






Differences in the prevalence of risk factors for severe COVID-19 across regions of São Paulo City

Diferenças na prevalência de fatores de risco para a COVID-19 grave em regiões da cidade de São Paulo

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INTRODUCTION

São Paulo City stands as the epicenter of the outbreak spreaded by SARS-CoV-2 in Latin America. On July 2nd, there were 134,984 confirmed COVID-19 cases and 7,370 deaths, roughly 10% of confirmed cases and deaths in Brazil¹. São Paulo City is composed of 5 regions (Northern, Eastern, Southern, Midwestern and Southeastern), each with its unique socioeconomic and epidemiological characteristics.

The health systems of São Paulo are currently being challenged in the attempt to control the transmission of SARS-CoV-2 while providing adequate care, in particular to a subset of infected patients with severe disease. Among deaths due to COVID-19 in Brazil, 69% were 60 years or older and 63% had at least one of the identified clinical risk factors for severe disease, amongst which the most prevalent were cardiovascular disease and diabetes². As part of response planning, it is of utmost importance to identify segments of the population that may be at risk for severe COVID-19, and describe their sociodemographic characteristics and how they are geographically distributed. The scientific community warns about the disproportionate impact of the pandemic among the population subgroups of lower socioeconomic status³.

In this study, we estimated the prevalence of risk factors for severe COVID-19 for people living in São Paulo City according to sociodemographic characteristics and city region using data from a population-based household survey.

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METHODS

We retrieved data from the most recent household-based survey conducted in São Paulo, ISA Capital 2015, which collected information of a representative sample of non-institutionalized residents. ISA-Capital 2015 collected the respondents' self-reported health conditions, weight and height, smoking habit, among other information. The survey was based on probabilistic sample. Two-stage sampling was done within census tracts (primary sampling unit) and households (second stage). A total of 4,043 respondents were interviewed. Data were collected with a structured questionnaire with mostly closed questions. The design, characteristics, and questionnaires of ISA-Capital 2015 have been described in detail in: https://www.prefeitura.sp.gov.br/cidade/secretarias/saude/epidemiologia_e_informacao/isacapitalsp/.

In our analysis, we included risk factors for severe disease described in the literature and other reliable public health resources⁴, which were available in ISA-Capital survey. From the total of people interviewed we included data of 3,223 adults (≥ 18 years old) for whom information on chronic diseases and lifestyle risk factors was available. Criteria of risk for severe disease included people aged ≥ 65 years old or with a diagnosis of cardiovascular disease, diabetes, chronic respiratory disease, hypertension, (current) cancer, history of stroke, obesity ($\text{BMI} \geq 30 \text{ kg/m}^2$), current smoking, or moderate to severe asthma (defined as asthma that moderately/severely limits daily activities as per respondents). We estimated the prevalence of one or more risk factors for severe COVID-19 by sex, age, education, income, race/ethnicity and São Paulo City region.

All statistical analyses considered ISA complex multistage sampling design and were carried out using Stata 15.0 software (StataCorp, TX, USA).

RESULTS

Of the participants included in our study, 47% were men, 66% had at least secondary education, 51% were white, and 54% lived with less than a minimal wage *per capita*.

Prevalence of single risk factors for severe COVID-19 among older adults (≥ 65 years old) were as high as 58% (hypertension), whereas for younger adults (< 65 years old) obesity was the most prevalent risk factor (21%). In general, risk factors were more prevalent among older adults, with two exceptions: obesity and smoking were more prevalent in younger adults (data not shown).

The prevalence of one or more risk factors for severe COVID-19 was 56.4% (4.7 million) in São Paulo City (Table 1). The proportion was lower in adults < 65 years old (51%) *versus* in older adults (80%). Among less educated adults, that is, those who had no formal education reported, 86% had at least one risk factor for severe COVID-19, as compared to 49% among those with university education initiated. Distribution of risk factors was similar according to income or race (Figure 1).

Table 1. Prevalence and 95% confidence intervals (95%CI) of one or more risk factors for severe COVID-19 by region of São Paulo City, ISA-Capital 2015.

