INSTITUTO NACIONAL DE ESTATÍSTICA
STATISTICS PORTUGAL

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Context and socioeconomic impact indicators for the COVID-19 pandemic in Portugal

COVID-19: a territorial view on demographic context and socioeconomic impact indicators

Despite the progressive spread of the pandemic throughout the national territory, its impact continues to be characterised by high regional heterogeneity, particularly when taking into account, in addition to the absolute numbers of confirmed cases and deaths, relative indicators according to the size and population density per km^2 of the territorial units considered in this analysis. Taking the municipality as a reference unit and the confirmed cases of COVID-19 referenced to May 20 (2 weeks more than in the previous press release on the same theme), it can be seen that:

- In Portugal, for every 10,000 inhabitants there were 29.1 confirmed cases of COVID-19. The number of confirmed cases of COVID-19 disease per 10 thousand inhabitants was above the national value in 53 municipalities and of this group, 36 belonged to the Norte region.

- The analysis of the relationship between the number of confirmed cases per 10 thousand inhabitants and population density highlights a set of 36 municipalities with values above the national average in both indicators.

- The pandemic also affected the housing market differently across the territory. The Metropolitan Area of Lisboa and the Algarve, regions with the most dynamic housing market, registered a decrease in the number of dwelling sales in March 2020, compared to the same period in the previous year.

As part of Statistics Portugal's Statslab, this press release also presents data on population mobility at the regional level provided by Facebook's "Data for Good" initiative.

The first cases diagnosed with COVID-19 in Portugal were reported on March 2nd 2020 and the first death as a result of COVID-19 was recorded on March 16th 2020. The WHO (World Health Organization) declared the outbreak of COVID-19 as a pandemic on March 11th 2020.

This press release includes results for the national context on the general deaths (all causes of death) that have occurred in national territory since March 1, 2020. The incidence of the pandemic in the territory has not been homogeneous, which justifies the analysis of context indicators, when possible, at NUTS 3 (Metropolitan Areas and Intermunicipal Communities in Portugal mainland, and Autonomous Regions) and municipality level. In addition, socioeconomic indicators, on a monthly basis, are presented in this press release to support the analysis of the impact of the pandemic in the different regions and municipalities.

The results of overall mortality refer to deaths (all causes of death) that occurred in the national territory from March 1st up to May 10th. Information on deaths is obtained through the Civil Register collected under the Integrated Civil Registration and Identification System (SIRIC). This information was computed on May 19th. This time lag prevents the disclosed information from being subjected to considerable revisions. Even so, the information is preliminary and will be subject to further updates. Data on resident population are based on the preliminary results of the Annual estimates of resident population, referenced to December 31, 2019.

The number of confirmed cases with COVID-19 is based on the information released for the entire country and by municipality in the 'Daily COVID-19 Status Report' edited by the Directorate-General of Health. This press release includes information available up to May 21 (data of the situation up to May 20).

Socioeconomic indicators are based on information from the Statistics on house prices at local level and from the House rental statistics at local level. The number of dwellings sales and the number of new lease agreements are based on preliminary results and will be subject to further updates. Final results will be published according to the regular dissemination calendars of these statistical operations.

Demographic and territorial context indicators

Number of deaths between March 1st and May 10th, 2020 higher than in the same period in 2019 and 2018

The preliminary total number of deaths between March 1st and May 10th, 2020 is 1,964 higher than the number registered in the same period in 2019 and 878 cases higher than number of deaths registered in 2018. The positive variation in relation to 2019 is due mainly to the increase in the number of deaths of people aged 75 and over (+1,893).

The following figures allow the comparison of the cumulative number of deaths from the beginning of March to May 10th, 2020 with that observed in the same period in 2019 and 2018. For the total number of deaths registered, and for the age group 75 and over, two lines were added in order to identify the moment values of cumulated deaths registered in 2020 surpass those registered in 2019 and 2018.

Figure 1 - Cumulative number of deaths in Portugal from March 1st to May 10th (2018-2020)

