

**Lower Prevalence of SARS-CoV-2 Infection Among People Experiencing Homelessness Tested in Outdoor Encampments Compared with Overnight Shelters – Denver, Colorado, June – July 2020**

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**Summary:** In the early months of the COVID-19 pandemic, a greater proportion of persons experiencing homelessness tested positive for SARS-CoV-2 RNA and antibodies in overnight shelters compared to outdoor encampments in Denver, Colorado. Results remained significant when controlling for participants' characteristics.

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## **Abstract**

**Background:** A better understanding of the risk for COVID-19 that people experiencing homelessness (PEH) face in congregate shelters versus unsheltered encampments is critical for an effective pandemic response.

**Methods:** We analyzed factors associated with current and past SARS-CoV-2 infection among PEH in day and overnight shelters and encampments in Denver, Colorado, during June 2-July 28, 2020, and constructed multivariable logistic regression models to examine risk factors for SARS-CoV-2 RNA and seropositivity with age, race/ethnicity, testing location, testing month, and symptom status as predictor variables.

**Results:** A total of 823 participants were tested for SARS-CoV-2 RNA, and 276 individuals were tested for SARS-CoV-2 antibodies. A greater percentage of PEH at overnight shelters tested positive for SARS-CoV-2 RNA (8.6% vs 2.5%,  $p < 0.01$ ) and antibodies (21.5% vs 8.7%,  $p = 0.03$ ) compared to encampments. In regression models, testing at an overnight shelter compared to testing at encampments (OR=3.03, 95% CI 1.16-9.02) had increased odds of a positive SARS-CoV-2 RNA result. Age >60 years compared to age <40 years (OR=5.92, 95% CI 1.83-20.3), Hispanic ethnicity (OR=3.43, 95% CI 1.36-8.95) and non-Hispanic Black race compared to non-Hispanic White race (OR=3.07, 95% CI 1.16-8.26), and testing at an overnight shelter compared to testing at encampments (OR=2.45, 95% CI 1.04-6.17) had increased odds of a positive antibody result.

**Conclusions:** Our findings support the need for continuing assessment of mitigation strategies in shelters, increasing access to individual rooms and linkage to housing options for PEH, and supporting people to remain in encampments when these options are not available.

**Key Words:** SARS-CoV-2, COVID-19, homelessness, homeless shelters, encampments

## Background

The U.S. Department of Housing and Urban Development estimates that >500,000 people in the United States experienced homelessness on a single night in January 2020, 39% of whom (>220,000 individuals) were staying in unsheltered locations, such as on the streets or in other locations not meant for habitation.<sup>1</sup> The COVID-19 pandemic has adversely impacted people experiencing homelessness (PEH) in many ways. Lack of housing is a risk factor for COVID-19, and PEH experience a disproportionate burden of comorbidities, placing them at increased risk for severe COVID-19, including hospitalization and death.<sup>2</sup> Preventing SARS-CoV-2 transmission and related morbidity and mortality among PEH is a critical public health priority with implications extending far beyond the current pandemic. The heterogeneity of settings where PEH congregate must be considered when designing strategies to mitigate the impact of COVID-19 among PEH.

Congregate shelters for PEH are often crowded indoor environments with poor ventilation through which hundreds of people may pass each day, eating and sleeping in close proximity. The frequency of close contact with others in this high-density indoor environment greatly increases the risk of transmission of respiratory pathogens. Moreover, SARS-CoV-2 can be transmitted from asymptomatic or pre-symptomatic hosts, making it difficult to identify and isolate those who may be contagious.<sup>3</sup> Reports of SARS-CoV-2 prevalence in overnight shelters have ranged 11% from 67% of guests tested in a shelters in Seattle, Boston, and San Francisco..<sup>4-6</sup> The combination of increased risk of SARS-CoV-2 transmission and increased risk for poor COVID-19 outcomes among those who contract the virus leaves shelter guests in the precarious position of deciding whether to stay in overnight shelters and risk illness from COVID-19 or seek other options which may also present serious risks to health and safety such as hypothermia or physical assault.<sup>7</sup>

In many cities, PEH congregate in encampments, defined as a group of people experiencing unsheltered homelessness together.<sup>6</sup> In 2020, a cross-sectional count estimated 6,104 individuals were experiencing homelessness in the greater metropolitan Denver area, including 1,561

experiencing unsheltered homelessness.<sup>9</sup> The US Centers for Disease Control and Prevention (CDC) has issued guidance that advises policymakers to allow individuals to remain in encampments to maintain connections with service providers and prevent spread of COVID-19.<sup>10</sup> This guidance may be difficult for state and local governmental organizations to follow in the face of competing demands and uncertainty around COVID-19 prevalence in encampments.

