**SC STRONG: S**outh **C**arolina **S**ampling and **T**esting **R**epresentative **O**utreach for **N**ovel coronavirus **G**uidance
Cohort 2: February 2021

## 1. Participation and Activity

    1A. Cohort 2 participation- From February 1 to March 4, 2021, a total 1,917 residents completed a viral test, 1,803 completed an antibody test, and 1,463 completed at least one test and a matched health survey. A response rate of 1.6% was noted, from an original 117,200 initially selected participants. Support and efforts to enroll participants were successful. The project phone bank received 970 emails and 730 voicemails. A 24 to 48 hour turnaround response time was achieved by 10 dedicated UofSC project staff. Primary project needs were: 11% wanting to do survey by phone; 16% wanting their test results; 8% having clinic trouble; 16% wanting additional information about the survey; 7% declining participation; and 42% miscellaneous concerns.

    1B. Participant originating locations – Participants originated from a variety of zipcodes, dispersed across the state. Purple dots represent a zipcode that had at least one participant in the SC Strong Cohort 2, with most participants originated from the four major metropolitan regions. Using optimized hotspot analysis in ArcGIS Pro, we identified hotspots (geographic regions with the most participants; red/orange gradients) and cold spots (geographic regions with the fewest participants; green/blue gradients).



Note: Optimized hot spot analysis of SC Strong Cohort 2 respondents
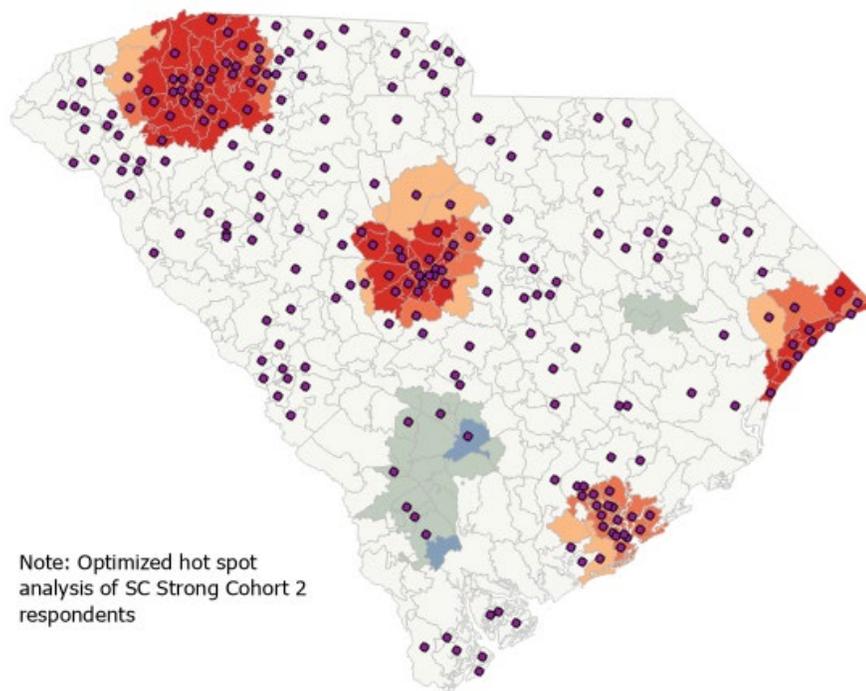
## 2. Viral Testing Results

2A: SARS-CoV-2 RT-PCR results - From February 1 to March 4, 2021, a total 1,917 residents completed a viral test. The estimated state incidence was 2.16 per 100 persons [95% CI: 1.47 - 3.18] and seroprevalence was 16.35% [14.38 - 18.52%]. Children and adolescents had the highest estimated incidence: 5.71 of 100 residents aged 5 to 19 years [1.88 - 16.11]. A median viral PCR detection duration of 29 days (range: 8-56 days) was noted among those with a current and prior PCR result (n=14 persons).

2B: Virus RNA positive statistical clustering- The only location in the state with a cluster of active COVID-19 infections was the Midlands region, namely Richland and Lexington Counties. No cold spots were observed.



