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Telehealth Usage and Impact on HIV Prevention Services Among Men Who Have Sex with Men Across the United States During 2020

By

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Epidemiology

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By

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Bachelor of Science
Columbus State University
2019

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An abstract of
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Rollins School of Public Health of Emory University
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Abstract

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By Tiana M. Williams

Background

The temporary expansion of telehealth services during COVID-19 pandemic has addressed interruptions in the delivery of healthcare and reduced some barriers to care in the United States (US). However, young men who have sex with men (MSM) are still being marginalized and disproportionately impacted by HIV and service interruptions caused by the COVID pandemic. This study determined the overall prevalence of telehealth usage and investigate the impact of telehealth use on HIV prevention services during COVID-19 pandemic among MSM in the US.

Methods

We examined types of healthcare provider (HCP) visits among MSM who responded to the 2020 cycle of American Men's Internet Survey (AMIS). Prevalence of telehealth usage by preventative services offered/received was assessed using log binomial regression.

Results

We found overall low rates of telehealth use (9%) in 2020. When compared to combined or in-person visits, those who used telehealth only when seeing their HCP in 2020 were more likely to be younger, Hispanic/Latino, located in Western region of the US, reside in large metro areas of with a population of 1 million+, have public insurance, and have a lower annual income ($p < 0.0001$, for all). Being offered HIV testing (PR: 0.95, 95% CI: 0.90, 0.99) or sexual health counseling (PR: 0.88, 95% CI: 0.79, 0.98) was less common among those who received their healthcare only by telehealth in 2020. Discussing PrEP, however, was 13% more common during telehealth visits after adjusting for confounders (PR: 1.13, 95% CI: 1.02, 1.25).

Conclusion

While telehealth was less common during 2020 in the AMIS cohort than was expected during a global pandemic, it was associated with differing access to preventive health services. Those who were seen only by telehealth were less likely to have been offered HIV testing or sexual health counseling although this difference was not seen with counseling associated with PrEP use. Those who received their healthcare in a combination of visit types in 2020 were 16-35% more likely to be offered an HIV test, discuss PrEP, or receive sexual health counseling compared to those who only saw their HCP in-person.

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Introduction

The novel coronavirus disease 2019 (COVID-19) pandemic has impacted our society, economy, and healthcare system. At the time of writing (April 13, 2022), prevalence estimates for the United States (US) are 80,260,092 confirmed cases and 983,237 deaths.[1] This devastating public health emergency presented the US healthcare delivery system with unprecedented challenges, forcing many healthcare facilities to transition to the use of telehealth. Vulnerable populations such those individuals at high-risk for and/or living with HIV have been impacted by HIV service interruptions.[2, 3] Barriers to HIV preventative care during the pandemic threatens the US Department of Health and Human Services' bold initiative of Ending the HIV Epidemic in the US (EHE) by 2030.[4]

Since COVID-19 was declared a public health emergency, HIV researchers and policy makers have been working to address barriers to HIV prevention services and care. The temporary expansion of telehealth services during COVID-19 has reduced some barriers by providing rural and urban areas around the US with access to telehealth and has allowed for providers to deliver care conveniently and safely to their patients all while social distancing.[5] Telehealth has since been integrated in each of the four key strategies in the EHE initiative by 2030.[6] However, individuals who identify as being gay, bisexual, or other men who have sex with men (MSM), particularly young MSM, are still being marginalized and disproportionately impacted by HIV and service interruptions caused by the COVID pandemic.[7, 8]

In recent years, the use of telehealth in HIV care has become more common. Many of the studies that investigated the impact of telehealth services on HIV care prior to the pandemic focused on telehealth acceptability and feasibility among study populations such as people living with HIV (PLWH) and/or medical providers themselves. [9, 10, 11] Studies that included individuals at high risk for HIV commonly focused on PrEP use.[12,13] Since COVID-19, studies investigating the impact of telehealth services as prevention among the MSM population have many limitations such as focusing on one form of telehealth (synchronous video conferencing visits, asynchronous recorded videos, or patient portals, email, and text messaging), small, nonrepresentative sample sizes, and sampling bias[14, 15, 16, 17, 18, 19] The results from these studies are hard to generalize to the entire population at risk due to small same sizes and nonrepresentative samples. Lack of access to telehealth resources along with regulatory barriers regarding state medical licensure requirements to conduct telehealth research visits for study participants that reside in a state where the provider is not licensed impact the eligibility of participants from enrolling and remaining in these studies. To our knowledge, no study has determined overall telehealth usage and the impact of type of visit on HIV prevention services among MSM across the US during 2020. Characterizing

the impacts of telehealth use on HIV prevention services is essential to understanding how those who identify as MSM are uniquely affected by the COVID-19 response in the US.