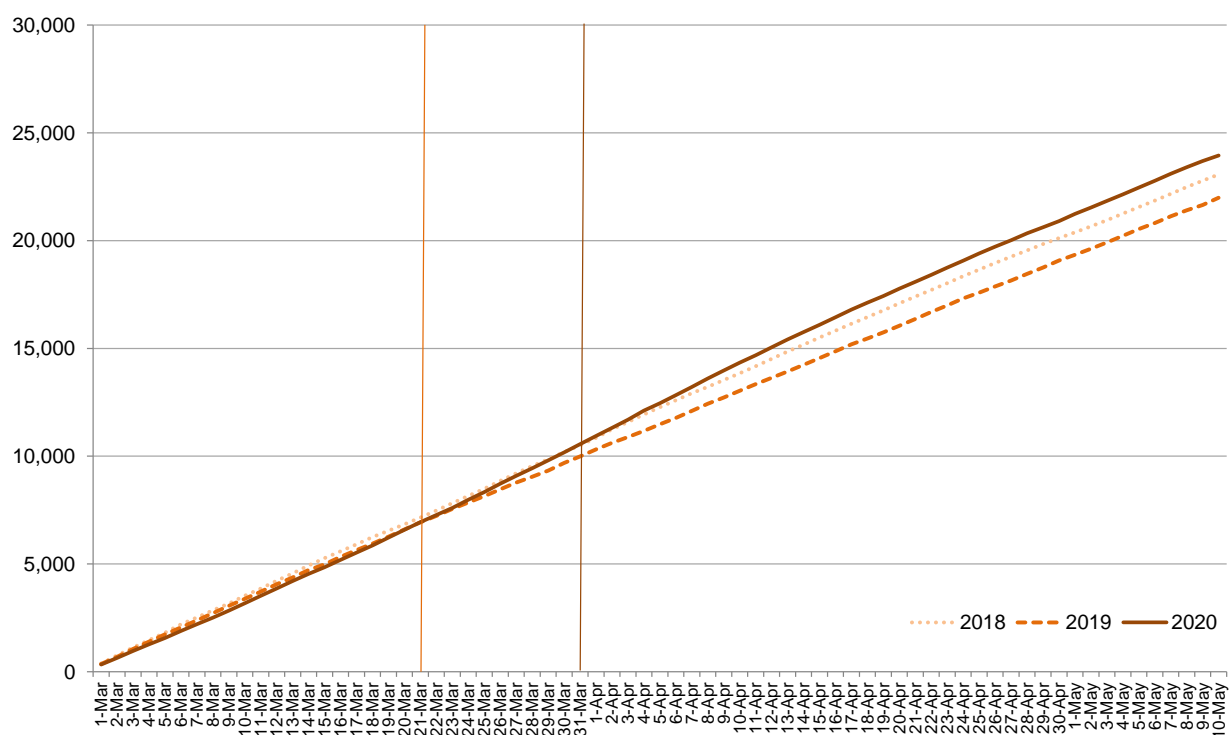|	Number of deaths			Number of deaths per 100 thousand inhabitants		
	2018	2019	2020	2018	2019	2020
Total	23,073	21,987	23,951	224.2	214.0	232.7
Males	11,481	10,914	11,799	235.9	224.9	243.1
Females	11,592	11,073	12,152	213.7	204.1	223.4
Under 64 years	3,192	3,138	3,112	39.5	39.1	38.8
65 to 69 years	1,369	1,396	1,417	220.8	225.8	227.6
70 to 74 years	1,874	1,881	1,953	359.3	349.3	355.6
75 to 79 years	2,626	2,485	2,749	617.9	583.1	637.4
80 to 84 years	4,118	3,835	4,143	1,178.8	1,092.0	1,175.6
85 years and over	9,892	9,250	10,571	3,324.6	2,981.2	3,251.7
65 years and over	19,879	18,847	20,833	898.2	839.8	913.4
75 years and over	16,636	15,570	17,463	1,552.0	1,431.6	1,574.9

Source: Statistics Portugal, Deaths; Statistics Portugal, Annual estimates of resident population