Note: Optimized hot spot analysis of SC Strong Cohort 2 respondents with active COVID19 infection
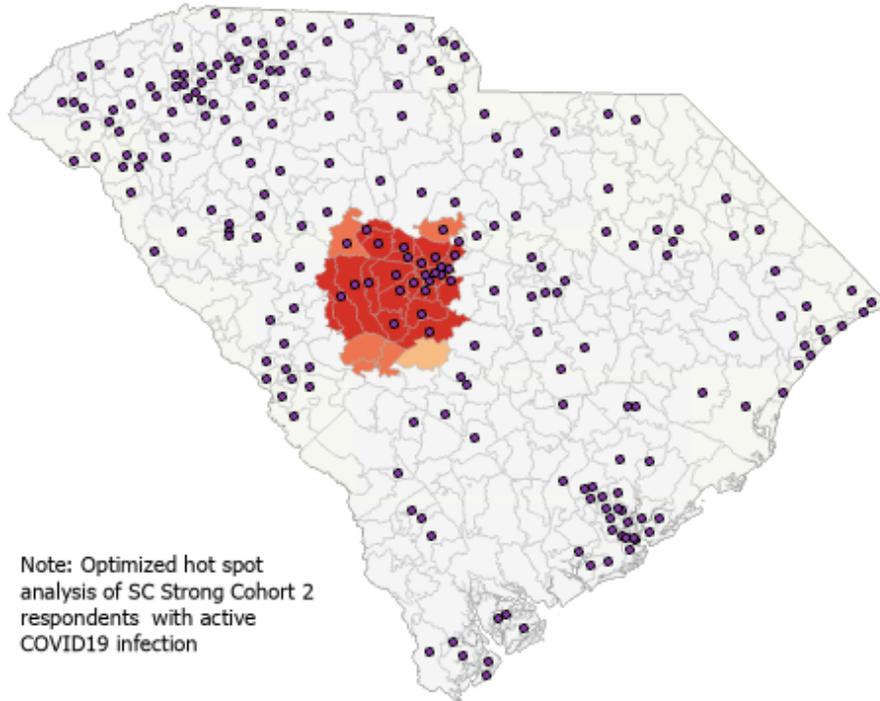
2C: SARS-CoV-2 incidence stratified by public health region and demographics.

| | No. tested for virus | No. virus positive* | Total population | Estimated incidence proportion[†] (95% CI) |
|---|---|---|---|---|
| *Total State* | 1917 | 40 | 4,729,875 | **2.16** (1.47-3.18) |
| **Public Health Region** | | | | |
| Upstate | 732 | 15 | 1,382,995 | 1.85 (1.01-3.34) |
| Midlands | 553 | 10 | 1,350,170 | 2.06 (0.82-5.08) |
| Lowcountry | 372 | 4 | 1,123,412 | 1.40 (0.34-5.67) |
| PeeDee | 260 | 11 | 873,298 | 3.91 (1.87-7.99) |
| **Race/Ethnicity** | | | | |
| Hispanic | 66 | 0 | 269,227 | ** |
| White, Non-Hispanic | 1567 | 34 | 3,114,751 | 2.32 (1.53- 3.51) |
| Black, Non-Hispanic | 182 | 4 | 1,274,629 | 2.59 (0.65-9.69) |
| Other/Unknown | 102 | 2 | 71,269 | 1.39 (0.13- 13.58) |
| **Age Category** | | | | |
| 5-19 yr | 70 | 4 | 952,137 | 5.71 (1.88-16.11) |
| 20-59 yr | 866 | 12 | 2,587,428 | 1.25 (0.67- 2.33) |
| 60+ yr | 981 | 24 | 1,190,311 | 2.67 (1.74- 4.07) |
| **Sex** | | | | |
| Female | 1102 | 18 | 2,442,789 | 1.75 (0.94-3.25) |
| Male | 815 | 22 | 2,287,087 | 2.63 (1.56-4.40) |

*Viral testing was performed using TaqPath COVID-19 RT-PCR Multiplex Assay (Thermo Fisher Scientific, Waltham, MA)
[†]Post-stratified for non-response and incidence rate is out of 100 residents aged 5 years and older
** Zero count of PCR positive test results among participating Hispanics, calculated an estimate incidence proportion of 0.000000007 (range: 0-1)

**3. Serologic Results:**

3A: SARS-CoV-2 antibody results - From February 1st to March 4th, a total of 1803 participants provided samples for IgG and IgM antibody testing. Of this cohort, 18% were antibody positive (IgM positive and/or IgG positive). 4.9% were

recently infected (IgM positive only), 7.5% were in a transitional antibody period (IgM and IgG positive), and 5.5% were historically infected (IgG positive only). Statistical hotspot analysis identified the Greenville-Spartanburg and Myrtle Beach metropolitan areas as hotpots for antibody positivity (3B). Poststratification weights were computed based on public health region, race/ethnicity, age and sex, followed by weighted logistic regression to compute estimated incidence proportions for active infection and seroprevalence (3C). The highest seroprevalence burdens were noted among Hispanic residents (32.90% [19.53 - 49.81%]), Non-Hispanic Black residents (20.56% [14.37 - 28.50%], persons aged 60+ years (21.56% [19.33 - 25.36%]), and those living in the Upstate public health region (18.46% [15.13 - 22.32%]). Antibody loss occurred in 28% of previously positive residents, with a median 136 days (range: 19-326 days) between current negative antibody test and prior PCR or antibody positive test result (n=42 out of 162).