The objective of this analysis is to investigate the impact of telehealth usage for HIV prevention during the COVID-19 pandemic and determine the overall prevalence of telehealth usage among MSM in the US during 2020. Based on the evidence of HIV preventive service interruptions due to COVID-19-related closures and restrictions, we hypothesized that the overall prevalence of telehealth use will increase in the US and want to examine the differences in HIV prevention services offered by type of visit for those who saw their healthcare provider (HCP) in the past 12 months.

Methods

Study Design

Data from the 2020 cycle of the American Men's Internet Survey (AMIS) were analyzed. AMIS is an annual online survey of cisgender gay, bisexual, same gender loving, and other men who have sex with men in the US. Detailed methods have been described previously.[20-25] To be eligible for AMIS, participants had to be 15 years of age or older, identify as male, reside in the United States, and report that they had oral or anal sex with a male at least once in the past.

Measures

Demographic characteristics including age, gender, sexual identity, race/ethnicity, region of residences, urbanicity of residence, educational level, insurance status, and annual household income were reported by participants in the survey. Care related to HIV prevention were also reported such as HIV testing, PrEP discussions, and sexual health counseling.

Participants age was categorized as 15-24, 25-29, 30-39, and 40 + years. Sexual identity was categorized as heterosexual or straight, homosexual or gay, bisexual, other sexual identity, and prefer not to answer/ don't know. Race/ethnicity was categorized as non-Hispanic Black, non-Hispanic White, Hispanic/Latino, and other or multiple races. Regions were defined as Northeast, Midwest, South, and West. Urbanicity was defined as large central, large fringe, medium, and small metro, micropolitan, and non-core. Education was categorized as less than high school diploma, high school diploma or equivalent, some college or technical degree, and college degree or postgraduate education. Insurance status was categorized as no insurance, private only, public only, or other/multiple insurance types. Income was categorized as: $0 – 19999, $20000 – 39999, $40000 – 74999, $75000 or more.

Three different outcomes were assessed using log binomial regression. Those participants who were not living with HIV, had never tested positive, and who had seen their HCP in the past 12 months were asked about the preventative services received during their visit. Participants who saw their HCP in the past 12 months were asked if an HIV test was offered and if they received sexual health counseling from an HCP. Participants who had heard of PrEP prior to their HCP visit were asked if they had discussed PrEP with an HCP during their visit in the past 12 months.

Statistical Analysis

Participants who did not reside in one of the 50 states or DC and those who had not seen their HCP in the past 12 months were excluded from these analyses. Analyses were restricted to those men who were HIV-negative and who had heard of PrEP in the past. HIV-negative status was determined if the participant's most recent HIV test was negative and if they had never tested positive in the past.

Descriptive statistics were calculated for age, gender, sexual identity, race/ethnicity, US region of residences, urbanicity of residence, educational level, insurance status, and annual household income. Prevalence of telehealth usage by preventative services offered/received was assessed using log binomial regression. Unadjusted (crude) models examined the relationship between type of HCP visit in the previous 12 months (telehealth only, in-person only or a combination of visit types) and the type of HIV prevention services offered (HIV testing, PrEP or other HIV counseling. Adjusted (robust) models included age, race/ethnicity, region of residences, urbanicity of residence, educational level, insurance status, and annual household income. Each of these variables were identified as potential confounders a priori using directed acyclic graphs. Variable multicollinearity was assessed; if any variable was found to be collinear, the variable was removed from initial model. There was no evidence of effect measure modification by any of these variables and the different preventative services offered. All statistical analyses were conducted using SAS software, Version 9.4.

Results

Participant Characteristics

In total, 13,081 participants completed the 2020 AMIS questionnaire and 49% (N= 6,447) of participants met the inclusion criteria for this analysis (Table 1). Most of the participants included in the analysis were between the ages of 15 – 24 years (35%), identified as homosexual or gay (79%), are White, non-Hispanic (64%), lived in the South (39%), lived in a large urban area (62%), had a college degree or postgraduate education (54%), had insurance through a private company (73%), and reported an annual income of $75,000 or more (41%) (Table 1). Among those who saw an HCP in the past 12 months of completing the AMIS survey, 544 (9%) completed their visit through telehealth services only (Table 1).

