



# COVID-19 Conspiracy Beliefs are not Barriers to HIV Status Neutral Care Among Black Cisgender Sexual Minority Men and Black Transgender Women at the Initial Peak of the COVID-19 Pandemic in Chicago, USA

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Accepted: 12 May 2022

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## Abstract

We examined associations between COVID-19 conspiracy beliefs and HIV status neutral care engagement among Black cisgender sexual minority men (BCSMM) and Black transgender women (BTW). Throughout April–July 2020, a total of 226 (222 in the current analysis: 196 BCSMM, 20 BTW, and 6 other) participants in Chicago’s Neighborhoods and Networks (N2) cohort study completed virtual assessments. Participants reported their HIV status, changes in the frequency of PrEP/ART use, and COVID-19 conspiracy beliefs. Three-quarters of the sample believed at least one conspiracy theory that COVID-19 was either government-created or lab-created accidentally or purposefully. Believing one or more COVID-19 conspiracy theories was significantly associated with better PrEP or ART engagement (using PrEP more frequently or continuously using PrEP/Missing ART less or continuously using ART) (aPR = 0.75 [95% CI 0.56–0.99],  $p < 0.05$ ). Believing COVID-19 came about naturally was strongly associated with worse PrEP engagement (i.e., use PrEP less or not on PrEP) or worse ART engagement (i.e., missed ART more or not on ART) (aPR = 1.56 [95% CI 1.23, 1.98],  $p < 0.001$ ). Findings suggested substantial COVID-19 conspiracies among BCSMM and BTW, and this was associated with HIV care engagement.

**Keywords** COVID-19 · Conspiracy beliefs · PrEP · ART · Black sexual minority men · Black transgender women

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## Introduction

The COVID-19 pandemic has accelerated health inequalities and structural vulnerabilities among racial and sexual minority populations who are at an increased risk for HIV [1, 2]. A recent World Health Organization (WHO) report using international data across 24 countries found that people living with HIV (PLWH) were at least 30% more likely to die from COVID-19 [3]. Racial and sexual/gender minorities are disproportionately impacted by the HIV epidemic [4, 5]. Based on an estimate from the Centers for Disease Control and Prevention (CDC), HIV infection among Black individuals is 7 times higher than is the prevalence of HIV infection among White individuals; 1 in 2 young Black cisgender SMM (BCSMM) are expected to be diagnosed with HIV in their lifetime [4, 5]. A recent meta-analysis shows that 44% of Black transgender women (BTW) are living with HIV [6]. Furthermore, Black individuals are almost 3 times more likely to be hospitalized for COVID-19, and 2 times more likely to die from COVID-19 as compared to White individuals [7]. However, even disproportionately impacted

by COVID-19, Black sexual and gender minorities have the lowest COVID-19 vaccine coverage across all other race/ethnicity categories of sexual and gender minorities [8]. The synergistic effects of the HIV and COVID-19 epidemics has placed both BCSMM [9, 10] and BTW [11] in massive physical, social, and economic crises.

In the era of “undetectable equals untransmittable (U=U)” and HIV pre-exposure prophylaxis (PrEP), continuously engaging in HIV biomedical intervention is a powerful tool to combat the HIV epidemics [12, 13]. The HIV status-neutral continuum posits that regardless of one’s HIV status, both people vulnerable to HIV infection and people living with HIV should use the same approach to engage in HIV prevention or treatment continuously [13]. This approach promotes the integration of HIV prevention and treatment program and emphasizes U=U as an essential part of HIV prevention. However, HIV status-neutral care engagement among racial and sexual/gender minorities has been largely limited by structural barriers such as HIV-related stigma, medical mistrust, and structural discrimination [14–17]. The history of the unethical Tuskegee Syphilis Study has created the generations of medical mistrust among Black sexual and gender minorities [18]. A recent qualitative study reveals that BCSMM believed that substandard medical care has become the norm for them and there was a high level of resistance to physician’s recommendation for PrEP due to distrustful relationships [19]. Rooted in systematic racism, these generations of mistrust have contributed to a persistent skepticism regarding both the origin of HIV and the biomedical intervention of HIV. [20] Using the 2016 National Surveys of Black Americans, Bogart et al. observed that there was substantial mistrust of the government and health care providers about HIV care [20]. Specifically, almost 40% of Black individuals believed that there is a cure for HIV but the government is withholding it from the poor and more than 30% believed that the medicine that doctors prescribed to treat HIV is poison [20]. Past studies indicated HIV conspiracy beliefs are negatively associated with HIV care engagement. These beliefs were associated with longer gaps in the time since the last health visit [14], less comfort discussing PrEP with a provider, [21], and lower interest in PrEP [22]. However, it should be noted that HIV conspiracy beliefs are not always regarded as an act of opposition and an undesired attitude. HIV conspiracy beliefs may not be irrational or unjustified given the generations of mistrust [20, 23]. Skepticism about HIV care has also been linked to a greater HIV testing [20, 24] and PrEP uptake [23] among Black individuals.

