

Estimation of human capital loss and YLL caused by COVID-19 deaths in the city of São Paulo.

(Paper presented for the conclusion of MBA in Health Technology Assessment course of fipe (Fundação Instituto de Pesquisas Economicas) – São Paulo, SP – Brazil)

Introduction

By May of 2021, the number of deaths caused by the COVID-19 pandemic (SARS-CoV-2) in Brazil had exceeded 500,000, with more than 40,000 occurring in the city of São Paulo, causing invaluable losses to those who lost friends and family. But in addition to personal and family tragedy, there is economic and social impact.

Premature death interrupts the individual's productive potential. All the knowledge and skills acquired throughout a lifetime that could be used or transmitted to others to generate income for himself or for any dependents and consequently for the country are also lost. ⁽¹⁾

This knowledge and skills that people accumulate throughout life, as well as the state of health that allows individuals to accomplish their potential as productive members of society is called Human Capital ⁽²⁾.

Economic Importance of Education and the Theory of Human Capital ^(3, 4, 5)

According to human capital theory, investments in education and health make people more productive, able to generate more wealth and positively influence economic progress.

To understand the origins of this theory, is it important to mention the so-called "residual approach," developed by Edward F. Dennison in his book *Why Growth Rates Differ?* In this work, Dennison began an initial attempt to estimate a production function for the American economy for the period 1929-1957. As you know, a production function relates the level of product to the production factors: capital-earth-work.

Mathematically, we would have: $Y=f(K,N,T)$, where Y =product; K =capital; N =work and T =earth.

However, the author notes that the unexplained residue was too large. It then started to speculate the reasons for this result, and it occurred to him that this would be associated with the change in the quality of the production factors.

Thus, Dennison sought to include variables indicative of the quality of inputs in his production function. Thus, as a variable of capital quality, it included technology, the quality of work was evaluated by education and that of land by the use of modern inputs.

Using the specified approach, this author concluded that of an average product growth rate of 1.6% p.a., the educational factor accounted for 0.6%, i.e., 40% of variations in product growth were explained by the increase in the educational level of labor. Thus, it emphasizes the role of education for economic development.

Based on the idea that there were other variables implicit in the studied models that were determinants for economic development and that the classic approach was insufficient to explain the inequalities and differences in productivity between countries and regions, other studies emerged to explain the influence of human capital on economic development.

Schultz (1964) defended the idea that if we provide an individual with a higher level of education, we will be allowing that individual's contribution to production to be higher, because individuals with higher education earn more and have higher productivity, because the neoclassical theory maintains that $\text{Salary} = \text{PMg}$, where PMg is marginal productivity. Thus, the expenditure in education will be similar to an expenditure in the production of new capital assets, that is, the expenditure in education is an investment expenditure (because $I = \Delta K$, investment is equal to the increase in capital stock).

Similarly, healthcare spending is not a consumer expenditure but an investment expenditure (individuals with a better level of health produce more), spending on better nutrition is an investment expenditure (a normal individual produces more than an anemic one), and migration expenditures can be viewed as investment if they are allowing an individual to move from a low-productivity area to a high-productivity area.

In 2018, the world bank published the 1st version of the Human Capital Index (HCI), which is an international metric that evaluates major components of human capital in economies aiming to estimate the productivity of the next generation of workers. The index analyzed the available health and education data and estimated the potential that a child born in those days would be able to achieve by the age of 18, taking into account the health risks and the quality of education in each country.

An update to this report, published in September 2020, indicated that the COVID-19 pandemic put at risk all gains in human capital obtained by countries

in recent decades through a lot of efforts. The interruption of essential health services (vaccination for example), the closure of schools and the difficulties generated by the loss of income from families may cause effects that will be felt over the next generations ⁽⁶⁾.

Considering the above, COVID-19 deaths represent a huge loss of human capital with difficult-to-measure social and economic developments in their entirety. This scenario requires governments and civil society to unite in the adoption of pandemic control measures that reduce COVID-19 deaths.

Human capital losses caused by the COVID-19 pandemic

A study conducted by Brazilian Institute of Economics (IBRE FGV) estimated that the loss of human capital due to the pandemic, measured by the loss of the potential income (i.e what each person could produce over the course of the life) of the 217,000 Brazilians aged 20 to 69 years who were killed by COVID-19 by May 2021 reached BRL 182.6 billion. Considering only the deaths of the state of São Paulo in the same period, this loss would be BRL 57.1 billion ⁽⁷⁾.

Nurchis et al (2020) estimated that permanent productivity losses caused by premature COVID-19 deaths in Italy in the first months of the pandemic (data up to April 2020) already reached €300 million ⁽⁸⁾.

It is important to mention that another commonly used measure in population health is “Years of Life Lost” due to premature death (YLL). YLL is the product of the number of deaths in a given population and the average life expectancy remaining at the time of death ⁽⁹⁾.

Rows and collaborators (2021) estimated that more than 20.5 million YLLs were lost due to COVID-19 by January 2021 in 81 countries, men lost about 45% more years of life than women, and 44.9% of total YLLs occurred in the age group between 55 and 75 years ⁽¹⁰⁾. Other studies also showed that COVID-19 YLLs were higher for men and older age groups ^(11, 12).

Previous studies on COVID-19 mortality conducted in the municipality of São Paulo (MSP) support international data showing that men and higher age groups are generally the most affected ⁽¹³⁾. Additionally, available data indicate that the black population and residents of regions with low socioeconomic indicators are at increased risk of dying from COVID-19, showing a great territorial heterogeneity between the regions of the city in relation to the effects of the pandemic. The data suggest that factors such as low levels of education and income, difficulty accessing to the basic health services, poor housing with high level of

crowding, and the need of using public transportation to for working activities increase the level of vulnerability to the disease ^(13, 14, 15).

This research proposes to estimate the loss of human capital in the MSP due to deaths caused by COVID-19. We assume average annual income as a proxy for the value of productivity* and estimate the total amount as the cumulative sum of personal income lost over years lost prematurely due to illness (YLL), in other words, how much these individuals could generate from personal income if they stayed alive as life expectancy.

In addition to productivity loss, the other data generated by this analysis were the absolute number of deaths, the mortality rate per 100,000 inhabitants, the estimated life years lost (YLL) and the YLL per 100,000 inhabitants for the municipality of São Paulo (MSP) and its 96 districts.

***Note1:** For simplicity, for this research we assume average annual income as a proxy for productivity, but as shown in the Human Capital Theory review above, labor income equals the marginal productivity value.

Methodology:

Data obtention

COVID-19 mortality data among residents of the city of São Paulo was extracted from the TABNET system (public database for health information) of the city hall of São Paulo, accessed on May 27, 2021 (last updated on May 20, 2021) ⁽¹⁶⁾.

This analysis included confirmed and suspected COVID19 deaths classified by CID10 codes B34.2 (coronavirus infectious disease) and U04.9 (severe acute respiratory syndrome) occurring between March 2020 and May 20, 2021. The data obtained was tabulated and analyzed in Microsoft Excel.

Number of deaths

Reports of COVID-19 deaths in the city of São Paulo were extracted by sex, administrative district of residence and age group.

To achieve the death rate per 100,000 inhabitants, the total deaths observed in each district were divided by the population projected for 2020 ⁽¹⁷⁾ of the same district and multiplied by 100,000.

Estimated Life Years Lost Prematurely (YLL)

YLLs are calculated from the number of deaths multiplied by a life expectancy at the age at which death occurs ⁽⁹⁾.

In this analysis, the estimate of life-years lost prematurely from COVID-19 was calculated for men and women and by age group: 1 (<1 Year); 2 (1-4 years); 3 (5-9 years); 4 (10-14 years); 5 (15-19 years); 6 (20-24 years); 7 (25-29 years); 8 (30-34 years); 9 (35-39 years); 10 (40-44 years); 11 (45-49 years); 12 (50-54 years); 13 (55-59 years); 14 (60-64 years); 15 (65-69 years); 16 (70-74 years); 17 (75-79 years); 18 (80-84 years) e 19 (higher than 85) according the formula below. The mean life expectancy at the age of death for each age group (E(X)) was obtained from the Brazilian Institute of Geography and Statistics (IBGE) 2019 mortality table ⁽¹⁷⁾.

$$YLL_i = \sum_{i=1,2,3 \dots 19} (\text{number of deaths}) \times (\text{mean } E(X) \text{ by age group})$$

Where i corresponds to age range 1 to 19

E(X) = Life expectancy at age X, IBGE mortality board 2019 ⁽¹⁸⁾.

Average income in each district of MSP

Data on income refer to the average income in each of the 96 districts of the Municipality of São Paulo. These are data obtained from the 2010 Demographic Census ⁽²⁰⁾ and include not only salaries but other forms of income (rents, interest)

The average monthly income presented should be as close as possible to the period 1st of March 2020 to May 2021. We present data from the 2010 Demographic Census since the new Census, which should have been carried out in 2020, was not done so far due to the Covid pandemic.

See Table 2 for annual income amounts corrected for each district in the city.

Estimating productivity loss

Estimation of productivity loss due to COVID-19 was done using a methodology adapted from Nurchis 2020 ⁽⁸⁾. In this paper, only losses attributed to individuals who died before retirement age, 62 years for women and 65 years for men ⁽¹⁹⁾ were considered. Only permanent losses due to premature deaths were

considered. Losses caused by sequelae of the disease, such as time away from work or temporary loss of income, were not considered.

Firstly, we estimated the loss of productivity for each individual (IPP) based on the age of death and place of residence in the municipality of São Paulo.

The average monthly income of each administrative district of the municipality of São Paulo obtained from the 2010 Census data ⁽²⁰⁾ was multiplied by 12 to arrive at the average annual income and corrected by the accumulated IPCA from December 2010 to December 2020, which was 75.09% ⁽²¹⁾.

Note 2: 3.2% of deaths analyzed to estimate loss of income had no record of place of residence and were classified as Administrative District = address ignored. To estimate the loss of productivity of these deaths, the average yield of the MSP was adopted.

Then, the average annual income was multiplied by the Productive Years of Life Lost (PYLL). PYLL was defined as the difference between retirement age and death age. She was considered 62 years old as retirement age for women and 65 years old for men ⁽⁸⁾.

For children and adolescents, PYLL was calculated as retirement age minus 18 years of age as we consider individuals to be paid from that age. We assumed that all individuals would be employed during this period and no unemployment rate was used, we also did not consider the 13th salary.

