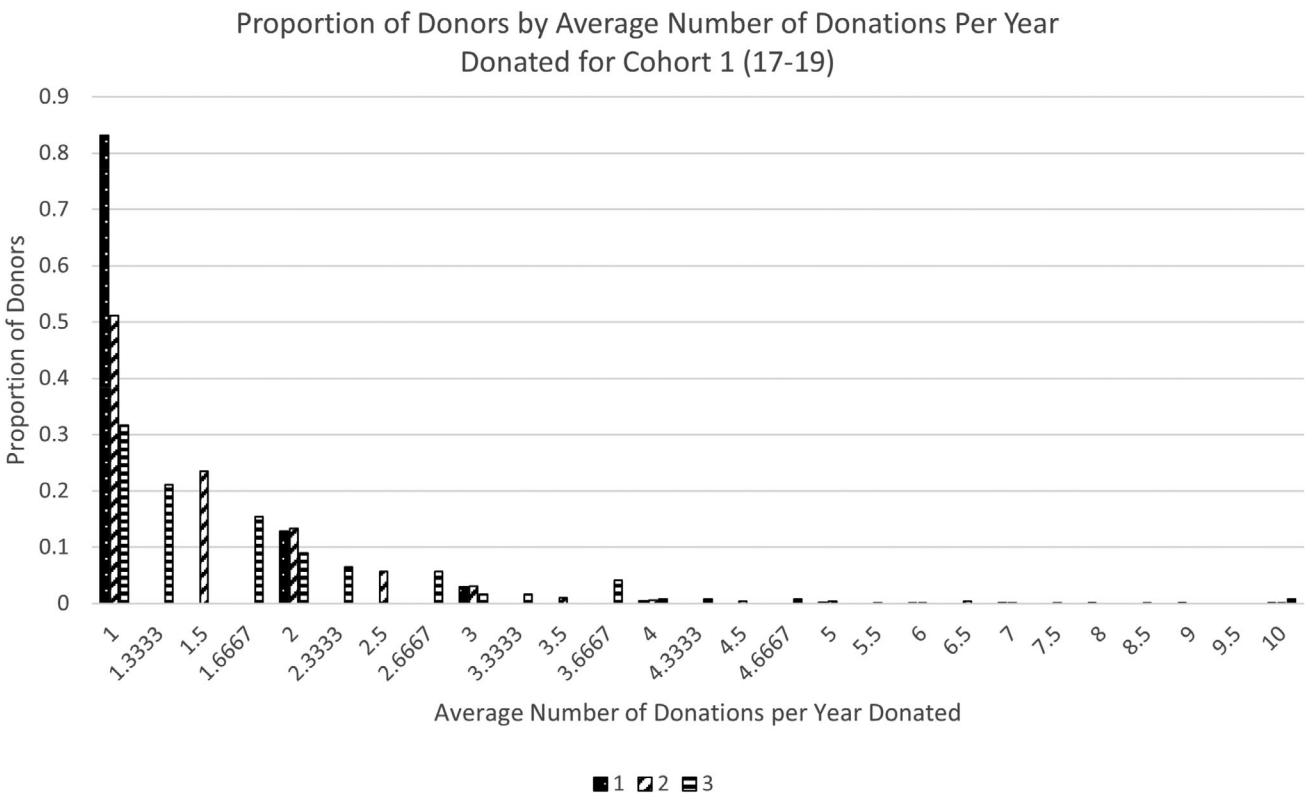

FIGURE 4 Average donations per number of years donated, cohort #1 (17–19 years of age), January 2014–2019

