DE GRUYTER J Osteopath Med 2021; 121(2): 199–210

Public Health and Primary Care Original Article

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The seroprevalence of SARS-CoV-2 in a rural southwest community

https://doi.org/10.1515/jom-2020-0287
Received November 5, 2020; accepted December 15, 2020; published online February 12, 2021

Abstract

Context: The true prevalence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), has been difficult to determine due to limited testing, inconsistent symptom severity, and asymptomatic infections. Systematic investigation of the prevalence of SARS-CoV-2 has been limited to urban environments and large academic centers. Limited data on the seroprevalence of SARS-CoV-2 is available for those who live in a rural community setting, leaving rural practitioners to extrapolate the epidemiology of COVID-19 to a nonhomogeneous population.
Objective: To determine the seroprevalence of SARS-CoV-2 in a community setting. The secondary objective of this study was to describe the difference in infection rate and reverse transcription polymerase chain reaction (RT-PCR) testing in the same rural community.
Methods: A prospective convenience sample of community members and healthcare workers from the Kingman, Arizona area were tested for SARS-CoV-2–specific antibodies using a lateral flow immunoassay with the VITROS Anti-SARS-CoV-2 IgG test (Ortho-Clinical Diagnostics, Inc.) from September 28, 2020 to October 09, 2020. Upon recruitment, participants were asked to complete a demographic survey assessing socioeconomic status, comorbidities, and COVID-19 symptoms in the preceding two months. Following enrollment, a retrospective chart review was completed to determine the percentage of patients who had undergone previous SARS-CoV-RT-PCR testing.
Results: A total of 566 participants were included in the final analysis: 380 (67.1%) were women, 186 (32.9%) were men, a majority (458; 80.9%) self-identified as White, and 303 (53.5%) were employed as healthcare professionals. Seroprevalence of SARS-CoV-2 was found to be 8.0% (45 of 566) across the sample and 9.9% (30 of 303) in healthcare workers. No statistical difference in seroprevalence was found between men and women, healthcare workers and other participants, amongst racial groups, by socioeconomic status, by comorbid conditions, or by education level. Among the participants, 108 (19.1%) underwent previous RT-PCR testing. Of the 45 patients who were antibody positive, 27 (60%) had received a previous RT-PCR test, with 20 (44.4%) testing positive for SARS-CoV-2. Participants with symptoms of anosmia/ageusia ($p<0.001$), chest congestion ($p=0.047$), fever ($p=0.007$), and shortness of breath ($p=0.002$) within the past two months were more likely to have antibodies to SARS-CoV-2.
Conclusion: Only 8% of 566 participants in this rural community setting were found to have antibodies for SARS-CoV-2. A large minority (18; 40%) of patients testing seropositive for SARs-CoV-2 had never received a prior test, suggesting that the actual rates of infection are higher than publicly available data suggest. Further large-scale antibody testing is needed to determine the true prevalence of SARS-CoV-2 in the rural setting.

Keywords: COVID-19, pandemic, public health, RT-PCR, rural healthcare, seroprevalence.

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At the time of writing, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), has infected more than 76.9 million people worldwide, with more than 17.8 million cases in the United States as of this writing.[1] Following the first documented case of SARS-CoV-2 in Washington state in January 2020, states have been recommended to report all laboratory confirmed cases of SARS-CoV-2 to Centers for Disease Control and Prevention (CDC).[2] Reported cases both at the state and national level are likely only a fraction of those infected with the disease due to asymptomatic infections, the lack of or selective testing capabilities, and the varied symptoms patients may experience.[3]

Following infection with SARS-CoV-2, there is a rapid antibody response in both those who are asymptomatic and those who are symptomatic.[4,5] Seroprevalence testing uses antibodies as a marker for exposure to a pathogen in order to estimate the proportion of a population that has been infected. Data in the United States on seroprevalence has been limited to SARS-CoV-2 "hot spots," large urban environments, specific racial and ethnic minority groups, and those at increased risk of severe illness from the virus that causes COVID-19.[6,7] Little is known about the spread of the disease in rural community settings. Therefore, we sought to determine the seroprevalence of residents in our rural community.