Individual productivity loss (IPP) by age of death and place of residence in the MSP:

$$\sum_{i=1,2,3,..64}^I \text{PYLL} \times \text{average annual income}$$

Where:

- I = Administrative district of the MSP
 - i = 0, 1, 2, 3, 4, 5...64= corresponds to the different ages at the time of death
0 to 61 years for women
0 to 64 years for men
- PYLL** = Retirement Age - Death Age
Under 18 years: PYLL = Retirement age – 18

The amounts obtained were brought to present value by applying a discount rate of 3% p.a. ⁽²²⁾.

$$V_p = V_{f\ n} \sum_{i=1,2,3...64} (1 - r)^{-n}$$

Where:

- V_p = Present value
- $V_{f\ n}$ = future value in year “n”
- I = Administrative district of the MSP
- $i = 0, 1, 2, 3, 4, 5...64$ = correspond to different ages of death
 0 to 61 years for women
 0 to 64 years for men
- “n” represents the number of periods in which the discount rate will be applied.
- $r = 3\%$ discount rate p.a.

Note 3: For example, a male who dies at age 18, the discount rate on future income will be applied from next year up to 64 years old, which would be the last year before retirement. In this case, the number of periods in which the discount rate would be applied would be 46. See Table 3 for the number of periods used by age and gender.

Lastly, to obtain the estimated value of productivity loss, we multiplied the individual productivity loss (PPI) by the number of deaths observed by age in each MSP residence district.

$$\text{Productivity loss} = \text{PPI} \times \text{number of deaths}$$

Results

Total deaths and mortality rate per 100,000 inhabitants

As of May 20, 2021, there have been 41,604 deaths among residents of the city of São Paulo, with 8,914 classified as suspected and 32,690 confirmed by COVID-19. Of this total, 45.20% of deaths were women and 54.75% were men, see Table 1.

Table 1 - Distribution of deaths by sex and between suspected and confirmed cases

	Suspected COVID-19 deaths (CID10: U04.9)	Confirmed COVID-19 deaths (CID10: B34.29)	Total
Women	4.361 (23,0%)	14.446 (77,0%)	18,807 (100%)
Men	4.551 (20,0%)	18.227 (80,0%)	22,778 (100%)
Ignored	2 (10,5%)	17 (89,5%)	19 (100%)
Total	8914 (21.5%)	32,690 (78.5%)	41,604 (100%)

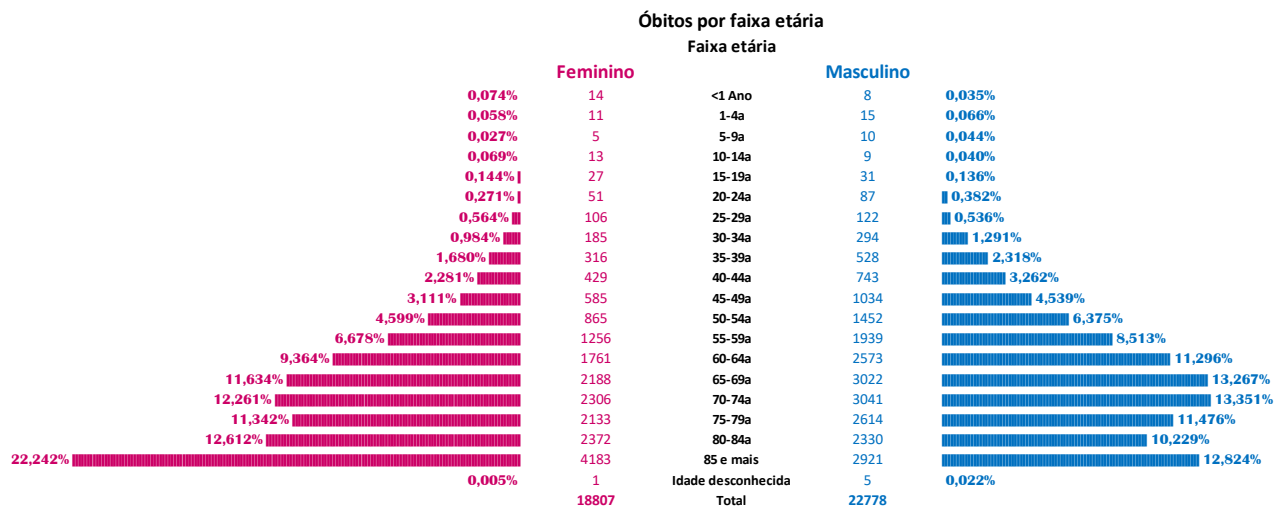
Of the 41,604 death registries, 19 did not contain the gender record and were not included in subsequent analyses.

Among the 18,807 deaths attributed to women, only 01 did not have an age record and was not included in the calculation of the estimate of life years lost and loss of productivity. Similarly, among the 22,778 male deaths, 05 had no age record and were withdrawn from these analyses.

For both gender, 1332 deaths (3.2%) had no record of place of residence and were classified as unknown place or address. Despite the lack of this information, these death records were included in the calculations of lost life years and loss of income (see note 3 in above under “Estimated productivity loss” in the methods section).

Figure 1 shows the distribution of deaths by sex and age group. For both sexes, deaths focus on the highest age groups with similar distribution between males and females, with the exception of the age group above 85 years, which accounts for more than 22.24% of female deaths while males had 12.8% of deaths in that same age group.

Figure 1 - Distribution of COVID-19 deaths by sex and age group.



Note: 19 records with missing sex were not included in this graph.

Figure 4 (see appendices) shows the distribution of deaths by sex and MSP district. Sapopemba districts with 1180 deaths (2.84%); Brazil with 984 (2.37%), Grajaú with 969 (2.33%), Cidade Ademar with 867 (2.08%) and Itaquera with 828 (1.99%) had the highest number of COVID-19 deaths.

The mortality rate per 100,000 inhabitants was also calculated and is available in Table 04 (see appendices). The mortality rate per 100,000 population for the MSP was 353.77 and the districts that had the highest rates were Aricanduva (563.59); Água Rasa (538.34); Ponte Rasa (530.18); Freguesia do Ó (528.02) and São Miguel (517.18).

Note 4: The 1332 deaths (3.2%) classified as address or location ignored represent the highest number of deaths among all districts.

We note in Table 5 (see appendices), that districts with the highest number of deaths are among the districts with the lowest average income. For example, among the 96 districts of the MSP, Sapopemba is the 1st place number of deaths and the 82nd place in annual average income. Similar situation occurs with the districts of Brasilândia, Grajaú, Cidade Ademar and Itaquera, which are listed as the first in number of deaths, but are in low positions in the annual average income table.

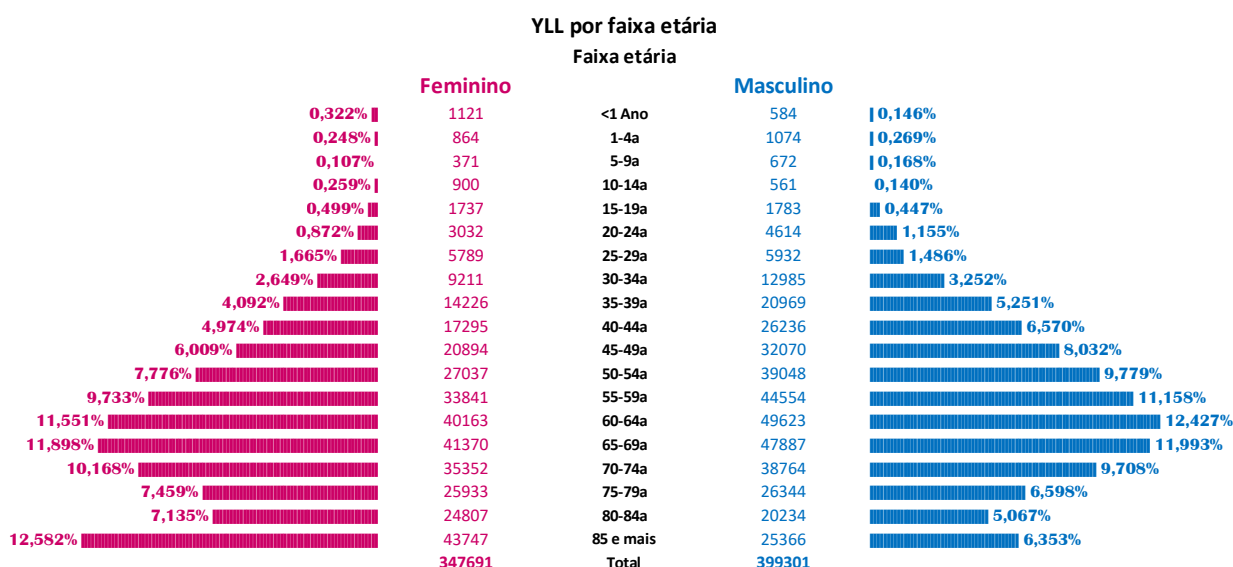
When analyzing the districts with the highest rates of deaths per 100,000 inhabitants (Aricanduva; Água Rasa; Ponte Rasa; Parish of O and São Miguel), it is observed that everyone remains in the middle zone of the table, between the 2nd and 3rd quartiles, with the exception of the Parish of O which is the 12th placed in number of deaths (1st quartile) and 49th in annual average income (3rd quartile) and of São Miguel which is in 43rd place in number of deaths (2nd quartile) and in 74th place in

Lost Life Years (YLL)

The 41,604 COVID-19 deaths represent 746,992 YLL lost life years for MSP residents, an average of 17.95 YLL per person. Of this total, 53.45% represents YLL for men (mean 17.53) and 45.55% for women (mean per woman 18.49), indicating that although men die more, it is women who on average lost more years of life prematurely from the disease.

Figure 2 shows the distribution of YLLs by gender and age group. Among women, the age group over 85 is the most lost years of life prematurely while the loss focuses between the ages of 60 and 64 for men. Overall, losses are concentrated between the ages of 55 and 74, accounting for 44.38% of total YLLs for both sexes.

Figure 2 - Distribution of life years lost prematurely (YLL) by age group in the municipality of São Paulo.



Note: 1 case with unknown age for female and 5 cases for male were not included in the graph

Figure 5 (see appendices) shows the distribution of YLL by sex and MSP administrative district. The districts that lost the most YLLs in absolute numbers were Sapopemba, Grajaú, Brazil, Cidade Ademar and Itaquera with 21,473.11, 19,709.53, 19,251.94 and 16,202.81 YLLs respectively.

YLL and YLL results per 100,000 inhabitants per MSP administrative district are consolidated in Table 06. The amount of YLL per 100,000 inhabitants for the MSP is 6,354.81 and the districts with the highest values are Aricanduva; Freguesia do Ó; São Miguel; Ponte Rasa and Vila Medeiros with 9,518.63, 9,465.18, 9,256.89, 9,152.53 and 9,113.45 YLL per 100,000 inhabitants respectively.