Mistrust of the government and medical establishments are particularly significant during the peak of the COVID-19 pandemic in the US [25]. Unlike the Tuskegee Syphilis Study, the current mistrustful relationship of racial and sexual/gender minorities, medical establishments, and

government agencies is a result of the racist system [25]. The horrible murder of George Floyd, police brutality, and unequal access to COVID-19 care (e.g., Dr. Susan Moore, a Black doctor, dies of COVID-19 due to mistreatment of COVID-19 in an Indiana hospital) [26] further fueled such medical mistrust and the skepticism about COVID-19 among racial minority groups. Based on the Kaiser Family Foundation survey (August–September 2020), compared to White individuals, Black individuals had lower levels of trust in a variety of groups and agencies (e.g., 59% of Blacks trusted doctors while 78% of Whites trusted doctors) [27].

Since the start of the pandemic, there has been an intense public debate about the origin of COVID-19 to be either a zoonotic origin or a laboratory escape. In the US, nearly 3 in 10 individuals believed the COVID-19 virus was most likely created in a lab [28]. The current scientific evidence indicates that the laboratory escape is extremely unlikely and the scientific community is largely in support of the zoonotic origin [29, 31]. While we should not completely discount the possibility of COVID-19 virus being a laboratory escape, beliefs about COVID-19 was made intentionally or accidentally in a lab are called “COVID-19 conspiracy beliefs” due to the fact that zoonotic origin is much more probable. Similar to the HIV conspiracy beliefs, COVID-19 conspiracy beliefs regarding the origins of the virus reflect the continuous structural inequality, discrimination, and mistrust even though COVID-19 conspiracy beliefs are further tied to international actors (e.g., incorrectly called as “Chinese virus”) and politicization. Endorsement of COVID-19 conspiracy beliefs may represent distrust in government under an uncertain information environment and unequal exposure to information on the COVID-19 pandemic, which may in turn result in greater structural barriers to healthcare engagement, including HIV care, among marginalized populations. The skeptical COVID-19 conspiracy beliefs may not necessarily be irrational, unjustified, untrue, or incorrect [32, 33]. Instead, it is vital to consider the social and historical contexts that may spawn COVID-19 conspiracy beliefs, especially among marginalized populations, such as BCSMM and BTW.

The COVID-19 pandemic may escalate the longstanding mistrust toward government and medical establishment, and impede care engagement for both HIV and COVID-19 among Black sexual and gender minorities. HIV-related mistrust and stigma is a prioritized research agenda at the US National Institutes of Health [17]. However, research on understanding mistrust among Black sexual and gender minorities in the context of the COVID-19 pandemic is limited [9–11]. Much is still unknown about how BCSMM and BTW perceive COVID-19. In this paper, we examine COVID-19 conspiracy beliefs regarding the origin of the virus and how these beliefs may be associated with HIV care engagement among BCSMM and BTW. We used the HIV

status neutral approach to examine the association between COVID-19 conspiracy beliefs and HIV care engagement regardless of an individual's HIV status [13].

## Methods

### Study Design and Data Collection

The data for this study was collected through a COVID-19 check-in survey in the Neighborhoods and Networks (N2) Cohort Study in Chicago (April–July 2020). The N2 Study is an ongoing longitudinal cohort study that examines social contexts and HIV neutral care engagement outcomes among BCSMM and BTW. The methods of the N2 Chicago COVID-19 survey in Chicago, Illinois have been described in detail elsewhere. [9] In brief, we contacted all participants who completed the N2 baseline survey (January 2018–December 2019) in Chicago using various methods, including email, text, phone calls, Facebook contact, and network proxy contact (participants relayed contact details of their close friends and familiars). Due to the “shelter-in-place” order, all participants underwent virtual interviews via Zoom or mobile device with a trained interviewer at the University of Chicago’s Survey Lab. None of the interviews were declined due to Internet or mobile device access issues. Interviews lasted approximately 40 min on an average. To maintain accuracy and minimize literacy issues, interviewers ensured that participants listened to all response choices and received necessary clarification before answering questions throughout each interview. At the end of the interview, participants were referred to social support and health services (e.g., COVID-19 and STI testing, food, and housing assistance) and were reimbursed with USD 35 either directly by staff or via PayPal, Venmo, or CashApp. A total of 226 participants completed the N2 COVID-19 survey. For the current analysis, 4 participants were excluded due to inconsistent HIV status information (clinically tested positive at N2 baseline survey but self-reported HIV-negative at the subsequent COVID-19 check-in survey) and yielded the analytic sample size 222 (196 BCSMM, 20 BTW, and 6 other gender identities).

