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Improving the fragile US supply of blood

For a system that relies on the altruism of contributors, an aging class of donors and changing attitudes put the nation's blood supply at risk.

by Abhi Satyavarapu and Dilip Wagle

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A little more than a year ago, Independence Day weekend in 2019 passed with few people in the Pacific Northwest aware of the health risk looming ahead of them. It wasn't the COVID-19 pandemic, though that, too, was just months away. Rather, it was the United States' perilously low stockpile of blood and blood products that put the Pacific Northwest's workforce and their families at risk.

In spite of impressive steps to reduce the need for blood through the use of minimally invasive surgeries, the amount of blood collected through donations had been falling for decades. And in Seattle, a local blood bank, Bloodworks Northwest, tells us that stocks were nearly depleted for the first time in its 75-year history—even in the absence of a crisis.

Then the COVID-19 pandemic hit. By July 2020, the American National Red Cross had already canceled nearly 40,000 blood drives and had seen more than a million fewer blood donations.[1] Just as abruptly, as lockdowns lifted, demand surged as hospitals raced to perform a backlog of delayed procedures.[2] Supplies fell so low that some blood-collection centers went as far as advising hospitals to delay elective procedures.

The risks for the nation and its workforce are eye opening. In the Southeast, one bad hurricane, in what is expected to be a busy season for hurricanes, could force doctors and hospitals to ration blood.[3] In the Pacific Northwest, one magnitude-nine earthquake could deplete blood inventories in a matter of hours.[4]

Like the novel coronavirus itself, a blood shortage is a risk to the lives and livelihoods of US residents. And even if the pandemic were resolved tomorrow, trends in blood-donor demographics and attitudes would continue to put the stability of the country's independent blood-supply system at risk. Replenishing and sustaining blood supplies can't be achieved by not-for-profit collection centers alone. Companies, blood centers, medical facilities, and local governments all have a role to play.

Together with Bloodworks Northwest, we looked into the challenges faced by blood centers. In the absence of nationwide databases, we supplemented that research with our own survey of blood donors in Oregon and Washington State.[5] The findings are illustrative of the nationwide blood-management system, and we believe the lessons learned will be applicable in most states.

Demand moderates, but supply falls

Every year in the United states, nearly 21 million blood components (red blood cells, platelets, and plasma) are transfused,[6] extending and improving the lives of more than four million Americans.[7] Blood is used for a wide spectrum of healthcare services: surgery, cancer, trauma, maternal hemorrhage, organ transplantation, and various other acute and chronic health conditions all require blood transfusions.

If there is good news in the story, it's that the demand for blood has steadily decreased over the past decade. From 2000 to 2020, the transfusion rate per capita in the United States has decreased by 2 percent per year.[8] That decline follows revisions to transfusion guidelines from professional medical societies to reduce the overall number of blood units used in various procedures. Advances in less invasive surgeries and pharmacologic agents have also helped reduce the need of transfusions in select situations.

[1] A. Pawlowski, "Red Cross urges COVID-19 survivors to donate convalescent plasma to prevent shortage," TODAY, July 23, 2020, today.com.
[2] Christopher Flavelle, "Red Cross warns of a 'staggering' drop in blood supplies," *New York Times*, June 2, 2020, nytimes.com.
[3] Ibid.
[4] John R. Hess, "Cascadia rising: Thoughts on a Seattle earthquake disaster exercise," *TRANSFUSION*, November 2018, Volume 58, Number 11, pp. 2736–40, onlinelibrary.wiley.com.
[5] The survey of 2,205 panelists aged 15 and over, conducted in March 2020, was diversified to reflect age, race, and sex demographics.
[6] "Blood needs & blood supply," American National Red Cross, September 9, 2020, redcross.org.
[7] "Blood facts," Community Blood Center, September 9, 2020, givingblood.org.
[8] National Blood Collection & Utilization Survey.

