

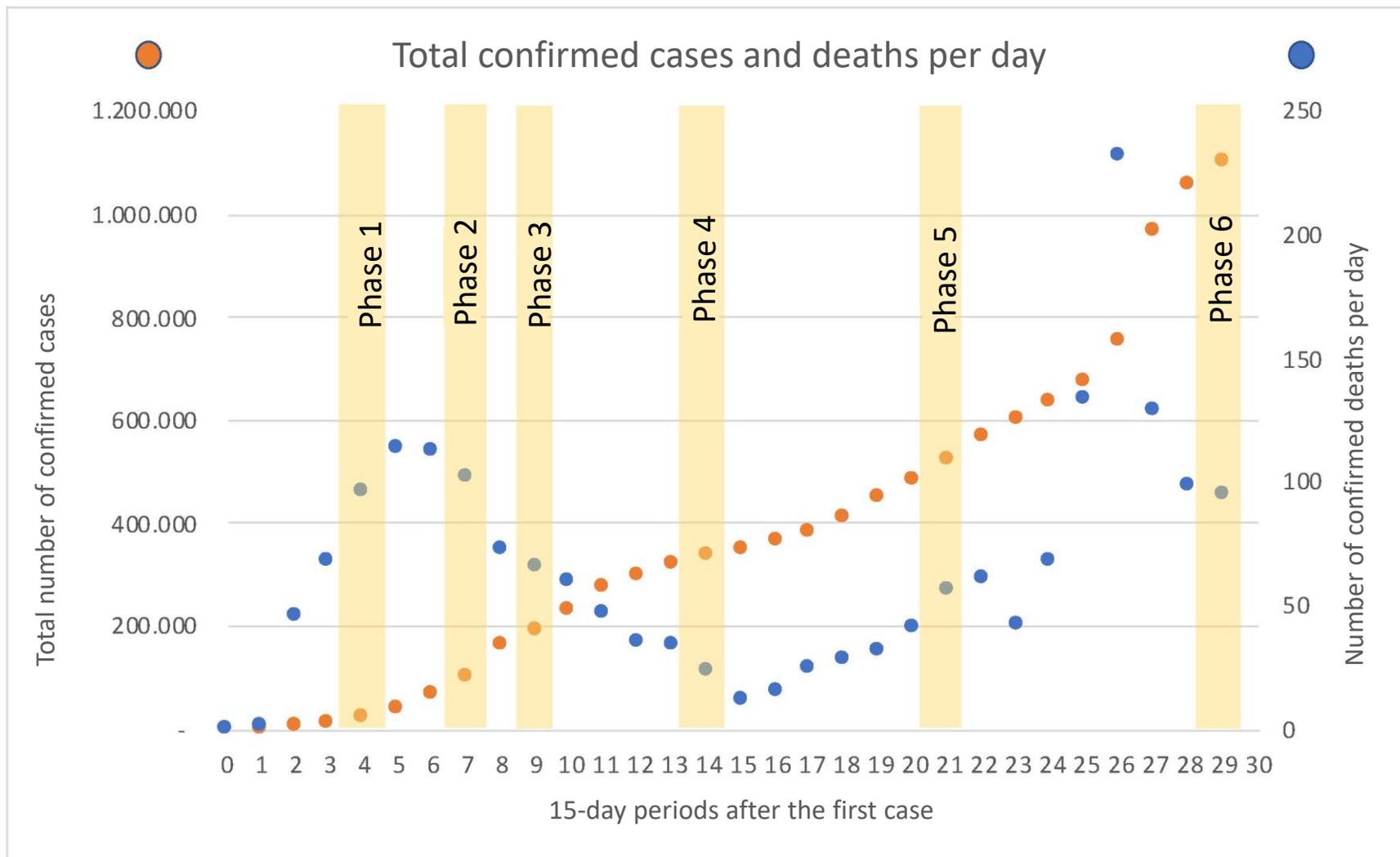
Phase 6: Forty-one point six percent (41.6%) of the adult population in the city of São Paulo already has antibodies against SARS-CoV-2. This estimate reaches 48.4% among those who declare brown and black race/skin color and 51.3% among people between 35 and 44 years old. No difference in seroprevalence was detected between the vaccinated and non-vaccinated

A household survey to monitor the seroprevalence of SARS-CoV-2 infection in adults: a cross-sectional study with probabilistic sampling, carried out in the city of São Paulo between April 22 to May 1, 2021 (58 weeks after the first case was registered in the city)