Methods

Geographic population

Kingman Regional Medical Center (KRMC) is a 214-bed community hospital annually serving approximately 50,000 patients. Located in Mohave County, Arizona, the community is comprised of 76.7% White, 16.9% Hispanic or Latino, 3.0% American Indian, 1.3% African American or Black, and 1.2% Asian American members.[8] The median per capita income of residents is $24,829; 12.9% of the population holds a bachelor's degree or higher.[8]

All protocols and procedures conducted in this study were approved by the KRMC Institutional Review Board. This study was registered at www.clinicaltrials.gov (NCT04533360).

Study design

A convenience sample of adult participants aged 18 years or older was recruited from the greater Kingman, Arizona area through social media, radio, newspaper, and press releases for one month preceding patient enrollment. Enrollment was open between September 28, 2020 and October 09, 2020 and occurred between the hours of 14:00 and 20:00. Participants self-selected inclusion in the study by either calling into the hospital's COVID-19 hotline or via a walk-in appointment at the testing center. Participants were included in the study following the self-reported absence of COVID-19 symptoms during study enrollment. Participants were excluded from the study if they lived outside of Mohave County or failed to complete more than 50% of their behavioral health survey. It should be noted that patients were only followed for the day survey completion and two days posttest for the return of their antibody results. No patients reported the development of symptoms in this timeframe, so none were excluded for that reason.

Upon arrival to the enrollment site, participants were administered an informed consent and asked to complete a demographics questionnaire (Appendix). The questionnaire assessed patient age, racial or ethnic identity, income bracket, educational background, employment status, active comorbidities, and respiratory symptoms over the previous two months. Following completion of the questionnaire, participants underwent venipuncture for serology testing.

Following venipuncture, SARS-CoV-2–specific antibodies were tested using a lateral flow immunoassay with the VITROS Anti-SARS-CoV-2 IgG test (Ortho-Clinical Diagnostics Inc.) under the Emergency Use Authorization (EUA) from the Food and Drug Administration (FDA). The diagnostic sensitivity of the immunoassay was 87.5% and specificity was 100%. The positive and negative predictive value with a prevalence of *a priori* 5% in the community was 100 and 99.3% respectively. A review of medical records at KRMC was then conducted on participants to assess the percentage of the sample who had received a COVID-19 nasopharyngeal swab or previous antibody test and the subsequent results.

Statistical analysis

Statistical analysis was conducted using IBM SPSS statistics software, version 27. Data is presented as descriptive statistics (mean, 95% confidence interval [CI], and interquartile range [IQR]) for participant ages and frequencies (n; %) for race/ethnicity, income, education, employment, comorbidities, and symptomology. Significant differences between SARS-CoV-2 antibody status ($AB^{+/-}$) and between men and women were detected with the independent samples t-test or the Pearson chi-squared analysis.

Results

Among the 569 participants screened for study inclusion, 568 consented for antibody testing and two were removed from analysis due to living outside the predefined geographical enrollment area of the study. Overall, a total of 566 participants were included in the study, with a mean age of 49.4 years. The majority (67.1%; 380 of 566) were women and self-identified their race as White (81.1%; 458 of 565 who responded). About a third (31%; 175 of 564) had an education level of high school or less, and 41.8% (232 of 554) had a yearly income between $39,475 and $84,200. The most common comorbid condition in the study group was hypertension (18.9%; 107 of 566). Full demographic characteristics are shown in Table 1.

In the overall cohort, the prevalence of antibodies to SARS-CoV-2 was 8% (45 of 566) with the average age of patients with an AB^+ result being 47.2 years (CI, 43.0–51.4 years). No significant difference was detected in $AB^{+/-}$ result by sex, with 7.5% of men (14 of 186) and 8.2% of women (31 of 380) testing positive. The majority of those who were positive for SARS-CoV-2 antibodies self-identified as White (35; 77.8%), had an income of between $84,201 and $160,725 (16; 35.6%), held a bachelor's degree (11; 24.4%), and worked full time (34; 75.6%) (Table 1). Students (two of 45; p=0.03) and those who were unemployed but not seeking work (three of 45; p=0.004) were more likely to be seropositive.