Differences by age, sexual identity, race/ethnicity, region, urbanicity, education, insurance status, income were observed across HCP visit types. When compared to combined or in-person visits, those who used telehealth only when seeing their HCP in 2020 were more likely to be between the ages of 25 – 29 years, to be Hispanic/Latino or other or multiple races, to be located in Western region of the US, to reside in large fringe areas, to have public insurance, to have a lower annual income ($p < 0.0001$ for all) and to identify as homosexual or gay ($p = 0.1512$) (Table 1). Those who used a combination of visits when seeing their HCP in 2020 were more likely to be 40 or older, to be White, non-Hispanic, to be located in the Northeast region of the US, to reside in large central metro areas, to have a higher education, to have private or other/multiple insurances, and to have a higher annual income ($p < 0.0001$ for all). Those who used in-person visits only when seeing their HCP in 2020 were more likely to be between the ages of 15 – 24 years, to be Black, non-Hispanic, to be located in the Midwest or southern regions of the US, to reside in less urban/rural areas, to have some college/ technical degree or less, and to have an annual income between $40000 – $74999 ($p < 0.0001$).

Log Binomial Regression

Univariate Analysis

In unadjusted analyses, being offered an HIV test (PR: 0.88, 95% CI: 0.80, 0.96) and receiving sexual health counseling (PR: 0.86, 95% CI: 0.77, 0.95) were less likely among those who had a telehealth visit with their HCP compared to those who had an in-person visit (Table 2). However, the prevalence of discussing PrEP with an HCP was 12% higher for those who had an HCP visit using telehealth compared to those who had their HCP visit in-person. Differences were also seen for those who received their healthcare both in-person and through telehealth (Combined visits) in 2020. Those who received their healthcare in a combination of visit types in 2020 were 16-35% more likely to be offered an HIV test, discuss PrEP, or receive sexual health counseling compared to those who only saw their HCP in-person.

Differences in HIV Presentation Services

Factors associated with greater likelihood of being offered HIV testing during 2020 include age, race/ethnicity, and urbanicity of residence. HIV testing was more common among young (PR: 1.13, 95% CI: 1.08, 1.17, $p < 0.0001$), Black, non-Hispanic individuals (PR: 1.08, 95% CI: 1.04, 1.13, $p < 0.0001$), and those who reside in large urban areas (PR: 1.18, 95% CI: 1.08, 1.30, $p = 0.0006$). There was no difference across US regions, education, insurance status, or annual income.

Factors associated with a greater likelihood of receiving PrEP counseling during healthcare visits in 2020 include race/ethnicity, US region, urbanicity of residence, educational level, and annual household income. PrEP counseling was more common among Black, non-Hispanic individuals (PR: 1.17, 95% CI: 1.07, 1.27, $p = 0.0006$), those who reside in large urban areas (PR: 1.77, 95% CI: 1.36, 2.30, $p < 0.0001$), those with higher education (PR: 1.17, 95% CI: 0.86, 1.58, $p= 0.3206$), and those who have a lower annual income (PR: 1.15, 95% CI: 1.05, 1.27, $p = 0.0041$). However, PrEP counseling was found to be less common among those with private insurance (PR: 0.92, 95% CI: 0.83, 1.02, $p = 0.1241$). There was no difference across age groups, US regions, or insurance status.

Factors associated with an increased likelihood of receiving sexual health counseling during a health care visit in 2020 include age, race/ethnicity, US region of residences, urbanicity of residence, and insurance status. Sexual health counseling was more common among young (PR: 1.41, 95% CI: 1.31, 1.52, $p < 0.0001$), Black, non-Hispanic individuals (PR: 1.14, 95% CI: 1.06, 1.22, $p = 0.0006$), those who reside in

large urban areas (PR: 1.50, 95% CI: 1.22, 1.85, p = 0.0001), and those with other or multiple insurance types (PR: 1.11, 95% CI: 0.98, 1.25, p = 0.1143). Sexual health counseling was less common in the south (PR: 0.83, 95% CI: 0.78, 0.89, p < 0.0001) and there was no difference across education levels or annual income.

