Household Survey to Monitor the Seroprevalence of SARS-CoV-2 infection in Adults in the City of São Paulo, Brazil.

Cross-sectional study with probabilistic sampling conducted in the city of São Paulo, Brazil between July 20 and 29, 2020 (21 weeks after the city's first recorded case)

Phase 3 Partial Results

Project SoroEpi MSP: https://www.monitoramentocovid19.org/

Financiers: SEMEIA, GrupoFleury, IBOPE inteligência, todos pela saúde uma aliança contra a Covid-19

Approved by the CEP/CONEP system under Brazilian Ethics Certification of Human Studies number: 31032620.0.0000.5474

Executive Summary

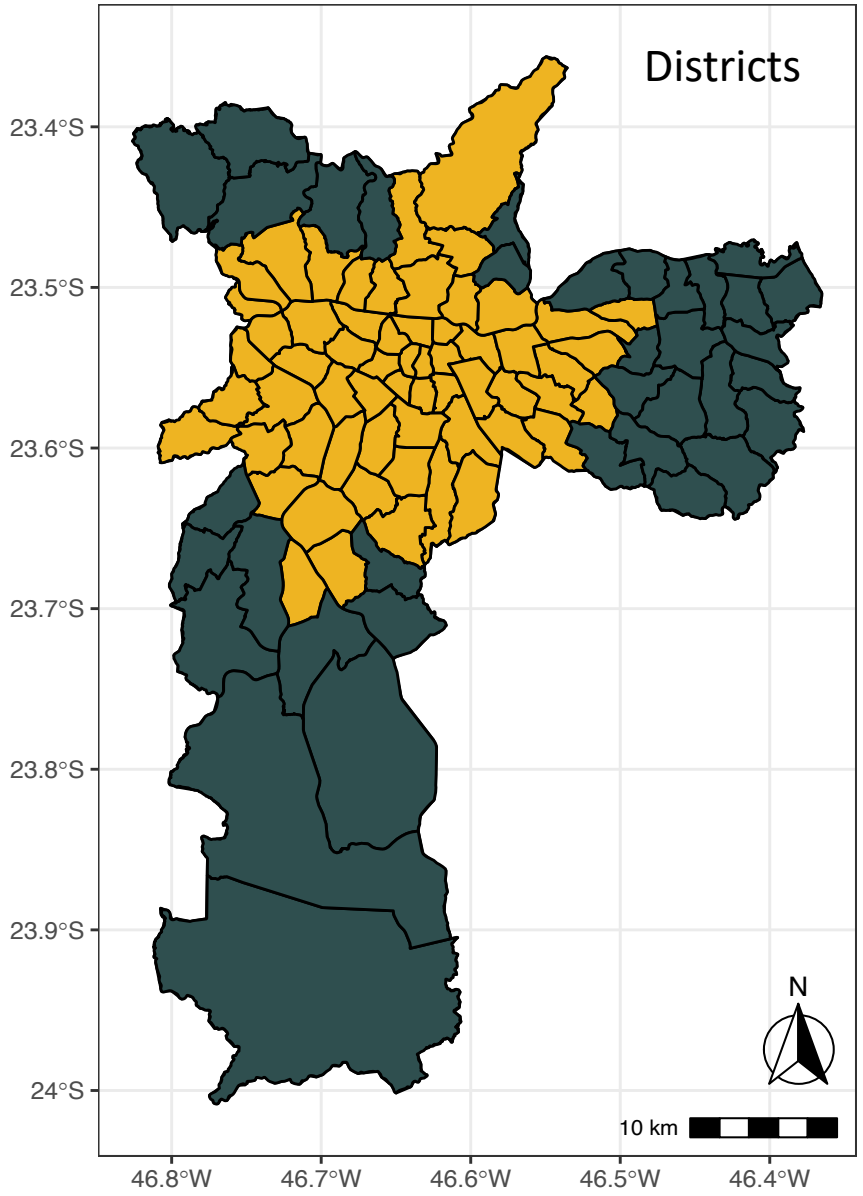
In the 35 days that separated Phase 2 from Phase 3 (data collection started on June 15 and July 20, respectively), it was not possible to detect significant changes in the seroprevalence of SARS-CoV-2 infection. If there has been any change, the estimate is within the confidence interval of the measurement. The differences in seroprevalence between races and educational levels are still statistically significant.