A large portion (53.5%; 303 of 566) of the sample consisted of healthcare workers who did vary significantly on several factors compared with the general public (Table 2). Healthcare workers had a younger mean age compared with the general public (44.5 years [CI, 43.0–46.0] vs. 55.2 years [53.2–57.3]; p<0.001) and were comprised of fewer men than expected (p=0.006). They also were less likely to make less than $39,475 per year (p=0.003) and more likely to make over $160,000 (p=0.003). Furthermore, healthcare workers had a higher level of educational attainment; they were more likely to hold a professional (p<0.001) or doctoral (p=0.013) degree. Healthcare workers (9.9%; 30 of 303) did not, however, show a significant increase in the likelihood of being seropositive for SARS-CoV-2 compared with to the public (5.7%; 15 of 263; p=0.069).

A total of 66.7% (30 of45) of those with AB^+ for SARS-CoV-2 did not report any symptoms within the prior two months. The most common symptoms reported were shortness of breath (20%; nine of 45) in AB^+ and cough (15.2%; 79 of 521) in AB^- participants. Participants with anosmia/ageusia (p<0.001), fever (p=0.007), and shortness of breath (p=0.002) were more likely to have antibodies to SARS-CoV-2 compared with those who did not (Table 1).

One-hundred and eight participants (19.1%) had undergone previous reverse transcription polymerase chain reaction (RT-PCR) testing. Of those who were seropositive for SARS-CoV-2, 60% (27 of 45) had received a previous RT-PCR test with 44.4% (20 of 45) testing positive and 15.6% (seven of 45) testing negative (Table 3). Forty percent (18 of 45) of those who were AB^+ had not undergone previous RT-PCR testing for SARS-CoV-2. Of participants who were seronegative for SARS-CoV-2, 15.5% (81 of 521) had received a previous negative RT-PCR test. Amongst the cohort, 4.8% (27 of 566) had received previous antibody testing. Of those who were seropositive for SARS-CoV-2, 6.6% (three of 45) had received a previous antibody test, with positive results returned for 4.4% (two of 45) of participants. Conversely, 4.6% (24 of 521) of seronegative participants received a previous antibody test, with 4.4% (23 of 521) returning negative results.

Discussion

The results of this study provide an important point of reference for understanding the spread of COVID-19 throughout the rural United States. KRMC documented its first patient with SARS-CoV-2 in March 2020 and has since documented only 534 cases out of 12,442 RT-PCR tests (4.3%), with most of those cases (62.4%; 333 of 534) testing positive in midsummer 2020. Previous RT-PCR testing efforts produced a much lower prior community prevalence estimate of 4.3% for COVID-19 infection. The seroprevalence rate detected in this study more closely aligns with the positivity rate reported throughout the whole of Mohave county, at 8.4%.[9] However, only 60% of AB^+ participants had received a previous RT-PCR test, suggesting that in rural Arizona, nearly 40% of cases may have gone undetected. With a seroprevalence of 8.0%, this study still suggests that community settings are well below the 67% infection rate need to reach herd immunity.[10]

Community-based sampling for the seroprevalence of SARS-CoV-2 has been conducted in six United States "hot spots,"[11] including four urban areas (Los Angeles, CA; New York, NY; Chelsea, MA; San Francisco, CA), and two statewide studies (Indiana; Oregon).[12–17] The estimated infection rate in urban centers as of early summer 2020 was between 4.06% (Los Angeles, CA) and 35.1% (Chelsea, MA); however, statewide sampling suggested a seroprevalence of only 1.0–1.01% percent of the population.[14,15] Our results (8.0%), in a large independent sampling from a rural area, suggest that while seroprevalence is lower in rural areas than urban centers, it is much higher than previously predicted, aligning with estimates published by the CDC.[18]

Unlike results from some previous reports, ours did not show a significant increase in seropositivity among healthcare workers.[19,20] This finding aligns with a recent multicenter report,[21] in which bidirectional differences in

Table 1: Demographic characteristics of SARS-CoV-2 seropositive participants.