This study was approved by the Biological Sciences Division/University of Chicago Medical Center Institutional Review Board (IRB) at the University of Chicago.

### Measures

#### HIV Status

Participants were tested for HIV at the baseline survey. Due to social distancing protocols, we did not test participants for HIV during the COVID-19 check-in survey. Participants’

HIV status for the current study was determined using (1) the diagnostic test at the baseline data collection and (2) self-reported responses during the N2 COVID-19 check-in survey. Participants not living with HIV ( $n = 132$ ) were defined if they (1) tested negative for HIV at baseline and self-reported HIV negative at the COVID-19 check-in survey ( $n = 130$ ), (2) self-reported HIV negative at the COVID-19 check-in survey but were missing in HIV testing results at baseline ( $n = 2$ ). Participants living with HIV ( $n = 90$ ) were defined if they (1) tested positive for HIV at baseline and self-reported HIV positive at the COVID-19 check-in survey ( $n = 72$ ), (2) tested positive for HIV at baseline, but missing in self-report HIV status at the COVID-19 check-in survey ( $n = 5$ ) or (3) self-reported HIV positive at the COVID-19 check-in survey but tested negative for HIV at baseline ( $n = 13$ ).

#### HIV Status Neutral Care Outcomes

We measured if the frequency of PrEP use or ART use had changed since the shelter-in-place order. For participants not living with HIV, we asked if they were currently using PrEP (yes/no). If they reported currently using PrEP, we further asked, “Since the shelter-in-place order, have you used PrEP more, less, or about as often as you used it before the pandemic?” For participants living with HIV, we asked if they were using ART (yes/no). If they reported ART use, we further asked, “Since the shelter-in-place order, have you missed doses of your HIV medication more, about the same, or less often than before the pandemic started?” The outcomes of interest combined whether someone was not on PrEP or reported using PrEP less since the pandemic for HIV-negative participants; similarly, for participants living with HIV the participants not using ART and those reporting missing more doses of ART were grouped together due to low cell sizes otherwise.

#### COVID-19 Conspiracy Beliefs

We measured participants’ belief regarding COVID-19’s origin and existence. These questions were developed based on the NIH repository of COVID-19 research tools. We asked the following: “Do you believe that COVID-19 is a government-made virus?”, “Do you believe that the current strain of the coronavirus came about naturally?”, “Do you believe the current strain of the coronavirus was developed intentionally in a lab?”, “Do you believe the current strain of coronavirus was made accidentally in a lab?”, “Do you believe the current strain of the coronavirus doesn’t really exist?” Response options include “yes”, “no”, and “unsure”. It should be noted that these COVID-19 related beliefs may be considered “conspiracy beliefs” at the time of the study while current evidence is inconclusive [30]. There is no

significant difference of the distribution of the COVID-19 conspiracy beliefs between BCSMM and BTW.

### Covariates

We controlled for several social-demographic variables that were considered to be associated with the COVID-19 related beliefs and the HIV care engagement outcomes. The social demographic variables derived from the baseline N2 survey (2018–2019) included age, sexual orientation, education, gender identity, employment status, and relationship status. Covariates which summarized whether participants experienced economic instability prior or due to shelter-in-place orders were additionally included; these variables were: (1) income loss/no income before shelter-in-place, (2) housing loss/housing instability before shelter-in-place, and (3) insurance loss/no insurance before shelter-in-place. We also controlled for several behavioral variables, including participants' PrEP or ART use at baseline and the number of sex partners at the COVID-19 check-in survey. The survey assessment period, which represents Illinois reopening phases, was considered an important confounder, and was included as a covariate. We categorized the study period into two general periods: Phase 1 (March 1, 2020–April 30, 2020)/Phase 2 (May 1, 2020–June 2, 2020) and Phase 3 (June 3, 2020–June 25, 2020)/Phase 4 (June 26, 2020 and after).