Yet those transfusion efficiencies have been offset by an increased demand because of population growth. In the Pacific Northwest, the number of transfusions required per capita has fallen, but the demand for blood has remained steady because of population growth in Oregon and Washington State. Moreover, the volume of blood collected from donors has declined. Exclusion criteria—health concerns, pregnancy, and recent donation, for example—are more stringent. And while more people may be eligible to donate because the US Food and Drug Administration has relaxed its donor criteria, donors are still often confused about their eligibility.

As a result, despite moderating demand, blood inventories around the nation have reached critical levels. In the Pacific Northwest, the decline in blood donation, coupled with population growth, has caused blood stocks to dip to critical levels more frequently than seen ten years ago (Exhibit 1). And inventories now routinely fall to critical levels—or less than two days of blood on hand. For example, Bloodworks Northwest was at critical inventory levels of at least one blood type for more than 80 percent of 2019.

At a national level, assuming no change in the current trends in blood use and expected donations, blood rationing could well become commonplace. That would force medical providers to make difficult decisions about which patients will and won't receive needed transfusions.

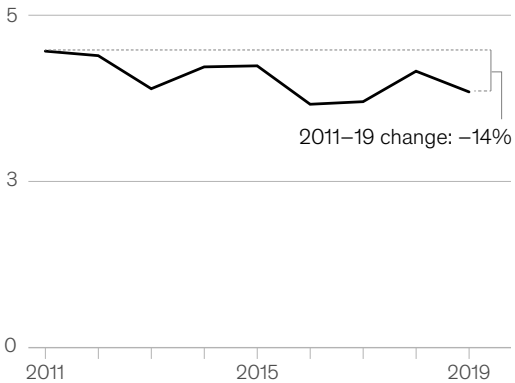
Donor demographics: The aging of the donor pool

The most notable cause of the lower number of blood donations is the result of shifting demographics. In the Pacific Northwest, for example, donors aged 45 and older account for 63 percent of the total blood volume collected from repeat donors. But baby boomers are aging out of the donor pool, and first-time donors aren't replenishing their ranks (Exhibit 2). In fact, new-

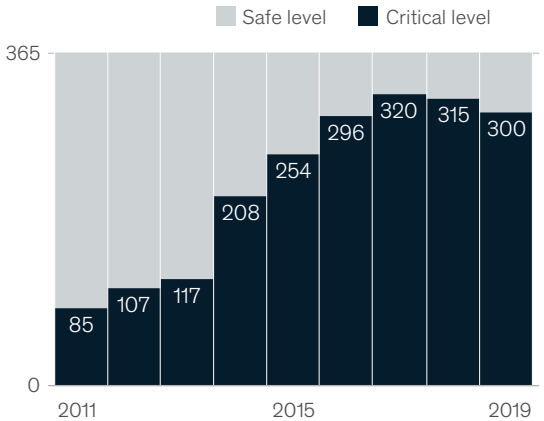
Exhibit 1

The supply of blood in recent years has fallen below critical levels around 300 days per year.

Average inventory of daily red blood cells,[1] thousands of units



Inventory status levels,[2] days per year



[1]Includes all red-blood-cell blood types.
[2]Safe inventory level defined as day on which inventory for all blood components was above critical threshold (ie, at least 2 days on hand). Threshold values are specific to each blood type.
Source: Bloodworks Northwest

donor recruitment has declined every year for the past four years, primarily driven by public misconceptions on blood needs and donation[9] and a lack of investment in acquiring new donors. In a survey we conducted of roughly 2,200 Oregon and Washington State residents,[10] only around a third of respondents aged 16 to 24 report having previously donated blood.