To better respond to the needs of all PEH during the ongoing pandemic, it is crucial to understand how COVID-19 impacts PEH staying in a variety of settings, such as encampments, day shelters (services offered during the day, without sleeping quarters), and overnight shelters (services with sleeping quarters). While ongoing work has assessed SARS-CoV-2 screening and COVID-19 management and mitigation strategies in overnight shelters, there has been less focus on SARS-CoV-2 transmission among PEH who are unsheltered. In this study, we analyzed factors associated with current and past SARS-CoV-2 infection among PEH staying in day and overnight shelters and encampments in Denver, Colorado, during the early COVID-19 pandemic.

## **Methods**

### Setting

Denver Public Health (DPH) is a public health agency within the Denver Health and Hospital Authority safety-net healthcare system. To meet community-based testing needs among Denver's population of PEH, the DPH Prevention and Outreach Team collaborated with local community leaders to identify four homeless shelters and three outdoor encampments for SARS-CoV-2 RNA and antibody testing. Testing was voluntary and available for all guests and staff at shelters as well as PEH staying in encampments. PEH who participated in testing were offered \$15 gift cards to a local grocery store chain.

## SARS-CoV-2 Testing

SARS-CoV-2 reverse transcription polymerase chain reaction (RT-PCR) testing was performed on nasopharyngeal swabs and conducted in the laboratory at the Colorado Department of Public Health and Environment using the CDC 2019-Novel Coronavirus (2019-nCoV) Real-Time RT-PCR Diagnostic Panel assay protocol. SARS-CoV-2 IgG antibody testing was performed on venous blood samples at Denver Health Medical Center using either the Thunderbolt (Gold Standard Diagnostics, Davis, CA) or Access (Beckman Coulter, Brea, CA) assays according to manufacturers' instructions. Delivery of testing results and subsequent support for safely isolating diagnosed cases were coordinated with staff members from the Colorado Coalition for the Homeless, a local organization that serves PEH. All testing occurred between June 2, 2020 and July 28, 2020.

## Data Collection

At each testing event, a short questionnaire was administered to participants who registered for testing. The questionnaire asked about the following sociodemographic factors: age, self-identified gender, and self-identified race and ethnicity; and any of the following symptoms they had experienced in the past two weeks: cough, fever, shortness of breath, loss of taste or smell.

## Statistical Methods

Factors associated with positive RT-PCR and antibody test results were compared across testing settings. Continuous variables are expressed as median and interquartile ranges (IQR), and categorical data are expressed as counts and percentages. We did not impute missing data. The Mann-Whitney U test was used to compare continuous variables, and the  $\chi^2$  test was used to compare categorical variables; Fisher Exact Test was used if the expected cell count was  $\leq 5$ . ANOVA was used to compare age between day shelters, overnight shelters, and encampments. An  $\alpha$  of 0.05 was considered significant. All statistical tests are two-sided. Data were initially entered into Microsoft Excel

(Microsoft, Redmond, WA); all statistical calculations were performed using R version 4.0.2 (R Foundation for Statistical Computing).<sup>11</sup>

Individuals who had previously tested positive for SARS-CoV-2 by RT-PCR were not eligible for repeat viral testing but were still eligible for antibody testing. Duplicate testing events were excluded from statistical analysis; for persons with more than one RT-PCR testing event, the first testing event recorded during the study period was included in the analysis. Persons with indeterminate RT-PCR or antibody test results were excluded from further analyses.

