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Syphilis Seroprevalence and Incidence in US Blood Donors from 2020 to 2022

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Abstract

Background—HIV, HBV, and HCV infections for ~60% of the US blood supply are monitored by TTIMS with syphilis added in 2020.

Study Design and Methods—Data were compiled from October 2020 to September 2022. Syphilis prevalence was estimated for allogeneic and directed donors who were consensus positive (CP) and the subset of those with confirmed-active infections (AI). Prevalence and incidence were stratified by demographics for two consecutive 1-year periods, starting October 1, 2020 and for both years combined. Incidence was estimated for repeat donors. Associations between syphilis positivity and other infections were evaluated.

Results—Among 14.75 million donations, syphilis prevalence was 28.4/100,000 donations and significantly higher during the 2nd year compared to the 1st year. Overall, syphilis incidence for the two-year period was 10.8/100,000 person-years. The adjusted odds of a CP infection were 1.18 (95% CI: 1.11, 1.26) times higher in the 2nd year compared to the 1st, and for AI, 1.22 (95% CI: 1.10, 1.35) times higher in year 2. Highest rates occurred among males, first-time, Black, and younger (ages 18–39) donors, and those in the South US Census region. Syphilis CP donors were 64 (95% CI: 46, 89) times more likely to be HIV CP, and AI donors 77 (95% CI: 52, 114) times more likely to be HIV CP than non-CP donors, when controlling for confounders.

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Conflict of Interest Statement

The authors have disclosed no conflicts of interest.

Summary/Conclusions—Syphilis prevalence increased over the study period mirroring national trends reported by CDC and is significantly associated with HIV CP.

Keywords

blood safety; syphilis; prevalence; incidence; transfusion-transmitted infections

Background

Syphilis is an infectious disease caused by the spirochete bacterium *Treponema pallidum* and has the potential to be transmitted via blood transfusion. Blood donation centers in the United States have screened for syphilis since the 1950's.[1] There has not been a documented case of transfusion-transmitted syphilis for over 50 years and some have questioned the actual infectivity of a test-reactive blood donation.[2] Regardless, routine serologic testing is performed pending evidence to show that transfusion-transmitted syphilis is not a risk to recipients, or pathogen inactivation for all components is available. Syphilis testing may contribute to disease monitoring for overall public health and benefit infected donors by informing them of their potential infection so that they may seek appropriate treatment and to prevent further transmission.

The Transfusion Transmissible Infections Monitoring System (TTIMS) monitors infectious disease and demographic changes in donors contributing approximately 60% of the US blood supply including at four major blood collection organizations (i.e., the American Red Cross (ARC), New York Blood Center Enterprises (NYBCe), OneBlood, and Vitalant).[3] Since October of 2020, syphilis infection markers, along with other modifications, have been included in TTIMS (called TTIMS2). This study reports the prevalence and incidence of syphilis infection over the first two-year period of TTIMS2, overall and by demographics and other risk factors, as well as the correlation of syphilis infection with other transfusion-transmissible infections (TTI).

Study Design and Methods

Data Source

TTIMS2 data from October 1, 2020, to September 30, 2022, were compiled for the study. Only donors of allogeneic (including COVID-19 convalescent plasma) and directed donations with valid test results for monitored infectious disease markers (syphilis, HBV, HCV, or HIV) were included in the analysis.

Demographics and Donor Characteristics

Donor demographics are from self-reported characteristics including sex, age group, race/ethnicity, and US Census region defined at the time of donation. We grouped sex as male or female, and divided age into the following groups: 16–17, 18–24, 25–39, 40–54, and 55 and older (capped at 105 years old). We grouped race/ethnicity as: White, Black, Hispanic/Latino, Asian, American Indian, more than one race, other, and missing/blank, and we defined geographic region using four US Census Regions: Midwest, Northeast, South, and

West based on zip code of residence.[3] We categorized donations as either first-time or repeat based on whether the donor had previously donated blood, looking back to September 2010.