### Statistical Analysis

We summarized descriptive statistics of the COVID-19 related beliefs, HIV care engagement, social and behavioral variables by HIV status within the sample. We examined if the COVID-19 related beliefs distributed differently by assessment period through the Chi-square or Fisher's exact test. We investigated if there was an association between COVID-19 related belief and HIV status of neutral outcomes using Poisson regressions. Because the prevalence of the outcomes was not rare, we use Poisson regression for the current study to create a robust estimate of relative risk (PR) to avoid over-estimated findings [34]. Recognizing there may be a fundamental difference in a person's motivation for HIV status neutral care (e.g., norms about engaging in HIV care), we stratified univariable and multivariable Poisson regression models by participants' HIV status. However, based on the status-neutral approach, we further conducted a sensitivity analysis to examine the association by combing people living with HIV and people not living with HIV. Using a combined sample without stratification may enable us to have a more stable result. However, the stratification approach may allow us to have a specific understanding among diverse groups within the status-neutral care continuum. Each independent variable was entered into the

multivariable model along with all covariates one at a time. The significance level was set at  $p < 0.05$ . All analyses were conducted using STATA 15, College Station, Texas.

### Role of the Funding Source

The funder had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

### Results

As reported previously [9], the mean age was 27.9 years (standard deviation was 4.1), 88.3% were male, 59.7% self-identified as gay, and 38.4% were in a relationship. Among participants not living with HIV ( $n = 132$ ), 90 (68.2%) were not on PrEP, 11 (8.3%) used PrEP less frequently, 26 (19.7%) used PrEP the same amount, and 5 (3.8%) used PrEP more frequently since shelter-in-place. Among participants living with HIV with known ART use status ( $n = 85$ ), 7 (7.8%) were not on ART, 13 (16.7%) missed ART more frequently, 40 (47.1%) used the same amount, and 25 (29.4%) missed ART less frequently since shelter-in-place (Table 1).

In terms of COVID-19 skepticism, 128 (57.7%) participants believed that COVID-19 was a government-made virus, 138 (62.7%) believed that COVID-19 was developed intentionally in a lab, and 40 (18.2%) believed that COVID-19 was made accidentally in a lab. Overall, the majority (74.8%) of participants believed one or more of the theories that COVID-19 was either government-created or lab-created accidentally or purposefully. There were 49 (22.3%) participants who believed that COVID-19 came about naturally and 25 (11.4%) believed that COVID-19 doesn't really exist (Table 1). None of the COVID-19 related beliefs differed significantly between the Chicago reopening phases, which suggests the COVID-19 related beliefs did not fluctuate over time among our participants during the initial peak of the pandemic (Table 2).

Table 3 presents a series of bivariate and multivariable Poisson regression models, each with one COVID-19 related belief and controlling for social demographic characteristics from both baseline and COVID-19 surveys. Among participants not living with HIV, those who believed or were unsure if COVID-19 came about naturally was significantly associated with poor PrEP engagement (i.e., use PrEP less or not on PrEP) after controlling for covariates ( $aPR = 1.3$  [95% CI 1.1–1.6],  $z = 3.05$ ;  $aPR = 1.3$  [95% CI 1.1–1.67,  $z = 2.41$ , respectively). Believing COVID-19 does not really exist was

**Table 1** Distribution of study participants and COVID-19 conspiracy beliefs among Black cisgender sexual minority men and Black transgender women in Chicago, the N2 COVID-19 check-in survey (April to July 2020)

	Total (n = 222)
<b>Socio-demographic characteristics</b>	
Variables collected from baseline survey	
Gender at baseline	
Male	196 (88.3%)
Trans feminine	20 (9.0%)
Other	6 (2.7%)
Sexual orientation at baseline	
Bisexual	61 (27.5%)
Gay	129 (58.1%)
Straight/other/don't know	32 (14.4%)
Relationship Status at baseline	
Single	135 (61.6%)
In a relationship	84 (38.4%)
Education	
Less than high school	23 (10.4%)
High school/GED or higher	199 (89.6%)
Variables collected from COVID-19 check-in survey	
Age at COVID-19 check-in survey (mean, SD)	27.9 (4.1)
Income status since shelter-in-place	
Maintained income	54 (24.3%)
Lost income since shelter-in-place	124 (55.9%)
No income before shelter-in-place	44 (19.8%)
Health insurance status since shelter-in-place	
Maintained insurance	170 (78.0%)
Lost health insurance since shelter-in-place	19 (8.7%)
No health insurance before shelter-in-place	29 (13.3%)
Housing status since shelter-in-place	
Maintained stable housing	180 (81.1%)
Lost housing since shelter-in-place	28 (12.6%)
Unstable housing before shelter-in-place	14 (6.3%)
<b>HIV care engagement</b>	
HIV status	
HIV positive	90 (40.5%)
HIV negative	132 (59.5%)
ART use since shelter-in-place <sup>a</sup>	
Not on ART	7 (8.2%)
Missed ART less	25 (29.4%)
Missed ART same amount	40 (47.1%)
Missed ART more	13 (15.3%)
PrEP use since shelter-in-place <sup>b</sup>	
Not on PrEP	90 (68.2%)
Used PrEP less	11 (8.3%)
Used PrEP same amount	26 (19.7%)
Used PrEP more	5 (3.8%)
<b>COVID-19 conspiracy beliefs</b>	
Beliefs that COVID-19 was a government-made virus	
Unsure	37 (16.7%)
No	57 (25.7%)
Yes	128 (57.7%)
Beliefs that the current strain of the coronavirus came about naturally	

