Frequency of Symptoms and Asymptomatic SARS-CoV-2 Infection in Louisiana

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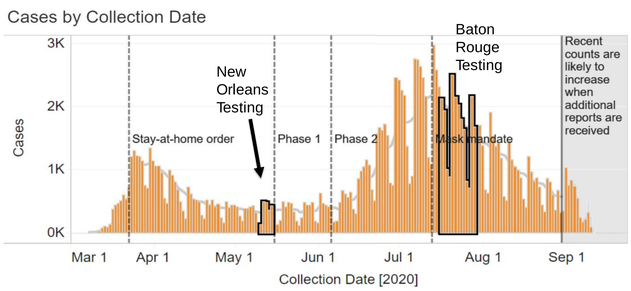
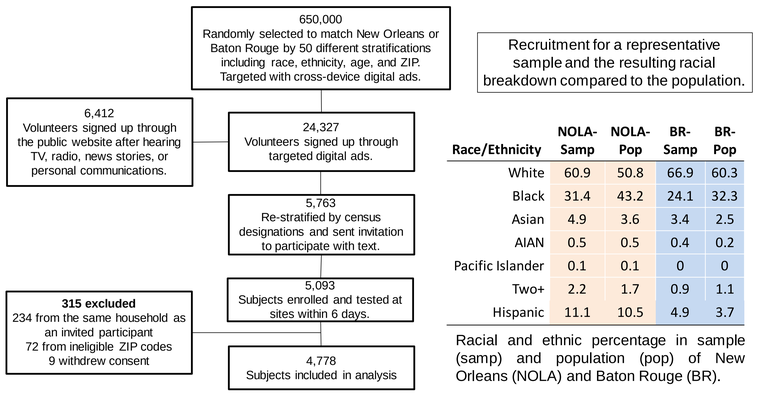
Introduction & Methods

New Orleans was hit particularly hard early in the pandemic, likely because of travelers and crowds throughout Mardi Gras, which ended on February 25th, and a summertime uptick in positive testing in Baton Rouge coinciding with phased reopening. Testing for the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been limited worldwide by supply chain issues and testing capacity. To estimate the true spread of infection, two high-throughput prevalence studies were performed in New Orleans at the end of a "stay-at-home" order (May 9-15) (1) and Baton Rouge after two phases of reopening (July 15-31) (2).

Positive case counts in Louisiana



From the Louisiana Department of Health: http://ldh.la.gov/Coronavirus

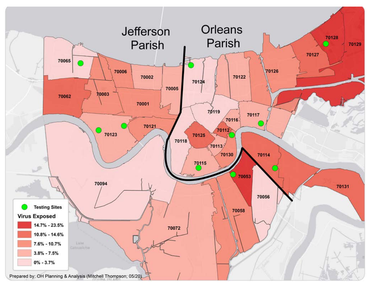


Recruitment for a representative sample and the resulting racial breakdown compared to the population.

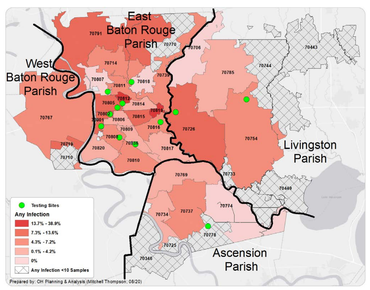
Race/Ethnicity	NOLA-Samp	NOLA-Pop	BR-Samp	BR-Pop
White	60.9	50.8	66.9	60.3
Black	31.4	43.2	24.1	32.3
Asian	4.9	3.6	3.4	2.5
AIAN	0.5	0.5	0.4	0.2
Pacific Islander	0.1	0.1	0	0
Two+	2.2	1.7	0.9	1.1
Hispanic	11.1	10.5	4.9	3.7

Racial and ethnic percentage in sample (samp) and population (pop) of New Orleans (NOLA) and Baton Rouge (BR).