Notes:
b) 2020 data: preliminary data based on information registered by the Civil Register Offices and sent to Statistics Portugal until May 19th 2020.
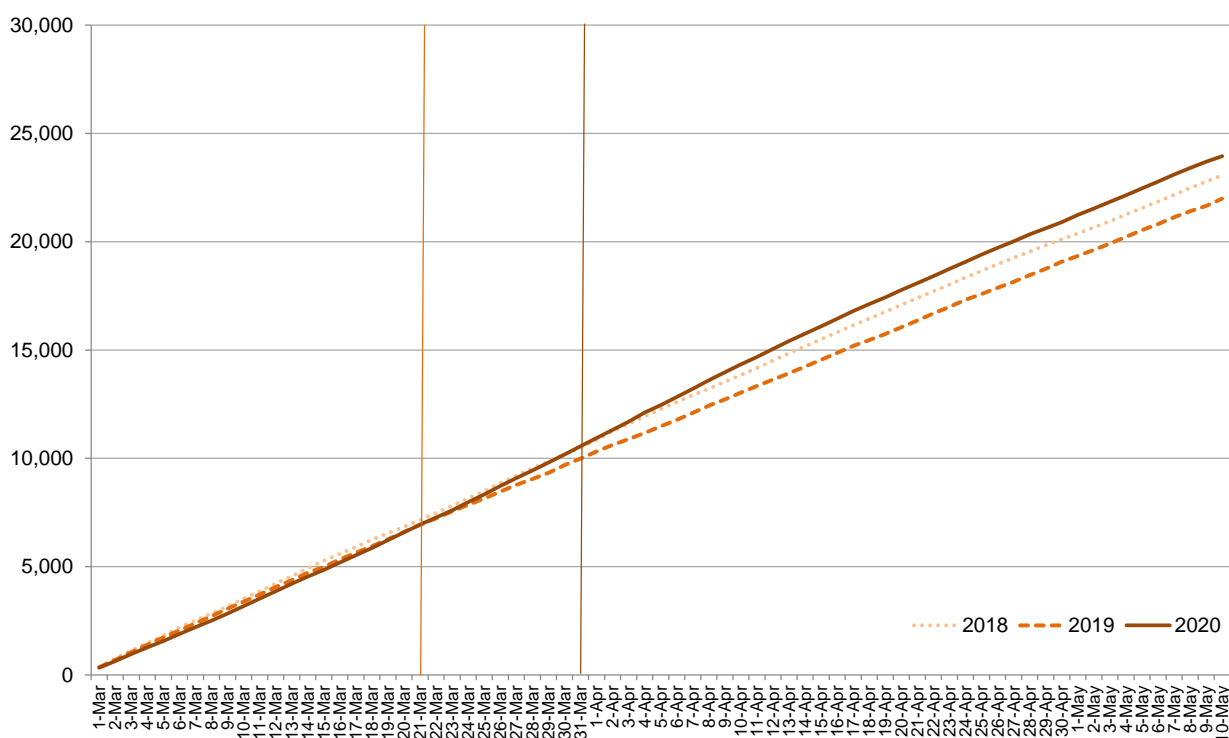a) The total number of deaths may not correspond to the sum of the partial figures due to the existence of records with unknown age.

Figure 2 - Cumulative number of deaths, by day of death, March 1st to May 10th (2018-2020)

Source: INE, I.P., Statistics on Deaths (Preliminary (2020) and Final Results (2018 and 2019)).

**Figure 3 - Cumulative number of deaths aged 75 and over, by day of death, March 1st to May 10th (2018-2020)**

Source: INE, I.P., Statistics on Deaths (Preliminary (2020) and Final Results (2018 and 2019)).

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In 172 municipalities the number of deaths registered in the last four weeks (between 13 April and 10 May, 2020) was higher than the corresponding reference value

In 172 out of the 308 Portuguese municipalities the number of deaths registered in the last four weeks (between 13 April and 10 May, 2020) was higher than the corresponding reference value (<u>average number of deaths in the same period in 2018 and 2019</u>). Of this total, 42 municipalities registered a number of deaths 1.5 times higher than in the same period of reference. For the remaining 136 municipalities (44% of the total number of municipalities) the number of deaths registered in the last four weeks was equal or lower than the number observed in the reference period.