Characteristic	All (N=566) n (%)	AB+ (n=45, 8.0%) n (%)	AB− (n=521, 92.0%) n (%)	p-value
Mean age, years (95% CI) [IQR]	49.4 (48–50.7) [25]	47.2 (43.0–51.4) [27]	49.6 (48.2–51) [26]	0.344
Men	186 (32.9)	14 (31.1)	172 (33.0)	0.879
Women	380 (67.1)	31 (68.9)	349 (67.0)	0.828
Healthcare worker	303 (53.5)	30 (66.7)	273 (52.4)	0.069
Self-reported race	**N=565**	**n=45**	**n=520**	
White	458 (81.1)	35 (77.8)	423 (81.3)	0.796
Hispanic or Latino	45 (8.0)	4 (8.9)	41 (7.9)	0.826
Black or African American	5 (0.9)	1 (2.2)	4 (0.8)	0.323
Native American	4 (0.7)	0(0)	4 (0.8)	0.569
Other	53 (9.4)	5 (11.1)	48 (9.2)	0.684
Income	**N=554**	**n=45**	**n=509**	
$9,700 or less	26 (4.7)	3 (6.7)	23 (4.5)	0.517
$9,701–$39,475	124 (22.3)	8 (17.8)	116 (22.8)	0.491
$39,475–$84,200	232 (41.8)	13 (28.9)	219 (43.0)	0.163
$84,201–$160,725	125 (22.5)	16 (35.6)	109 (21.4)	0.053
$160,726 or more	47 (8.5)	5 (11.1)	42 (8.3)	0.521
Education	**N=564**	**n=45**	**n=519**	
Highschool or less	175 (31.0)	10 (22.2)	165 (31.8)	0.265
Associate degree	113 (20.0)	10 (22.2)	103 (19.8)	0.728
Bachelor's degree	155 (57.5)	11 (24.4)	144 (27.7)	0.679
Master's degree	63 (11.2)	9 (20.0)	54 (10.4)	0.062
Professional degree	38 (6.7)	3 (6.7)	35 (6.7)	1.000
Doctoral degree	20 (3.5)	2 (4.4)	18 (3.5)	0.742
Employment	**N=564**	**n=44**	**n=520**	
Full time, 40 hours	413 (73.2)	34 (75.6)	379 (72.9)	0.741
Part time, 20 hours	34 (6.0)	2 (4.4)	32 (6.2)	0.657
Unemployed-SW	9 (1.6)	0 (0)	9 (1.7)	0.384
Unemployed-NSW	9 (1.6)	3 (6.7)	6 (1.2)	**0.004**
Student	6 (1.1)	2 (4.4)	4 (0.8)	**0.027**
Retired	93 (16.5)	3 (6.7)	90 (17.3)	0.097
Comorbidities	**N=566**	**n=45**	**n=521**	
Diabetes	35 (6.2)	4 (8.9)	31 (6.0)	0.432
CHF	8 (1.4)	0 (0)	8 (1.5)	0.402
Asthma	57 (10.1)	7 (15.6)	50 (9.6)	0.203
Hypertension	107 (18.9)	12 (26.7)	95 (18.2)	0.166
COPD	11 (1.9)	0 (0)	11 (2.1)	0.325
Liver disease	6 (1.1)	1 (2.2)	5 (1.0)	0.428
Symptoms	**N=566**	**n=45**	**n=521**	
Anosmia/ageusia	14 (2.5)	6 (13.3)	8 (1.5)	**<0.001**
Cough	86 (15.2)	7 (15.6)	79 (15.2)	0.994
Chest congestion	28 (4.9)	5 (11.1)	23 (4.4)	**0.047**
Fever	28 (4.9)	6 (13.3)	22 (4.2)	**0.007**
Shortness of breath	46 (8.1)	9 (20.0)	37 (7.1)	**0.002**
Chest pain	15 (2.7)	3 (6.7)	12 (2.3)	0.080

AB, antibody; CI, confidence interval; IQR, interquartile range; SW, seeking work; NSW, not seeking work; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.

Table 2: Demographic comparisons of public and healthcare worker participants.