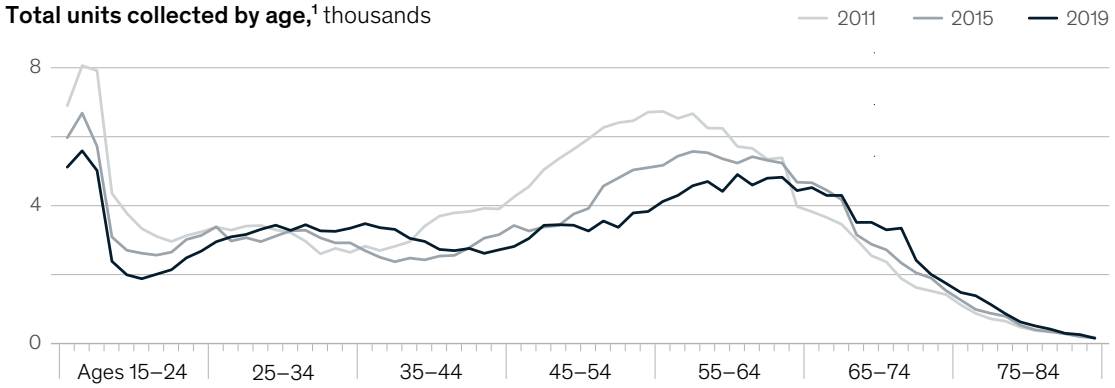
When millennials and Gen Zers do donate, they donate less than baby boomers and Gen Xers do, and younger donors donate less frequently. By volume, the expected average numbers of donations in a five-year period are 2.3 from people aged 15 to 24, 4.5 from people aged 55 to 64, and 5.6 from people aged 65 and older. As a result, blood units from first-time donors fell from around 39,000 units in 2011 to around 29,000 units in 2019.

Moreover, as we saw in the Pacific Northwest, the makeup of the donor pool often doesn't reflect the diversity of the local population.[11] The numbers of donations are down in all ethnic groups, including Black Americans, but especially among the area's fastest-growing populations, Asian Americans and Latin Americans (Exhibit 3). Nationwide, that trend poses a long-term problem for the safety and reliability of blood supplies.

When blood types don't match phenotypically, patients are at a higher risk of developing complications from transfusion therapy. Donor diversity needs to match patient diversity, as certain rarer blood types are unique to specific ethnic groups. Blood type B positive, for example, is found in only 8 percent of the total population, so it's fairly uncommon. But it's three times more common in Asian Americans and more than twice as common in Black Americans. An ever rarer blood type, AB positive, is found in only 3 percent of the general population but in 7 percent of Asian Americans and 4 percent of Black Americans. The most common blood type, O positive, is also more common in Asian, Latin, and Black Americans—but it's also the one most frequently in short supply.

Exhibit 2

As older donors lose eligibility, younger ones are not replenishing the donor pool.