Table 1 (continued)

	Total (n = 222)
Unsure	29 (13.2%)
No	142 (64.5%)
Yes	49 (22.3%)
Beliefs that the current strain of the coronavirus was developed intentionally in a lab	
Unsure	36 (16.4%)
No	46 (20.9%)
Yes	138 (62.7%)
Beliefs that the current strain of the coronavirus was made accidentally in a lab	
Unsure	41 (18.6%)
No	139 (63.2%)
Yes	40 (18.2%)
Beliefs that believe the current strain of the coronavirus doesn't really exist	
Unsure	21 (9.6%)
No	173 (79.0%)
Yes	25 (11.4%)
Beliefs that COVID-19 was government-made, developed intentionally in a lab, and/or developed accidentally in a lab	
Unsure to at least one belief	29 (13.1%)
No to all	27 (12.2%)
Yes to at least one belief	166 (74.8%)

<sup>a</sup>Questions were only asked among HIV-positive participants (n = 85); 5 participants living with HIV were removed from analysis because they did not provide their current HIV status at the COVID-19 follow-up survey and follow-up questions related to medication use were not asked

<sup>b</sup>Questions were only asked among HIV-negative participants (n = 132)

significantly associated with better ART engagement after controlling for covariates (aPR = 0.2 [95% CI 0.05–0.7],  $z = -2.40$ ). Believing one or more of the theories that COVID-19 was either government-created or lab-created accidentally or purposefully was significantly associated with better PrEP engagement (aPR = 0.8 [95% CI 0.6–1.0],  $z = -2.40$ ).

In the sensitivity analyses where we combined people living with HIV and people not living with HIV, results regarding beliefs that COVID-19 came about naturally and beliefs about COVID-19 was government-created or lab-created remained similar (Table 4). However, the association between COVID-19 not existing in reality and HIV care engagement outcome shifted in significance from those who were sure it did not exist to those who were unsure of its existence.

## Discussion

The present study assessed COVID-19 conspiracy beliefs and how these beliefs were associated with HIV care engagement among BCSMM and BTW. Results showed that almost three-quarters of the sample believed one or more of the theories that COVID-19 was either government-created or

lab-created accidentally or purposefully. Notably, believing one or more of the theories COVID-19 was either government-created or lab-created accidentally or purposefully was significantly associated with continued PrEP engagement. To our knowledge, this is one of the first empirical studies that examine the COVID-19 conspiracy beliefs among Black sexual and gender minority populations in the U.S.

The present results show that COVID-19 conspiracy beliefs were common among BCSMM and BTW. Such beliefs must be considered along with the social and structural inequalities among racial, sexual, and gender minorities in the U.S. During the initial peak of the pandemic, there was a surging tension over the ongoing racial segregation and police brutality in the U.S. As Bogart et al. noted in their recent study conducted in May–June 2020, in conjunction with the Black Lives Matter movement, there was a high level of COVID-19 medical mistrust, especially towards the government, among Black individuals living with HIV in the U.S. [33]. In addition to the racial injustice, N2 study participants have experienced excessive social and economic stress at multiple levels since the start of the pandemic (e.g., lost income, lost housing, more intimate partner violence) [9]. The heightened COVID-19 related stress along with the COVID-19 mistrust, may contribute to greater levels

**Table 2** COVID-19 conspiracy beliefs by time of participant interview among Black cisgender sexual minority men and Black transgender women in Chicago, the N2 COVID-19 check-in survey (April to July 2020)