Infection Definitions

We defined a donation as consensus positive (CP) for syphilis if screening reactive on the PK automated agglutination system for the detection of *Treponema pallidum* antibodies and equivocal or positive on the confirmatory CAPTIA™ Syphilis (*T. pallidum*)-G EIA (Trinity Biotech, Jamestown, NY). For the PK-TP System (Fujirebio, Inc., Tokyo, Japan), the PK7300 Automated Microplate System (Beckman Coulter, Brea, CA) was used between October 2020 and May 2022 and after that, testing transitioned to the TP HA REAGENT antibody screening test (Newmarket Biomedical Ltd., Kentford, UK) on the PK7400 Automated Microplate System (Beckman Coulter); both systems yield identical test performance.[4] The PK-TP and TP HA tests detect IgM or IgG and CAPTIA™ EIA detects IgG antibodies to *T. pallidum*. Detection of treponemal antibodies may indicate a recent, past, or successfully treated infection.[5] Donations reactive for the first antibody screen but not positive or equivocal for the CAPTIA confirmatory test were classified as false positive and not included as cases. All testing was performed by Creative Testing Solutions for samples fromARC, Vitalant, and OneBlood. Samples from NYBCe were tested within their network.

A donation was considered an active infection (AI) if a syphilis CP donation further tested positive on a rapid plasma reagin (RPR) test (Arlington Scientific, Springville, UT). A positive result for reagin indicates a recent infection at 3 to 6 weeks after initial infection.[6] Further dilutions are not performed as part of routine blood center testing as the donor is deferred by the equivocal or positive result on the CAPTIA confirmatory test. However, further dilutions would be required to determine if a prozone is present in a very high-titer sample, albeit rare in asymptomatic individuals. Donations from NYBCe were not included in syphilis AI rates as the blood center was not using the RPR test during the first year of the study.

Statistical Methodology

Syphilis prevalence was calculated for donations and was stratified by the first (October 1, 2020-September 30, 2021) and second year (October 1, 2021-September 30, 2022) of TTIMS2, and Fisher's Exact Test was used to assess differences overall and among demographic groups. Significant differences between strata were determined using Bonferroni correction to the 0.05 p-value. Infection prevalence was calculated as the number of syphilis CP cases per 100,000 donations. Infection incidence was calculated for the full two-year period using the classic method previously described[5] for which the numerator consisted of the number of repeat donors who had seroconverted from negative to positive during the two-year period and the denominator consisted of total person-time for negative repeat donors in the two-year period, and half of the inter-donation interval for seroconverting donors.

We used logistic regression to estimate the odds of a syphilis positive donor in the second year versus the first, using a donor-based dataset with both first-time and repeat donors. For

this analysis, a donor's last donation was included for each individual year to create a donor dataset, and if they were a syphilis CP donor, the donation chosen was their first positive donation. The crude odds ratio measured the odds of a donor being positive (as opposed to negative) for syphilis during the second year of the study versus a donor being positive for syphilis in the first year of the study. The adjusted odds ratio measured the same association after controlling for sex, age group, race/ethnicity, donor status, and US Census Region.

Because demographics and risk factors associated with syphilis infection may be common with other infections monitored as part of TTIMS2, relationships between syphilis and HIV, HBV and HCV were investigated. For this analysis, a donor's last donation in the two-year period was included to create a donor dataset, which would include a syphilis CP donors' positive donation and for syphilis CP donors with two positive donations the first positive donation was chosen. Logistic regression was also used to quantify the crude and adjusted odds between syphilis and HIV, HBV, and HCV prevalence with the same adjustment variables. HIV, HBV, and HCV prevalence was calculated using donations that were classified as CP, which includes concordant positives (nucleic acid and antibody reactive), NAT-yield confirmed positives (antibody nonreactive) and HIV low-level NAT confirmed positives (NAT-nonreactive by mini-pool NAT but independently anti-HIV confirmed positive).[3]

All analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC).