We constructed two logistic regression models to examine risk factors for SARS-CoV-2 RT-PCR and antibody positivity. In the first model, the outcome of interest was a positive SARS-CoV-2 RT-PCR result and in the second, the outcome of interest was a positive antibody assay. In both models, equivocal or indeterminate laboratory results were excluded. Predictor variables of interest were gender; race/ethnicity; categorical age; a composite variable for presence or absence of any one of the following self-reported symptoms within the previous two weeks: subjective or measured fever, cough, or shortness of breath; month of sample collection (June or July); and setting in which the participant was tested (overnight shelter or encampment). Age was categorized as <40, 40-59, and ≥60 years; these ranges were chosen as PEH aged ≥60 years were considered to be at higher risk for severe COVID-19 and potentially eligible for temporary motel stays to prevent exposure.<sup>12</sup> Day shelters were excluded from the risk factors analysis due to small sample size and potential for overlapping risk factors given that individuals from both encampments and overnight shelters could be among those tested in day shelters. We constructed univariable models and a single multivariable model comprised of all predictor variables of interest. The measure of association was the odds ratio.

## Oversight

The Colorado Multiple Institutional Review Board reviewed this study and determined it was not research and therefore exempt from full IRB review. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.\* Participants consented to testing and to sharing of their protected health information (PHI) among public health agencies and their respective shelters where applicable. All participant information was de-identified prior to analysis.

## **Results**

### Participant Characteristics

From June 2 to July 28, 2020, a total of 871 participants were tested during 11 testing events. Of these participants, 823 were tested using SARS-CoV-2 RT-PCR and 276 were tested for SARS-CoV-2 antibodies; 228 of these participants were tested for both SARS-CoV-2 RT-PCR and antibodies. Both antibody and RT-PCR testing were available during five testing events while six testing events had only RT-PCR testing available. Participant characteristics are listed in Table 1. Median participant age was 46 years (IQR 36-55 years). Among 870 participants with available information regarding their gender 82.3% were men. Among 812 participants who self-reported their race/ethnicity, 46.4% were non-Hispanic white, 22.0% were Hispanic, 20.1% were non-Hispanic Black, and 3.9% were non-Hispanic American Indian or Alaskan Native. Of the 871 participants, 61.8% were tested in overnight shelters, 30.7% were tested in encampments, and 7.2% were tested in a day shelter. Participants' age, gender, and race/ethnicity varied by testing location (Table 1).

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\* See e.g., 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.



### SARS-CoV-2 RT-PCR Results

SARS-CoV-2 RT-PCR results were available for 823 individuals; 54 tests (6.5%) were positive, 757 (92.0%) were negative, and 12 (1.5%) were indeterminate. SARS-CoV-2 RT-PCR positive results were more common among men than women (7.7% vs 1.5%,  $p=0.03$ ) and among those tested in overnight shelters than those tested in encampments (8.6% vs 2.5%,  $p<0.01$ ) (Figure 1). RT-PCR positivity did not differ by age, race, ethnicity, or symptom status (Table 2).

In logistic regression models, male gender was associated with increased odds of having a positive RT-PCR result in the multivariable model (OR = 4.30, 95% CI 1.14-28.3), and overnight shelter as the testing location was associated with increased odds of having a positive RT-PCR result (OR = 3.03, 95% CI 1.16-9.02) (Table 3). Age 40-59 years was significantly associated with having a positive RT-PCR result in the univariable model (OR = 2.15, 95% CI 1.12-4.49), but this result attenuated in the multivariable model (OR = 1.94, 95% CI 0.94-4.43).

### SARS-CoV-2 Antibody Results

SARS-CoV-2 antibody results were available for 276 individuals; 42 (15.2%) were positive, 229 (83.0%) were negative, and 5 (1.8%) were indeterminate. Indeterminate results were excluded from further analyses. Persons with positive SARS-CoV-2 antibody results were older (median age 54 years [IQR 48-58]) than persons who tested negative (median age 43 years [IQR 34-53]) ( $p<0.001$ ). A higher proportion of persons tested at overnight shelters were SARS-CoV-2 seropositive compared to those tested at encampments (21.5% vs 8.7%,  $p=0.006$ ) (Figure 1). A higher proportion of non-Hispanic Black persons and Hispanic persons had positive SARS-CoV-2 antibody results; antibody results did not differ by gender (Table 2). Antibody positivity was significantly higher for both men and women in shelters than those staying in encampments (Figure 1).