	Time of participants interview		$\chi^2(2)$	p-value
	Phase 1/phase 2 (April 20–June 2) (n = 76)	Phase 3/post (June 3–July 31) (n = 146)		
Beliefs that COVID-19 is a government-made virus			0.84	0.66
Unsure	11 (14.5%)	26 (17.8%)		
No	22 (28.9%)	35 (24.0%)		
Yes	43 (56.6%)	85 (58.2%)		
Beliefs that the current strain of the coronavirus came about naturally			3.14	0.21
Unsure	7 (9.5%)	22 (15.1%)		
No	46 (62.2%)	96 (65.8%)		
Yes	21 (28.4%)	28 (19.2%)		
Beliefs that the current strain of the coronavirus was developed intentionally in a lab			0.03	0.98
Unsure	12 (16.2%)	24 (16.4%)		
No	16 (21.6%)	30 (20.5%)		
Yes	46 (62.2%)	92 (63.0%)		
Beliefs that the current strain of the coronavirus was made accidentally in a lab			1.99	0.37
Unsure	13 (17.6%)	28 (19.2%)		
No	51 (68.9%)	88 (60.3%)		
Yes	10 (13.5%)	30 (20.5%)		
Beliefs that believe the current strain of the coronavirus doesn't really exist			1.24	0.54
Unsure	8 (11.0%)	13 (8.9%)		
No	59 (80.8%)	114 (78.1%)		
Yes	6 (8.2%)	19 (13.0%)		
Beliefs that COVID-19 was government-made, developed intentionally in a lab, and/or developed accidentally in a lab			0.43	0.81
Unsure to at least one belief	11 (14.5%)	18 (12.3%)		
No to all	8 (10.5%)	19 (13.0%)		
Yes to at least one belief	57 (75.0%)	109 (74.7%)		

of skepticism of the origin of COVID-19 and beliefs about COVID-19 was government-made or made in a lab.

We found that BCSMM and BTW who believed COVID-19 was government-created or lab-created were more likely to engage in PrEP and ART continuously (does not include initiating PrEP) during the initial peak of the pandemic. Additionally, our finding could be interpreted inversely, as those who believe that COVID-19 came about naturally were less likely to adhere to PrEP or ART during the initial peak of the pandemic. Although this relationship may appear counterintuitive, past research on HIV conspiracy beliefs and HIV care engagement found similar trends among racial minority people living with HIV [20, 35]. For example, a past study showed that Black individuals from a nationally representative sample who believed in HIV conspiracy theories were more likely to get tested for HIV [20]. It is important to note that these COVID-19 conspiracy beliefs are not necessarily irrational or undesired, even while scientific community has reached consensus that COVID-19 virus is zoonotic [29, 31]. During the initial peak of the pandemic,

information regarding the origin of the virus was much more inconsistent. Under this uncertain information environment, COVID-19 conspiracy beliefs may reflect a line of broken trust with government agencies and an increased perceived threat under the racist environment [36, 37]. It is possible that high levels of threats perceived by BCSMM and BTW may in turn associate with better HIV care engagement as a way to cope with stress under the false impression that biomedical HIV prevention and treatment may protect them from COVID-19 infection during the initial peak of the pandemic [38]. This finding further shed light on the distinction between HIV-related conspiracy beliefs and COVID-19 conspiracy beliefs for BCSMM and BTW populations. Our finding merits further investigation to understand why BCSMM and BTW who seem to be mistrustful are more likely to have better PrEP engagement outcomes (e.g., threat perception, resilience or self-determination factors).

This study has certain limitations. We used self-reported data to measure if the frequency of PrEP use or ART use had changed since the start of the pandemic. Our measures may

**Table 3** Bivariate and multivariable associations of COVID-19 conspiracy beliefs and HIV status neutral care engagement among Black cisgender sexual minority men and Black transgender women in Chicago, the N2 COVID-19 check-in survey (April to July 2020)