Results

There were 14,747,489 donations in the final dataset, with 7,576,645 in the first year of the study and 7,170,844 during the second year (Table 1). There were 16 donors, who had two syphilis positive donations; both donations of each of these donors were counted in prevalence estimates (donation based), but only the first positive donation was chosen for donor-based analyses (incidence and regression analyses) within a given time frame (one year or two years). Six of these double positive donations occurred due to frequent repeat donors returning to donate before being notified of infection and deferred, and the rest were a mixture of donors returning for a variety of reasons (Table 2). The syphilis CP prevalence for the two-year period was 28.4 per 100,000 (PHT) donations. There was a significant increase in syphilis CP prevalence in donations in the second year (32.1 PHT) compared to the first year (25.0 PHT) ($p<0.0001$). Stratification by sex, age group, race/ethnicity, donor status and geographic area showed a significant increase in prevalence among donations from donors who were both male and female, aged 18–24, 25–39, 40–54, and 55 and older, White, Black, and Asian, first-time and repeat donors, and living in the Northeast, South, and West US Census regions in the second year. The highest rates occurred among male, first-time, Black, and younger (ages 18–39) donors, and those in the South.

The syphilis AI prevalence (Table 3) for the two-year period was 11.7 PHT donations. There was a significant increase in syphilis AI prevalence in donations in the second year (13.4 PHT) compared to the first year (10.0 PHT) ($p<0.0001$). Stratification by sex, age group, race/ethnicity, donor status and geographic area showed a significant increase in syphilis AI prevalence among donations from donors who were both male and female, aged 18–24,

25–39, and 40–54, White, first-time and repeat donors, and living in the South US Census region in the second year. As true for syphilis CP donors, the highest rates for AI donors occurred among males, first-time, Black and younger (ages 18–39) donors, and those in the South.

Syphilis CP and AI prevalence plotted by quarter show a steady significant increase from 24.9 PHT in quarter 4 (Q4) of 2020 to 35.8 PHT in Q3 of 2022 (p=0.0012), and from 8.9 PHT in Q4 of 2020 to 17.4 PHT in Q3 of 2022 for syphilis AI prevalence (p=0.0052) (Figure 1).

Syphilis CP repeat donor incidence per 100,000 person-years (PY) was 10.8 (95% CI: 9.6, 12.0) for the full two-year period. The highest incidence was observed among donors who were male, aged 18 to 39, Black, and from the South (Table 4).

Logistic regression models further quantified the increased presence of syphilis positive donors in the second year of the study compared to the first year. The odds of a syphilis CP donor were 1.25 (95% CI: 1.18, 1.33) times more likely during the second year of the study compared to the first year (Table 5). When adjusting for sex, race/ethnicity, region, age group, and donor status, the odds ratio remained significant at 1.18 (95% CI: 1.11, 1.26). The odds of a syphilis AI positive donor were 1.31 (95% CI: 1.18, 1.44) times more likely during the second year of the study compared to the first year (Table 5). When adjusting for sex, race/ethnicity, region, age group, and donor status, the odds ratio remained significant at 1.22 (95% CI: 1.10, 1.35).

We assessed associations between syphilis and other TTI markers over the two-year period (Table 5). Of the eligible 4174 syphilis CP donors (who also had test results for HIV), there were 62 donors who were HIV CP (1.5%) compared to 211 HIV CP donors among 5,381,325 donors negative for syphilis (0.004%) for the two-year period. Quantified by logistic regression, a syphilis CP donor was 384 times (95% CI: 289, 511) more likely to also be HIV CP compared to a donor without syphilis. After adjusting for sex, race/ethnicity, region, age group, and donor status, the odds were 63 (95% CI: 45, 88) times more likely that a syphilis CP donor was also HIV CP. Of the 1544 syphilis AI donors, there were 37 donors who were HIV CP (2.4%) compared to 223 HIV CP donors in the 4,854,339 donors (excluding NYBCe donors) who did not have syphilis AI (0.005%) for the two-year period. Quantified by logistic regression, a donor who had a syphilis AI was 534 times (95% CI: 376, 759) more likely to also be HIV CP compared to a donor who was not AI positive. When adjusting for sex, race/ethnicity, region, age group, and first-time donor status, the odds were 77 (95% CI: 52, 114) times more likely that a syphilis AI donor was also HIV CP.