Infections across New Orleans



Infections across Baton Rouge



Prevalence of past or current infection by ZIP across New Orleans and Baton Rouge. Prevalence data for these studies are available elsewhere. (1,2)

Results

1

	Number reporting n=4778		Any positive test n= 311 (6.5%)		Prevalence by factor
	n	%	n	%	
Any symptoms	1322	27.7%	164	52.7%	12.4%
Fever	471	9.9%	84	27.0%	17.8%
Fatigue	658	13.8%	95	30.5%	14.4%
Dry Cough	568	11.9%	82	26.4%	14.4%
Myalgia	519	10.9%	83	26.7%	16.0%
Nasal congestion	456	9.5%	68	21.9%	14.9%
Runny nose	327	6.8%	45	14.5%	13.8%
Sore Throat	488	10.2%	60	19.3%	12.3%
Diarrhea	245	5.1%	33	10.6%	13.5%
Anosmia	229	4.8%	93	29.9%	40.6%
Chills	337	7.1%	54	17.4%	16.0%
Headache	522	10.9%	74	23.8%	14.2%
Other	194	4.1%	16	5.1%	8.2%
Asymptomatic	3446	72.1%	147	47.3%	4.3%
Any Comorbidities	2142	45%	136	43.7%	6.3%
Diabetes	444	9.3%	30	9.6%	6.8%
High Blood Pressure	1366	28.6%	90	28.9%	6.6%
Elevated Cholesterol	797	16.7%	53	17.0%	6.6%
Heart Disease	170	3.6%	12	3.9%	7.1%
Kidney Disease	51	1.1%	6	1.9%	11.8%
COPD	50	1.0%	3	1.0%	6.0%
History of Cancer	317	6.6%	13	4.2%	4.1%
HIV	23	0.5%	0	0.0%	0.0%
Organ Tx	19	0.4%	1	0.3%	5.3%
Weakened immune system	155	3.2%	9	2.9%	5.8%
History of TB	26	0.5%	0	0.0%	0.0%
Other	216	4.5%	9	2.9%	4.2%
No Comorbidities	2636	55.2%	175	56.3%	6.6%

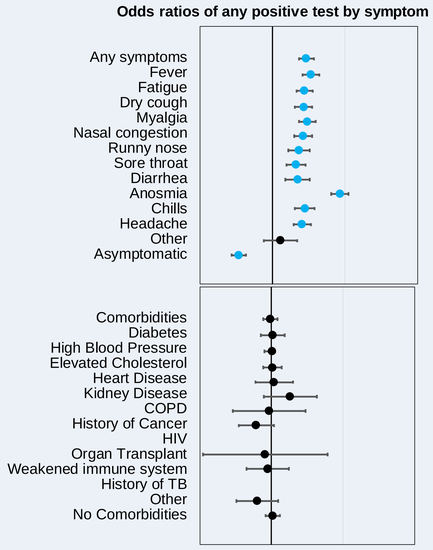
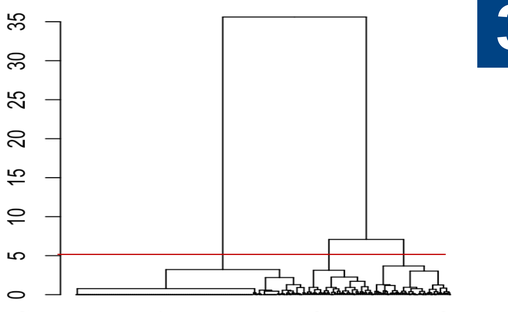


Figure 1. Table of frequency, positivity, and prevalence by symptoms and comorbidities (left) and odds ratios with 95% confidence intervals (right). The number positive over the total number reporting that symptom or comorbidity was used to calculate the % prevalence. Significant odds ratios are noted by blue color.

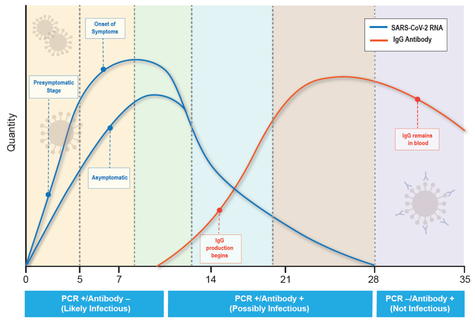
2

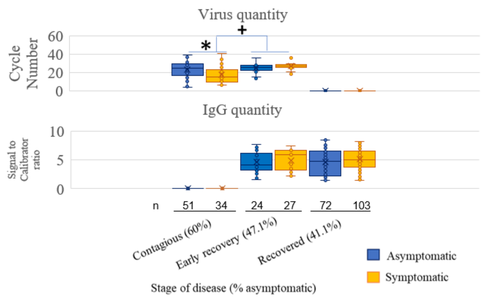


Cluster	1	2	3
Avg # symptoms (SD)	0.4 (0.9)	7.5 (1.9)	4.0 (1.5)
Top symptoms	Anosmia (13%)	Fatigue (94%)	Fever (68%)
	Dry Cough (7%)	Headache (84%)	Fatigue (61%)
	Sore throat (5%)	Myalgia (81%)	Myalgia (50%)
	Nasal Congestion (4%)	Dry Cough (75%)	Anosmia (45%)