Multivariate Analysis

After adjusting for age, race/ethnicity, region of residence, urbanicity of residence, educational level, insurance status, and annual household income, those who received their healthcare only by telehealth in the past twelve months were 5% less likely to be offered HIV testing (PR: 0.95, 95% CI: 0.90, 0.99) and 12% less likely to receive sexual health counseling (PR: 0.88, 95% CI: 0.79, 0.98) compared to those who received all of their healthcare in 2020 in-person (Table 3). However, those who were seen by telehealth only were 13% more likely to have discussed PrEP during their healthcare visit compared to those who received all of their care in person in 2020 (PR: 1.13, 95% CI: 1.02, 1.25). Those who received their healthcare in a combination of visit types in 2020 were significantly more likely to be offered all forms of prevention: 7% more likely to be offered an HIV test (PR: 1.07, 95% CI: 1.04, 1.10), 34% more likely to have discussed PrEP (PR: 1.34, 95% CI: 1.27, 1.43), and 20% more likely to have received sexual health counseling (PR: 1.20, 95% CI: 1.14, 1.26) compared to those who received their care in-person only.

Discussion

The use of telehealth visits has been successful at delivering HIV preventative services to patients. Recent studies show that patients who are willing to engage in telehealth have benefited from reduced barriers to care.[19, 26, 27, 28] We conducted a cross-sectional study to investigate the impact of telehealth usage for HIV prevention during the COVID-19 pandemic and determine the overall prevalence of telehealth usage among MSM in the US during 2020. Prior studies that evaluated the impact of telehealth on HIV prevention have specifically focused on PrEP use. In this analysis, we examined the frequency of multiple prevention services such as HIV testing, PrEP discussions, and sexual health counseling in 2020 when much of healthcare was impacted by the COVID-19 pandemic and many people received their care by telehealth.

Our research found very low rates (9%) of telehealth use among participants who saw their HCP in 2020. Our findings for overall telehealth prevalence align with the results from another national study, which was conducted in 2020 that found lower rates of telehealth use among US residents.[19] Our analysis also found that telehealth visits were less common than both in-person visits and combined visits. Similarly, in 2021 a cross-sectional study identified all ambulatory visits within New England health care system in Massachusetts and found only 6% of visits were virtual only compared to in-person only and combined visits.[29] We did find that telehealth was more common among Hispanic/Latino patients as well as those who identify as other or multiple races. This finding is similar to differences in telehealth use by race/ethnicity seen in a study by Trepka et al. which found highest rates of telehealth use among Hispanics followed by non-Hispanic Blacks, and Haitians.[30] Individuals with public insurance such as Medicare, Medicaid, and state-specific plans were more likely to use telehealth compared to those who did not have insurance or those who had private insurance or other forms of insurance. Similarly, results from a national survey of 670,155 adults found that Medicaid and Medicare were associated with the highest rates of telehealth use.[31]

We found HIV testing and sexual health counseling to be less common with telehealth, but more common with combined visits, whereas PrEP counseling was more common with telehealth and combined visits compared to those who received care only by in-person visits in 2020. Our findings differ from others that found HIV testing, specifically self-testing, to be positively associated with telehealth use.[32,33] Since the World Health Organization (WHO) recommended HIV self-testing (HIVST) for individuals at risk for or living with undiagnosed HIV infection in 2016[34], some studies have incorporated digital support in their interventions and found that participants prefer completing the kit at home and have more successful

specimen collections when digital support is available.[33, 35] Even though there are data to support that at home HIV testing is well accepted, the AMIS participants who were seen by telehealth only in 2020 were less likely to be offered HIV testing than those who were seen in-person for some or all of their visits.

We found that all preventive health outcomes, HIV testing, sexual health counseling and PrEP, were significantly more common among those who had a combination of both in-person and telehealth visits compared to those who were seen in-person only for health care in 2020. To our knowledge, there has not been any research that has evaluated the association between combined visits and HIV prevention services. However, this may be explained by the fact that a person being seen with both modalities of health care visits in 2020, in-person and by telehealth, must be seen at least twice and therefore they may have a greater number of visits than those seen only by telehealth or in-person during this year. Because we do not have data on number of visits in a twelve-month time period, we cannot rule out this association being the product of a higher overall number of visits and not the visit type. This may particularly be true for those who had visits that consist of establishing care, routine follow-ups, consults, and/or monitored self-testing which may be completed using telehealth, compared to visits that require intensive blood work and some wellness exams. Additionally, it is unknown what time of the year each participant had their HCP visit, but it may be that those who had combined visit types had one or more in-person visits prior to COVID lockdowns in March 2020, while the other visit(s) were conducted after shelter-in-place mandates and stay-at-home orders.