Characteristics	Regions of São Paulo City					
	Northern (n = 624)	Mid-western (n = 499)	Southeastern (n = 690)	Southern (n = 746)	Eastern (n = 664)	Total (n = 3,223)
Risk factors for severe COVID-19						
Cardiovascular disease	8.0 (6.2. 10.3)	9.1 (5.8. 13.9)	11.9 (8.9. 15.7)	5.6 (4.1. 7.6)	8.0 (6.5. 9.9)	8.6 (7.5. 9.9)
Diabetes	7.1 (5.2. 9.8)	6.6 (4.6. 9.4)	7.3 (5.9. 9.0)	8.2 (6.4. 10.6)	7.8 (6.0. 10.0)	7.5 (6.6. 8.4)
Chronic respiratory disease	2.9 (1.6. 5.3)	2.5 (1.4. 4.3)	2.4 (1.4. 4.3)	2.5 (1.5. 4.1)	3.9 (2.7. 5.4)	2.8 (2.2. 3.5)
Hypertension	23.1 (19.1. 27.7)	22.8 (17.5. 29.1)	24.8 (21.7. 28.3)	19.7 (16.3. 23.7)	21.9 (18.4. 25.8)	22.5 (20.7. 24.4)
Cancer (currently)	1.8 (0.8. 3.9)	0.4 (0.1. 1.4)	1.1 (0.5. 2.3)	0.2 (0.1. 0.6)	0.3 (0.1. 1.1)	0.8 (0.5. 1.2)
Stroke	1.0 (0.6. 1.9)	1.9 (0.9. 3.9)	1.4 (0.7. 2.8)	1.1 (0.6. 2.0)	1.3 (0.6. 2.7)	1.3 (1.0. 1.8)
Obesity (BMI \geq 30 kg/m ²)	23.0 (19.6. 26.8)	17.5 (13.9. 21.9)	23.1 (19.3. 27.5)	19.7 (17.0. 22.8)	18.8 (15.9. 22.3)	20.7 (19.2. 22.4)
Smoking	18.3 (15.7. 21.2)	16.7 (13.2. 20.8)	17.8 (14.2. 22.2)	20.4 (17.3. 23.9)	14.8 (12.2. 17.8)	17.8 (16.3. 19.4)
Moderate to severe asthma	2.4 (1.5. 3.8)	1.4 (0.8. 2.7)	2.4 (1.5. 3.8)	3.2 (2.1. 4.9)	2.2 (1.3. 3.7)	2.4 (1.9. 3.0)
Number of risk factors for severe COVID-19*						
None	41.3 (37.2. 45.6)	46.2 (39.7. 52.9)	40.2 (35.6. 45.1)	44.0 (40.0. 48.2)	48.2 (45.0. 51.4)	43.6 (41.6. 45.7)
1	33.0 (29.2. 37.1)	28.2 (23.3. 33.6)	31.0 (27.2. 35.1)	33.1 (29.8. 36.5)	29.1 (26.0. 32.3)	31.1 (29.3. 32.9)
2	15.8 (12.9. 19.1)	13.3 (10.3. 17.2)	15.1 (12.0. 18.8)	15.0 (12.5. 17.9)	13.4 (11.0. 16.2)	14.6 (13.3. 16.1)

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Table 1. Continuation.

Characteristics	Regions of São Paulo City					
	Northern (n = 624)	Mid-western (n = 499)	Southeastern (n = 690)	Southern (n = 746)	Eastern (n = 664)	Total (n = 3,223)
3+	9.9 (7.4. 13.0)	12.3 (8.8. 16.9)	13.7 (11.0. 16.8)	7.9 (6.1. 10.1)	9.4 (7.3. 11.9)	10.6 (9.4. 12.0)
Adult population living in São Paulo City**	1,787.806	1,253.318	2,180.543	2,120.010	1,894.605	8,411.089
Number of adults with risk factors for severe COVID-19***	1,049.442	674.285	1,303.965	1,187.206	981.405	4,743.854

*Criteria: age ≥ 65 years old, or diagnosis of cardiovascular disease, diabetes, chronic respiratory disease, hypertension, cancer (currently), stroke, obesity (body mass index — BMI ≥ 30 kg/m²), current smoking, moderate to severe asthma (limit moderate/severe daily activities); **adult population (≥ 18 years old) living in São Paulo City in 2020; ***adult population (≥ 18 years old) presenting with one or more risk factors for severe COVID-19 (age ≥ 65 years old, cardiovascular disease, diabetes, chronic respiratory disease, hypertension, cancer (currently), stroke, obesity (BMI ≥ 30 kg/m²), smoking, moderate to severe asthma, in São Paulo City, 2020.