HBV and HCV also had significant correlations with the syphilis infection status, though to a lesser extent. The crude odds ratios for syphilis CP and AI among HBV or HCV CP ranged from 34 to 38 times more likely that a syphilis CP or AI donor was also HBV or HCV positive. The adjusted odds ratios were all lower, ranging from 4.4 to 9.3 with the lower confidence limits all above 1.0 indicating a greater likelihood of HBV and HCV positivity for a syphilis CP or AI (Table 5) compared to a donor who was not CP or AI positive.

Discussion

The most recent national data from the US Centers for Disease Control and Prevention (CDC) show syphilis prevalence trending gradually upward over the course of the past 10 years (2012 to 2021), along with a marked increase from 40.4 PHT in 2020 to 53.2 PHT in 2021.[8] Our study reports syphilis prevalence among the blood donors from TTIMS2-participating blood centers from October 2020 to September 2022. As successful blood donors tend to be a healthier subset of the US population, because of pre-donation screening, education, and potential self-deferral, the lower syphilis prevalence rates observed as compared to national rates are expected.[9] However, it is also apparent from national syphilis prevalence that there is a recent surge in syphilis rates universally, which may explain the current trend in the blood donor population. When only ARC data were reviewed for an eight-year period to better understand trends over a longer period of time, syphilis prevalence was relatively constant until 2021, after which a significant increase was observed (data not shown), like what is shown in Figure 1. Furthermore, national syphilis prevalence stratified by demographic groups mirror many of the trends observed in this study; i.e., higher rates among donors who are male, younger (20–39), and non-white (with the exception for Asian-Americans).[8] One notable difference however, is that the Western region had the highest syphilis prevalence followed by the South in US national statistics, whereas the Southern US Census region had consistently higher prevalence in the blood donor population.

The observed associations between syphilis and HIV, HBV, and HCV in blood donors are not surprising since these sexually transmitted infections have similar risk factors. However, previous research[10] as well as this study found that syphilis testing is not an effective surrogate marker for the risk of other TTIs since most TTI-marker positive donations were not syphilis positive. For example, we found 62 HIV-CP donors who were syphilis CP versus 211 HIV-CP donors who were syphilis negative. Canada is also experiencing a dramatic increase in syphilis, but not HIV, again noting limited effectiveness of syphilis as a surrogate marker.[11] However, syphilis testing remains important as a public health measure especially since both general population and blood donor population increases in syphilis positivity are occurring. This testing is important to continue to prevent transfusion transmission (unless proven otherwise[2]), to monitor the disease trajectory, to communicate individual's knowledge of their infection status and to refer infected individuals for treatment.

Donor eligibility in the US has undergone multiple changes before and after this study. In April 2020, the deferral time-period for men who have sex with men (MSM) was changed from 12 to 3 months.[12] In addition, FDA-approved changes in donor eligibility extended to a broader range of individuals than only MSM, including (for example) women who had sex with MSM, those individuals who were tattooed or pierced, had sex in exchange for money or drugs, or engaged in nonprescription injection drug use, among others.[12] It is possible that some of these policy changes could have contributed to the observed increase in syphilis prevalence among donors, particularly since some of the policy changes include shorter deferral times for individuals who partake in high-risk sexual behaviors. However, since the rate of syphilis positivity is increasing in the general population, and blood donors are

a subset of the general population, an increase in syphilis prevalence among blood donors may be expected. Subsequently, in May 2023, FDA approved the use of an individual donor risk assessment versus a time-based deferral, implemented by TTIMS2 centers between August and October 2023.[13] TTIMS2 will assess the effectiveness of this policy change by monitoring TTI marker rates and risk factors in US blood donors.