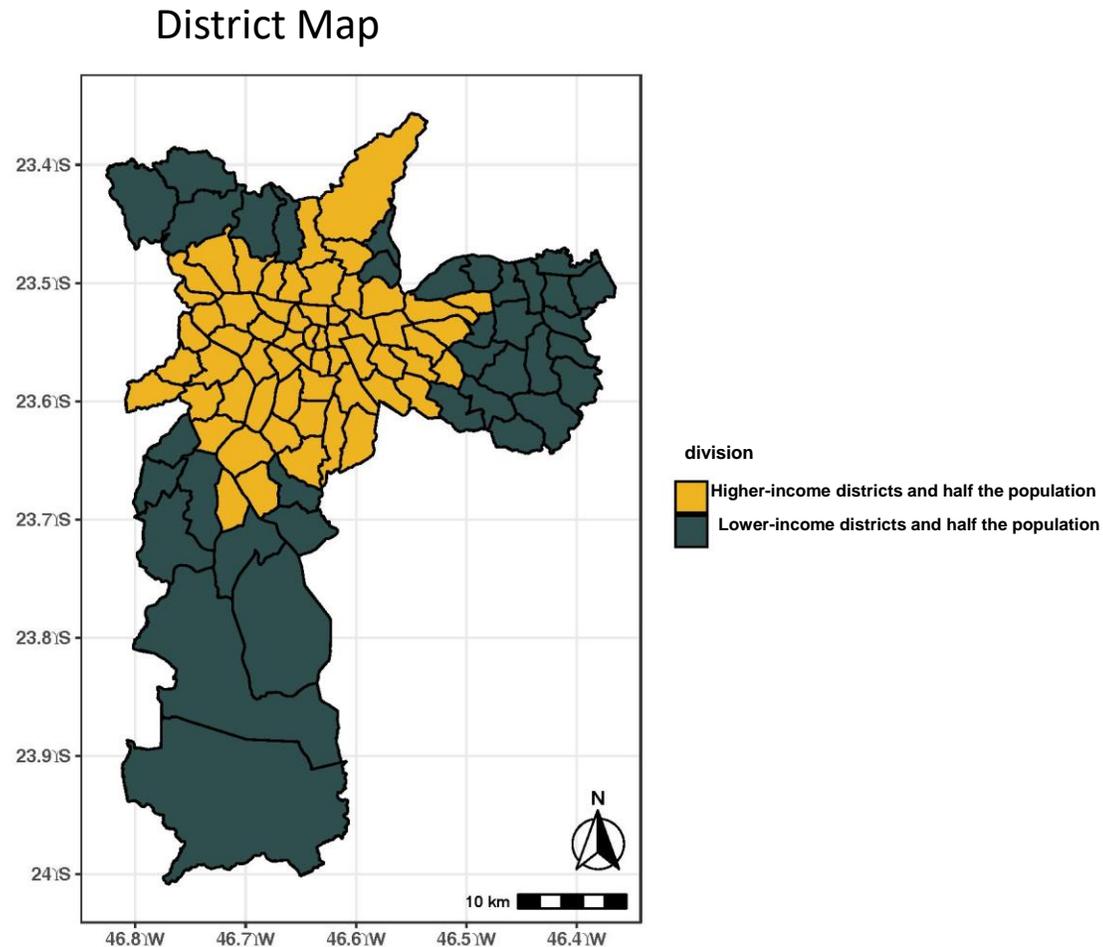
Financiers:



The collection ended on May 1st, when the municipality had a total of 1,052,190 confirmed cases of infection (red dots) and a total of 27,449 confirmed deaths. There were approximately 98 deaths per day (blue dots).



There were 1,187 blood samples from participants in 160 census sectors analyzed to measure seroprevalence in the city of São Paulo. 8 households were drawn in each census sector



Methodology Summary: The city of São Paulo has a population of 8,407,202 inhabitants 18 years old or over. Two strata were created in the city: districts with the highest income and districts with the lowest income, each of which corresponds to about half of the adult population in the city.

The sample was obtained by probabilistic sampling with a two-stage drawing: census sector and households. In the first stage, 160 census sectors were drawn. In the second stage, 8 households were drawn in each sector. Any resident in the selected households over the age of 18 was invited to participate.