Figure 4- Number of deaths in the last four weeks (13 April to 10 May) per deaths in the same period of reference, Portugal, NUTS 3 and municipality
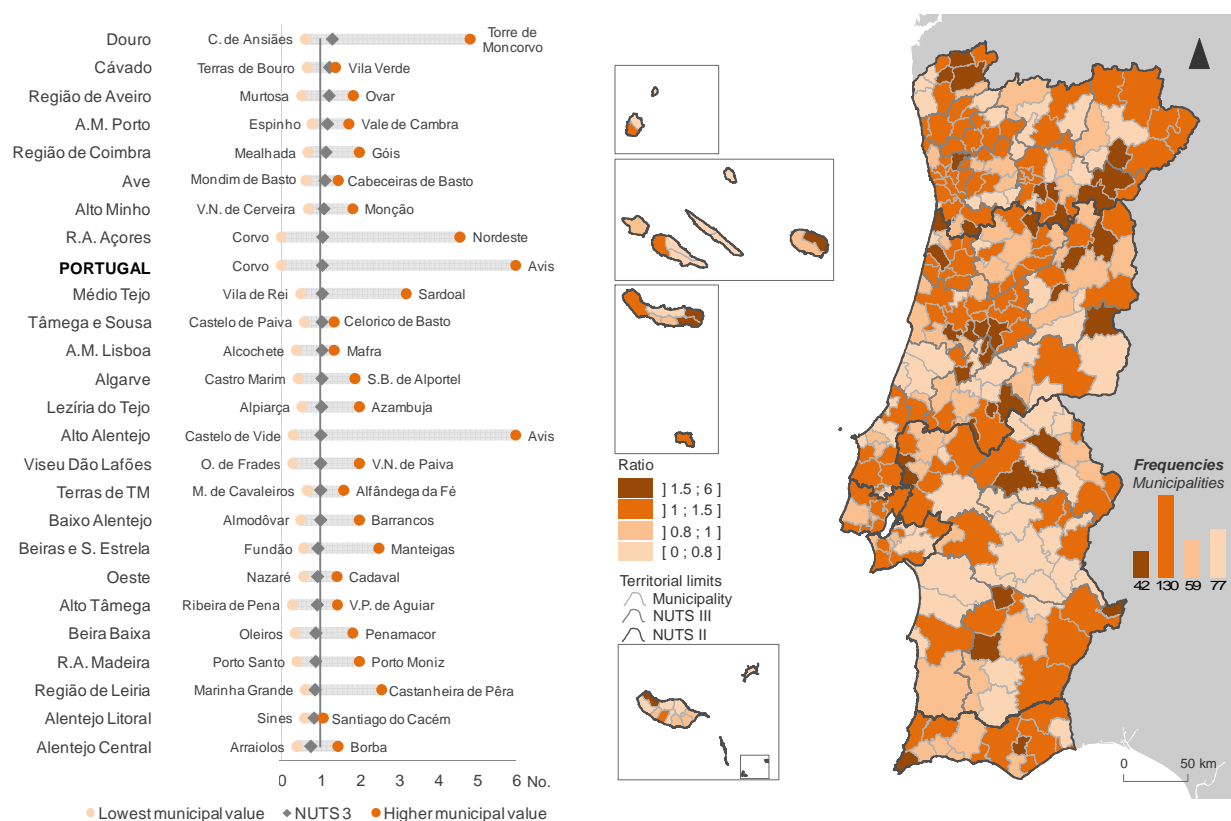
Source: INE, I.P., Statistics on Deaths (Preliminary (2020) and Final Results (2018 and 2019)).

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53 municipalities with confirmed cases of COVID-19 disease per 10 thousand inhabitants above the national value

On May 20, 2020, in Portugal, for every 10 thousand inhabitants there were 29.1 confirmed cases of COVID-19, which represents an increase of 12% compared to May 6, the reference date analysed in the last press release. Between May 6 and April 22, there was an increase of 20% in the number of confirmed cases per 10 thousand inhabitants, and between April 22 and 7 (reference date of the first press release) there was a 70% increase in this indicator.

The number of confirmed cases of COVID-19 disease per 10 thousand inhabitants was above the national value in 53 municipalities. In the Norte region, 36 municipalities registered a value above the national average, and a set of contiguous municipalities in the Metropolitan Area of Porto stood out, with more than 50 confirmed cases per 10 thousand inhabitants: Valongo, Matosinhos, Maia, Gondomar, Porto, Santo Tirso and Vila Nova de Gaia. Some municipalities in the Centro (12), Metropolitan Area of Lisboa (Lisboa, Loures and Amadora), Alentejo (the municipality of Moura) and Região Autónoma dos Açores (the municipality of Nordeste) also scored values above the national value [Figure 5].

Despite this differentiation, the estimated location coefficient[1] for March 25th and May 20th suggests a decrease in territorial concentration of cases, i.e., a progressive spatial dissemination throughout the country. The location curves graphically reflect this trend by the approximation to the straight line of equal distribution between the number of confirmed cases and the resident population in the municipalities [Figure 6].

Figure 5 - Number of confirmed cases of COVID-19 disease per 10 thousand inhabitants until May 20 , 2020, by municipality
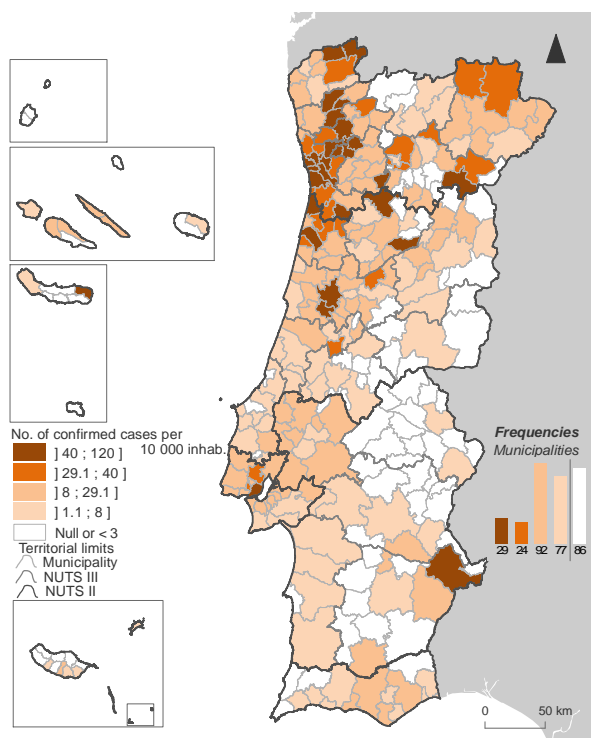
Figure 6 - Territorial concentration of COVID-19 confirmed cases until March 25 and until May 20 in relation to the resident population, based on the distribution by municipality