Limitations

We acknowledge that this study has several limitations. First, the cross-sectional design limits our ability to look at temporal variations throughout 2020 such as when COVID-19 lockdown measures took place and how telehealth services were impacted. This design also limits our ability to make causal inferences about the relationship between preventative service offered/received and type of HCP visit and may not be easily generalizable to other MSM in the US and/or online because AMIS used convenience sampling when recruiting for participants to complete its 2020 survey. Non-Hispanic Blacks and Hispanic/Latinos are underrepresented in our analysis. The over-representation of non-Hispanic Whites who are highly educated and who have a high-income level is not representative of all who need HIV prevention services. Additionally, our analytic sample was restricted to those currently in care and those who had heard of PrEP prior to their HCP visit. Therefore, we may be excluding those who are at higher risk of HIV because they have not established care at the time of the survey and do not know all their available options for HIV prevention. Participants were also only asked if they were offered an HIV test and if they discussed PrEP

with their HCP provider in the past 12 months, therefore we are not assessing if the participant completed an HIV test or how many discussions regarding PrEP they had with the providers, or if they started PrEP. Finally, we did not have the data to evaluate number of visits in the year, a probable reason as to why those who had combined visits were offered more HIV prevention than those receiving their healthcare in other visit types. The other explanation for increased prevention among those with combined visits is the in-person component. Because we do not know when their services were provided for those who had both in-person and telehealth visits, we cannot determine if the services were more likely to be offered during one type of visit or due to the number of visits. Both are plausible explanations and need further examination.

Conclusions

In response to the COVID-19 pandemic, telehealth services were expanded to provide care to patients during lockdowns and limited access to in-person care. However, telehealth visits as the sole form of care for the AMIS cohort in 2020 was not common. Instead, we saw more combined services during this time suggesting that telehealth services were used in addition to in-person visits instead of replacing them. This analysis also found that HIV prevention services were overall less likely to be part of a health care visit if the visit was solely done by telehealth but that they were much more common if health care had been received both in-person and by telehealth during the year. Future studies should investigate ways to expand the telehealth experience for at-risk MSM to include a robust set of sexual health counseling and HIV prevention services.

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Figure 1. Study population and populations used for each analysis

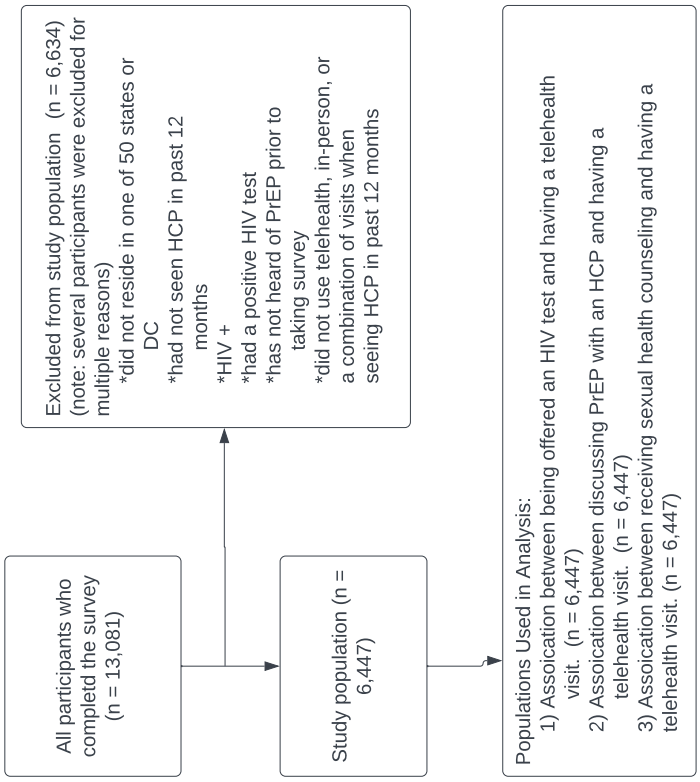

Figure 2. Preventative Services Offered/Received by Visit Type Among Men Who Have Sex with Men (MSM) in the United States