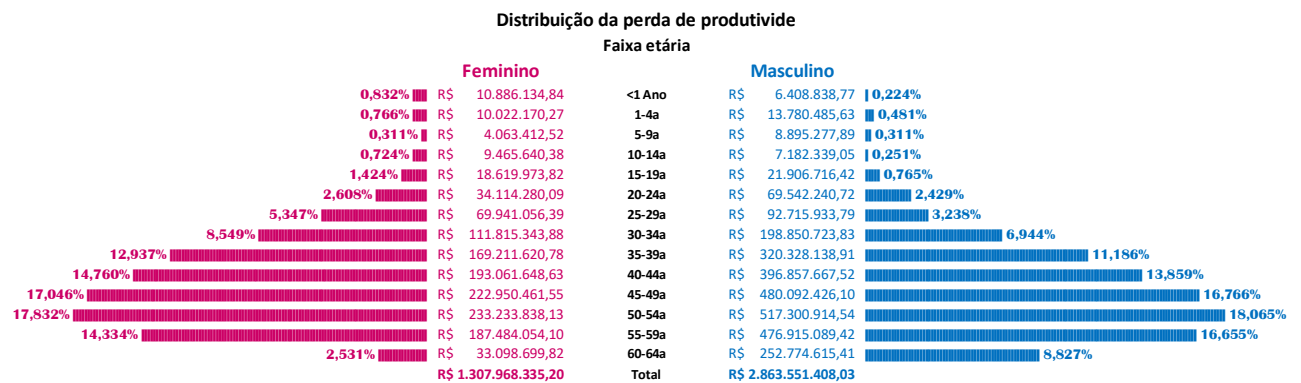
Loss of Productivity

As mentioned earlier, for the estimate of productivity loss only deaths of women between 0 and 61 years and men between 0 and 64 years were considered. In this cut-out, there are a total of 13,382 deaths, 4,518 females and 8,845 males, accounting for approximately 31.65% of total deaths.

The loss of productivity due to these more than 13,000 deaths is estimated at BRL 4,171.519.743.23 (€ 647.349.432,53), with BRL 1,307.968.335.20 (€202.974.601,99) for women and BRL 2,863.551.408.03 (€ 444.374.830,54) for men, an average of BRL 311,726.18 (€ 48.374,64) per deceased person. All of these values are corrected for the year 2020. For presentation in ERSA 2022, values were converted to euros (rate on 27May21 R\$1,000 = €6,444).

Figure 3 shows a distribution of similar productivity loss values for both genders according to age groups, with a higher concentration between 50 and 54 years of age.

Figure 3 - Distribution of estimated productivity loss by sex and age group in MSP



The loss of productivity by MSP administrative district is presented in appendix, Table 07. The most affected districts are Sacomã, Grajaú, Jabaquara; Brasilândia; Vila Andrade and Tremembé with losses of R\$ 82.8; R\$ 79.59; R\$ 78.95; R\$ 77.46 million respectively.

Discussion

According to IBGE data from 2018, the city of São Paulo generated more than R\$714.6 billion of GDP that year ⁽²³⁾, which corresponded to the 1st place among Brazilian cities. This analysis estimates that approximately 0.58% of this amount (R\$4.17 billion) is the amount MSP residents could produce if they had not been killed by COVID-19.

The results of this analysis show that COVID-19 deaths focus on the highest age groups and that districts that had the highest number of deaths are positioned among the lowest-average-income districts. These results may indicate that retirees and lower-income workers are most affected. We assumed that this income data can be understood as a proxy for quality of life, as district like Marsilac, with an average monthly income of R\$772.15, certainly has worse primary and secondary schools, worse hospitals and clinics, worse transport equipment, and is much more insecure than Moema, with an average monthly income of R\$7,384.73. In addition, in the Covid-19 situation, fewer residents of Marsilac would be able to work from home.

In addition to what was presented above, a study conducted by the Polis Institute in São Paulo reported that approximately 49% of COVID-19 victims at MSP were represented by retirees, housewives, students and unemployed people and that 76.7% had not completed the elementary education cycle. This indicates

that Covid-19 mortality is higher among lower-income workers, characterized by the informality and impossibility of remote work ⁽²⁴⁾.

Important to mention that the productivity loss estimated in this analysis may be underestimated, since only potential individual's income until the age of retirement was used in the calculation. This would be compensated including deaths at ages over 62 and 65 for women and men respectively and considering an estimated income for this population. However, this additional analysis was not done in this paper.

Still on the annual average income variable, it is important to say that the source of this information is from the last populational Census in 2010, based on the gained reported by citizens. Then the share of income from informal activities may not have been properly captured. The fact that the risk of dying from COVID-19 is more associated with lower-income workers, and consequently subject to a higher level of informality, could also contribute for an underestimated value of productivity loss for society.

It is also important to mention that intangible values such as knowledge and experience acquired over a lifetime and that other indirect costs, such as loss of productivity due to temporary absences from work or sequelae caused by the disease, and even direct costs due to COVID-19 were considered in this analysis, which indicates that not only the loss of human capital, but also the financial impact would be greater.

On the other hand, in this analysis we do not consider an unemployment rate. We assume that all individuals would be employed throughout their economically active life which certainly does not correspond to reality. This premise certainly overestimated the estimate of productivity loss. This point could be corrected by applying a population unemployment rate to the analysis.

This analysis also estimated that between March 2020 and May 2021, people who died from COVID-19 in the MSP lost an average of 17.95 years of life prematurely (YLL). Although men died more, it was women who on average lost more YLLs (18.45 vs. 17.53). This result can be explained by the fact that women have a longer life expectancy than men.

The YLL value per 100,000 population for MSP was 6354.81, 4.61 times higher than the overall YLL value per 100,000 population for lower respiratory tract infections which was 1377.6 ⁽²⁵⁾. This number proves that the COVID-19 pandemic increases mortality in the population and evidence of the serious public health problem it represents.

Another point this study tried to explore was the relationship between COVID-19 lethality and the place of residence, which has already been studied by some authors.

Ribeiro et al., evaluated mortality data in the city of São Paulo from March to September 2020 and showed that higher mortality rates are associated with areas with less education, more family clutter and lower income and that men and blacks have higher COVID-19 mortality rates compared to women, whites and asians respectively ⁽¹³⁾.

Bermudi et al. developed a statistical model to evaluate deaths in the city of São Paulo considering geolocation and socioeconomic aspects. The results showed that the risk of death from COVID-19 is higher in areas with worse socioeconomic conditions. Mortality was higher for men and increases as age increases ⁽¹⁴⁾

The results presented in this paper, corroborates the data from these previous studies showing that men die more from COVID-19 than women, that for both sexes the highest age groups are the most affected, and that the volume of deaths is higher in lower middle-income districts.

However, the COVID-19 pandemic is a complex phenomenon with several variables that may interfere to a lesser or greater degree with population mortality. To try to establish any correlation between mortality and other social and economic characteristics of each MSP district, it would be necessary to analyze a greater amount of data and use more sophisticated analysis methods. Another study by the Polis Institute showed that the division of the municipality into 96 administrative districts is not sufficient to capture the heterogeneity and diversity present in the MSP and that more detailed analyses would be more appropriate to describe with more details the impacts of the pandemic ⁽¹⁵⁾.

In this work, we calculate only the gross mortality rates of each MSP administrative district. In order to compare mortality rates between districts appropriately, it would be necessary to use standardization techniques in order to eliminate any differences in the composition of the different populations that could interfere with the result. The calculation of mortality rates standardized by sex, age, and income would be important so that the COVID-19 mortality rates observed in the different MSP districts can be evaluated and may be done as an adjunct to this research.

As previously highlighted, about 3.2% of death records did not contain address information and could not be assigned to any of the 96 MSP administrative districts. Although it represents a small fraction of the total and it is included in all analyses of this research, this amount proved relevant when results among each

MSP districts were compared. The group of data classified as address or location ignored was the one with the highest number of deaths, YLL and loss of productivity than all districts, see table 02 in attachments.

This study was conducted in a public database with anonymized data, so it was not necessary to obtain approval from the Local Ethics Committee.

Conclusion

The COVID-19 pandemic is a public health emergency that notably increased the mortality rate of the population. The data indicate that men die more than women, deaths is more prevalent in the highest age groups and in the MSP districts with lower average income values.

This study estimated the loss caused by the deaths in the MSP due to COVID-19 to reach BRL 4.17 billion (€ 647.3 billion), but the financial and social impact is greater, because when an individual dies, all their skills and their productive potential are also lost and these intangible values were not accounted in the analysis.

In addition to the personal drama of those who have lost their loved ones, all of these deaths represent a loss of human capital which is hard to measure in terms of economic and social effects. Despite methodological limitations, the results of this analysis aim to stimulate debate on the negative effects caused by the excess of deaths of COVID-19 and highlight the need to adopt protective measures for the control and reduction of the impacts of the pandemic.

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Attachments

Table 2 – Average annual income (2010) per IPCA adjusted administrative district from Dez2010 to Dez2020

Administrative District	Census monthly average income from 2010 ¹⁰ R\$	Average Annual Income (2010) BRL	IPCA accumulated from Dez2010 to Dez2020 ^b (75.09%)
Água Rasa	2.227,14	26.725,63	46.793,91
Alto de Pinheiros	6.169,36	74.032,29	129.623,13
Anhanguera	1.020,39	12.244,64	21.439,14
Aricanduva	1.381,44	16.577,25	29.025,10
Artur Alvim	1.243,95	14.927,40	26.136,38
Barra Funda	3.927,67	47.132,03	82.523,48
Bela Vista	3.459,55	41.514,59	72.687,90
Belém	2.107,39	25.288,71	44.278,00
Bom Retiro	1.642,71	19.712,52	34.514,65
Brás	1.520,73	18.248,81	31.951,85
Brasilândia	982,56	11.790,73	20.644,39
Butantã	3.185,22	38.222,61	66.923,96
Cachoeirinha	1.276,79	15.321,48	26.826,39
Cambuci	2.668,57	32.022,81	56.068,74
Campo Belo	5.133,28	61.599,32	107.854,25
Campo Grande	2.934,59	35.215,14	61.658,19
Campo Limpo	1.323,83	15.885,97	27.814,75
Cangaíba	1.264,97	15.179,67	26.578,08
Capão Redondo	1.034,82	12.417,87	21.742,45
Carrão	2.020,23	24.242,74	42.446,61
Casa Verde	1.874,83	22.497,93	39.391,63
Cidade Ademar	1.227,13	14.725,50	25.782,88
Cidade Dutra	1.268,98	15.227,81	26.662,38
Cidade Líder	1.270,83	15.249,96	26.701,16
Cidade Tiradentes	868,24	10.418,88	18.242,42
Consolação	5.164,51	61.974,07	108.510,40
Cursino	2.389,66	28.675,95	50.208,73
Ermelino Matarazzo	1.197,43	14.369,20	25.159,03
Freguesia do Ó	1.626,98	19.523,76	34.184,15
Grajaú	909,62	10.915,44	19.111,84
Guaianases	1.024,67	12.296,01	21.529,09
Iguatemi	911,68	10.940,20	19.155,20
Ipiranga	2.469,80	29.637,59	51.892,46
Itaim Bibi	6.004,91	72.058,93	126.167,98
Itaim Paulista	914,45	10.973,43	19.213,38
Itaquera	1.191,38	14.296,56	25.031,85
Jabaquara	2.055,01	24.660,15	43.177,45