		Using PrEP less or not on PrEP <sup>a</sup>			Missing ART more or not on ART <sup>c</sup>			z					
		Bivariate PR (95% CI)	z	p-value	Multivariable <sup>b</sup> aPR (95% CI)	z	p-value	Bivariate PR (95% CI)	z	p-value	Multivariable <sup>d</sup> aPR (95% CI)	z	p-value
<b>Beliefs that COVID-19 is a government-made virus</b>													
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	1.07 (0.82, 1.38)	0.49	0.623	1.03 (0.79, 1.35)	0.25	0.803	0.68 (0.15, 3.03)	-0.51	0.610	0.92 (0.20, 4.21)	-0.11	0.916	
Yes	0.94 (0.75, 1.18)	-0.50	0.615	0.90 (0.72, 1.13)	-0.92	0.359	1.14 (0.46, 2.83)	0.29	0.771	0.89 (0.29, 2.77)	-0.20	0.842	
Beliefs that the current strain of the coronavirus came about naturally													
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	1.32* (1.05, 1.65)	2.41	0.016	1.37* (1.05, 1.78)	2.34	0.019	0.41 (0.06, 2.87)	0.41	0.371	0.37 (0.08, 1.84)	-1.21	0.225	
Yes	1.34** (1.11, 1.62)	3.05	0.002	1.39** (1.14, 1.71)	3.22	0.001	1.82 (0.83, 3.99)	1.82	0.138	3.09 (0.99, 9.66)	1.94	0.052	
Beliefs that the current strain of the coronavirus was developed intentionally in a lab													
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	1.07 (0.83, 1.37)	0.52	0.602	1.10 (0.84, 1.45)	0.69	0.490	0.73 (0.15, 3.45)	-0.40	0.692	0.32 (0.05, 2.01)	-1.22	0.223	
Yes	0.89 (0.71, 1.12)	-0.98	0.329	0.88 (0.71, 1.09)	-1.15	0.251	1.25 (0.47, 3.36)	0.45	0.652	0.70 (0.21, 2.36)	-0.58	0.564	
Beliefs that the current strain of the coronavirus was made accidentally in a lab													
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	0.89 (0.67, 1.16)	-0.87	0.382	0.97 (0.73, 1.29)	-0.19	0.852	0.29 (0.04, 1.98)	-1.27	0.204	0.38 (0.05, 2.82)	-0.94	0.347	
Yes	0.92 (0.72, 1.18)	-0.64	0.524	0.85 (0.67, 1.07)	-1.40	0.162	0.82 (0.23, 3.01)	-0.29	0.769	1.35 (0.43, 4.28)	0.51	0.611	
Beliefs that believe the current strain of the coronavirus doesn't really exist													
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	0.95 (0.67, 1.34)	-0.31	0.758	1.03 (0.78, 1.37)	0.23	0.820	3.33** (1.57, 7.06)	3.14	0.002	1.75 (0.44, 7.00)	0.79	0.429	
Yes	1.19 (0.84, 1.51)	1.47	0.141	1.09 (0.81, 1.48)	0.59	0.554	1.15 (0.38, 3.51)	1.15	0.801	0.18** (0.05, 0.73)	-2.40	0.017	
Beliefs that COVID-19 was government-made, developed intentionally in a lab, and/or developed accidentally in a lab <sup>e</sup>													
Unsure to at least one belief	0.96 (0.72, 1.28)	-0.27	0.789	0.94 (0.71, 1.24)	-0.44	0.659	0.30 (0.04, 2.30)	-1.16	0.247	0.26 (0.02, 3.29)	-1.04	0.297	
No to all	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Yes to at least one belief	0.85 (0.67, 1.07)	-1.37	0.172	0.78* (0.63, 0.95)	-2.40	0.017	0.71 (0.28, 1.79)	-0.72	0.473	0.39 (0.09, 1.71)	-1.24	0.213	

\*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001

<sup>a</sup>Among those who were HIV-negative at follow-up (n = 132)

<sup>b</sup>Controlled for: follow-up age, sexual orientation, relationship status, education, gender, time period, number of sexual partners, baseline PrEP use, changes in housing due to shelter-in-place, changes in health insurance due to shelter-in-place, and changes in income due to shelter-in-place

<sup>c</sup>Among those who were HIV-positive at follow-up (n = 85); 5 participants living with HIV were removed from analysis because they did not provide their current HIV status at the COVID-19 follow-up survey and follow-up questions related to medication use were not asked

<sup>d</sup>Controlled for: follow-up age, sexual orientation, relationship status, education, gender, time period, baseline ART use, changes in housing due to shelter-in-place, changes in health insurance due to shelter-in-place, and changes in income due shelter-in-place

<sup>e</sup>Controlled for: follow-up age, sexual orientation, relationship status, education, gender, time period, baseline ART use, changes in housing due to shelter-in-place, and changes in income due shelter-in-place only for the ART outcome



**Table 4** Bivariate and multivariable associations of COVID-19 conspiracy beliefs and HIV status neutral care engagement among Black cisgender sexual minority men and Black transgender women in Chicago, the N2 COVID-19 check-in survey (April to July 2020)

	Using PrEP less/not at all or missing ART doses more/not on ART					
	Bivariate PR (95% CI)	z	p-value	Multivariable aPR (95% CI)	z	p-value
Beliefs that COVID-19 is a government-made virus						
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	1.07 (0.75, 1.53)	0.37	0.710	0.99 (0.69, 1.40)	-0.08	0.934
Yes	0.99 (0.74, 1.31)	-0.10	0.922	0.94 (0.71, 1.25)	-0.42	0.675
Beliefs that the current strain of the coronavirus came about naturally						
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	1.22 (0.86, 1.73)	1.09	0.276	1.15 (0.80, 1.67)	0.77	0.444
Yes	1.54*** (1.21, 1.97)	3.54	<0.001	1.56*** (1.23, 1.98)	3.70	<0.001
Beliefs that the current strain of the coronavirus was developed intentionally in a lab						
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	1.08 (0.74, 1.57)	0.40	0.689	1.00 (0.67, 1.49)	-0.01	0.989
Yes	0.97 (0.72, 1.32)	-0.17	0.862	0.94 (0.71, 1.25)	-0.41	0.680
Beliefs that the current strain of the coronavirus was made accidentally in a lab						
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	0.91 (0.64, 1.28)	-0.56	0.579	0.88 (0.61, 1.27)	-0.68	0.498
Yes	1.12 (0.83, 1.49)	0.74	0.461	0.97 (0.73, 1.29)	-0.22	0.822
Beliefs that believe the current strain of the coronavirus doesn't really exist						
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Unsure	1.29 (0.94, 1.77)	1.55	0.121	1.34* (1.02, 1.75)	2.10	0.035
Yes	0.96 (0.63, 1.45)	-0.20	0.845	0.75 (0.47, 1.19)	-1.22	0.223
Beliefs that COVID-19 was government-made, developed intentionally in a lab, and/or developed accidentally in a lab						
Unsure to at least one belief	0.91 (0.59, 1.40)	-0.44	0.661	0.78 (0.51, 1.20)	-1.11	0.265
No to all	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Yes to at least one belief	0.86 (0.62, 1.19)	-0.90	0.370	0.75* (0.56, 0.99)	-2.01	0.044