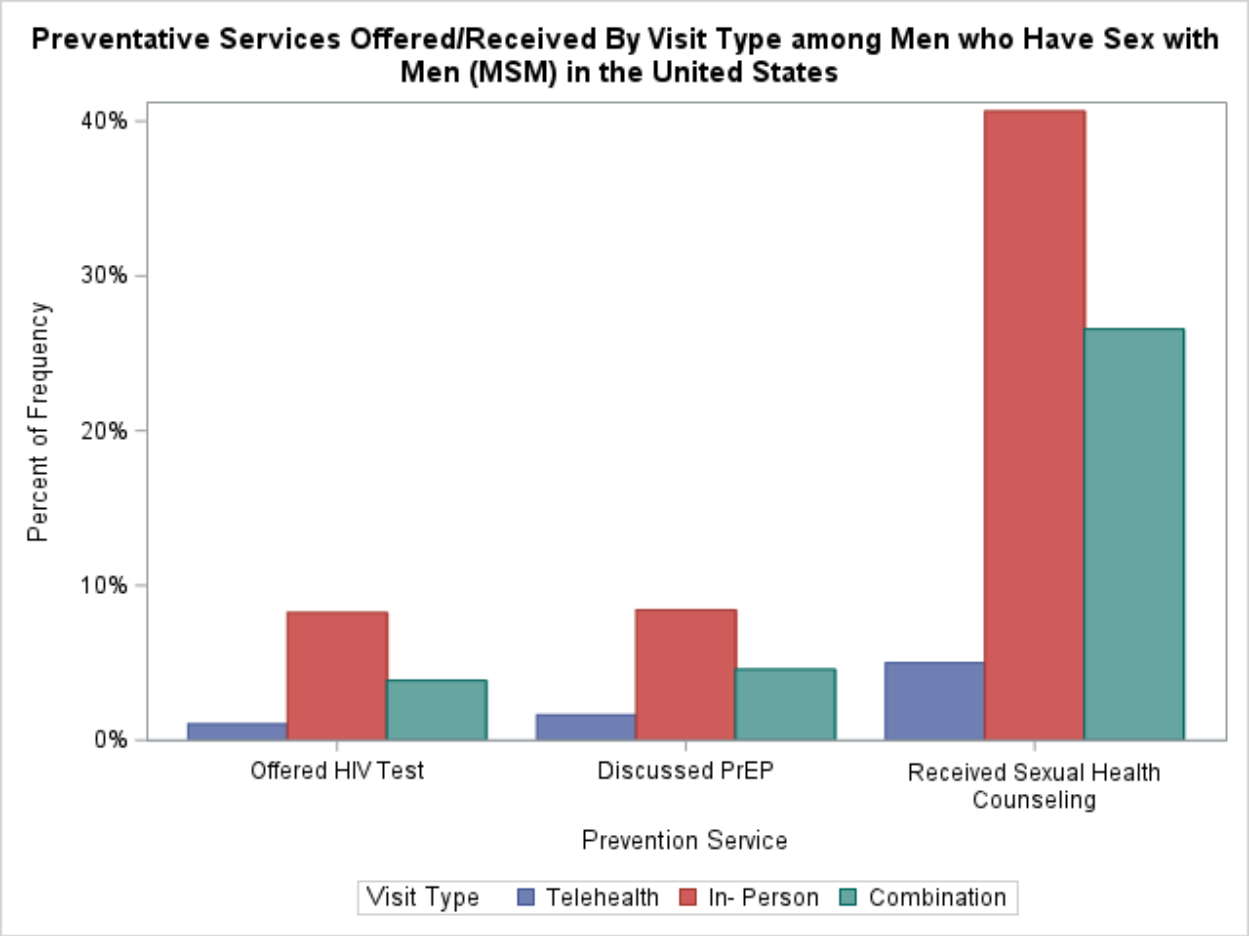

Table 1. Characteristics of 6,447 men who have sex with men who completed an online HIV prevention survey, United States, 2020 by visit health care visit type in 2020