Table 2 -- Average nominal income per administrative district, corrected by IPCA from Dez2010 to Dez2020

Administrative District	Census monthly average income from 2010 ^{to} R\$	Average Annual Income (2010) BRL	IPCA accumulated from Dez2010 to Dez2020 ^b (75.09%)
Jaçanã	1.317,99	15.815,82	27.691,93
Jaguara	1.642,51	19.710,09	34.510,39
Jaguaré	2.056,68	24.680,16	43.212,49
Jaraguá	1.087,78	13.053,34	22.855,10
Jardim Ângela	887,97	10.655,60	18.656,89
Jardim Helena	897,78	10.773,40	18.863,14
Jardim Paulista	6.647,48	79.769,77	139.668,90
Jardim São Luís	1.110,48	13.325,76	23.332,07
José Bonifácio	1.068,52	12.822,26	22.450,49
Lajeado	861,38	10.336,55	18.098,27
Lapa	3.689,18	44.270,19	77.512,68
Liberdade	3.128,80	37.545,62	65.738,63
Limão	1.593,00	19.115,94	33.470,10
Mandaqui	2.101,77	25.221,21	44.159,81
Marsilac	772,15	9.265,76	16.223,41
Moema	7.384,73	88.616,76	155.159,08
Mooca	2.931,70	35.180,40	61.597,37
Morumbi	6.959,73	83.516,79	146.229,55
Parelheiros	888,32	10.659,88	18.664,38
Pari	1.606,11	19.273,32	33.745,66
Parque do Carmo	1.338,32	16.059,82	28.119,14
Pedreira	1.032,30	12.387,54	21.689,35
Penha	1.679,35	20.152,26	35.284,59
Perdizes	4.780,31	57.363,76	100.438,21
Perus	1.008,28	12.099,39	21.184,82
Pinheiros	5.466,61	65.599,30	114.857,82
Pirituba	1.666,66	19.999,87	35.017,76
Ponte Rasa	1.365,13	16.381,61	28.682,56
Raposo Tavares	1.459,53	17.514,30	30.665,79
República	2.080,65	24.967,80	43.716,13
Rio Pequeno	2.295,56	27.546,67	48.231,46
Sacomã	1.578,61	18.943,33	33.167,88
Santa Cecília	3.164,21	37.970,49	66.482,53
Santana	3.159,52	37.914,19	66.383,96
Santo Amaro	4.834,04	58.008,46	101.567,01
São Domingos	1.653,40	19.840,74	34.739,15
São Lucas	1.491,51	17.898,18	31.337,92
São Mateus	1.177,72	14.132,68	24.744,90
São Miguel	1.139,74	13.676,82	23.946,75
São Rafael	950,63	11.407,58	19.973,54

Table 2 -- Average nominal income per administrative district, corrected by IPCA from Dez2010 to Dez2020

Administrative District	Census monthly average income from 2010 ^{to} R\$	Average Annual Income (2010) BRL	IPCA accumulated from Dez2010 to Dez2020 ^b (75.09%)
Sapopemba	1.022,94	12.275,34	21.492,89
Saúde	3.810,18	45.722,14	80.054,90
Sé	1.401,49	16.817,90	29.446,46
Socorro	2.873,05	34.476,56	60.365,01
Tatuapé	3.313,50	39.762,04	69.619,35
Tremembé	1.351,78	16.221,37	28.402,00
Tucuruvi	2.005,30	24.063,54	42.132,86
Vila Andrade	3.631,95	43.583,36	76.310,11
Vila Curuçá	997,39	11.968,64	20.955,89
Vila Formosa	2.136,78	25.641,33	44.895,40
Vila Guilherme	1.934,62	23.215,41	40.647,86
Vila Jacuí	1.062,61	12.751,31	22.326,27
Vila Leopoldina	4.794,89	57.538,62	100.744,37
Vila Maria	1.438,49	17.261,93	30.223,90
Vila Mariana	5.339,15	64.069,81	112.179,83
Vila Matilde	1.643,15	19.717,79	34.523,89
Vila Medeiros	1.266,05	15.192,60	26.600,72
Vila Prudente	1.954,13	23.449,53	41.057,78
Vila Sônia	2.953,22	35.438,62	62.049,49
Endereço ignorado ^c	1.999,11	23.989,37	42.002,99

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c – Address ignored = nominal average income = average in the municipality of São Paulo

Table 3 - Number of periods for applying the discount rate of 3% p.a.

Number of periods to apply the 3% discount rate p.a.

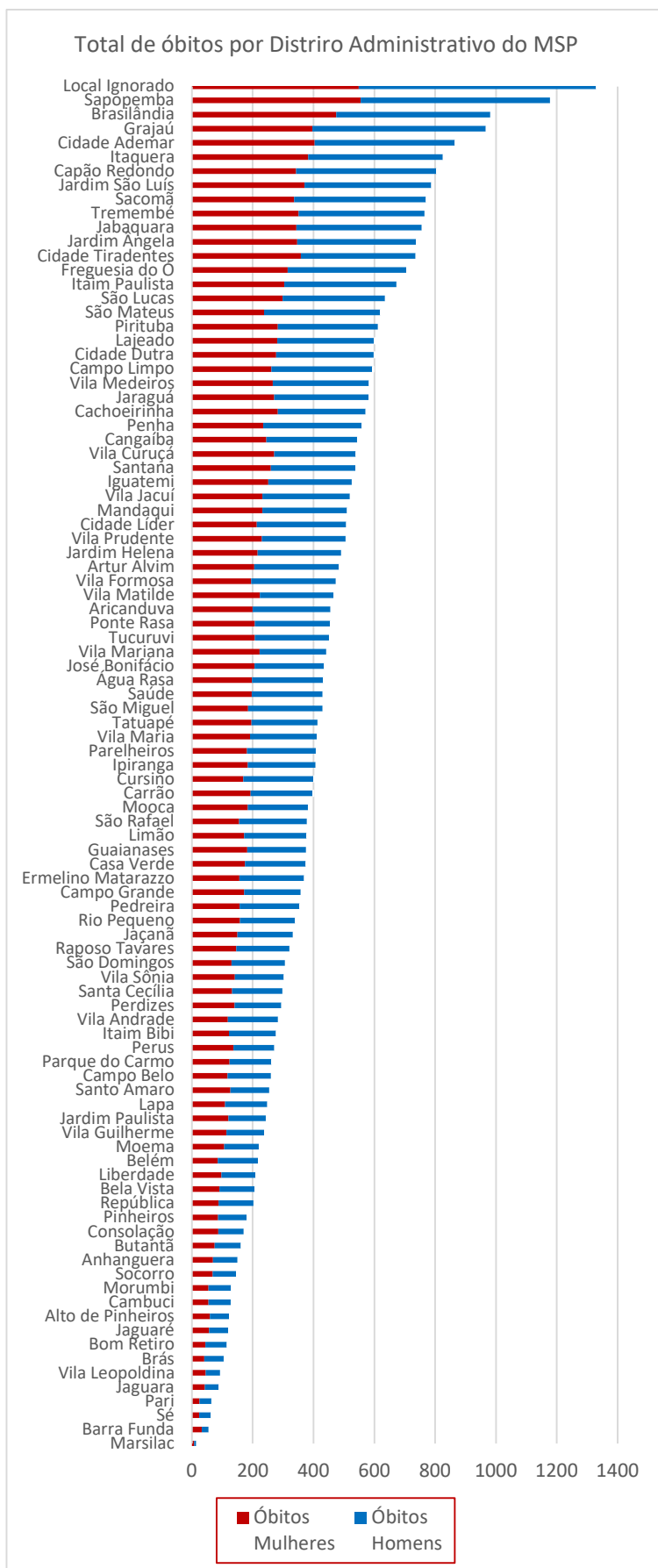
Age of death in years	Men	Women
Under 1 year	64	61
1	63	60
2	62	59
3	61	58
4	60	57
5	59	56
6	58	55
7	57	54
8	56	53
9	55	52
10	54	51
11	53	50
12	52	49
13	51	48
14	50	47
15	49	46
16	48	45
17	47	44
18	46	43
19	45	42
20	44	41
21	43	40
22	42	39
23	41	38
24	40	37
25	39	36
26	38	35
27	37	34
28	36	33
29	35	32
30	34	31
31	33	30
32	32	29

Number of periods to apply the 3% discount rate p.a.

Age of death in years	Men	Women
33	31	28
34	30	27
35	29	26
36	28	25
37	27	24
38	26	23
39	25	22
40	24	21
41	23	20
42	22	19
43	21	18
44	20	17
45	19	16
46	18	15
47	17	14
48	16	13
49	15	12
50	14	11
51	13	10
52	12	9
53	11	8
54	10	7
55	9	6
56	8	5
57	7	4
58	6	3
59	5	2
60	4	1
61	3	0
62	2	-
63	1	-
64	0	-

Note: We consider that individuals under the age of 18 would only generate income from the age of 18. Therefore, we apply the discount rate from the age of death until 18 years of age and then until retirement age.