Results from this study represent the syphilis prevalence and incidence in a large proportion of the US blood donor population. The syphilis cases identified by blood donor screening represent overall trends in the donor population and should not be interpreted as a definitive diagnosis for any specific donor. In addition, syphilis CP donors may represent positivity from a resolved infection and does not necessarily indicate a potential risk of sexual transmission. Lastly, syphilis AI donors represent individuals who have been reactive by three unique tests and therefore are unlikely to be false positive.

Strengths of the study are that this is the most representative data source for US blood donors and provides insight into their syphilis seroprevalence and incidence, and as identified in this study, parallels general population trends. TTIMS allows for identification of at-risk demographic groups who can benefit public health surveillance and help guide targeted interventions. As noted, the increasing trends for both blood donors and the general population are cause for concern. As the TTIMS2 program continues, longitudinal trends for syphilis will be continuously evaluated to better understand the trajectory of the infection in the US after adoption of new individual donor risk assessment-based donor deferral policy.

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References

1. Crowder LA, Steele WR, Stramer SL. Infectious disease screening. In: Cohn CS et al., editors. Technical manual. 20th ed. Bethesda, MD: AABB Press; 2020. P. 173–227.
2. Orton SL, Liu H, Dodd RY, et al. Prevalence of circulating *Treponema pallidum* DNA and RNA in blood donors with confirmed-positive syphilis tests. Transfusion 2002;42:94–9. [PubMed: 11896319]
3. Steele WR, Dodd RY, Notari EP, et al. Prevalence of human immunodeficiency virus, hepatitis B virus, and hepatitis C virus in United States blood donations, 2015 to 2019: the Transfusion-Transmissible Infections Monitoring System (TTIMS). Transfusion 2020;60:2327–39. [PubMed: 32869326]
4. PK7400 TP HA REAGENT Instructions for Use. Creative Testing Solutions. Web Site, https://www.mycts.org/Portals/0/Assay_PI/WholeBlood/Syphilis.pdf. Accessed November 21, 2023.
5. Halling VW, Jones MF, Bestrom JE, et al. Clinical comparison of the *Treponema pallidum* CAPTIA syphilis-G enzyme immunoassay with the fluorescent treponemal antibody absorption immunoglobulin G assay for syphilis testing. Journal of Clinical Microbiology 1999;37:3233–34. [PubMed: 10488183]
6. Henao-Martínez AF, Johnson SC. Diagnostic tests for syphilis: New tests and new algorithms. Neurology: Clinical Practice. 2014;4:114–22. [PubMed: 27606153]
7. Steele WR, Dodd RY, Notari EP, et al. HIV, HCV, and HBV incidence and residual risk in US blood donors before and after implementation of the 12-month deferral policy for men who have sex with men. Transfusion 2021;61:839–50. [PubMed: 33460470]
8. Sexually Transmitted Disease Surveillance 2021. US Centers for Disease Control and Prevention. Web Site, https://www.cdc.gov/std/statistics/2021/figures.htm. Accessed August 17, 2023.
9. Atsma F, Veldhuizen I, Verbeek A, et al. Healthy donor effect: its magnitude in health research among blood donors. Transfusion 2011;51:1820–8. [PubMed: 21342203]

10. Zou S, Notari EP, Fang CT, et al. (2009). Current value of serologic test for syphilis as a surrogate marker for blood-borne viral infections among blood donors in the United States. Transfusion. 2009;49:655–61. [PubMed: 19170999]

11. O'Brien SF, Drews SJ, Yi QL, et al. (2023). Monitoring syphilis serology in blood donors: Is there utility as a surrogate marker of early transfusion transmissible infection behavioral risk? Transfusion. 2023;63:1195–203. [PubMed: 37158235]

12. Revised recommendations for reducing the risk of human immunodeficiency virus transmission by blood and blood products. US Food and Drug Administration. Web Site, https://collections.nlm.nih.gov/catalog/nlm:nlmuid-9918227270706676-pdf. Accessed August 17, 2023.