Characteristic	All (N=566) n (%)	Public (n=263; 46.5%) n (%)	Healthcare (n=303; 53.5%) n (%)	p-value
Mean age, years (95% CI) [IQR]	49.4 (48–50.7) [25]	55.2 (53.2–57.3) [26]	44.5 (43.0–46.0) [22]	<0.001
Men	186 (32.9)	106 (40.1)	80 (26.6)	0.006
Women	380 (67.1)	157 (59.9)	223 (73.4)	0.056
SARS-CoV-2 seropositive	45 (8.0)	15 (5.7)	30 (9.9)	0.069
Race	**N=565**	**n=262**	**n=303**	
White	458 (81.1)	223 (85.1)	235 (77.6)	0.321
Hispanic or Latino	45 (8.0)	22 (8.4)	23 (7.6)	0.742
Black or African American	5 (0.9)	2 (0.8)	3 (1.0)	0.788
Native American	4 (0.7)	2 (0.8)	2 (0.7)	0.920
Other	53 (9.4)	13 (5.0)	40 (13.2)	0.001
Income	**N=554**	**n=253**	**n=301**	
$9,700 or less	26 (4.7)	20 (7.9)	6 (2.0)	0.001
$9,701–$39,475	124 (22.3)	73 (28.9)	51 (16.9)	0.003
$39,475–$84,200	232 (41.8)	100 (39.5)	132 (43.9)	0.414
$84,201–$160,725	125 (22.5)	47 (18.6)	78 (25.9)	0.099
$160,726 or more	47 (8.5)	13 (5.1)	34 (11.3)	0.013
Education	**N=564**	**n=261**	**n=303**	
Highschool or less	175 (31.0)	112 (42.9)	63 (20.8)	<0.001
Associate degree	113 (20.0)	53 (20.3)	60 (19.8)	0.925
Bachelor's degree	155 (57.5)	60 (23.0)	95 (31.4)	0.053
Master's degree	63 (11.2)	28 (10.7)	35 (11.6)	0.940
Professional degree	38 (6.7)	4 (1.5)	34 (11.2)	<0.001
Doctoral degree	20 (3.5)	4 (1.5)	16 (5.3)	0.018
Comorbidities	**N=566**	**n=263**	**n=303**	
Diabetes	35 (6.2)	19 (7.3)	16 (5.3)	0.338
CHF	8 (1.4)	5 (1.9)	3 (1.0)	0.360
Asthma	57 (10.1)	22 (8.4)	35 (11.6)	0.209
Hypertension	107 (18.9)	54 (20.6)	53 (17.5)	0.357
COPD	11 (1.9)	10 (3.8)	1 (0.3)	0.003
Liver disease	6 (1.1)	4 (1.5)	2 (0.7)	0.319
Symptoms	**N=566**	**n=263**	**n=303**	
Anosmia/ageusia	14 (2.5)	7 (2.7)	7 (2.7)	0.788
Cough	86 (15.2)	35 (13.4)	51 (19.5)	0.244
Chest congestion	28 (4.9)	18 (6.9)	10 (3.8)	0.052
Fever	28 (4.9)	11 (4.2)	17 (6.5)	0.435
Shortness of breath	46 (8.1)	19 (7.3)	27 (10.3)	0.464
Chest pain	15 (2.7)	8 (3.1)	7 (2.7)	0.589

CI, confidence interval; IQR, interquartile range; SW, seeking work; NSW, not seeking work; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.

the prevalence of SARS-CoV-2 antibodies among healthcare workers and the public were detected.[21] A determining factor for the infection rate of SARS-CoV-2 among healthcare workers has been reliable access to personal protective equipment (PPE).[22] When available, appropriate PPE has been shown to reduce the risk of infection.[23]

In our community, the strongest demographic predictor for the seroprevalence of SARS-CoV-2 was employment status. Those who are unemployed, either as students or not seeking work, were at a significantly greater risk of contracting COVID-19. The contributing factors to this group's increase in seroprevalence remain

Table 3: Previous testing results for SARS-CoV-2 seropositive and seronegative participants.

Test	All (N=566) n (%)	AB⁺ (n=45) n (%)		AB⁻ (n=521) n (%)	
	Tests administered	Positive result	Negative result	Positive result	Negative result
SARS-CoV-2 RT-PCR	108 (19.1)	20 (44.4)	7 (15.6)	0 (0)	81 (15.5)
Anti-SARS-CoV-2 IgG	27 (4.8)	2 (4.4)	1 (2.2)	1 (0.2)	23 (4.4)

IgG, immunoglobulin G; RT-PCR, reverse transcription polymerase chain reaction SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

to be determined. Unlike the results from previous reports, our sample, though predominantly White (81.1%), did now show a significant increase in the infection rate among races or between the sexes.[24–26] The discrepancies between our results, previous reports, and that of RT-PCR confirmed infection rates in the United States may be due to unexplored barriers to health care access within our community. Individuals living in the rural United States suffer from a lack of health services, insufficient public transportation, and minimal access to broadband Internet.[27,28] These factors make receiving an RT-PCR test for SARS-CoV-2 more difficult than in urban centers.