3B: Seroprevalence clustering locations – Spatial clusters of positive SARS-CoV-2 antibodies among tested participants were identified in the Upstate and Myrle Beach area. A cold spot was identified in the rural Lowcountry, where we previously noted a cluster of fewer participants (see Section 1B). When participants with positive antibodies or active COVID19 infection were combined, the analysis revealed hot spots in the Greenville, Columbia, and Myrtle Beach metropolitan areas (map not shown).



Note: Optimized hot spot analysis of SC Strong Cohort 2 respondents with positive COVID19 antibodies
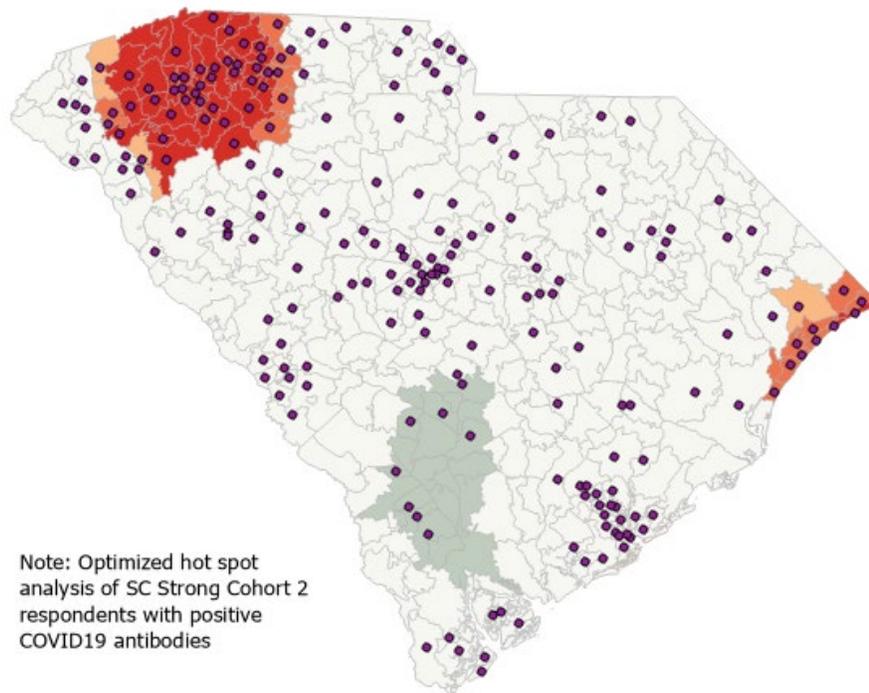
## 3C: SARS-CoV-2 seroprevalence stratified by public health region and demographics.

| | Total population | No. tested for antibodies | No. virus antibody positive[§] | Estimated seroprevalence[¶] (95% CI) |
|---|---|---|---|---|
| *Total State* | 4,729,875 | 1803 | 324 | **16.35** (14.38-18.52) |
| **Public Health Region** | | | | |
| Upstate | 1,382,995 | 725 | 146 | 18.46 (15.13-22.32) |
| Midlands | 1,350,170 | 496 | 85 | 17.09 (13.29- 21.68) |
| Lowcountry | 1,123,412 | 340 | 42 | 11.27 (7.97-15.65) |
| PeeDee | 873,298 | 242 | 51 | 18.10 (13.26-24.19) |
| **Race/Ethnicity** | | | | |
| Hispanic | 269,227 | 64 | 16 | 32.90 (19.53-49.81) |
| White, Non-Hispanic | 3,114,751 | 1482 | 260 | 14.52 (12.64-16.62) |
| Black, Non-Hispanic | 1,274,629 | 162 | 33 | 20.56 (14.37- 28.50) |
| Other/Unknown | 71,269 | 95 | 15 | 14.87 (8.48- 24.64) |
| **Age Category** | | | | |
| 5-19 yr | 952,137 | 64 | 10 | 15.78 (8.27-27.83) |
| 20-59 yr | 2,587,428 | 805 | 111 | 13.78 (11.29-16.70) |
| 60+ yr | 1,190,311 | 934 | 203 | 21.56 (18.78-24.63) |
| **Sex** | | | | |
| Female | 2,442,789 | 1037 | 188 | 16.79 (14.14-19.81) |
| Male | 2,287,087 | 766 | 136 | 15.86 (13.03-19.14) |