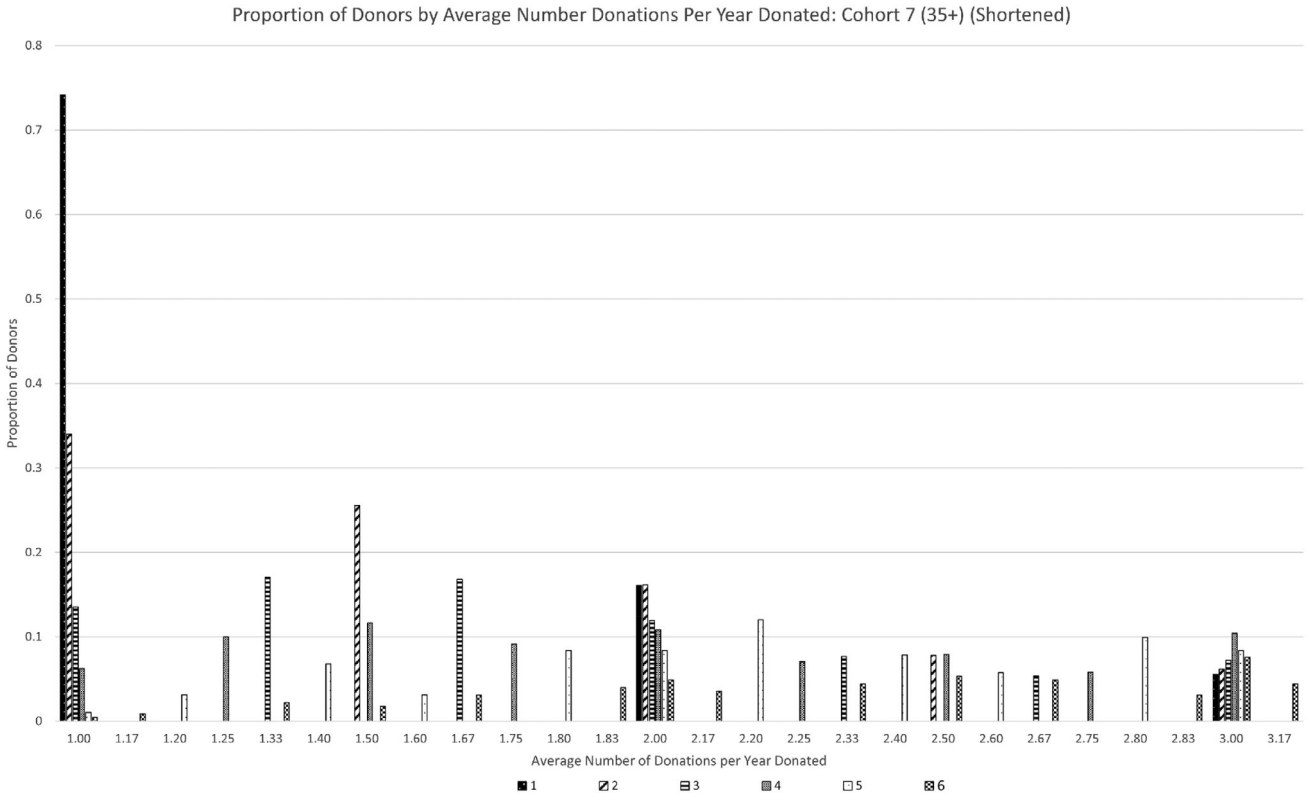

FIGURE 5 Average donations per number of years donated, cohort #7 (35+ years of age), January 2014–2019 (shortened)

less frequently than older donors.[12] Similarly, our study results showed that the proportion of donors is inversely correlated to the average number of donations per year (Figures 4 & 5). In the youngest and oldest cohorts, the donors who returned to donate more than 1 year were more likely to donate more frequently each year. This emphasized the value of converting FTD to RD across all ages, especially younger donors.

Our study is significant since UCLA is a university-affiliated HBDC. HBDCs pose multiple advantages compared to community blood centers. The presence of HBDCs may motivate more individuals to donate blood or donate more frequently. The center is physically located closer to their classes, campus activities, or homes. Their blood donations are predominately used to support patients at UCLA hospitals, which may promote and enhance a sense of community within the UCLA population.

For ensuring a sufficient blood supply, it is necessary to explore additional strategies to improve blood collections. Even with the recruitment efforts among the students, such as student on-campus mobile blood drives and class announcements, we saw that younger cohorts tended to donate less frequently than older cohorts. To create a sustainable donor population, university-affiliated HBDCs need to incentivize younger donors to donate more frequently. For example, a reward system that offers better incentives to returning donors or a greater emphasis on promoting frequent blood donations in the first year of undergraduate study could be implemented. Besides working with UCLA on-campus student-run organizations, the UCLA Blood & Platelet Center should also work with UCLA on-campus ethnic associations/clubs to sponsor week-long blood drives to maintain the similarity between the diversity of the donor population and the diversity of the UCLA population. Also, to increase donation frequency, recruitment and donation education could be incorporated into undergraduate events, such as freshman year orientation or involvement fairs. It's important to capture the incoming UCLA students who have donated in high school and transition them into UCLA donors before they lose their passion for donating and become too busy with other obligations. By attending undergraduate events, we can convert high school donors into college donors, increase the number of FTD, and transform FTD to RD. Understanding the unique characteristics of the surrounding donor populations may help create a more sustainable pool of donors for HBDCs.

There are several limitations to this study. First, the data collection was retrospective. Further, uncontrollable events, such as wildfires, earthquakes, campus events, etc., occurred in the years from 2014 to 2019, which may have affected blood donations. In addition, because the donor survey included three additional ethnicities for donors to identify with (Filipino, Indian, and Middle Eastern), some overlap and reporting errors could have occurred. Also, equating White with Caucasian and Black with African American from different surveys may have led to additional reporting errors. Future studies may analyze the events that occurred each year within the greater Los Angeles area and their potential influences on blood donations. Last, graduate students at UCLA were not identified and classified in this study. Future studies may identify and compare undergraduate, graduate, and employee blood donors. To further elucidate imbalances in the number of blood donations among the different cohorts and genders, other factors such as changes in hemoglobin levels, nutrition status, donor reactions, and other modifiers of donation success during blood donors' undergraduate education may be analyzed.

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CONFLICT OF INTEREST

The authors have disclosed no conflicts of interest.

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