Limitations

Given that our study was done in a single rural community in northern Arizona, the results may not be generalizable to other communities from a rural setting. Enrollment in the study was also on a volunteer basis and included a convenience sample of both public and healthcare participants. The demographic breakdown of our sample did not accurately represent the community served by KRMC due to self-selection and inclusion. The sample tested in this study overrepresented women and underrepresented individuals who were not White (Hispanic or Latino, African American or Black, or American Indian). Our participants had higher mean income and education level than the general population. Subject demographics collected by an in-person survey were also self-reported. Since IgG was the only antibody tested, seroconversion could have been missed based upon timing of symptom onset and laboratory collection.

Conclusion

Rural community seroprevalence for SARS-CoV-2 was detected at 8.0% of a population in Mohave County, Arizona, and appears to be far below what would be needed for herd immunity. Unlike what has been observed in urban areas, members of the public and healthcare workers in rural communities shared a similar degree of risk for contracting COVID-19 based on our results. Individuals experiencing anosmia/ageusia, fever, and shortness of breath had an increased likelihood of being seropositive for SARS-CoV-2 antibodies in our community setting. Further large-scale studies in rural settings are needed to determine the seroprevalence of SARS-CoV-2 and to continue surveillance of this contagious respiratory pathogen.

Acknowledgments: The authors would like to thank the KARe (Kingman Area Research) Consortium for the assistance in recruiting and registering participants for venipuncture and administering questionnaires.
Research funding: The study was privately funded by the KHI (Kingman Health Initiative) Foundation, a group of hospital donors who prioritized determining the spread of COVID in the Greater Kingman Area. The funding was used to purchase and administer the antibody tests.
Author contributions: All authors provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; Drs Santarelli, Lalitsasivimol, Ashurst, and Mr Lyon drafted the article or revised it critically for important intellectual content; all authors gave final approval of the version of the article to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
Competing interests: Authors state no conflict of interest.
Informed consent: Informed consent was obtained from all participants included in this study.
Ethical approval: This study was reviewed and approved by Institutional Review Board at Kingman Regional Medical Center. This study was registered at www.clinicaltrials.gov (NCT04533360).

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Appendix. Seroprevalence survey.

This survey was distributed by the authors to participants in this study and is reprinted without edits.

Seroprevalence of SARS CoV2 Antibodies	KHI IRB 0205	PI: John Ashurst, DO

Your participation in this research is entirely voluntary and you may withdraw at any time.

Certification:

Before beginning the assessment please certify the following. Using a 10-digit hexadecimal code of your choice, this code will be used to collate the collective assessments administered during this research. Tell no one your hexadecimal code.

I certify that I completed this survey of my own free will, and that the answers contained within are accurate to the best of my knowledge. I may choose to leave any questions/sections of the survey blank.

____ ____ ____ ____ ____ ____ ____ ____ ____ ____

Section 1: Demographics

1. **Please indicate your sex assigned at birth.**
○ Male ○ Female ○ Intersex

2. **Please indicate your gender identity.**
○ Male ○ Female ○ Non-binary ○ prefer not to answer

3. **Please indicate your current age.**
○ 18–25 ○ 25–30 ○ 31–40 ○ 41–50 ○ 51–60 ○ 61–70 ○ 71–80 ○ 81–90 ○ 90+

In what year were you born? ______________________________

4. **Please indicate your race/ethnicity.**
○ Hispanic ○ White (non-Hispanic) ○ Black (non-Hispanic) ○ Native American ○ Other

5. **Please indicate your average income per year.**
○ $0–$9,700 ○ $9,701–$39,475 ○ $39,476–$84,200 ○ $84,200–$160,725 ○ over $160,726

6. **Please indicate the highest degree you have completed.**
○ Highschool diploma or GED
○ Associates degree (AA, AS, etc)
○ Bachelor's degree (BA, BS)
○ Master's degree (MA, MS, MEd, etc)
○ Professional degree (MD, DO, DDS, DVM etc)
○ Doctorate degree (PhD, EdD, etc)