13. Recommendations for Evaluating Donor Eligibility Using Individual Risk-Based Questions to Reduce the Risk of Human Immunodeficiency Virus Transmission by Blood and Blood Products. US Food and Drug Administration. Web Site, https://www.fda.gov/regulatory-information/search-fda-guidance-documents/recommendations-evaluating-donor-eligibility-using-individual-risk-based-questions-reduce-risk-human. Accessed August 17, 2023.

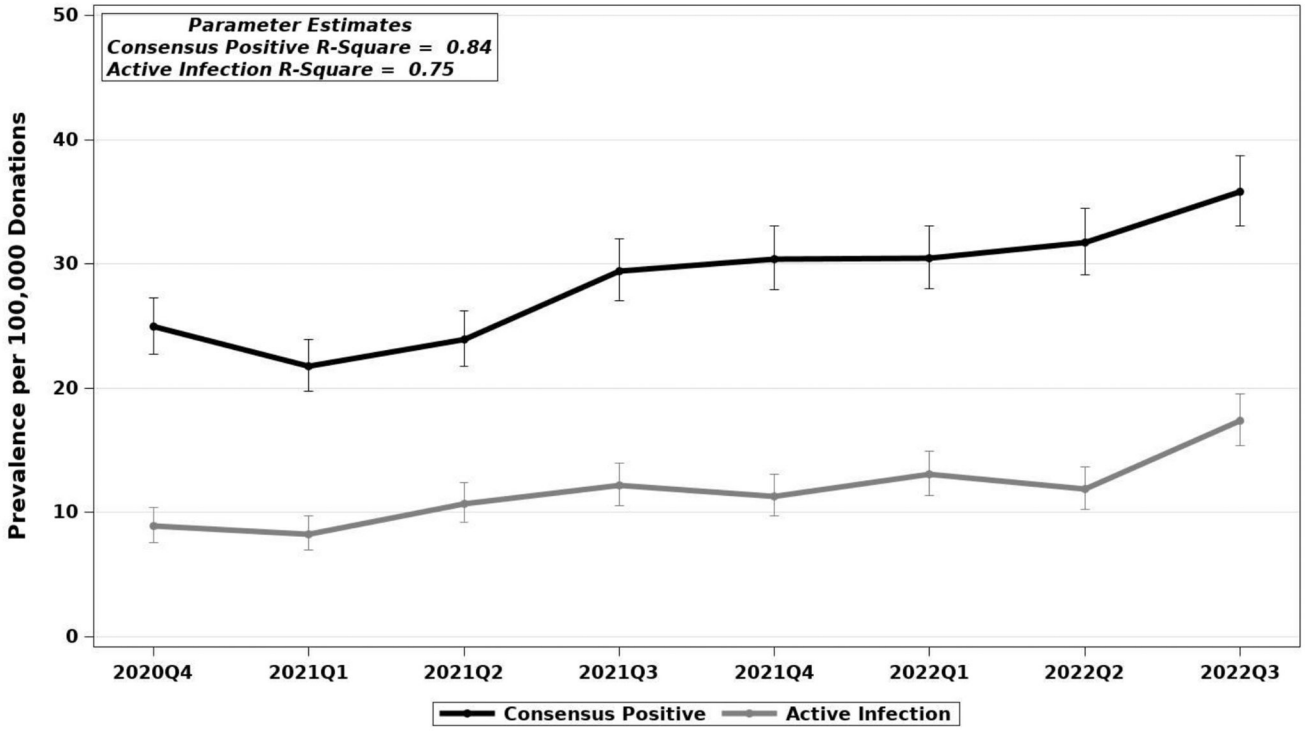

Figure 1.

Syphilis Consensus Positive and Active Infection Prevalence PHT Donations in TTIMS2, October 2020 to September 2022

Table 1.