[§]Antibody positive was defined as being IgG and/or IgM positive on either SARS-CoV-2 IgG assay (Abbott Industries, Abbott Park, IL), COVID-19 IgG/IgM Rapid Test Cassette (Healgen Scientific LLC, Potomac, MD), or Assure COVID-19 IgG/IgM Rapid Test Device (Assure Tech, Hangzhou, Zhejiang)
[¶]post-stratified for non-response and adjusted for specificity = 0.996 and sensitivity = 0.975

## 4. Survey Results

4A. Summary of study results: Persons working in a nursing home or as a front-line medical care worker had 7- and 4.6-times greater odds of testing positive for virus or antibody, respectively. Being 70 years or older was associated with 2.2 times greater odds of testing positive. Lastly, having a close family member or friend with COVID-19 or currently experiencing symptoms was associated with 2.8- or 1.7- times greater odds of testing positive. Having COVID-19 symptoms was significantly associated with having either a PCR or antibody positive test; however, 61% of persons PCR positive were asymptomatic (n=20 out of 33), suggesting a potential symptom latency.

No statistical differences were noted between vaccine perceptions or attitudes by testing status; however, some important descriptive findings were identified. Overall, vaccine hesitancy was low (13%), and most people reported planning to take the vaccine as soon as they are eligible (87%). Vaccine uptake was high, with 19% self-reporting receipt of their first vaccine and 4% of their second vaccine at the time sample testing and survey completion. Among survey respondents, most felt COVID-19 vaccines were safe (71%) and effective (69%). Additionally, most felt confident in the design and development of the vaccines (73%) and the regulatory approval process of the vaccines (71%).

4B. Table with detailed survey results:

| | All Survey Respondents[††] % (N) | Survey respondents' testing result[§§] | | |
| --- | --- | --- | --- | --- |
| | | SARS-CoV-2 positive | SARS-CoV-2 negative | p-value, OR (95% CI) |
| **Personal Risk Factors** | | | | |
| I work in a nursing home, rehabilitation center or long-term care facility | 0.8%(12/1463) | 7(2.8%) | 5(0.4%) | <0.01, 7.03(2.21-22.33) |
| I am a front-line medical care worker | 3.2%(47/1463) | 22(8.9%) | 25(2.1%) | <0.01, 4.63,(2.57-8.36) |
| I am an essential worker | 16.7%(244/1463) | 38(15.3%) | 206(17.0%) | 0.53 |
| I have or have had a close family or friend diagnosed with COVID-19 | 75.8%(1058/1396) | 213(88.4%) | 845(73.2%) | <0.01, 2.79,(1.84-4.23) |
| I am a person of color: | 13.2%(192/1463) | 31(12.5%) | 161(13.3%) | 0.75 |
| Black (non-Hispanic) | 8.3%(121/1463) | 22(8.9%) | 99(8.2%) | 0.71 |
| Hispanic | 2.7%(39/1463) | 7(2.8%) | 32(2.6%) | 0.87 |
| Mixed Race, Native American, Asian or Other (non-Hispanic) | 2.2%(32/1463) | 2(0.8%) | 30(2.5%) | 0.12 |
| I have a defined high-risk comorbid health condition | 46.6%(682/1463) | 109(43.9%) | 573(47.2%) | 0.36 |
| I am 70 years or older | 20.0%(292/1463) | 79(31.9%) | 213(17.5%) | <0.01, 2.20(1.62-2.98) |
| My annual household income was less than $50,000 last year | 20.5%(235/1146) | 38(20.5%) | 197(20.5%) | 0.99 |
| I am currently experiencing COVID-19 symptoms | 24.6%(360/1463) | 84(33.9%) | 276(22.7%) | <0.01, 1.74,(1.3-2.34) |
| In the last two weeks, I have never worn a face covering outside of the home | 0.8%(12/1456) | 3(1.2%) | 9(0.7%) | 0.47 |
| I have previously tested positive for active infection | 16.5%(153/925) | 104(53.6%) | 49(6.7%) | <0.01, 16.08(10.73-24.10) |
| Median days since prior positive viral test | 57 | 51 | 129.5 | <0.01 |
| I have previously tested positive for antibodies | 13.8%(26/188) | 15(48.4%) | 11(7.0%) | <0.01, 12.44,(4.89-31.65) |
| Median days since prior antibody positive test | 34 | 1.5 | 152.5 | <0.01 |
| **Vaccine-Related Questions** | | | | |
| I have had at least one dose of the COVID-19 vaccine | 18.8%(274/1455) | 96 (38.9%) | 178 (14.7%) | <0.01 3.68 (2.72-4.97) |
| Median days since first vaccination | 24 | 28 | 20.5 | <0.01 |
| Median days since last vaccination | 10 | 13 | 9 | 0.17 |
| I have not had the vaccine, but I plan to take the COVID-19 vaccine: | | | | |
| As soon as I am eligible | 88.6%(875/987) | 97(86.6%) | 778(88.9%) | *** |
| I plan to wait 1-3 months after eligible | 5.8% (57/987) | 9(8.0%) | 48(5.5%) | 0.28 |
| I plan to wait until Fall or Winter 2021 | 3.2%(32/987) | 4(3.6%) | 28(3.2%) | 0.80 |
| I plan to wait longer to take the vaccine | 3.2%(23/987) | 2(1.8%) | 21(2.4%) | 0.72 |