In the univariable logistic regression models, persons aged 40-59 years (OR = 2.44, 95% CI 1.09-6.01), persons aged greater than 60 years (OR = 6.99, 95% CI 2.43-20.9), persons testing at overnight

shelters (OR = 2.89, 95% CI 1.43-6.28), Hispanic persons (OR=2.94, 95% CI 1.23-7.18), and non-Hispanic Black persons (OR=2.89, 95% CI 1.16-7.27) had significantly higher odds of antibody positivity (Table 3). In the multivariable model, persons aged greater than 60 (OR = 5.92, 95% CI 1.83-20.3), Hispanic persons (OR = 3.43, 95% CI 1.36-8.95), non-Hispanic Black persons (OR=3.07, 95% CI 1.16-8.26), and testing at an overnight shelter (OR = 2.45, 95% CI 1.04-6.17) were significantly associated with antibody positivity (Table 3).

## Discussion

A greater proportion of PEH tested positive for both current and prior SARS-CoV-2 infection at shelters compared to encampments, suggesting that SARS-CoV-2 transmission may be higher in shelters than outdoor encampments. These findings support current CDC recommendations to leave encampments intact when possible to reduce SARS-CoV-2 transmission risk, which may be higher among sheltered PEH.<sup>10</sup> A seroprevalence study conducted among the general population in Denver during July-August 2020 estimated that 8% had detectable SARS-CoV-2 antibodies, which is lower than our point estimate of 16.6% among PEH participants.<sup>13</sup> In Denver, the hospitalization rate among PEH with COVID-19 has been three times higher than in housed individuals with COVID-19 throughout the pandemic, underscoring the vulnerability of PEH to SARS-CoV-2 infection and severe COVID-19 outcomes and the need for effective transmission prevention measures in this population.<sup>2,14</sup>

Higher SARS-CoV-2 RNA point prevalence among PEH living in shelters compared to those living unsheltered has also been reported in a prior study in Atlanta, Georgia (2.1% vs 0.5%).<sup>15</sup> Potential reasons for this difference include lower SARS-CoV-2 transmission in outdoor versus indoor settings and the increase in physical space between individuals during waking and sleeping hours in encampments versus shelters.<sup>16</sup> A SARS-CoV-2 seroprevalence study in Paris, France, conducted in March – May 2020 identified overcrowding as a key predictor of antibody positivity.<sup>17</sup> The frequent use of tents in encampments may provide an additional physical barrier to transmission. It is also

possible that participants staying in encampments have fewer interpersonal contacts, compared to participants who stay at overnight shelters. Notably, symptom screening upon entrance had been instituted at all shelters prior to the start of the study, with measures in place to provide motel rooms for symptomatic and medically vulnerable individuals.<sup>12</sup> Despite this practice, prevalence of SARS-CoV-2 RNA and antibodies remained significantly higher in shelters. RT-PCR positivity in participants tested at the day shelter (6.3%) was between that seen in people tested at overnight shelters (8.6%) and encampments (2.5%), consistent with the practice that the day shelter serves individuals staying at both overnight shelters and encampments, supporting the suggestion that overnight shelters pose the highest risk for SARS-CoV-2 transmission.

PEH sometimes move between shelters or from other congregate settings with high SARS-CoV-2 risk (e.g., respite care, jails). However, exposures during the prior 14 days were not asked of our participants, so it is unknown whether exposures from other settings could have contributed to the higher infection rates among individuals in our study. However, a previous study in Toronto, Canada, found that individuals in shelters who tested positive were less likely to have been in a different shelter in the prior 14 days<sup>18</sup>, suggesting that infections were acquired in the shelter in which individuals were tested rather than from an outside source.