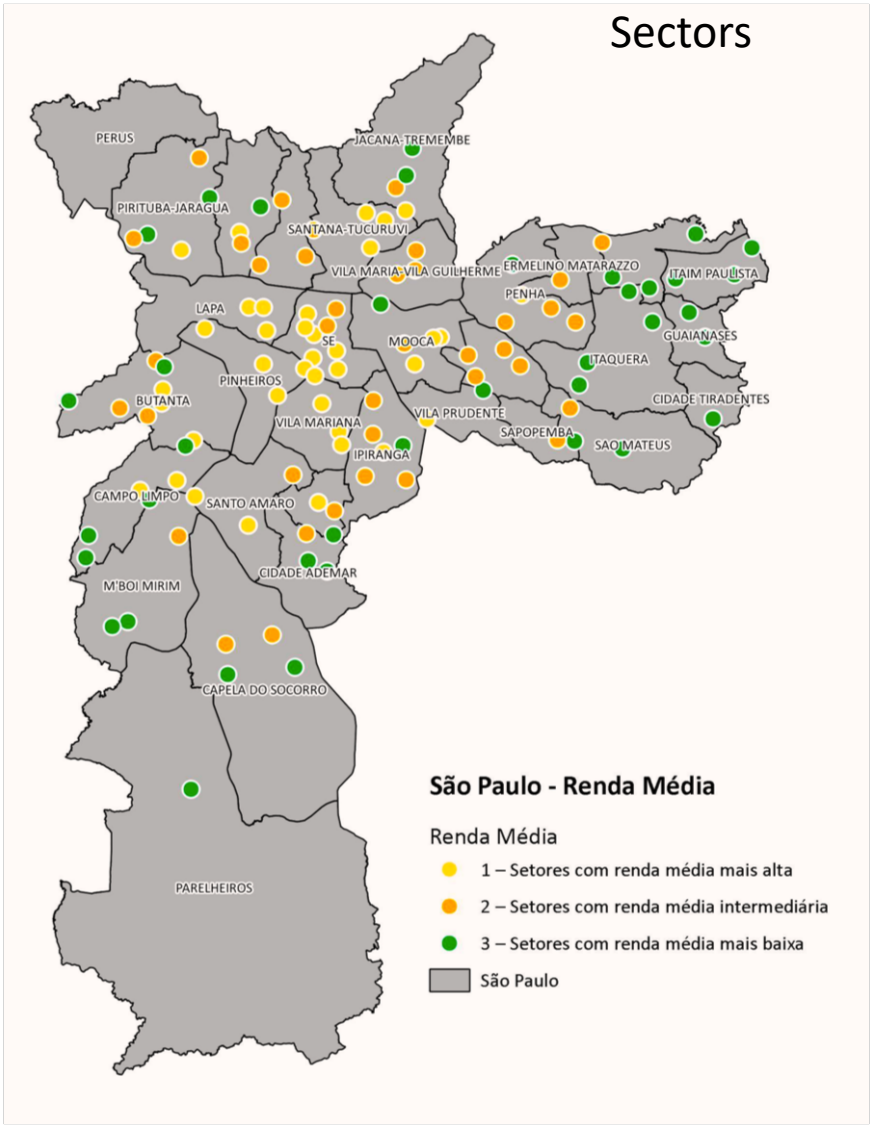
In Phase 3, we introduced a second type of serological test, which was also administered to all 1,470 analyzed individuals. This new test detects antibodies against other SARS-CoV-2 epitopes and can detect a greater number of those infected, increased the seroprevalence in 56% in the city of São Paulo. This result demonstrates that a single test is not sufficient to identify all seropositive individuals in a population.

- Seroprevalence in the municipality (considering the two tests combined): 17,9%
  - Seroprevalence in the strata with the highest average income: 9,4%
  - Seroprevalence in the strata with average middle income: 18,4%
  - Seroprevalence in the strata with the lowest average income: 22,0%

Assuming a seroprevalence of 17,9 % considering the population of the municipality of São Paulo 18 years and older, 8,4 million inhabitants, the number of adults already infected with SARS-CoV-2 is around 1,5 million.

There were 1,470 blood samples from participants in 115 census sectors analyzed to measure seroprevalence in the city of São Paulo. 12 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 surveyed population. (figure on the left)

To analyze the results, the city was also divided into three strata based on the average income of the census sectors where interviews were conducted (figure on the right).

The sample was obtained by probabilistic sampling with a two-stage drawing: census sector and household. In the first stage, 115 census sectors were drawn. In the second stage, 12 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 taken from the participants by venipuncture. The amount of anti-SARS-CoV-2 antibodies (IgG and IgM) was measured using chemiluminescence and a second test using electrochemiluminescence (total Ig).

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

In the 35 days that separated Phase 2 from Phase 3, it was not possible to identify statistically significant changes in seroprevalence in the municipality of São Paulo. If there has been change, is within the confidence interval of the measurement

Districts

PHASE 2 (June 15-24)

Estratos	n=1183 %	Prevalência %	IC 95%	Valor de p
Total	100	**11,4**	9,2 - 13,6	
Distritos mais ricos	48	6,5	4,4 - 8,5	<0.0001
Distritos mais pobres	52	16,0	12,2 - 19,8	

*teste quiquadro com ajuste de Rao-Scott

PHASE 3 (July 20-29)

Estratos	n=1470 %	Prevalência %	IC 95%	Valor de p
Total	100	**11,5**	9,1 - 13,9	
Distritos mais ricos	48	10,7	8,1 - 13,4	0,5195
Distritos mais pobres	52	12,3	8,4 - 16.2	