Location Curve
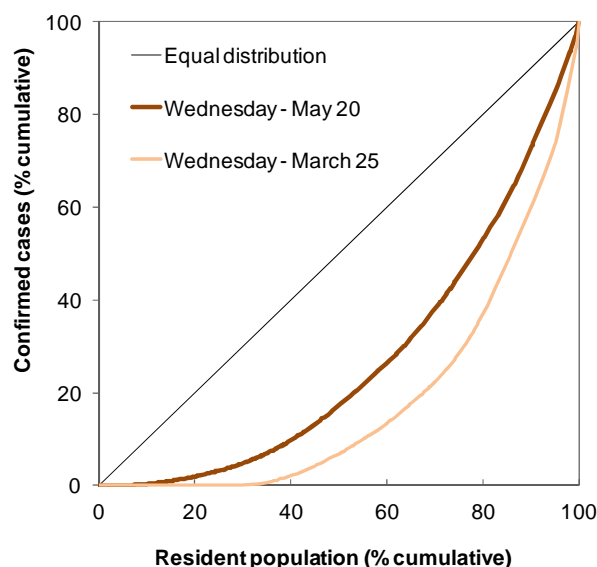
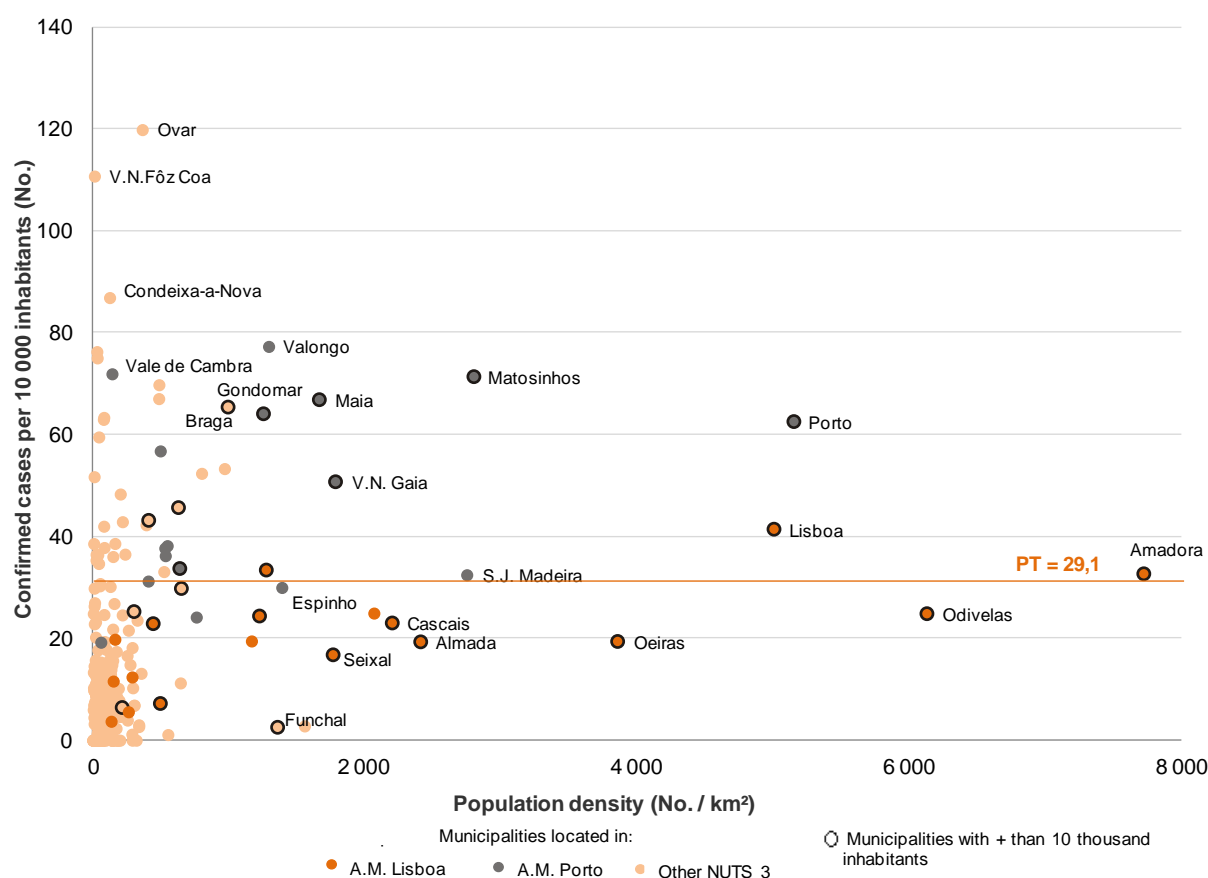| Location coefficient	
Wednesday – May 20	33.7
Wednesday - March 25	47.7