Syphilis Consensus Positive Prevalence per 100,000 Donations by Year, TTIMS2

	Consensus Positive			
	Year 1[1]	**Year 2**	**Overall**	**Fisher's Exact Test**
Number of Donations	7,576,645	7,170,844	14,747,489	Significance between Year 1 and Year 2 (p)
	(N)	(N)	(N)	
Overall	25.0 (1,893)[2]	32.1 (2,301)	28.4 (4,194)	<.0001
Sex				
Female	15.1 (589)	20.6 (740)	17.7 (1,329)	<.0001
Male	35.6 (1,304)	43.6 (1,561)	39.6 (2,865)	<.0001
Age				
16 to 17	12.7 (16)	23.8 (59)	20.0 (75)	0.03*
18 to 24	30.5 (136)	48.7 (217)	39.6 (353)	<.0001
25 to 39	38.5 (540)	55.7 (670)	46.4 (1,210)	<.0001
40 to 54	29.1 (584)	35.6 (626)	32.2 (1,210)	0.0004
55 to 105	17.2 (617)	20.7 (729)	18.9 (1,346)	0.0006
Race/Ethnicity				
White	13.5 (890)	16.6 (1,011)	15.0 (1,901)	<.0001
Black	247.6 (436)	302.9 (614)	277.2 (1,050)	0.001
Hispanic/Latino	94.9 (395)	97.4 (431)	96.2 (826)	0.7
Asian	25.1 (46)	43.5 (88)	34.7 (134)	0.002
American Indian	43.0 (10)	68.8 (16)	55.9 (26)	0.3
>1 Race	45.0 (26)	57.7 (34)	51.4 (60)	0.4
Other	47.0 (21)	56.6 (26)	51.8 (47)	0.6
Blank	74.1 (69)	77.2 (81)	75.7 (150)	0.9
Donor Status				
First-time donor	128.8 (1,251)	164.5 (1,604)	146.7 (2,855)	<.0001
Repeat donor	9.7 (642)	11.3 (697)	10.5 (1,339)	0.008
Region				
Midwest	12.0 (263)	12.4 (250)	12.2 (513)	0.7
Northeast	16.2 (233)	23.2 (317)	19.6 (550)	<.0001
South	46.4 (1,029)	60.2 (1,250)	53.1 (2,279)	<.0001
West	21.5 (368)	28.2 (483)	24.8 (851)	<.0001

[1]Year 1 was October 1, 2020 to September 30, 2021, and Year 2 was October 1, 2021 to September 30, 2022

[2]There were 16 donors with two syphilis consensus positive donations

*Not significant with Bonferroni correction

Table 2:

Reason for Donors Presenting with two Syphilis Positive Donations

Reason	Number of Donors (%)
Donor Returned Prior to Receipt of Confirmatory Results	6 (37.5)
Donor was Treated for Syphilis and Cleared to Return but Subsequently Tested Reactive	4 (25.0)
Donor was Cleared to Return but Subsequently Tested Reactive	2 (12.5)
Donor was Notified and Still Presented	3 (18.7)
Donor Could Not Be Contacted	1 (6.3)
Total	**16**

Table 3.

Syphilis Active Infection Prevalence per 100,000 Donations by Year, TTIMS2

	Active Infection[1]			
	Year 1[2]	Year 2	Overall	Fisher's Exact Test
Number of Donations	6,832,444	6,457,741	13,290,185	Significance between Year 1 and Year 2 (p)
	(N)	(N)	(N)	
Overall	10.0 (683)[3]	13.4 (866)	11.7 (1,549)	<.0001
Sex				
Female	5.1 (182)	7.2 (266)	6.6 (448)	<.0001
Male	15.2 (501)	18.7 (600)	17.0 (1,101)	0.0007
Age				
16 to 17	9.5 (11)	19.2 (43)	15.9 (54)	0.03*
18 to 24	22.4 (89)	34.3 (137)	28.4 (226)	0.002
25 to 39	19.2 (241)	29.4 (314)	23.9 (555)	<.0001
40 to 54	9.9 (180)	13.3 (210)	11.5 (390)	0.004
55 to 105	5.0 (162)	5.1 (162)	5.0 (324)	0.9
Race/Ethnicity				
White	5.0 (297)	6.8 (375)	5.9 (672)	<.0001
Black	102.0 (161)	126.4 (229)	115.0 (390)	0.04*
Hispanic/Latino	44.2 (166)	45.2 (180)	44.7 (346)	0.9
Asian	8.3 (13)	18.0 (31)	13.4 (44)	0.02*
American Indian	23.1 (5)	41.7 (9)	32.4 (14)	0.3
>1 Race	18.4 (9)	29.7 (15)	24.1 (24)	0.3
Other	16.8 (6)	25.3 (9)	21.1 (15)	0.5
Blank	34.4 (26)	20.8 (18)	27.1 (44)	0.1
Donor Status				
First-time donor	49.3 (450)	64.9 (585)	57.1 (1,035)	<.0001
Repeat donor	3.9 (233)	5.1 (281)	4.5 (514)	0.005
Region				
Midwest	4.1 (79)	5.4 (95)	4.7 (174)	0.08*
Northeast	4.0 (41)	4.6 (44)	4.3 (85)	0.5
South	18.8 (403)	26.2 (527)	22.3 (930)	<.0001
West	9.3 (160)	11.7 (200)	10.5 (360)	0.04*