*teste quiquadro com ajuste de Rao-Scott

Sectors

PHASE 2 (June 15-24)*

Estratos	Renda do estrato	n=1183 %	Prevalência %	IC 95%	Valor p
Total		100	**11,4**	9,2 - 13,6	
Setores de maior renda	R$ 6.740 e mais	27	6,2	3,0 - 9,4	0,0014
Setores de renda intermediária	R$ 2.797 a R$ 6.739	32	9,9	6,3 - 13,4	
Setores de menor renda	até R$ 2.796	41	16,1	11,9 - 20,2	

*teste quiquadro com ajuste de Rao-Scott

PHASE 3 (July 20-29)*

Estratos	Renda do estrato	n=1470 %	Prevalência %	IC 95%	Valor p
Total		100	**11,5**	9,1 - 13,9	
Setores de maior renda	R$ 5.541 e mais	22	6,3	3,4 - 9,1	0,0014
Setores de renda intermediária	R$ 3.350 a R$ 5.540	37	12,4	8,3 - 16,5	
Setores de menor renda	até R$ 3.349	42	13,4	9,3 - 17,5	

*teste quiquadro com ajuste de Rao-Scott

*Post-stratification by average income in the census sector: census sectors were arranged from the largest to the smallest average income of the sector, and one-third of the sectors were allocated to each stratum.

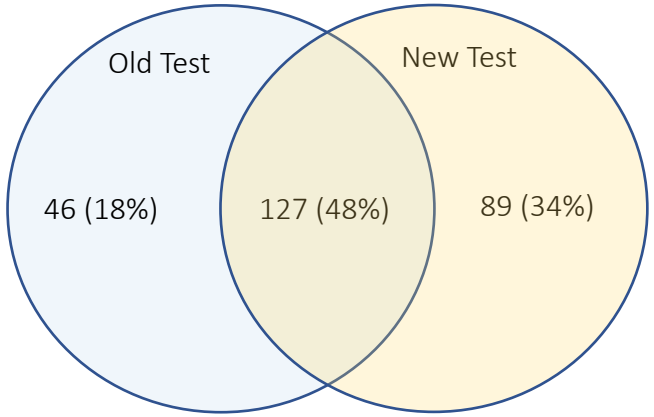
In Phase 3, we introduced a new serological test capable of detecting antibodies to other SARS-CoV-2 epitopes. Thus, considering the combination of the two tests, seroprevalence increased by 56% (from 11,5% to 17,9%) in relation to the measurement found using the previous methodology.

PHASE 3 (July 20-29)

Estrato	n=1470 %	Teste Anterior Prevalência	Teste Anterior IC 95%	Teste Novo Prevalência	Teste Novo IC 95%	Combinação dos Testes Prevalência	Combinação dos Testes IC 95%
Total	100	**11,5**	9,1 – 13,9	**14,8**	12,1 – 17,6	**17,9**	15,0 – 20,9
Setores de maior renda	22	6,3	3,4 - 9,1	6,8	3,4 - 10,2	9,4	6,0- 12,8
Setores de renda intermediária	37	12,4	8,3 - 16,5	15,2	10,4 - 19,9	18,4	13,3 - 23,4
Setores de menor renda	42	13,4	9,3 - 17,5	18,7	14,3 - 23,0	22,0	17,2 - 26,7

Old Test: Maglumi IgM and IgG
Manufacturer: Snibe
Method: Chemiluminescence
Detects IgG and IgM separately
Antigen: Spike Protein and Nucleo Capsid Protein

New Test: Elecsys SARS-CoV-2
Manufacturer: Roche
Method: Electrochemiluminescence
Detects total antibodies
Antigen: Nucleo Capsid Protein



n = 1470 (100%)
Negative Total: 1208 (82%)
Positive Total: 262 (18%)
Positive Old-Only: 46 (18%)
Positive New-Only: 89 (34%)
Positive in Both: 127 (48%)

Note: unweighted results

The diagram above shows that although both tests identified 127 of the seropositive individuals, the old test identified 46 individuals who were not identified by the new test and the new test identified 89 individuals who were not identified by the old test.

Differences in seroprevalence between educational levels and between races/color are statistically significant

Variável		FASE 3			Valor p
		Prevalência (%)	IC 95%		
Total		17,9	15,0	20,9	
	Setores de maior renda	9,4	6,0	12,8	0,0014
	Setores de renda intermediária	18,4	13,3	23,4	
	Setores de menor renda	22,0	17,2	26,7	
Sexo	Masculino	17,8	14,2	22,1	0,7992
	Feminino	18,4	15,2	22,1	
Idade	18-29	19,2	14,3	25,2	0,4031
	30-39	15,8	12,1	20,3	
	40-49	22,0	16,5	28,6	
	50-59	17,8	11,4	26,8	
	60 e +	15,8	11,7	20,9	
Escolaridade	Menos que Fundamental	22,5	17,2	28,5	0,0033
	Ensino Fundamental	23,7	16,8	32,3	
	Ensino Médio	17,5	13,9	21,8	
	Ensino Superior	12,0	9,1	15,5	
Raça/cor	Preta e Parda	20,8	17,0	25,2	0,0430
	Branca	15,4	12,3	19,2	
	Outras	14,0	7,1	25,8	

SARS-CoV-2 Mapping Group

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