▲ **Figure 2. Symptom cluster analysis**. Symptom data was hierarchically clustered and plotted using the Ward method with the hclust and dendextend packages in R to explore patterns in patient-reported symptom presentation. The above plot of patient-reported symptoms of SARS-CoV-2 infection with cut at height = 5 generated 3 symptomatic clusters. Clusters vary in Mean (SD) number of symptoms as well as specific symptom prevalence.

3





▶ **Figure 3. Cycle number and signal to calibrator ratio by disease stage and symptom status.** Cycle number (CN) and signal to calibrator ratio (S/C) were averaged by disease stage and a t-test was performed to assess differences in CN or S/C by symptom status, using a Wilcoxon-Mann-Whitney test. The symptomatic group had lower mean cycle number versus the asymptomatic group during the contagious phase of disease. Antibody did not differ by symptom or disease stage. * p<0.001; + p=0.004

Methods

Recruitment

- A two-step system developed by Public Democracy (Arlington, VA) was used to recruit a demographically representative sample of the residents of the Greater New Orleans area (Orleans and Jefferson parishes) and the Greater Baton Rouge area (Ascension, East Baton Rouge, West Baton Rouge, and Livingston parishes).
- Invitations and recruitment were iteratively adjusted daily based on responsiveness and study enrollment.
- Digital recruitment ads, consent forms and surveys were created in English, Spanish, and Vietnamese.
- Participants were offered free rideshare service to and from the test sites.

Participation

- Subjects who were selected went to a testing site, were consented, responded to a survey and received a free nasopharyngeal swab and blood draw. 88% who were selected participated.

Analysis

1. The number of people reporting symptoms are tabulated by the total sample and those testing positive on either test along with odds ratios of testing positive.
2. A hierarchical cluster plot of patient-reported symptoms with cut at height = 5 to generate 3 symptomatic clusters. Clusters vary in Mean (SD) number of symptoms as well as specific symptom prevalence.
3. Proxy measures for quantity of virus and antibody were used to determine if there were differences by disease stage and symptom status.

Discussion

- Anosmia is a signature symptom of SARS-CoV-2 infection
- Comorbidities do not influence spread
- Symptoms cluster into low/asymptomatic, flu-like and very symptomatic, flu-like with moderate symptoms and high rate of anosmia
- Those with symptoms have more virus present in the contagious phase but antibodies are similar regardless of symptom status
- This does not include those who are severely ill, hospitalized or in nursing homes

Conclusions

- Anosmia will help clinicians distinguish SARS-CoV-2 from the flu and could be used for screening
- The high proportion of asymptomatic infection and variable symptomatic presentation underscores the need for widespread mask use and testing for asymptomatic individuals who are exposed
- The amount of virus was greater in contagious symptomatic individuals, but there is a chance asymptomatics were presymptomatic
- IgG was not different by symptom status, but others have found variability by symptom status over time. (3)

References

1. Feehan AK, Fort D, Garcia-Diaz J, Price-Haywood E, Velasco C, Sapp E, et al. Seroprevalence of SARS-CoV-2 and Infection Fatality Ratio, Orleans and Jefferson Parishes, Louisiana, USA, May 2020. Emerg Infect Dis. 2020;26(11).
2. Feehan AK, Velasco C, Fort D, Burton JH, Price-Haywood E, Katzmarzyk PT, et al. Racial and workplace disparities in seroprevalence of SARS-CoV-2 in Baton Rouge, Louisiana, July 15-31, 2020. medRxiv. 2020:2020.08.26.20180968.
3. Long QX, Tang XJ, Shi QL, Li Q, Deng HJ, Yuan J, et al. Clinical and immunological assessment of asymptomatic SARS-CoV-2 infections. Nat Med. 2020;26(8):1200-4.