Source: Directorate-General of Health, Daily COVID-19 Status Report (released on May 21); INE, I.P., Annual estimates of resident population, 31 December 2019 (Preliminary Results). Note: For the calculation of the location coefficients zero cases were considered for the municipalities with no value in the Directorate-General of Health report (null or less than 3 cases).

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[1] The Location coefficient varies between 0 and 100, with values closer to 100 reflecting greater inequality in the distribution of confirmed cases of COVID-19 against the total resident population.

36 municipalities registered both a number of confirmed cases per 10 thousand inhabitants and population density values above the national reference

The following figure illustrates the relationship between population density and the number of confirmed cases per 10 thousand inhabitants for the country's municipalities. Of the 53 municipalities with a number of confirmed cases per 10 thousand inhabitants above the value for Portugal, 36 also had population density values above the national average. From this set of 36 municipalities, the municipality of Ovar (120.0), in Região de Aveiro, the municipality of Condeixa-a-Nova (87.0) in Região de Coimbra, the municipalities of Valongo (77.4), Vale de Cambra (72.0), Matosinhos (71.4), Maia (66.9), Gondomar (64.1), Porto (62.6), Santo Tirso (56.9) and Vila Nova de Gaia (50.8), in the Metropolitan Area of Porto, the municipalities of Felgueiras (69.9), Lousada (67,1) and Paços de Ferreira (52,5) in Tâmega e Sousa, the municipality of Braga (65.4) in Cávado, and the municipality of Vizela (53.4) in the sub-region of Ave, stood out with more than 50 confirmed cases per 10 thousand inhabitants. Like the municipality of Porto, the municipality of Lisboa has a high population density, registering, on May 20, a total of 41.4 confirmed cases per 10 thousand inhabitants, a value that is above the national average. It should also be noted that 179 of the 308 municipalities in the country had a number of confirmed cases per 10 thousand inhabitants and population density below the national reference.

Figure 7 - Number of confirmed cases per 10 thousand inhabitants on May 20, 2020 and Population density, by municipality

Source: Directorate-General of Health, Daily COVID-19 Status Report (released on May 21); INE, I.P., Annual estimates of resident population, 31 December 2019 (Preliminary Results).

Socioeconomic impact indicators

Metropolitan Area of Lisboa and Algarve, regions with the most dynamic housing market, show a decrease in the number of dwelling sales in March 2020, compared to the same period in the previous year

In March 2020, there were 2.2 new lease agreements per one thousand conventional dwellings in Portugal. At regional level, with the exception of the Metropolitan Area of Lisboa and the Algarve, the other NUTS 2 regions presented a lower number of new lease agreements per one thousand conventional dwellings than the national reference. In March 2020, in Portugal and in the seven NUTS 2 regions, there was a decrease in the number of new lease agreements per one thousand conventional dwellings compared to the same month in the previous year, with Região Autónoma dos Açores standing out with the highest year-on-year variation: -39% [Figure 8].

In March 2020, around 6 dwellings were sold per one thousand conventional dwellings in Portugal, compared with sales of 6.15 in March of the previous year and 6.66 in February 2020. In March 2020, at the regional level, with the exception of the Metropolitan Area of Lisboa and the Algarve, the remaining regions showed a lower number of sales per one thousand dwellings than the national reference value, standing out with values below 5, the regions of Centro (4.49) and Alentejo (4.70). The Metropolitan Area of Lisboa and the Algarve, despite having sales per one thousand conventional dwellings above the national value, in March 2020 registered a decrease in this value compared to the same period in the previous year: -2.1% and -0.9% respectively. Besides these regions, the Centro (-3.7%) and Norte (-3.3%) regions also observed, in March 2020, a decrease in the number of sales per one thousand conventional dwellings compared to the same month in the previous year [Figure 9].