PEH tested at overnight shelters had a higher prevalence of antibodies against SARS-CoV-2, suggesting that overnight shelters have a higher risk of SARS-CoV-2 transmission; this association remained significant in the adjusted models. PEH with prior SARS-CoV-2 infection tended to be older than individuals without evidence of prior infection. This association remained when controlling for testing location type, age, race/ethnicity, symptom status, and testing month; participants who were tested in overnight shelters were older on average than those tested in encampments. While the reasons for the higher prevalence of past infection in older individuals are not readily apparent, the

finding has concerning implications given that age is a risk factor for severe COVID-19 and additional measures to protect older individuals experiencing homelessness may be warranted.

Data about SARS-CoV-2 infection rates in homeless shelters suggest that prevalence varies widely depending in part on whether a cluster of cases had been identified prior to widespread screening. A review of SARS-CoV-2 testing in three US cities early in the pandemic revealed an average positivity rate of 37% in shelters which had identified  $\geq 2$  cases in the preceding two weeks and 4-5% in shelters which had zero or one reported case in the preceding two weeks.<sup>19</sup> The overall current infection prevalence of 9% in shelters in our study reflects the heterogeneity of prevalent cases in the shelters tested, though with the exception of two testing events at encampments, all testing events during the study period identified at least two new cases of active SARS-CoV-2 infection, with some events identifying as many as 12 cases.

The generalizability of these findings is limited by several factors. First, this study is observational and thus subject to unmeasured differences in populations by testing location type. Second, our results may have been influenced by selection bias as testing was voluntary and represents only individuals who opted in for testing. Third, movement of participants between shelters and encampments was not measured and it is possible that persons who tested at an overnight shelter may not have resided in an overnight shelter when they initially acquired SARS-CoV-2 infection. However, we would have expected this potential misclassification to dilute the strength of our findings, rather than accentuate them. Furthermore, the Colorado Coalition for the Homeless street outreach team has found that minimal overlap exists between sheltered and unsheltered communities in Denver, noting that when an encampment with approximately 80 people was disbanded in the summer of 2020, only one person accepted transportation to an overnight shelter. (Wessley, J. Personal Communication) Review of DPH SARS-CoV-2 testing among PEH during this period revealed that of the 73 individuals with repeat tests, only four tested at different location types. Another potential limitation is that these data encompass only two months in a pandemic

that has lasted nearly two years and has been marked by significant temporal and geographic variability.<sup>20,21</sup> While we included “month of testing” as a variable in our analysis, this may not fully address the effect of changing incidence of disease week to week during the study period. However, the findings of higher antibody prevalence in people living in shelters compared to encampments suggest that the SARS-CoV-2 RNA incidence had likely been higher over the months preceding the study as well.

Our findings support the need for continued assessment of mitigation strategies in congregate shelters and consideration of more transitional housing and non-congregate shelter options to reduce transmission and protect vulnerable PEH.<sup>22-25</sup> Maintaining access to outdoor encampments, reducing the density of people staying in overnight shelters, and providing stable housing are important measures to reduce transmission risk among PEH. Recognition of the lower rates of active and prior SARS-CoV-2 infection in encampments suggests that interventions designed to optimize distancing, decrease density, and promote ventilation in indoor settings may be particularly helpful to reduce transmission. Additionally, novel approaches to address homelessness such as the creation of safe outdoor spaces or sanctioned camping areas (which promote distancing and provide access to sanitation) within cities may further decrease risk of COVID-19 among PEH while more affordable housing is made available. Importantly, the finding that PEH staying in encampments are at lower risk for SARS-CoV-2 infection supports the CDC recommendation to allow people living unsheltered in encampments to remain where they are when individual housing options are not available.<sup>10</sup> Finally, increasing convenient and reliable access to COVID-19 vaccines for PEH is critical to minimize impact of the pandemic for this vulnerable population.

## NOTES

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**Conflicts of Interest:** KW reports payments made to the institution outside of the submitted work for Hologic research and surveillance grant and Pfizer stock paid to self. KK reports payments made to the institution outside of the submitted work for Hologic research and surveillance grant. SR reports Gilead Sciences research grant paid to the institution outside of the submitted work. All other authors report no conflicts of interest.