Figure 4 Distribution of COVID-19 Deaths by Gender and MSP Administrative District



Distrito Admin residência	Óbitos Mulheres	Óbitos Homens	Óbitos totais	%
Local Ignorado	549	783	1332	3,20%
Sapopemba	555	625	1180	2,84%
Brasília	475	509	984	2,37%
Grajaú	396	573	969	2,33%
Cidade Ademar	404	463	867	2,08%
Itaquera	382	446	828	1,99%
Capão Redondo	343	463	806	1,94%
Jardim São Luís	370	420	790	1,90%
Sacomã	336	436	772	1,86%
Tremembé	351	417	768	1,85%
Jabaquara	344	414	758	1,82%
Jardim Ângela	346	394	740	1,78%
Cidade Tiradentes	358	380	738	1,77%
Freguesia do Ó	315	393	708	1,70%
Itaim Paulista	304	371	675	1,62%
São Lucas	298	339	637	1,53%
São Mateus	237	385	622	1,50%
Pirituba	283	331	614	1,48%
Lajeado	281	320	601	1,45%
Cidade Dutra	277	323	600	1,44%
Campo Limpo	261	335	596	1,43%
Vila Medeiros	266	319	585	1,41%
Jaraguá	271	313	584	1,40%
Cachoeirinha	283	291	574	1,38%
Penha	235	326	561	1,35%
Cangaíba	245	301	546	1,31%
Vila Curuçá	271	270	541	1,30%
Santana	260	280	540	1,30%
Iguatemi	251	277	528	1,27%
Vila Jacuí	232	290	522	1,26%
Mandaqui	232	281	513	1,23%
Cidade Líder	213	297	510	1,23%
Vila Prudente	230	278	508	1,22%
Jardim Helena	216	277	493	1,19%
Artur Alvim	205	281	486	1,17%
Vila Formosa	195	281	476	1,14%
Vila Matilde	224	244	468	1,13%
Aricanduva	200	258	458	1,10%
Ponte Rasa	207	250	457	1,10%
Tucuruvi	207	247	454	1,09%
Vila Mariana	223	221	444	1,07%
José Bonifácio	206	231	437	1,05%
Água Rasa	198	236	434	1,04%
São Miguel	185	247	432	1,04%
Saúde	197	235	432	1,04%
Tatuapé	196	220	416	1,00%
Vila Maria	191	223	414	1,00%
Parelheiros	181	229	410	0,99%
Ipiranga	184	225	409	0,98%
Cursino	169	233	402	0,97%
Carrão	193	206	399	0,96%
Mooca	184	200	384	0,92%
São Rafael	155	226	381	0,92%
Limão	172	208	380	0,91%
Guaianases	182	196	378	0,91%
Casa Verde	175	202	377	0,91%
Ermelino Matarazzo	156	215	371	0,89%
Campo Grande	172	188	360	0,87%
Pedreira	157	200	357	0,86%
Rio Pequeno	158	184	342	0,82%
Jaçanã	150	184	334	0,80%
Raposo Tavares	146	177	323	0,78%
São Domingos	130	179	309	0,74%
Vila Sônia	141	164	305	0,73%
Santa Cecília	132	168	300	0,72%
Perdizes	140	157	297	0,71%
Vila Andrade	118	167	285	0,69%
Itaim Bibi	122	157	279	0,67%
Perus	137	136	273	0,66%
Parque do Carmo	124	140	264	0,63%
Campo Belo	117	145	262	0,63%
Santo Amaro	127	130	257	0,62%
Lapa	109	141	250	0,60%
Jardim Paulista	120	126	246	0,59%
Vila Guilherme	114	126	240	0,58%
Moema	106	117	223	0,54%
Belém	85	135	220	0,53%
Liberdade	97	115	212	0,51%
Bela Vista	91	118	209	0,50%
República	88	117	205	0,49%
Pinheiros	86	97	183	0,44%
Consolação	87	86	173	0,42%
Butantã	75	89	164	0,39%
Anhanguera	69	83	152	0,37%
Socorro	68	80	148	0,36%
Morumbi	55	76	131	0,32%
Cambuci	55	75	130	0,31%
Alto de Pinheiros	59	66	125	0,30%
Jaguare	56	66	122	0,29%
Bom Retiro	44	73	117	0,28%
Brás	41	66	107	0,26%
Vila Leopoldina	45	50	95	0,23%
Jaguara	43	48	91	0,22%
Pari	25	42	67	0,16%
Sé	24	41	65	0,16%
Barra Funda	32	25	57	0,14%
Marsilac	7	10	17	0,04%
Total	18807	22778	41585	100,00%

Table 4 – Consolidated data of deaths by sex, classification and deaths per 100,000 hab per MSP administrative district

Distrito Admin residência	Óbitos totais Mulheres	Óbitos totais Homens	Óbitos Total	Projeção População 2020	Óbitos por 100.000
Água Rasa	198	236	434	80618	538,34
Alto de Pinheiros	59	66	125	40117	311,59
Anhanguera	69	83	152	108277	140,38
Aricanduva	200	258	458	81265	563,59
Artur Alvim	205	281	486	95587	508,44
Barra Funda	32	25	57	15306	372,40
Bela Vista	91	118	209	73243	285,35
Belém	85	135	220	49151	447,60
Bom Retiro	44	73	117	41428	282,42
Brás	41	66	107	32656	327,66
Brasilândia	475	509	984	272203	361,49
Butantã	75	89	164	53517	306,45
Cachoeirinha	283	291	574	133831	428,90
Cambuci	55	75	130	45602	285,07
Campo Belo	117	145	262	62228	421,03
Campo Grande	172	188	360	106487	338,07
Campo Limpo	261	335	596	223750	266,37
Cangaíba	245	301	546	130278	419,10
Capão Redondo	343	463	806	287693	280,16
Carrão	193	206	399	85107	468,82
Casa Verde	175	202	377	84096	448,29
Cidade Ademar	404	463	867	280322	309,29
Cidade Dutra	277	323	600	193256	310,47
Cidade Líder	213	297	510	131582	387,59
Cidade Tiradentes	358	380	738	225069	327,90
Consolação	87	86	173	57898	298,80
Cursino	169	233	402	111820	359,51
Ermelino Matarazzo	156	215	371	115902	320,10
Freguesia do Ó	315	393	708	134085	528,02
Grajaú	396	573	969	374484	258,76
Guaianases	182	196	378	105278	359,05
Iguatemi	251	277	528	153605	343,74
Ipiranga	184	225	409	110810	369,10
Itaim Bibi	122	157	279	100916	276,47
Itaim Paulista	304	371	675	226408	298,13

Table 4 – Consolidated data of deaths by sex, classification and deaths per 100,000 hab per MSP administrative district

Distrito Admin residência	Óbitos totais Mulheres	Óbitos totais Homens	Óbitos Total	Projeção População 2020	Óbitos por 100.000
Itaquera	382	446	828	199804	414,41
Jabaquara	344	414	758	224378	337,82
Jaçanã	150	184	334	93524	357,13
Jaguara	43	48	91	23121	393,57
Jaguaré	56	66	122	56147	217,29
Jaraguá	271	313	584	224583	260,04
Jardim Ângela	346	394	740	340623	217,25
Jardim Helena	216	277	493	125760	392,02
Jardim Paulista	120	126	246	90190	272,76
Jardim São Luís	370	420	790	287809	274,49
José Bonifácio	206	231	437	138014	316,63
Lajeado	281	320	601	164553	365,23
Lapa	109	141	250	68882	362,94
Liberdade	97	115	212	74009	286,45
Limão	172	208	380	75258	504,93
Mandaqui	232	281	513	107670	476,46
Marsilac	7	10	17	7784	218,39
Moema	106	117	223	93540	238,40
Mooca	184	200	384	86925	441,76
Morumbi	55	76	131	61153	214,22
Parelheiros	181	229	410	160529	255,41
Pari	25	42	67	19365	345,98
Parque do Carmo	124	140	264	69762	378,43
Pedreira	157	200	357	156792	227,69
Penha	235	326	561	126095	444,90
Perdizes	140	157	297	115707	256,68
Perus	137	136	273	87257	312,87
Pinheiros	86	97	183	65058	281,29
Pirituba	283	331	614	167201	367,22
Ponte Rasa	207	250	457	86197	530,18
Raposo Tavares	146	177	323	105524	306,09
República	88	117	205	65271	314,07
Rio Pequeno	158	184	342	120451	283,93
Sacomã	336	436	772	258138	299,07
Santa Cecília	132	168	300	94454	317,62

Table 4 – Consolidated data of deaths by sex, classification and deaths per 100,000 hab per MSP administrative district

Distrito Admin residência	Óbitos totais Mulheres	Óbitos totais Homens	Óbitos Total	Projeção População 2020	Óbitos por 100.000
Santana	260	280	540	108605	497,22
Santo Amaro	127	130	257	81143	316,73
São Domingos	130	179	309	83362	370,67
São Lucas	298	339	637	139504	456,62
São Mateus	237	385	622	149101	417,17
São Miguel	185	247	432	83531	517,18
São Rafael	155	226	381	159003	239,62
Sapopemba	555	625	1180	275147	428,86
Saúde	197	235	432	138951	310,90
Sé	24	41	65	26676	243,66
Socorro	68	80	148	35026	422,54
Tatuapé	196	220	416	101555	409,63
Tremembé	351	417	768	227872	337,03
Tucuruvi	207	247	454	93545	485,33
Vila Andrade	118	167	285	210129	135,63
Vila Curuçá	271	270	541	145493	371,84
Vila Formosa	195	281	476	91858	518,19
Vila Guilherme	114	126	240	56651	423,65
Vila Jacuí	232	290	522	136971	381,10
Vila Leopoldina	45	50	95	55660	170,68
Vila Maria	191	223	414	108477	381,65
Vila Mariana	223	221	444	132053	336,23
Vila Matilde	224	244	468	102641	455,96
Vila Medeiros	266	319	585	115190	507,86
Vila Prudente	230	278	508	102091	497,60
Vila Sônia	141	164	305	129099	236,25
Endereço Ignorado	549	783	1332		NA
Total	18807	22778	41585	11754736	353,772