7. **How many individuals reside within your household?**
____

8. **Please indicate your employment status.**
○ Employed full-time (40+ hours/week) ○ Employed part-time (<40 hours/week)
○ Unemployed (currently seeking work) ○ Unemployed (not currently seeking work)
○ Student ○ Retired

9. **Are you currently working as a healthcare provider?**
   ○ yes ○ No

   At KRMC? ___________________

10. **Do you believe that you have had COVID-19 within the past 2 months**

    ○ yes ○ no ○ maybe

11. **In which community do you currently reside?**
    ○ Kingman ○ New Kingman-Butler ○ Golden Valley ○ Valle Vista ○ Peach Springs
    ○ Dolan Springs ○ Meadview ○ Chloride ○ Valentine ○ Wikieup ○ Yucca
    ○ Hackberry ○ Hualapai Tribe ○ Oatman

Section 2: Health and lifestyle

1. **Have you experienced any of the following symptoms over the past 2 months?**

   ○ Loss of the sense of smell or taste
   ○ Cough
   ○ Chest congestion
   ○ Fever
   ○ Shortness of breath
   ○ Chest pain

   If yes, When? ___________

2. **Do you suffer from any of the following health conditions?**

   ○ Diabetes ○ Hypertension
   ○ Congestive Heart Failure (CHF) ○ Chronic Obstructive Lung Disease (COPD)
   ○ Diabetes ○ Hypertension

3. **Over the past 2 months, how frequently have you engaged in the following behaviors? Has this increased or decreased during the quarantine period?**

	Never	Monthly	Bi-weekly	Weekly	Daily	Multiple Times Per Day	Increased	Decreased	No Change
Recreational Drug Use	☐	☐	☐	☐	☐	☐	☐	☐	☐
Alcohol Use	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tobacco Products Use (Inhalation)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tobacco Products (Non-inhalation)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Exercise	☐	☐	☐	☐	☐	☐	☐	☐	☐
Attended a Gathering of 5+ People	☐	☐	☐	☐	☐	☐	☐	☐	☐
Had a Meal at a Sit-Down Restaurant	☐	☐	☐	☐	☐	☐	☐	☐	☐
Traveled Outside of Mohave County	☐	☐	☐	☐	☐	☐	☐	☐	☐

4. **On average how many hours of sleep do you get per night?**

______

5. **Have you recently experienced any fluctuation in weight?**

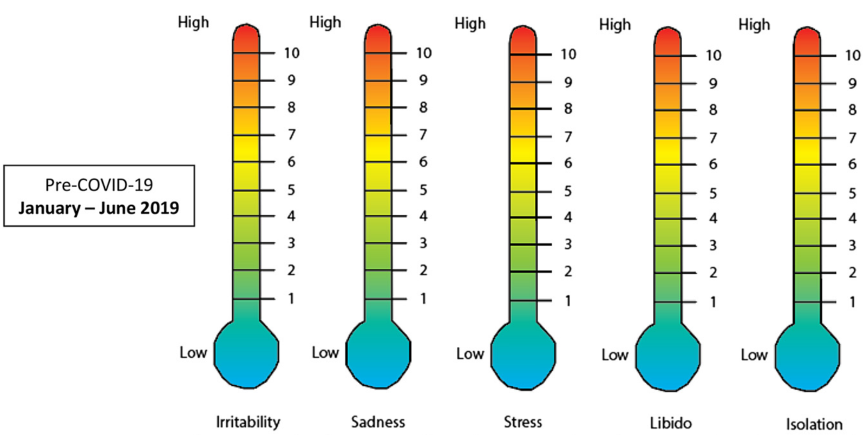
○ Lost weight (20lbs or more) ○ Lost weight (10lbs – 20lbs) ○ Maintained current weight
○ Gained weight (10lbs - 20lbs) ○ Gained weight (20lbs or more)