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**FIGURE LEGEND**

**Figure 1.** SARS-CoV-2 RT-PCR Positivity and Antibody Positivity by Location Type and Gender

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**Table 1.** Demographic characteristics, symptom status, and testing location for participants tested for SARS-CoV-2 RNA and/or antibodies, Denver, June-July 2020

	Overall (N = 871)	Overnight Shelter (N = 541)	Encampment (N = 267)	Day Shelter (N = 63)	<i>p</i> -value*
<b>Age in years (Median, IQR)</b>	46, 36-55	48, 38-56	41, 32-51	50, 37-56	<0.001
<b>Categorical Age, years (n, %)</b>					
<40	298 (34.2)	161 (29.8)	120 (44.9)	17 (27.0)	<0.001
40-59	477 (54.8)	313 (57.9)	129 (48.3)	35 (55.6)	
≥60	96 (11.0)	67 (12.4)	18 (6.7)	11 (17.5)	
Missing	0 (0)	0 (0)	0 (0)	0 (0)	
<b>Gender (n,%)</b>					
Women	154 (17.7)	73 (13.5)	62 (23.3)	19 (30.2)	<0.001
Men	716 (82.3)	468 (86.5)	204 (76.7)	44 (69.8)	
Missing	1 (<1.0)	0 (0)	1 (<1.0)	0 (0)	
<b>Race/Ethnicity (n, %)</b>					
White, non-Hispanic	377 (43.2)	243 (44.9)	101 (37.8)	33 (52.3)	0.002
Black, non-Hispanic	163 (18.7)	119 (22.0)	34 (12.7)	10 (15.9)	
American Indian/Alaska Native, non-Hispanic	32 (3.7)	13 (2.4)	18 (6.7)	1 (1.6)	
Hispanic	179 (20.6)	111 (20.5)	60 (22.5)	8 (12.6)	
Other	61 (7.0)	35 (6.5)	21 (7.9)	5 (7.9)	
Missing	59 (6.8)	20 (3.7)	33 (12.4)	4 (6.3)	
<b>Symptom Status (n,%)</b>					
Asymptomatic	642 (73.7)	392 (72.5)	214 (80.1)	36 (57.1)	0.20
Symptomatic	110 (12.6)	58 (10.7)	43 (16.1)	9 (14.3)	
Missing	119 (13.7)	91 (16.8)	10 (3.7)	18 (28.6)	
<b>Month at Testing (n, %)</b>					
June	511 (58.7)	398 (73.6)	49 (18.4)	63 (100)	N/A †
July	360 (41.3)	143 (26.4)	218 (81.6)	0 (0)	
Missing	0 (0)	0 (0)	0 (0)	0 (0)	

\* P-values compare variables across the three different shelter types. P-values were calculated using ANOVA (age in years), Chi-square (gender, symptom status, and categorical age), or the Fisher Exact test (race/ethnicity). Chi-square tests were performed after exclusion of missing values.

†P-value not calculated as no tests were performed in day shelters in the month of July.

**Table 2.** Demographic characteristics, symptom status, and testing location of participants stratified by SARS-CoV-2 RT-PCR and SARS-CoV-2 antibody results, Denver, June-July 2020