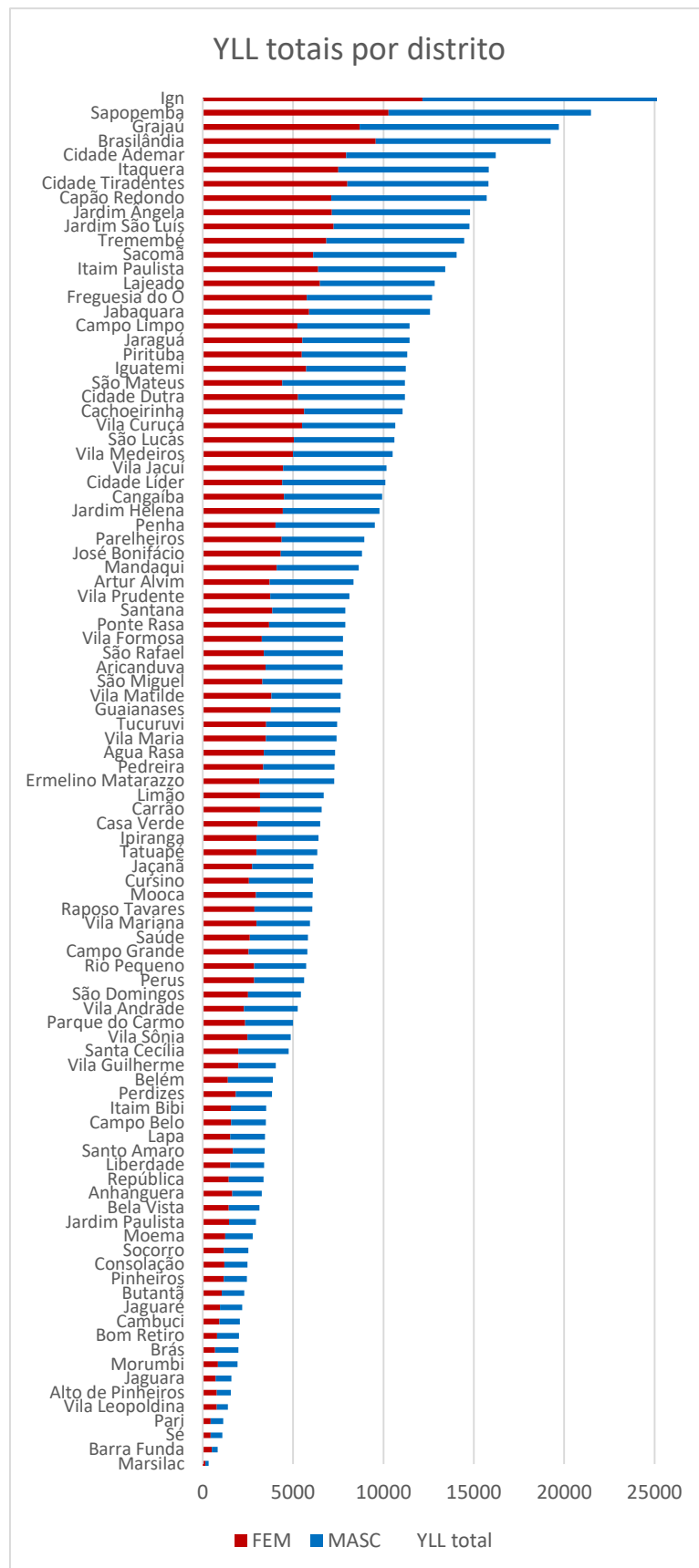
Note: Deaths per 100,000: Total deaths per administrative district divided by the projected 2020 population of the same district multiplied by 100,000.

Death rate per 100,000 for MSP = 353,772

Table 5 - Ranking of the administrative districts with the highest number of deaths Vs ranking with the highest annual income

	Ranking Distrito administrativo total de óbitos	Total óbitos	Ranking Distrito administrativo renda anual	IPCA acumulado de Dez2010 a Dez2020 (Ref) (75,09%)	
1o quartil - 25% dos distritos com maiores número de óbitos	1 Sapopemba	1180	1 Moema	155.159,08	1o quartil - 25% dos distritos com maior renda anual média
	2 Brasilândia	985	2 Morumbi	146.229,55	
	3 Grajaú	969	3 Jardim Paulista	139.668,90	
	4 Cidade Ademar	867	4 Alto de Pinheiros	129.623,13	
	5 Itaquera	828	5 Itaim Bibi	126.167,98	
	6 Capão Redondo	806	6 Pinheiros	114.857,82	
	7 Jardim São Luís	790	7 Vila Mariana	112.179,83	
	8 Sacomã	772	8 Consolação	108.510,40	
	9 Tremembé	768	9 Campo Belo	107.854,25	
	10 Jabaquara	758	10 Santo Amaro	101.567,01	
	11 Jardim Ângela	740	11 Vila Leopoldina	100.744,37	
	12 Cidade Tiradent	739	12 Perdizes	100.438,21	
	13 Freguesia do Ó	709	13 Barra Funda	82.523,48	
	14 Itaim Paulista	675	14 Saúde	80.054,90	
	15 São Lucas	638	15 Lapa	77.512,68	
	16 São Mateus	622	16 Vila Andrade	76.310,11	
	17 Pirituba	614	17 Bela Vista	72.687,90	
	18 Lajeado	601	18 Tatuapé	69.619,35	
	19 Cidade Dutra	600	19 Butantã	66.923,96	
	20 Campo Limpo	596	20 Santa Cecília	66.482,53	
	21 Vila Medeiros	586	21 Santana	66.383,96	
	22 Jaraguá	584	22 Liberdade	65.738,63	
	23 Cachoeirinha	574	23 Vila Sônia	62.049,49	
	24 Penha	561	24 Campo Grande	61.658,19	
2o quartil - 25% dos distritos localizados na zona intermediária-alta em número de óbitos	25 Cangaíba	546	25 Mooca	61.597,37	2o quartil - 25% dos distritos com renda anual intermediária-alta
	26 Santana	541	26 Socorro	60.365,01	
	27 Vila Curuçá	541	27 Cambuci	56.068,74	
	28 Iguatemi	528	28 Ipiranga	51.892,46	
	29 Vila Jacuí	522	29 Cursino	50.208,73	
	30 Mandaqui	513	30 Rio Pequeno	48.231,46	
	31 Cidade Líder	510	31 Água Rasa	46.793,91	
	32 Vila Prudente	508	32 Vila Formosa	44.895,40	
	33 Jardim Helena	493	33 Belém	44.278,00	
	34 Artur Alvim	487	34 Mandaqui	44.159,81	
	35 Vila Formosa	476	35 República	43.716,13	
	36 Vila Matilde	468	36 Jaguaré	43.212,49	
	37 Aricanduva	458	37 Jabaquara	43.177,45	
	38 Ponte Rasa	457	38 Carrão	42.446,61	
	39 Tucuruvi	455	39 Tucuruvi	42.132,86	
	40 Vila Mariana	444	40 Vila Prudente	41.057,78	
	41 José Bonifácio	437	41 Vila Guilherme	40.647,86	
	42 Água Rasa	434	42 Casa Verde	39.391,63	
	43 São Miguel	433	43 Penha	35.284,59	
	44 Saúde	432	44 Pirituba	35.017,76	
	45 Tatuapé	416	45 São Domingos	34.739,15	
	46 Vila Maria	414	46 Vila Matilde	34.523,89	
	47 Parelheiros	410	47 Bom Retiro	34.514,65	
	48 Ipiranga	409	48 Jaguará	34.510,39	
3o quartil - 25% dos distritos localizados na zona intermediária-baixa em número de óbitos	49 Cursino	403	49 Freguesia do Ó	34.184,15	3o quartil - 25% dos distritos com renda anual média intermediária-baixa
	50 Carrão	399	50 Pari	33.745,66	
	51 Mooca	384	51 Limão	33.470,10	
	52 São Rafael	381	52 Sacomã	33.167,88	
	53 Limão	380	53 Brás	31.951,85	
	54 Guaianases	378	54 São Lucas	31.337,92	
	55 Casa Verde	377	55 Raposo Tavares	30.665,79	
	56 Ermelino Matarazzo	371	56 Vila Maria	30.223,90	
	57 Campo Grande	360	57 Sé	29.446,46	
	58 Pedreira	357	58 Aricanduva	29.025,10	
	59 Rio Pequeno	342	59 Ponte Rasa	28.682,56	
	60 Jaçanã	335	60 Tremembé	28.402,00	
	61 Raposo Tavares	323	61 Parque do Carmo	28.119,14	
	62 São Domingos	309	62 Campo Limpo	27.814,75	
	63 Vila Sônia	305	63 Jaçanã	27.691,93	
	64 Santa Cecília	300	64 Cachoeirinha	26.826,39	
	65 Perdizes	298	65 Cidade Líder	26.701,16	
	66 Vila Andrade	285	66 Cidade Dutra	26.662,38	
	67 Itaim Bibi	279	67 Vila Medeiros	26.600,72	
	68 Perus	274	68 Cangaíba	26.578,08	
	69 Parque do Carmo	264	69 Artur Alvim	26.136,38	
	70 Campo Belo	262	70 Cidade Ademar	25.782,88	
	71 Santo Amaro	257	71 Ermelino Matarazzo	25.159,03	
	72 Lapa	250	72 Itaquera	25.031,85	
4o quartil - 25% dos distritos com menor número de óbitos	73 Jardim Paulista	246	73 São Mateus	24.744,90	4o quartil - 25% dos distritos com menor renda média
	74 Vila Guilherme	241	74 São Miguel	23.946,75	
	75 Moema	223	75 Jardim São Luís	23.332,07	
	76 Belém	220	76 Jaraguá	22.855,10	
	77 Liberdade	212	77 José Bonifácio	22.450,49	
	78 Bela Vista	209	78 Vila Jacuí	22.326,27	
	79 República	205	79 Capão Redondo	21.742,45	
	80 Pinheiros	183	80 Pedreira	21.689,35	
	81 Consolação	173	81 Guaianases	21.529,09	
	82 Butantã	164	82 Sapopemba	21.492,89	
	83 Anhanguera	152	83 Anhanguera	21.439,14	
	84 Socorro	148	84 Perus	21.184,82	
	85 Morumbi	131	85 Vila Curuçá	20.955,89	
	86 Cambuci	130	86 Brasilândia	20.644,39	
	87 Alto de Pinheiro	125	87 São Rafael	19.973,54	
	88 Jaguaré	122	88 Itaim Paulista	19.213,38	
	89 Bom Retiro	117	89 Iguatemi	19.155,20	
	90 Brás	107	90 Grajaú	19.111,84	
	91 Vila Leopoldina	95	91 Jardim Helena	18.863,14	
	92 Jaguará	91	92 Parelheiros	18.664,38	
	93 Pari	68	93 Jardim Ângela	18.656,89	
	94 Sé	65	94 Cidade Tiradentes	18.242,42	
	95 Barra Funda	58	95 Lajeado	18.098,27	
	96 Marsilac	17	96 Marsilac	16.223,41	
	local Ignorado	1335	local Ignorado	42.002,99	

Figure 5 - Years of Life Lost Prematurely (YLL) from COVID-19 by Gender and MSP Administrative District