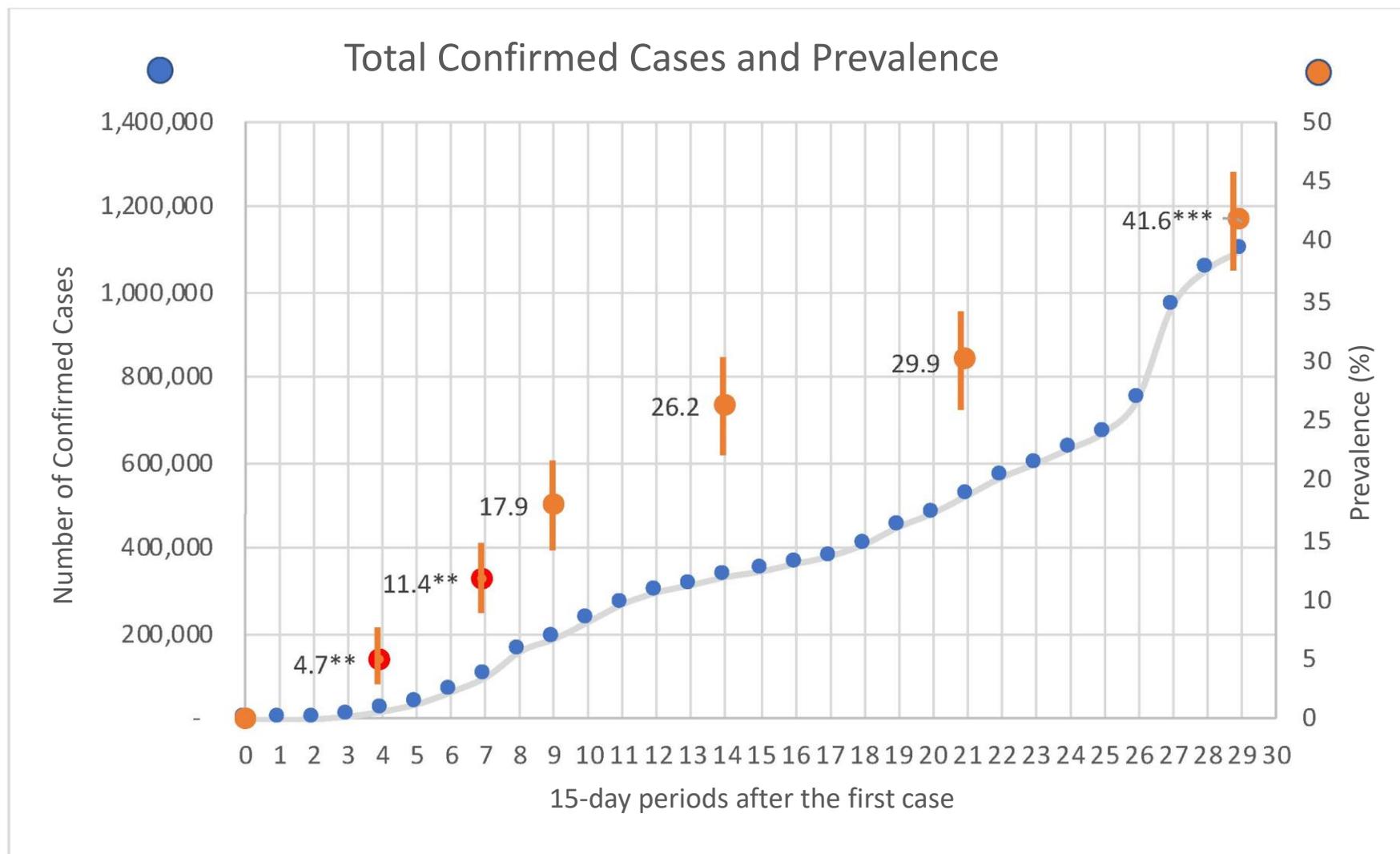
After answering a questionnaire, a blood sample was collected from the participants by venipuncture. The amount of anti-SARS-CoV-2 antibodies (IgG and IgM) was measured using chemiluminescence (Abbott Architect) and a second test using electrochemiluminescence (total Ig - Roche).

Project details can be found at:
<https://www.monitoramentocovid19.org/>

Seroprevalence in the city of São Paulo is estimated at 41.6%, lower in the wealthier districts (35.9%) and higher in the poorer districts (47.0%). There is a statistically significant difference between the strata of the sample

Strata	N= 1,187 %	Prevalence %	CI 95%	p Value
Total	100	41.6	37.7-45.4	
Wealthier districts	49.2	35.9	30.3-41.6	
Poorer districts	50.8	47.0	42.0-52.0	0.0046
*Rao-Scott chi-square test				

The seroprevalence (orange) measured in our study increases with the number of confirmed cases of infection (blue). Vertical bars indicate the 95% confidence interval (CI).