	SARS-CoV-2 RT-PCR (N = 811)			SARS-CoV-2 Antibody (N = 276)		
	Positive (N = 54)	Negative (N = 757)	p-value	Positive (N = 42)	Negative (N = 229)	p-value
<b>Age (median, IQR)</b>	49, 41–56	46, 36–55	0.16	54, 48–58	43, 34–53	<0.0001
<b>Categorical Age (n, %)</b>						
<40	11 (4.1)	260 (95.9)	0.08	8 (7.8)	95 (92.2)	0.001
40-59	38 (8.4)	417 (91.6)		24 (17.0)	117 (83.0)	
≥60	5 (5.9)	80 (94.1)		10 (37.0)	17 (63.0)	
<b>Gender (n, %)</b>						
Women	2 (1.5)	132 (98.5)	0.007	8 (11.4)	62 (88.6)	0.37
Men	52 (7.7)	624 (92.3)		34 (16.9)	167 (83.1)	
<b>Race/Ethnicity (n, %)</b>						
White, non-Hispanic	20 (5.7)	330 (94.3)	0.84	11 (10.9)	90 (89.1)	0.05
Black, non-Hispanic	12 (7.8)	141 (92.2)		12 (26.1)	34 (73.9)	
American Indian/Alaska Native, non-Hispanic	2 (7.1)	26 (92.9)		2 (13.3)	13 (86.7)	
Hispanic	13 (7.6)	157 (92.4)		14 (26.4)	39 (73.6)	
Other	3 (5.7)	50 (94.3)		2 (9.1)	20 (90.9)	
<b>Location Type (n, %)</b>						
Overnight Shelter	44 (8.6)	465 (91.4)	0.003	31 (21.5)	113 (78.5)	0.006
Encampment	6 (2.5)	233 (97.5)		11 (8.7)	116 (91.3)	
Day Shelter	4 (6.3)	59 (93.7)		N/A	N/A	
<b>Symptom Status (n, %)</b>						
Asymptomatic	46 (6.6)	656 (93.4)	0.92	38 (15.6)	206 (84.4)	1.0
Symptomatic	8 (7.3)	101 (92.7)		4 (14.8)	23 (85.2)	
<b>Month at Testing (n, %)</b>						
June	41 (8.1)	467 (91.9)	0.05	8 (25.0)	24 (75.0)	0.12
July	13 (4.3)	290 (95.7)		34 (14.2)	205 (85.8)	
<b>SARS-CoV-2 Antibody Result (n, %)</b>						
Positive	8 (25.8)	23 (74.2)	<0.0001	N/A	N/A	N/A
Negative	3 (1.0)	283 (99.0)		N/A	N/A	

Row percentages are shown. Indeterminate results are not displayed. Abbreviations: RT-PCR = Reverse Transcription-Polymerase Chain Reaction; IQR = Interquartile Range

**Table 3.** Association between SARS-CoV-2 RT-PCR positivity (left two columns) and SARS-CoV-2 antibody status (right two columns) using logistic regression models, Denver, June-July 2020. Both multivariable (all variables included) and univariable models are shown.

	<b>SARS-CoV-2 RT-PCR Positivity as Outcome of Interest</b>		<b>SARS-CoV-2 Antibody Positivity as Outcome of Interest</b>	
	Univariable Model OR, 95%CI	Multivariable Model OR, 95%CI	Univariable Model OR, 95%CI	Multivariable Model OR, 95%CI
<b>Categorical Age, years</b>				
<40	Reference	Reference	Reference	Reference
40-59	2.15, 1.12-4.49	1.94, 0.94-4.43	2.44, 1.09-6.01	1.87, 0.76-5.13
≥60	1.48, 0.45-4.19	1.45, 0.43-4.40	6.99, 2.43-20.9	5.92, 1.83-20.3
<b>Gender</b>				
Female	Reference	Reference	Reference	Reference
Male	5.50, 1.68-33.9	4.30, 1.14-28.3	1.58, 0.72-3.83	2.01, 0.78-5.65
<b>Race/Ethnicity</b>				
White, non-Hispanic	Reference	Reference	Reference	Reference
Black, non-Hispanic	1.40, 0.65-2.91	1.29, 0.58-2.78	2.89, 1.16-7.27	3.07, 1.16-8.26
Hispanic	1.37, 0.65-2.79	1.44, 0.67-3.00	2.94, 1.23-7.18	3.43, 1.36-8.95
Other	1.09, 0.35-2.78	1.04, 0.29-2.97	0.99, 0.26-3.13	0.86, 0.21-3.00
<b>Location Type</b>				
Encampment	Reference	Reference	Reference	Reference
Overnight Shelter	3.67, 1.66-9.72	3.03, 1.16-9.02	2.89, 1.43-6.28	2.45, 1.04-6.17
<b>Symptom Status</b>				
Asymptomatic	Reference	Reference	Reference	Reference
Symptomatic	1.13, 0.48-2.34	1.13, 0.41-2.61	0.94, 0.27-2.62	1.03, 0.26-3.43
<b>Month at Testing</b>				
June	Reference	Reference	Reference	Reference
July	0.51, 0.26-0.94	1.31, 0.56-2.88	0.50, 0.21-1.26	1.10, 0.38-3.41

Abbreviations: RT-PCR = Reverse Transcription-Polymerase Chain Reaction; OR = Odds Ratio

Figure 1