Figure 8 – Number of new lease agreements per one thousand conventional dwellings, monthly (last 3 months), Portugal and NUTS 2
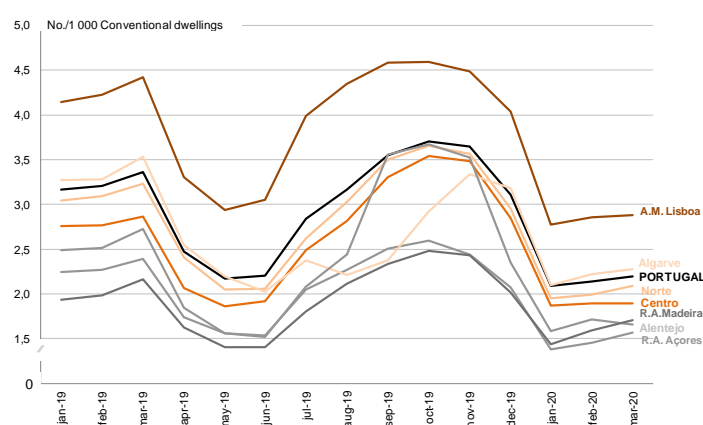
Figure 9 – Number of dwellings sales per one thousand conventional dwellings, monthly (last 3 months), Portugal and NUTS 2
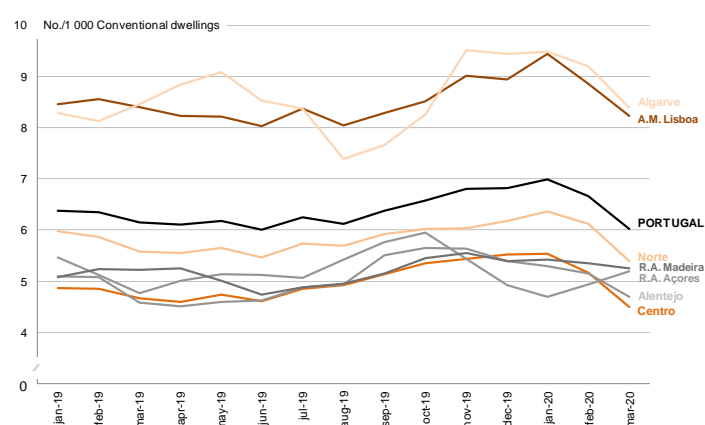
Source: Statistics Portugal, House rental statistics at local level. Statistics Portugal,Statistics on house prices at local level.

In 14 out of the 25 Portuguese NUTS 3 sub-regions, the number of dwellings sales in March 2020 was lower than in the same period. Of this group, the sub-regions of Baixo Alentejo (0.76) and Beiras e Serra da Estrela (0.85) stood out as having the lowest ratios [Figure 10].

Figure 10 – Relation between the number of dwellings sales in March 2020 (last 3 months) and sales in the same reference period, Portugal and NUTS 3

● Lowest municipal value ◆ NUTS 3 ● Highest municipal value
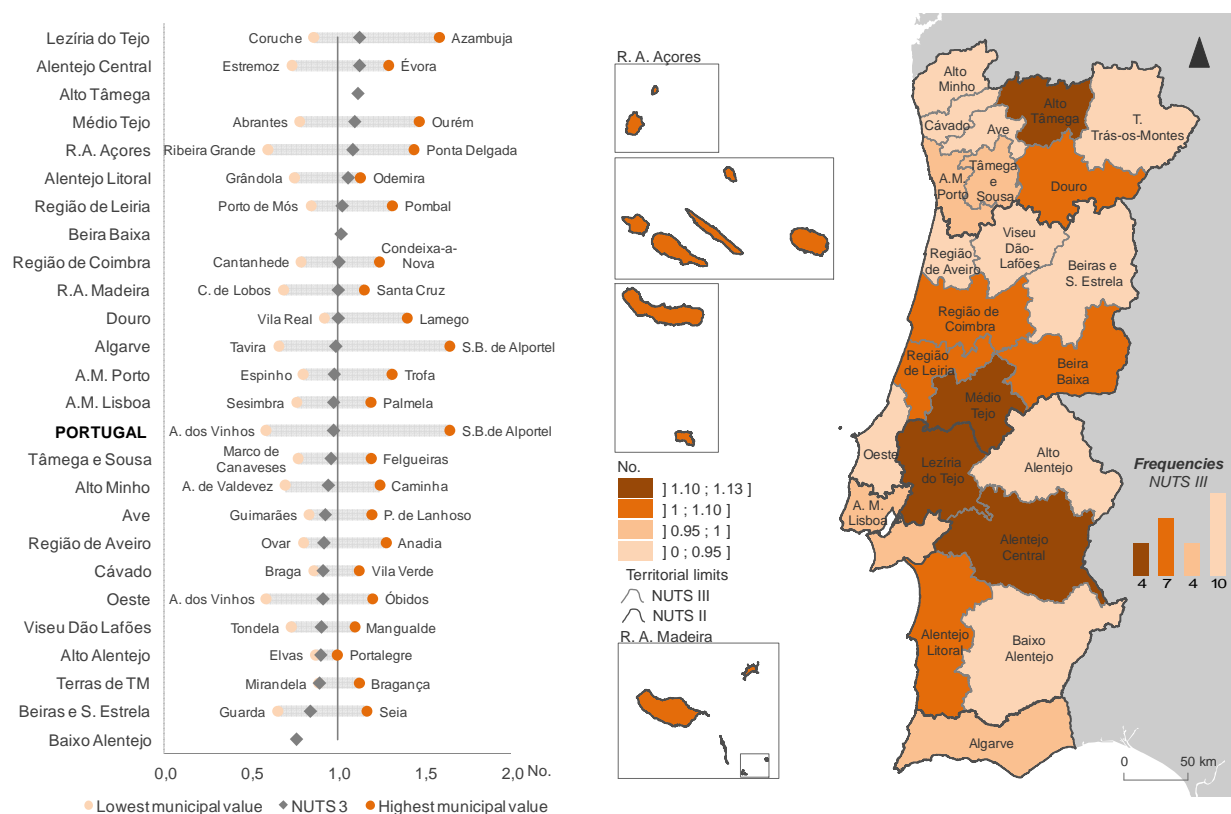
Source: Statistics Portugal, Statistics on house prices at local level.
Note: The lowest and highest municipal values are based on the municipalities with data available (number of sales equal or higher than 33): 144 municipalities.