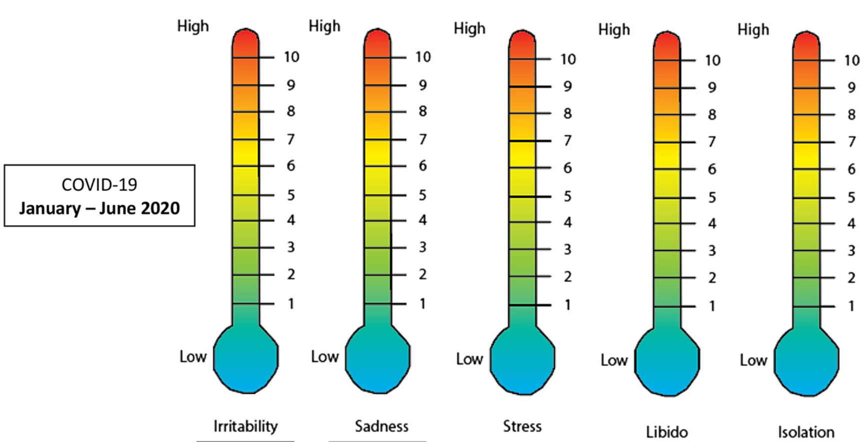
6. **When in the community, how often do you wear a mask?**

○ Never ○ Rarely ○ Occasionally ○ Frequently ○ Always

Section 3: Psychosocial Wellness

Please draw a line across the thermometers Indicating the degree to which you would rate your level of the following feelings and physiological arousal. Please reflect and try to estimate your level of each during the pre-COVID-19 pandemic (January – June 2019) and the COVID-19 pandemic (January – June 2020).

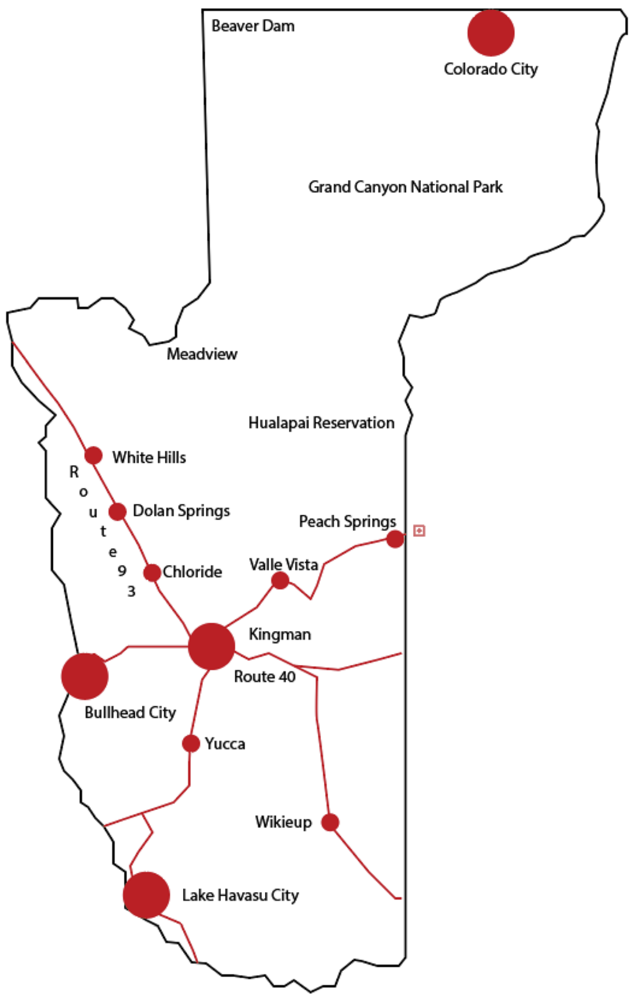




Section 4: COVID-19 Community Spread Mapping

Using distinct line segments, please illustrate your travel throughout Mohave County.

- Image your busiest possible day. You have your normal obligations to meet, your chores need to be completed, and your social engagements need to be attended. Please illustrate how you would travel throughout Mohave County over the course of this day. With a circle, indicate you point of origin and destination. Connect those dots with a line. Repeat this process for every trip you may take during your busiest day.



Using distinct line segments, please illustrate your average bi-weekly travel in the Kingman Area.

- Image your busiest possible day. You have your normal obligations to meet, your chores need to be completed, and your social engagements need to be attended. Please illustrate how you would travel throughout Kingman over the course of this day. With a circle, indicate you point of origin and destination. Connect those dots with a line. Repeat this process for every trip you may take during your busiest day.