**Phase 1 (pilot) and Phase 2 data was obtained with only one test (MAGLUMI).

***In Phase 6, an Abbott test was used instead of the MAGLUMI test. Retesting the Phase 5 samples demonstrated that the substitution does not significantly alter the seroprevalence measurement.

Education, race/skin color, age, and number of inhabitants per residence are related to seroprevalence.

Seroprevalence is 1.8 times higher for individuals who did not complete high school than it is for individuals who completed college (45.2% versus 24.7%).

A similar phenomenon occurs in relation to race/skin color. Seroprevalence is 1.4 times higher among people declaring themselves as black and brown when compared to those declaring themselves as white (48.4% versus 35.0%).

The prevalence in the 35 to 44 age group is 1.4 times higher than that observed among the 60 or over age group (51.3% versus 36.2%).

For the first time, we found a higher seroprevalence in homes with more than 5 inhabitants when compared to homes with 1 and 2 inhabitants (48.2% versus 34.3%).

Variable	N= 1,187 %	Prevalence %	CI 95%	p Value
Total	100	41.6	37.7 45.5	
Sex				
Male	46.5	39.5	34.4 44.5	
Female	53.4	43.4	38.8 48.0	0.192
Age				
18 to 34	35.2	41.5	36 47.1	
35 to 44	19.1	51.3	43.7 59.0	
45 to 59	26.0	39.1	33 45.1	
60+	20.7	36.2	29.3 43.1	0.0142
Education Level				
Did Not Complete High School	34.6	45.2	39.5 50.8	
Completed High School	41.9	48.0	43.2 52.8	
Graduated College	23.5	24.7	17.8 31.7	<0.0001
Race/color				
Black and Brown	45.2	48.4	43.7 53.0	
White	49.3	35.0	29.8 40.1	
Other	5.5	32.5	19.1 46	0.0002
Residents				
1 & 2	18.9	34.3	27.5 41.1	
3 & 4	40.5	38.3	32.3 44.2	
5 and more	40.6	48.2	42.4 54.0	0.0041

Participants were asked about their vaccination status. 83.7% of adults have not yet been vaccinated.

Vaccination Status	n=<1,187	Weighted Frequency %	CI 95%
Vaccinated with 1 or 2 doses	184	16.3	14.1 18.9
Not Vaccinated	1,003	83.7	81.1 85.9

Seroprevalence among those vaccinated is 45.7%, and it is 40.8% among those non-vaccinated. The difference in seroprevalence between these two groups is not significant*

Seroprevalence	N= 1,187 %	Prevalence %	CI 95%	p Value
Vaccinated with 1 or 2 doses	16.3	45.7	37.3 54.0	
Not Vaccinated	83.7	40.8	36.6 44.9	0.2679
Total	100	41.6	37.7 45.5	

*The serological methods used in the study preferentially detect antibodies against the nucleoprotein. This antigen is not in the Astra Zeneca vaccine. It is not known whether the Sinovac/Butantan vaccine, which does contain the nucleoprotein, significantly generates antibodies against this antigen.

Conclusions

In the 109 days that separated Phase 5 (January 14 to 23) from Phase 6 (April 22 to May 1) it was possible to verify changes in the seroprevalence of SARS-CoV-2 infection in the city of São Paulo.

Seroprevalence increased from 29.9% to 41.6%, an increase of 11.7 percentage points, which is mainly due to the second wave arriving to the city. In the wealthiest stratum, it rose from 22.8% to 35.9% and in the poorest from 36.4% to 47.0%. The differences in seroprevalence between races/skin colors, as with education levels, are still statistically significant.

For the first time, a significant difference in seroprevalence was detected between households with 1 and 2 people and households with 5 or more inhabitants (34.3% versus 48.2%). This suggests that household transmission has increased.

Considering the seroprevalence of 41.6% and the total 18 or over population in the city of São Paulo (8.4 million people), the number of adults already infected is approximately 3.5 million. In the period between Phase 5 and Phase 6, about 1 million adults were infected with SARS-CoV-2.

During the data collection period, 16.3% of the adult population in the city had already been vaccinated.

SARS-CoV-2 Mapping Group

- Dr. Beatriz HC Tess, University of São Paulo Medical School
- Dr. Maria Cecília Goi Porto Alves, Instituto de Saúde (São Paulo)
- Dr. Fernando Reinach
- Dr. Celso F. H. Granato, Grupo Fleury and UNIFESP
- Dr. Edgar Gil Rizzati, Grupo Fleury
- Dr. Maria Carolina Pintão, Fleury Group
- Marcia Cavallari Nunes, IPEC - Inteligência em Pesquisa e Consultoria

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