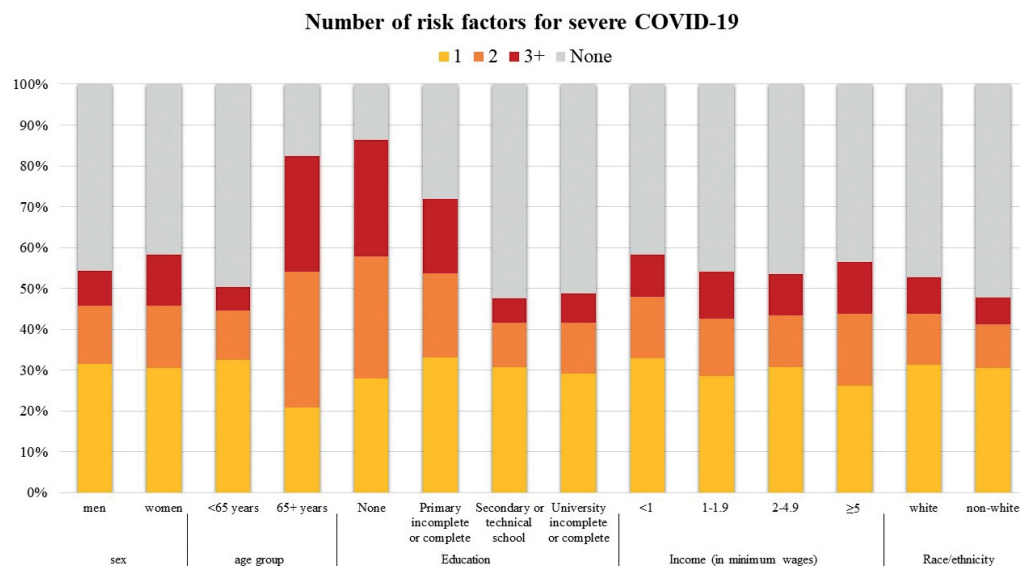


Figure 1. Distribution of risk factors for severe COVID-19 according to sociodemographic characteristics.

The Southeastern (59.8%), Northern (58.7%), and Southern (56%) regions had higher prevalence of one or more risk factors, whereas it was relatively lower in the Midwestern region (53.8%) (Table 1), despite the high proportion of adults ≥ 65 years old (data not shown).

DISCUSSION

We found that more than half of the population, and hence a large number of adults, presented with at least one risk factor for severe COVID-19 in São Paulo City, including those under 65. A similar estimate for worldwide risk for severe disease pointed out to a fifth of the population, but is likely to be underestimated, since the calculation did not include obesity, a highly prevalent risk factor globally⁵.

We also described how the prevalence of risk factors is unequally distributed across São Paulo City: in the Northern and Southeastern regions, these risk factors were more prevalent, which may partially explain the higher death rates, alongside with inequalities in resources for care, particularly in the Northern region. Population subgroups with lower education rates, a robust indicator of lower socioeconomic status, had higher prevalence of risk factors for severe disease. Data analysis of the first weeks of the pandemic in São Paulo City pointed out to a concentration of COVID-19 cases in the Midwestern and Southeastern regions, whereas COVID-19 deaths were concentrated in the Northern, Southeastern and Eastern regions⁶, probably also reflecting disparities in accessing the necessary health services.

As part of an effective COVID-19 response, describing the distribution of risk factors for severe disease in the population is important to identify vulnerabilities and tailor prevention and care strategies.

The present study has limitations. Risk factors were self-reported and prone to misclassification bias. In addition, ISA-Capital dates from 2015, and other risk factors (known and unknown) were not captured. Nevertheless, our findings contribute to a better understanding of the greater impact of COVID-19 in lower-resource settings and population subgroups. Response strategies will need to be tailored to address such vulnerabilities.

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