[1]Please note that NYBCe did not use the RPR test during the first year of the study so donations from this center were not used in Active Infection rates

[2]Year 1 was October 1, 2020, to September 30, 2021, and Year 2 was October 1, 2021, to September 30, 2022

[3]There were 3 donors with two syphilis active infection donations

*Not significant with Bonferroni correction

Table 4.

Repeat Donor Syphilis Incidence per 100,000 Person-Years (PY), TTIMS2

Number of Syphilis Consensus Positive Repeat Donors	309
Person-Years	2,873,899
	(95% CI)
Overall	10.8 (9.6, 12.0)
Sex	
Female	7.5 (6.1, 8.9)
Male	14.1 (12.2, 16.1)
Age	
16 to 17	14.7 (4.5, 24.9)
18 to 24	15.8 (9.0, 22.5)
25 to 39	15.1 (11.7, 18.6)
40 to 54	11.0 (8.6, 13.3)
55 to 105	8.5 (6.9, 10.0)
Race/Ethnicity	
White	9.5 (8.3, 10.7)
Black	35.5 (21.0, 50.0)
Hispanic/Latino	20.0 (12.7, 27.2)
Asian	12.1 (3.7, 20.5)
American Indian	0.0 (0.0, 0.0)
>1 Race	24.6 (3.0, 46.2)
Other	12.3 (0.0, 29.4)
Blank	5.9 (0.0, 14.0)
Region	
Midwest	8.9 (6.9, 10.8)
Northeast	11.9 (9.1, 14.8)
South	13.8 (11.2, 16.3)
West	8.6 (6.3, 10.9)

Table 5.

The Odds of Syphilis CP and AI among TTIMS Donors for Study Year, HIV, HBV, and HCV Status

	Syphilis CP OR (95% CI)[1] aOR (95%CI)[2]		**Syphilis AI[3] OR (95% CI) aOR (95%CI)**	
Year 2[4]	1.25	(1.18, 1.33)	1.31	(1.18, 1.44)
	1.18	(1.11, 1.26)	1.22	(1.10, 1.35)
HIV CP[5]	384.53	(289.24, 511.22)	534.44	(376.02, 759.59)
	63.73	(45.81, 88.66)	77.29	(52.38, 114.06)
HBV CP	33.68	(22.03, 51.48)	35.80	(18.53, 69.16)
	4.36	(2.81, 6.76)	6.07	(3.10, 11.90)
HCV CP	37.81	(27.57, 51.85)	37.27	(22.72, 61.12)
	8.69	(6.25, 12.08)	9.28	(5.61, 15.36)

[1] OR is abbreviated for odds ratio

[2] aOR is abbreviated for adjusted odds ratio. Adjusting for sex, race/ethnicity, region, age group, and first-time donor status

[3] Please note that NYBCe did not use the RPR test during the first year of the study so donations from this center were not used in active infection rates

[4] Versus year 1

[5] HIV, HBV, and HCV are for the full two-year period