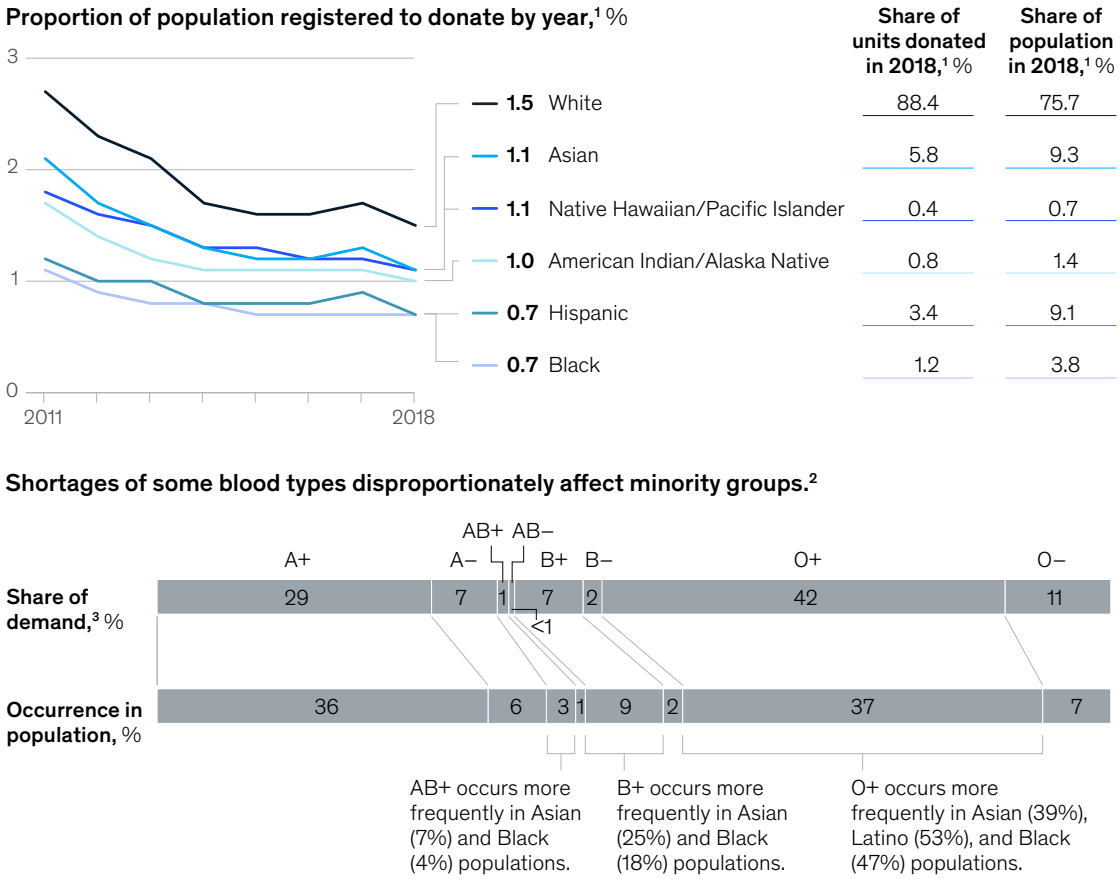


[1]Includes all blood types and blood components (red blood cell, plasma, and platelets).
Source: Bloodworks Northwest

[9] According to American National Red Cross Cascades Region spokesperson.
[10] Demographically balanced with the most recent census data to ensure a representative sample for age, ethnicity, and gender within the states of Oregon and Washington.
[11] A 2016 survey of 42 blood-donation centers around the world concluded that ethnic and racial minorities are underrepresented in most developed countries.

Exhibit 3

Blood donations are declining among all races and ethnic groups.



Note: Data above do not include "2 or more races" or "other" categories.
[1]Only includes population served by Bloodworks Northwest, ie, people in counties in Washington and Oregon with Bloodworks fixed donation centers and/or 5+ mobile blood drives in the calendar year.
[2]Figures may not sum to 100%, because of rounding.
[3]Share of total units shipped to Bloodworks Northwest customers in 2019.
Source: Bloodworks Northwest; Stanford Blood Center; US Census Bureau

Donor attitudes

Many blood centers struggle financially, and few have the staff, technology, or funding needed to support research on donor-pool expansion. To understand more, we surveyed around 2,200 residents aged 15 and older in the states of Oregon and Washington[12] to determine some of the drivers behind blood donation (or lack thereof) and to unearth interventions to promote donations in critical segments. Nearly 15 percent of survey respondents say they had donated in the prior 12 months, while around 10 percent say they had never considered donating. The difference in attitudes and behaviors between active and nonactive donors is striking—and offers insight into how and where blood banks might most effectively target their efforts to increase donations.

[12] Demographically balanced with the most recent census data to ensure a representative sample for age, ethnicity, and gender within the states of Oregon and Washington.

By hosting virtual campaigns for customer and employee blood drives, companies have a unique opportunity (and arguably, a responsibility) to help blood centers quickly reach large audiences.

Active blood donors, for example, are around 25 percent more likely than nonactive donors to report being involved in their communities, sociable with friends and colleagues, and good role models. Around 65 percent of them see blood donation as a social responsibility and are actively willing to donate if there is an urgent event. One reason those donors don't donate more often is that the process can be inconvenient in the amount of time it takes or the locations of donation sites. Investing in convenience will likely be a key factor in increasing donations from active donors.

In contrast, four out of five nonactive donors don't see blood donation as a social responsibility and are unaware of their local blood banks. More than two in five of them don't know anyone who has ever needed a transfusion. Moreover, their reasons for not donating are often grounded in fear. Three of the top four reasons they give for not donating are fear of blood draw, concern about donating during a pandemic, and worry about a negative reaction after blood draw.