Distrito	Admin	residência	YLL FEM	YLL MASC	YLL total
Água Rasa			3376,574	3939,172	7315,75
Alto de Pinheiros			782,1681	775,19565	1557,36
Anhanguera			1631,552	1625,6416	3257,19
Aricanduva			3472,512	4262,8246	7735,34
Artur Alvim			3705,444	4633,8367	8339,28
Barra Funda			502,5432	322,13029	824,67
Bela Vista			1445,618	1685,2604	3130,88
Belém			391,502	2484,0921	3875,59
Bom Retiro			796,0372	1209,1308	2005,17
Brás			675,4856	1303,6263	1979,11
Brasilândia			9571,97	9679,9688	19251,94
Butantã			1048,414	1245,8795	2294,29
Caçoierinha			5608,819	5442,8896	11051,71
Cambuci			914,766	1144,3006	2059,07
Campo Belo			1572,611	1971,7486	3490,36
Campo Grande			2529,923	3251,1166	5781,34
Campo Limpo			5238,796	6209,1483	11447,99
Cangaíba			4488,78	5427,2919	9916,07
Capão Redondo			7113,958	8600,9096	15714,87
Carrão			3172,515	3406,362	6578,88
Casa Verde			3040,915	3499,2647	6490,18
Cidade Ademar			7932,886	8269,9282	16202,81
Cidade Dutra			5261,305	5915,1392	11176,44
Cidade Lúder			4388,765	5710,1428	10099,18
Cidade Tiradentes			8001,793	7810,169	15811,96
Consolação			1199,776	1265,6485	2465,42
Cursino			2546,115	3553,8619	6099,98
Ermelino Matarazzo			3123,903	4104,3941	7273,30
Freguesia do Ó			5746,46	6944,95	12691,41
Grajá			8685,119	11024,408	19709,53
Guaianases			3769,864	3844,7341	7614,60
Iguatemi			5714,154	5523,3346	11237,49
Ipiranga			2972,88	3421,3045	6394,18
Itaim Bibi			1551,952	1954,2804	3506,23
Itaim Paulista			6378,852	7308,076	13141,93
Itaquera			7506,291	8322,9304	15829,22
Jabaquara			5883,78	6688,1525	12571,93
Jaçanã			2735,791	3391,3381	6127,13
Jaguara			712,8893	878,72433	1591,61
Jaguare			956,364	1220,622	2176,53
Jaguaraú			5503,299	5944,6237	11447,92
Jardim Helena			7142,809	7646,5322	14789,34
Jardim Angola			4434,059	5354,0826	9784,14
Jardim Paulista			1458,852	1484,2747	2943,13
Jardim São Luís			7247,91	5701,0222	12748,93
José Bonifácio			4323,175	4479,9329	8803,11
Lajeado			6476,287	6354,0268	12830,31
Lapa			1521,695	1920,955	3442,65
Liberdade			1523,75	1862,3892	3386,14
Limão			3172,827	3525,3138	6698,14
Mandaqui			4083,494	4554,7246	8638,22
Marsilac			139,7397	189,62338	329,36
Moema			1245,365	1512,5021	2757,87
Mooca			2934,325	3104,7791	6075,10
Morumbi			839,1051	1080,51	1919,62
Paraisópolis			4370,147	4566,2958	8936,44
Pari			441,6622	690,76535	1132,43
Parque do Carmo			2337,456	2660,0419	4997,50
Pedreira			3344,027	3942,3833	7286,41
Penha			4016,929	5509,1177	9526,05
Perdizes			1826,722	2010,2032	3836,93
Perus			2838,994	2717,7035	5610,70
Pinheiros			1163,512	1269,5021	2433,01
Pirituba			5479,504	5826,2264	11305,73
Ponte Rasa			3669,006	4022,2143	7691,22
Raposo Tavares			2854,588	3210,1708	6064,76
República			1445,325	1921,8528	3367,18
Rio Pequeno			2841,141	2877,9453	5719,09
Sacomã			6305,014	7946,1219	14051,14
Santa Cecília			1964,051	2793,5639	4758,21
Santana			3849,117	4040,784	7890,10
Santa Amaro			1658,691	1763,9376	3421,83
São Domingos			2503,534	2920,1396	5423,73
São Lucas			5042,688	5564,1688	10606,86
São Mateus			4400,682	6788,2063	11188,89
São Miguel			3303,062	4299,2618	7732,32
São Rafael			3373,614	4379,9764	7753,59
Sapopemba			10283,87	11189,243	21473,11
Saúde			2601,415	3214,9903	5816,41
Sé			442,1822	632,49932	1074,68
Socorro			1164,289	1360,541	2524,83
Tatupet			2968,395	3620,1524	6328,55
Tremembé			8831,97	7367,6574	14459,65
Tucuruvi			2505,966	3934,4012	7440,37
Vila Andrade			3274,597	2983,7896	5258,39
Vila Curuçá			5501,165	5154,7419	10655,91
Vila Formosa			3267,378	4091,1281	7758,51
Vila Guillerme			1975,361	2068,0956	4043,46
Vila Jacuí			4447,458	5718,7924	10166,25
Vila Leopoldina			772,7868	624,88158	1397,67
Vila Maria			3489,752	3918,4264	7408,18
Vila Mariana			2972,338	2959,8003	5929,14
Vila Matilde			3795,934	3838,4146	7634,35
Vila Medeiros			4998,58	4599,2001	10497,78
Vila Prudente			3730,561	4375,9602	8106,52
Vila Sônia			2743,953	2391,8753	4865,83
local Ignorado			12157,67	16375,885	28533,55
Total			347691,2	399300,91	746992,11

Table 6 - Lost life years (YLL due to Covid-19 and YLL per 100,000 inhabitants

Distrito Admin residência	FEM	MASC	YLLs totais	população projetada para 2020	YLL por 100.000 habitantes
Água Rasa	3376,574	3939,172	7315,746	80617,695	9074,616
Alto de Pinheiros	782,168	775,196	1557,364	40117,131	3882,042
Anhanguera	1631,552	1625,642	3257,194	108277,301	3008,196
Aricanduva	3472,512	4262,825	7735,337	81265,275	9518,625
Artur Alvim	3705,444	4633,837	8339,281	95587,431	8724,244
Barra Funda	502,543	322,130	824,673	15306,295	5387,806
Bela Vista	1445,618	1685,260	3130,878	73242,783	4274,657
Belém	1391,502	2484,092	3875,594	49150,935	7885,087
Bom Retiro	796,037	1209,131	2005,168	41427,531	4840,182
Brás	675,486	1303,626	1979,112	32656,120	6060,463
Brasilândia	9571,970	9679,969	19251,939	272203,238	7072,634
Butantã	1048,414	1245,879	2294,294	53516,534	4287,075
Cachoeirinha	5608,819	5442,896	11051,715	133830,819	8257,974
Cambuci	914,766	1144,301	2059,067	45602,268	4515,272
Campo Belo	1572,611	1917,749	3490,359	62228,235	5608,964
Campo Grande	2529,923	3251,417	5781,340	106487,055	5429,148
Campo Limpo	5238,796	6209,198	11447,994	223750,153	5116,418
Cangaíba	4488,780	5427,292	9916,072	130278,217	7611,458
Capão Redondo	7113,958	8600,910	15714,868	287692,706	5462,380
Carrão	3172,515	3406,360	6578,876	85107,456	7730,081
Casa Verde	3040,915	3449,265	6490,180	84096,468	7717,542
Cidade Ademar	7932,886	8269,928	16202,814	280321,995	5780,072
Cidade Dutra	5261,305	5915,139	11176,444	193255,877	5783,236
Cidade Líder	4388,765	5710,414	10099,180	131581,611	7675,221
Cidade Tiradentes	8001,793	7810,169	15811,962	225069,026	7025,383
Consolação	1199,776	1265,648	2465,424	57898,306	4258,197
Cursino	2546,115	3553,862	6099,977	111819,783	5455,186
Ermelino Matarazzo	3132,903	4140,394	7273,297	115901,547	6275,410
Freguesia do Ó	5746,460	6944,950	12691,410	134085,221	9465,182
Grajaú	8685,119	11024,408	19709,527	374483,693	5263,120
Guaianases	3769,864	3844,734	7614,598	105278,068	7232,843
Iguatemi	5714,154	5523,335	11237,489	153604,691	7315,850
Ipiranga	2972,880	3421,305	6394,184	110810,479	5770,379
Itaim Bibi	1551,952	1954,280	3506,232	100916,246	3474,398
Itaim Paulista	6378,852	7038,076	13416,928	226407,968	5925,996
Itaquera	7506,291	8322,930	15829,221	199803,779	7922,383

Table 6 - Lost life years (YLL due to Covid-19 and YLL per 100,000 inhabitants

Distrito Admin residência	FEM	MASC	YLLs totais	população projetada para 2020	YLL por 100.000 habitantes
Jabaquara	5883,780	6688,152	12571,933	224377,679	5603,023
Jaçanã	2735,791	3391,338	6127,129	93524,045	6551,394
Jaguara	712,889	878,724	1591,614	23121,454	6883,709
Jaguaré	956,364	1220,162	2176,526	56146,949	3876,482
Jaraguá	5503,299	5944,624	11447,923	224582,999	5097,413
Jardim Ângela	7142,809	7646,532	14789,341	340622,924	4341,851
Jardim Helena	4434,059	5350,083	9784,142	125759,826	7780,022
Jardim Paulista	1458,852	1484,275	2943,127	90189,990	3263,252
Jardim São Luís	7247,910	7501,022	14748,932	287809,201	5124,552
José Bonifácio	4323,175	4479,933	8803,108	138014,492	6378,394
Lajeado	6476,287	6354,027	12830,314	164553,119	7797,065
Lapa	1521,695	1920,955	3442,650	68882,480	4997,860
Liberdade	1523,750	1862,389	3386,139	74008,901	4575,313
Limão	3172,827	3525,314	6698,140	75258,278	8900,204
Mandaqui	4083,494	4554,725	8638,219	107669,648	8022,892
Marsilac	139,740	189,623	329,363	7784,081	4231,240
Moema	1245,365	1512,502	2757,867	93540,370	2948,317
Mooca	2934,325	3140,779	6075,104	86924,912	6988,910
Morumbi	839,105	1080,510	1919,615	61153,156	3139,029
Parelheiros	4370,147	4566,296	8936,443	160529,029	5566,870
Pari	441,662	690,765	1132,428	19365,122	5847,769
Parque do Carmo	2337,456	2660,042	4997,498	69761,589	7163,682
Pedreira	3344,027	3942,383	7286,410	156792,029	4647,182
Penha	4016,929	5509,118	9526,047	126095,064	7554,655
Perdizes	1826,722	2010,203	3836,925	115706,501	3316,085
Perus	2838,994	2771,703	5610,698	87256,890	6430,091
Pinheiros	1163,512	1269,502	2433,015	65058,045	3739,760
Pirituba	5479,504	5826,226	11305,731	167200,513	6761,780
Ponte Rasa	3669,006	4220,214	7889,220	86197,122	9152,533
Raposo Tavares	2854,588	3210,171	6064,758	105524,443	5747,255
República	1445,325	1921,853	3367,178	65271,191	5158,751
Rio Pequeno	2841,141	2877,945	5719,086	120450,585	4748,077
Sacomã	6105,014	7946,122	14051,136	258137,688	5443,272
Santa Cecília	1964,650	2793,564	4758,213	94453,720	5037,614
Santana	3849,117	4040,978	7890,096	108604,636	7264,971
Santo Amaro	1658,691	1763,138	3421,829	81142,626	4217,055
São Domingos	2503,534	2920,194	5423,728	83361,791	6506,252
São Lucas	5042,688	5564,169	10606,857	139503,880	7603,270
São Mateus	4400,682	6788,206	11188,888	149100,810	7504,244