| | | | | |
|---|---|---|---|---|
| I think the COVID-19 vaccines are safe¶¶ | 71.2%(1036/1455) | 172(69.9%) | 864(71.5%) | 0.63 |
| I think the COVID-19 vaccines are effective¶¶ | 68.7%(998/1452) | 174(71.0%) | 824(68.3%) | 0.40 |
| I feel confident in the design and development of the COVID-19 vaccines¶¶ | 73.0%(1059/1450) | 181(73.9%) | 878(72.9%) | 0.74 |
| I feel confident in the regulatory approval process of the COVID-19 vaccines¶¶ | 71.4%(1033/1447) | 178(72.7%) | 855(71.1%) | 0.63 |

†† Total number of affirmative responses over the total number of survey responses for that specific question
§§Completed either viral RNA, IgM and/or IgG antibody surveillance-related diagnostic assay.
¶¶Response shown is 'agree' compared to 'neutral' or 'disagree'
*** Denotes reference category in logistic regression

**5. Infectious disease forecast models**- A SIR statistical model was executed that yielded 72 distinct scenarios. Of these distinct projection scenarios, a few common themes emerged. Please note, technical details on forecast model methodology and variable descriptions are available in Appendix 1.

- In all scenarios, infection incidence will linearly decrease between April and July 2021. Approximately 17% of the scenarios, a slight increase in UK variant incidence will occur, peaking in early May.

- In half the scenarios, the UK variant will be the dominant strain in circulation. In the other half of the scenarios, strains without any variants will be the dominant strain in circulation. In every scenario, the South African strain is a rare contributor to incidence.

**6. Scientific and community dissemination of results**- The findings of cohort 3 yielded three scientific manuscripts, as listed below. These manuscripts will be made publicly available via journal open access and will be listed on the project website following publication. This internal report will be shared with our clinic partners, pending permission from DHEC.

- Nolan MS, Daguise V, Davis M, Duwve J, Sherrill W, Heo M, Litwin A, Kanyangarara M, Watson S, Huang R, Eberth JM, Gual Gonzalez L, Lynn M, Korte J.  SARS-CoV-2 viral incidence, antibody point prevalence, associated population characteristics and vaccine attitudes-South Carolina, February 2021. *In review: Public Health Reports*
- Gormley MA, Alier A, Daguise V, Heo M, Litwin A, Korte J, Nolan MS. Emergency medical services workers are at a greater risk of SARS-CoV-2 infection than other healthcare workers.  *In preparation: Journal of Emergency Medical Services*
- Kanyangarara M, Daguise V, Gual Gonzalez L, Litwin A, Korte J, Ross C, Nolan MS. Trends in SARS-CoV-2 testing behaviors and risk perceptions in South Carolina from November 2020 to February 2021: Results from a representative statewide survey.  *In preparation: American Journal of Epidemiology*

**7. Future directions and next steps**-Cohort 3 is planned for May 1, 2021 to June 15th, 2021. A total of 300,000 persons have been selected for Cohort 3, anticipating a response rate of 1,500 to 2,000 participants. Targeted testing events for Cohort 3 include Spartanburg Jail and pediatric clinics.

**8. Disclaimer**-This preliminary report is subject to change. The conclusions, findings, and opinions expressed by authors contributing to this report do not necessarily reflect the official position of the U.S. Department of Health and Human Services, the South Carolina Department of Health and Environmental Control or the authors' affiliated institutions.

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