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

Controlled for: follow-up age, sexual orientation, relationship status, education, gender, time period, number of sexual partners, baseline PrEP/ART use, changes in housing due to SIP, changes in health insurance due to SIP, and changes in income due SIP

also be limited by social desirability; however, the social desirability may be minimized as our interviewers were highly trained at the professional Survey Lab at the University of Chicago and have developed a long-term relationship with participants. Second, the cross-sectional design of the study may be limited in understanding causal relationships between COVID-19 conspiracy beliefs and PrEP or ART use. We measured participants' current belief about the origin of COVID-19 and their past PrEP or ART use behavior. Given changing social, health, and political environments, especially during the global pandemic, individual beliefs regarding the origin of COVID-19 may have also changed. Future research should consider how changes in COVID-19 conspiracy beliefs are associated with the changes in PrEP or ART use behaviors. Moreover, we did not measure mistrust of HIV biomedical interventions, stigma toward HIV, or HIV-related conspiracy beliefs, which has shown to negatively associated the uptake of HIV biomedical interventions

[39] and can also associated with individual's COVID-19 conspiracy beliefs due to the mistrust. Although we do not have measure for mistrust, the previous wave of the N2 survey showed that nearly three quarters of study participants reported perceived discrimination against due to their race or sexual orientation. As our participants experienced a substantial day-to-day discrimination, it is possible that our participants also experienced widespread mistrust and the variation of mistrust would also be minimal. Lastly, the small number of BTW in our sample has limited our ability to examine the differences of COVID-19 conspiracy beliefs between BCSMM and BTW due to lack of power. Future research with larger sample size of BTW is warranted.

## Conclusions

The results of the current study indicate a substantial number of BCSMM and BTW believed in COVID-19 conspiracies. To our surprise, believing in COVID-19 conspiracies was protective in terms of HIV care engagement. This result indicated that COVID-19 conspiracy beliefs may not necessarily be barriers for HIV care engagement and may even have a positive association with HIV care. We suggested that community-based outreach and care providers should consider an open conversation regarding COVID-19, including the COVID-19 related conspiracy beliefs, to ensure that BCSMM and BTW have adequate resources to engage in HIV care continuum as well as mental health and supportive services during the global pandemic. Future research is urged to examine structural and contextual factors (e.g., stigma, discrimination, mistrust) that may be associated with COVID-19 conspiracy beliefs, HIV care engagement, or COVID-19 related care, especially among the marginalized populations who have long endured mistrust, stigma, and racism.

**Acknowledgements** The authors would like to thank the participants for engaging in this research.

**Author Contributions** YTC conceptualized and lead manuscript preparation. NDV and YTC conceived the analysis. DD, JS, JK, YTC are the principal investigators of the N2 study. All authors contributed to data interpretation and have contributed to the intellectual content and preparation of the manuscript. All authors read and approved the final manuscript.

**Funding** This study was funded by the National Institutes of Health (Grant Nos. R01MH112406, R03DA053161, R01HL160325, R01DA054553) and Centers for Disease Control and Prevention (Grant No. U01PS005202).

**Data Availability** Data of the study can be obtained by contacting the corresponding author.

**Code Availability** Code of the study analyses can be obtained by contacting the corresponding author.

## Declarations

**Conflict of interest** The authors declare there is no conflict of interest regarding this manuscript.

**Ethical Approval** This study was approved by the Biological Sciences Division/University of Chicago Medical Center Institutional Review Board (IRB) at the University of Chicago.

**Consent to Participate** Informed consent was obtained from all individuals in the N2 Study.

**Consent for Publication** Not applicable.

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