Table 6 - Lost life years (YLL due to Covid-19 and YLL per 100,000 inhabitants)

Distrito Admin residência	FEM	MASC	YLLs totais	população projetada para 2020	YLL por 100.000 habitantes
São Miguel	3303,062	4429,262	7732,324	83530,511	9256,886
São Rafael	3373,614	4379,976	7753,591	159002,779	4876,387
Sapopemba	10283,868	11189,243	21473,111	275146,773	7804,239
Saúde	2601,415	3214,990	5816,405	138950,781	4185,946
Sé	442,182	632,499	1074,681	26676,117	4028,628
Socorro	1164,289	1360,541	2524,830	35026,205	7208,404
Tatuapé	2968,395	3360,152	6328,548	101554,807	6231,657
Tremembé	6831,970	7627,675	14459,645	227872,038	6345,511
Tucuruvi	3505,966	3934,401	7440,367	93545,446	7953,746
Vila Andrade	2274,597	2983,790	5258,386	210129,394	2502,452
Vila Curuçá	5501,165	5154,742	10655,906	145492,571	7324,021
Vila Formosa	3267,378	4491,128	7758,506	91857,976	8446,198
Vila Guilherme	1975,361	2068,096	4043,457	56651,058	7137,478
Vila Jacuí	4447,458	5718,792	10166,251	136971,395	7422,171
Vila Leopoldina	772,787	624,882	1397,668	55659,622	2511,099
Vila Maria	3489,752	3918,426	7408,179	108477,133	6829,254
Vila Mariana	2972,338	2956,800	5929,138	132052,963	4489,970
Vila Matilde	3795,934	3838,415	7634,349	102640,941	7437,918
Vila Medeiros	4998,580	5499,200	10497,780	115190,024	9113,446
Vila Prudente	3730,561	4375,960	8106,521	102090,740	7940,506
Vila Sônia	2473,953	2391,875	4865,829	129099,213	3769,061
Local Ignorado	12157,668	16375,885	28533,553	-	-
Total	347691,221	399300,914	746992,134	11754736,200	6354,818

Note: YLL per 100,000: Sum of YLLs by sex per administrative district divided by the projected 2020 population of the same district and multiplied by 100,000.

YLL 100,000 inhabitants for MSP = 6,354,818.

Table 7 – Loss of productivity by sex and MSP administrative district

	Loss of productivity Gender Fem (R\$)	Loss of productivity Gender Masc (R\$)	Total productivity loss (R\$)
Shallow Water	17.282.562,81	35.418.719,43	52.701.282,25
High Pine	4.615.497,69	7.350.062,44	11.965.560,13
Anhanguera	6.351.578,47	8.814.058,13	15.165.636,60
Aricanduva	10.989.626,24	23.628.680,90	34.618.307,14
Artur Alvim	9.223.815,88	23.742.410,52	32.966.226,40
Deep Bar	3.403.292,58	1.999.130,28	5.402.422,86
Beautiful Vista	5.626.040,82	16.187.707,37	21.813.748,19
Beautiful	5.770.895,42	25.782.390,41	31.553.285,83
Good Removal	4.116.974,65	8.365.645,19	12.482.619,84
Bras	1.759.171,25	10.809.364,91	12.568.536,15
Brazil	28.536.534,43	50.414.597,73	78.951.132,17
Butanthan	4.514.184,84	11.789.027,13	16.303.211,97
Puppy	20.051.044,87	33.783.060,95	53.834.105,82
Cambuci	5.006.307,74	9.681.149,04	14.687.456,78
Beautiful Field	5.308.888,52	25.550.328,65	30.859.217,17
Large Field	7.186.035,43	41.951.717,14	49.137.752,57
Clean Field	20.999.605,15	41.534.907,27	62.534.512,42
Cangaiba	13.095.691,14	32.525.430,14	45.621.121,28
Round Capon	23.580.772,52	44.029.026,15	67.609.798,67
Carriage	13.908.347,55	28.856.962,02	42.765.309,57
Green House	13.361.034,70	28.282.949,25	41.643.983,94
City of Love	29.652.474,40	46.566.140,05	76.218.614,45
Dutra City	17.564.567,36	37.864.531,16	55.429.098,52
Leading City	18.585.711,45	36.786.147,27	55.371.858,71
Tyrant City	23.830.778,83	37.891.248,08	61.722.026,90
Consolation	6.225.049,96	24.724.979,94	30.950.029,90
Course	8.110.878,85	30.542.394,57	38.653.273,42
Ermelino Matarazzo	11.262.781,47	25.552.240,56	36.815.022,02
Parish of O	21.842.670,22	50.604.094,96	72.446.765,18
Grajaú	26.903.141,50	52.696.704,84	79.599.846,34
Guaianases	12.860.758,71	21.870.340,88	34.731.099,59
Iguatemi	18.309.708,24	26.742.046,81	45.051.755,05
Ipiranga	15.084.566,87	26.349.043,08	41.433.609,95
Itaim Bibi	7.630.592,53	19.971.419,64	27.602.012,17
Itaim Paulista	18.306.746,53	31.856.818,92	50.163.565,45
Itaquera	23.476.125,42	49.455.245,17	72.931.370,59
Jabaquara	26.217.571,47	53.015.252,09	79.232.823,56
Jepan	8.235.910,36	21.707.507,47	29.943.417,83

Table 7 – Loss of productivity by sex and MSP administrative district

	Loss of productivity Gender Fem (R\$)	Loss of productivity Gender Masc (R\$)	Total productivity loss (R\$)
Jaguara	2.602.052,74	7.100.394,68	9.702.447,42
Jaguaré	4.216.714,73	12.554.890,13	16.771.604,86
Jaraguá	16.838.672,40	32.444.950,41	49.283.622,81
Angel Garden	19.755.400,59	36.899.777,64	56.655.178,23
Helena Garden	13.396.291,94	25.586.571,04	38.982.862,97
Paulista Garden	1.872.491,54	15.976.155,38	17.848.646,92
St. Louis Garden	23.006.478,20	38.212.230,42	61.218.708,62
José Bonifácio	14.066.016,06	23.553.808,47	37.619.824,53
Slab	22.214.375,59	30.196.058,97	52.410.434,56
Lap	5.599.615,13	16.763.659,49	22.363.274,62
Freedom	7.588.548,55	22.209.869,51	29.798.418,05
Lemon	13.845.992,73	25.694.656,12	39.540.648,85
Mandaqui	19.279.274,22	37.115.997,88	56.395.272,10
Marsilac	294.673,04	622.560,93	917.233,97
Moema	2.075.643,75	24.932.292,30	27.007.936,05
Moocca	14.291.532,26	35.604.121,24	49.895.653,50
Morumbi	9.858.269,81	25.549.418,83	35.407.688,64
Peers	16.311.417,46	21.513.726,52	37.825.143,98
Pari	1.629.401,78	4.795.513,55	6.424.915,32
Carmo Park	8.267.048,89	18.464.024,03	26.731.072,93
Bricklayer	11.056.888,81	21.660.411,43	32.717.300,24
Penha	16.860.980,17	40.199.648,15	57.060.628,32
Misses	4.521.387,20	19.090.378,68	23.611.765,87
Turkeys	7.765.180,92	15.896.949,22	23.662.130,14
Pine trees	8.891.170,25	17.554.026,60	26.445.196,85
Pirituba	24.034.438,65	42.500.323,65	66.534.762,31
Shallow Bridge	9.808.531,31	25.857.612,17	35.666.143,48
Tavares Fox	11.289.086,30	22.248.334,77	33.537.421,07
Republic	3.779.693,95	14.898.203,34	18.677.897,29
Small River	15.944.087,03	24.384.243,98	40.328.331,02
Sachoman	22.286.929,24	60.548.039,04	82.834.968,28
Holy Cecilia	8.006.435,87	34.740.399,40	42.746.835,27
Santana	15.723.120,66	36.641.610,72	52.364.731,38
Santo Amaro	6.299.060,23	24.258.433,28	30.557.493,51
St. Sundays	12.090.771,71	18.733.854,52	30.824.626,23
St. Lucas	16.877.293,96	33.690.932,82	50.568.226,78
St. Mathew	12.195.917,73	37.890.342,27	50.086.260,00
St. Michael	9.190.809,31	25.032.241,76	34.223.051,08
St. Rafael	11.177.127,72	22.324.142,44	33.501.270,16
Sapopemba	24.757.372,20	52.317.135,22	77.074.507,42
Health	7.780.003,93	30.615.825,44	38.395.829,37

Table 7 – Loss of productivity by sex and MSP administrative district

	Loss of productivity Gender Fem (R\$)	Loss of productivity Gender Masc (R\$)	Total productivity loss (R\$)
Sé	1.630.121,29	3.537.887,99	5.168.009,29
Relief	6.440.000,24	18.156.707,95	24.596.708,19
Tattoo	13.843.736,82	36.466.673,99	50.310.410,81
Tremmbé	25.828.639,30	51.632.219,26	77.460.858,57
Tucuruvi	14.585.023,63	26.735.198,37	41.320.222,00
Andrade Village	23.628.258,45	54.358.247,73	77.986.506,18
Curuçá village	17.535.709,24	28.449.558,49	45.985.267,73
Formal Village	14.490.056,42	38.137.525,13	52.627.581,55
Guilherme Village	9.075.869,85	16.562.621,65	25.638.491,50
Jacuí village	12.000.069,92	33.542.494,99	45.542.564,91
Leopoldina village	5.345.781,49	4.339.141,58	9.684.923,06
Village Maria	12.302.552,42	26.393.752,59	38.696.305,01
Mariana Village	12.763.875,59	37.143.874,32	49.907.749,90
Matilde Village	11.163.504,36	23.362.768,17	34.526.272,53
Village Medeiros	15.710.861,33	31.252.939,65	46.963.800,98
Prudent Village	13.088.320,94	32.085.008,97	45.173.329,91
Sonia Village	16.258.391,32	22.966.400,54	39.224.791,87
Address Ignored	86.143.427,15	196.861.139,72	283.004.566,87
Total	1.307.968.335,20	2.863.551.408,03	4.171.519.743,23