	Telehealth Visit Only	Combined Visits	In- Person Visit Only	Total	*P* value
	n (%)	n (%)	n (%)	n (%)	
Total observations	549 (9)	2075 (32)	3823 (59)	6447(100)	
Age					<0.0001
Mean age (years) (SD)	34 (15)	34 (15)	33 (18)	33 (17)	
15 - 24	179 (33)	642 (31)	1416 (37)	2237 (35)	
25 - 29	164 (30)	585 (28)	1063 (28)	1812 (28)	
30 - 39	70 (13)	278 (13)	431 (11)	779 (12)	
40+	136 (25)	570 (27)	913 (24)	1619 (25)	
Sex					
Male	549 (100)	2075 (100)	3823 (100)	6447 (100)	
Sexual identity					0.1512
Heterosexual/ Straight	3 (0.6)	13 (0.6)	21 (0.6)	37 (0.6)	
Homosexual/ Gay	445 (81)	1645 (80)	2973 (78)	5063 (79)	
Bisexual	91 (17)	371 (18)	764 (20)	1226 (19)	
Other sexual identity	6 (1)	30 (1)	33 (0.9)	69 (1)	
I prefer not to answer/ Don't know	2 (0.4)	10 (0.5)	27 (0.7)	39 (0.6)	
Race/ Ethnicity					<0.0001
Black, non- Hispanic	53 (10)	141 (7)	453 (12)	647 (10)	
Hispanic/ Latino	112 (21)	330 (16)	729 (19)	1171 (18)	
White, non- Hispanic	325 (60)	1430 (70)	2310 (62)	4065 (64)	
Other/ multiple races	49 (9)	147 (7)	264 (7)	460 (7)	
Region					<0.0001
Northeast	83 (15)	423 (20)	681 (18)	1187 (18)	
Midwest	101 (18)	380 (18)	781 (20)	1262 (20)	
South	195 (36)	790 (38)	1551 (41)	2536 (39)	
West	170 (31)	482 (23)	810 (21)	1461 (23)	
Urbanicity					<0.0001
Large central metro	222 (40)	933 (45)	1488 (39)	2643 (41)	
Large fringe metro	131 (24)	416 (20)	776 (20)	1323 (21)	
Medium metro	116 (21)	417 (20)	825 (22)	1358 (21)	
Small metro	47 (9)	164 (8)	371 (10)	583 (9)	
Micropolitan	23 (4)	99 (5)	246 (6)	368 (6)	
Non-core	10 (2)	46 (2)	116 (3)	172 (3)	
Education					<0.0001
Less than High School diploma	6 (1)	18 (0.9)	60 (2)	84 (1)	
High school or equivalent	60 (11)	184 (9)	500 (13)	744 (12)	
Some college or technical degree	180 (33)	634 (31)	1334 (35)	2148 (33)	
College degree or postgraduate education	303 (55)	1239 (60)	1918 (50)	3460 (54)	
Insurance Status					<0.0001
None	41 (8)	75 (4)	314 (8)	430 (7)	
Private only	371 (69)	1542 (75)	2698 (72)	4611 (73)	
Public only	99 (18)	282 (14)	531 (14)	912 (14)	
Other/ multiple	30 (6)	161 (8)	203 (6)	394 (6)	
Income (yearly)					<0.0001
$0-19999	66 (13)	182 (9)	421 (12)	669 (11)	
$20000-39999	124 (24)	332 (17)	770 (22)	1226 (20)	
$40000-74999	128 (25)	516 (26)	997 (28)	1641 (27)	
$75000 or more	194 (38)	932 (48)	1358 (38)	2484 (41)	

[1] Variable distribution are reported as (%) unless otherwise specified.

[2] Values may not sum to the total due to missing data.

[3] Abbreviations: SD, standard deviation

[4] chi-square *P* values

Table 2. Univariate crude log binomial regression results

	HIV Test Offered		PrEP Discussed		Sexual Health Counseling Received	
	Adjusted PR (95% CI)	*P* value	Adjusted PR (95% CI)	*P* value	Adjusted PR (95% CI)	*P* value
Types of Visits						
Telehealth Only	0.88 (0.80, 0.96)	0.005	1.12 (1.01, 1.24)	0.033	0.86 (0.77, 0.95)	0.0033
Combined Visits	1.16 (1.11, 1.21)	<0.0001	1.35 (1.28, 1.43)	<0.0001	1.21 (1.15, 1.27)	<0.0001
In-Person Only	Ref		Ref		Ref	