Potential interventions

In the United States, blood that is transfused into a patient must be donated. It can't be purchased—and there is no artificial or synthetic blood. So the entire blood-supply system hinges on the altruism of donors. To ensure a safe and stable supply in the future, companies, blood centers, local groups, and governments must promote continued engagement with the current network of blood suppliers while also educating and engaging with stakeholders to support research to reduce dependency on blood. Strict use and abundant provision of personal protective equipment will naturally be essential for all in-person interactions.

Companies

Even in a pandemic, corporations can play a more active role in partnering with their local blood banks. Active and nonactive blood donors frequently cite convenience and social pressure as core drivers in promoting increased donation rates. By hosting virtual campaigns for blood drives, companies have a unique opportunity (and arguably, a responsibility) to help blood centers quickly reach large audiences in the areas most convenient for them.

Partnering with local blood banks provides a meaningful avenue for companies to contribute to their own communities. And often, it's a low-effort commitment, given that blood banks will typically take the lead in marketing and staging blood drives that accommodate physical distancing. With some companies, for example, Bloodworks Northwest has discussed including donations in employee-wellness programs, providing civic pay for those who donate blood, and measuring employee participation as part of the organization's social impact.

Blood centers

Once a blood donor is recruited, blood centers need to focus on convenience, such as flexible scheduling and mobile locations near workplaces and in residential neighborhoods. Instead of sending general reminders on the importance of donation, organizations could target their communication efforts to remind donors when they will be eligible to donate again. Outreach to engaged donors is more likely to increase donations, so those should take priority. Additionally, blood-donation advocacy is most effective when it is powered organically—either through word of mouth or social media.

Across all segments, our survey respondents list a sense of urgency as the top feature to get them to donate blood. In a comprehensive test on improving the blood-donation experience, two of the top three features are "specific requests for my blood type when it's in high demand" and "notifications when the need for blood is not being met and supply is dropping to critical levels." Those results indicate that establishing a direct line of communication that recipients trust can be a powerful tool for incentivizing donations.

Blood centers should encourage donors to share their experiences on social-media channels such as Instagram, Facebook, and Twitter and provide current donors with incentives to invite their friends and families to donate. Email messages are more effective for existing donors; nonactive donors are less likely to be receptive to them. Nonactive donors cite physical ads, such as on billboards, subway cars, and the sides of buses, as the communications that most often remind them of blood-donation need, though those channels are clearly less effective during a pandemic and associated lockdowns.

Schools, religious institutions, and community organizations

Local groups have major roles to play, as they have for decades, in making their constituents aware of the social responsibility to give blood. But although schools continue to host blood drives, data indicate that the number of repeat donors falls off as students graduate—and remote learning may further inhibit donations. Additionally, schools aren't very practical locations for blood drives during a pandemic, when they aren't necessarily open and the health and safety of students and teachers are of paramount importance.

Recognizing the current challenges, blood centers could keep connecting with local-group alumni to help keep the issue top of mind in the appropriate moment. Schools, religious institutions, and other organizations could also develop virtual and online groups over social media. Such groups, led by "blood champions," could provide news and contests related to blood donation.

Governments

Government funding of blood-related research, in addition to the maintenance of ongoing donation operations, will likely be needed for long-term sustainability of the US blood-supply system. Statewide coordination and policy may also help with emergency planning for key supplies. They could relieve some pressure on blood centers, which are trying to balance inventories to account for major disasters. For example, even having public officials endorse blood donation as a safe and essential activity has been critical over the past months and has helped raise awareness around the need. Such organizations may not have on-demand visibility outside of the hospitals they serve.

Maintaining an adequate blood supply is a solvable problem. Over the past year, Bloodworks Northwest put a variety of the strategies described in place, reversed the trend, and maintained robust blood stocks during the COVID-19 pandemic. But the pandemic has also elevated public awareness of the issue and the desire to do something to make a difference. A broad range of stakeholders will be needed to sustain that momentum before the next catastrophic event occurs.

Abhi Satyavarapu is a consultant in McKinsey's San Francisco office, and **Dilip Wagle** is a senior partner in the Seattle office.

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