[1] chi-square *P* values

Table 3. Multivariate adjusted log binomial regression results

	HIV Test Offered		PrEP Discussed		Sexual Health Counseling Received	
	Adjusted PR (95% CI)	*P* value	Adjusted PR (95% CI)	*P* value	Adjusted PR (95% CI)	*P* value
Types of Visits						
Telehealth Only	0.95 (0.90, 0.99)	0.0427	1.13 (1.02, 1.25)	0.0243	0.88 (0.79, 0.98)	0.0163
Combined Visits	1.07 (1.04, 1.10)	<0.0001	1.34 (1.27, 1.43)	<0.0001	1.20 (1.14, 1.26)	<0.0001
In-Person Only	Ref		Ref		Ref	
Age						
15 - 24	1.13 (1.08, 1.17)	<0.0001	1.28 (1.17, 1.40)	<0.0001	1.41 (1.31, 1.52)	<0.0001
25 - 29	1.10 (1.06, 1.14)	<0.0001	1.29 (1.18, 1.40)	<0.0001	1.29 (1.20, 1.39)	<0.0001
30 - 39	1.08 (1.03, 1.13)	0.0006	1.28 (1.16, 1.41)	<0.0001	1.21 (1.11, 1.33)	<0.0001
40+	Ref		Ref		Ref	
Race/ Ethnicity						
Black, non- Hispanic	1.08 (1.04, 1.13)	<0.0001	1.17 (1.07, 1.27)	0.0006	1.14 (1.06, 1.22)	0.0006
Hispanic/ Latino	1.04 (1.01, 1.07)	0.0258	1.13 (1.05, 1.22)	0.0007	1.02 (0.96, 1.08)	0.5499
Other/ multiple races	1.05 (1.00, 1.10)	0.0575	1.15 (1.04, 1.27)	0.0055	1.10, 1.02, 1.19)	0.0166
White, non- Hispanic	Ref		Ref		Ref	
Region						
Midwest	0.95 (0.91, 0.99)	0.0217	0.94 (0.86, 1.04)	0.2183	0.87 (0.80, 0.93)	0.0002
South	0.96 (0.92, 0.99)	0.0115	0.92 (0.85, 0.99)	0.0436	0.83 (0.78, 0.89)	<0.0001
West	0.97 (0.94, 1.01)	0.1798	1.01 (0.93, 1.10)	0.8017	0.92 (0.86, 0.98)	<0.0001
Northeast	Ref		Ref		Ref	
Urbanicity						
Large central metro	1.18 (1.08, 1.30)	0.0006	1.77 (1.36, 2.30)	<.0001	1.50 (1.22, 1.85)	0.0001
Large fringe metro	1.11 (1.01, 1.22)	0.0375	1.45 (1.11, 1.90)	0.0066	1.28 (1.03, 1.58)	0.0253
Medium metro	1.10 (1.00, 1.21)	0.0639	1.42 (1.08, 1.85)	0.0106	1.22 (0.98, 1.51)	0.074
Small metro	1.10 (1.00, 1.22)	0.0802	1.39 (1.05, 1.84)	0.0218	1.27 (1.02, 1.59)	0.0338
Micropolitan	1.05 (0.94, 1.17)	0.381	1.40 (1.04, 1.87)	0.0267	1.09 (0.86, 1.38)	0.4894
Non-core	Ref		Ref		Ref	
Education						
High school or equivalent	0.93 (0.83, 1.06)	0.2803	0.97 (0.71, 1.32)	0.8392	0.99 (0.77, 1.28)	0.9565
Some college or technical degree	0.94 (0.84, 1.06)	0.3134	1.06 (0.78, 1.43)	0.7091	0.96 (0.75, 1.22)	0.7158
College degree or postgraduate education	1.00 (0.85, 1.08)	0.4696	1.17 (0.86, 1.58)	0.3206	0.98 (0.77, 1.25)	0.8532
Less than High School diploma	Ref		Ref		Ref	
Insurance Status						
Private only	1.01 (0.96, 1.07)	0.6979	0.92 (0.83, 1.02)	0.1241	1.01 (0.92, 1.12)	0.7946
Public only	1.05 (0.99, 1.12)	0.088	0.96 (0.85, 1.09)	0.5694	1.04 (0.92, 1.16)	0.556
Other/ multiple	1.02 (0.95, 1.10)	0.5428	0.98 (0.84, 1.14)	0.7759	1.11 (0.98, 1.25)	0.1143
None	Ref		Ref		Ref	
Income (yearly)						
$0-19999	1.00 (0.95, 1.04)	0.9216	1.15 (1.05, 1.27)	0.0041	0.99 (0.91, 1.07)	0.8129
$20000-39999	1.01 (0.97, 1.04)	0.7557	1.05 (0.96, 1.13)	0.2799	0.95 (0.89, 1.02)	0.1644
$40000-74999	1.00 (0.97, 1.03)	0.9266	1.09 (1.02, 1.17)	0.0157	0.98 (0.92, 1.04)	0.499
$75000 or more	Ref		Ref		Ref	

[1] chi-square *P* values