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Population mobility indicators at regional level: an analysis based on information from Facebook's "Data for Good" Initiative

In this box, taking advantage of Facebook's "Data for Good" Initiative, population mobility indicators at NUTS 3 level in the national territory are released.

The data represented in the figure below correspond to the proportion of population "staying put" between March 1st and May 18th, namely minimum, median and maximum values obtained from the 25 NUTS 3 sub-regions of the country. For a better contextualization of the information, the figure includes the main key moments associated with the COVID-19 pandemic in Portugal.

Figure 11: Proportion of the population "staying put" between March 1st and May 18th – minimum, median and maximum values of NUTS 3
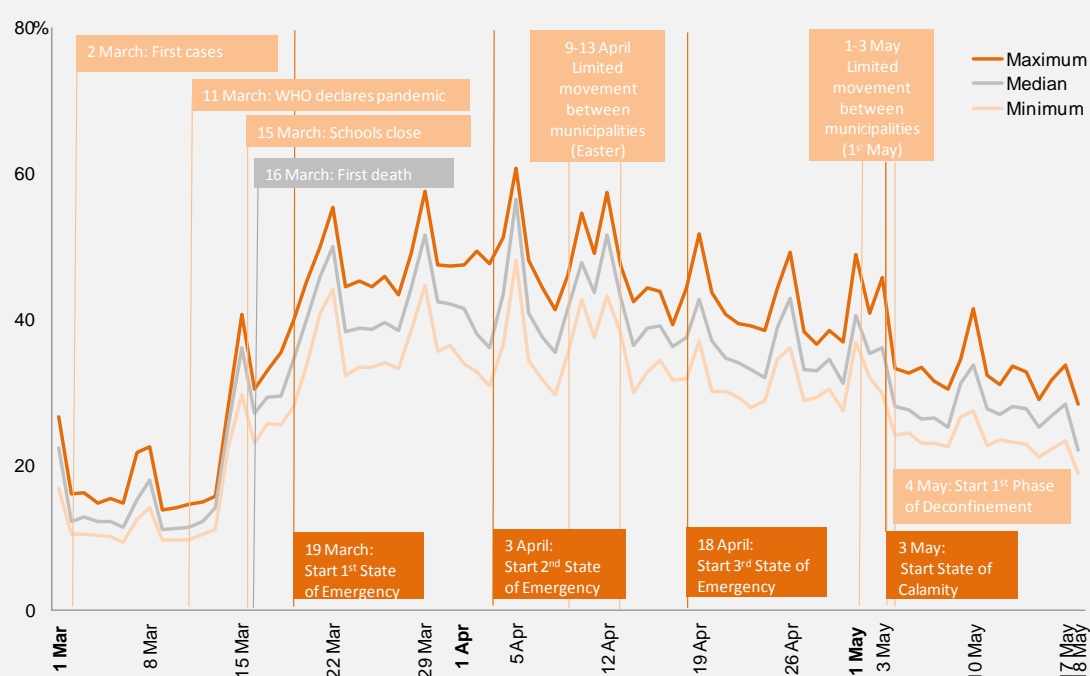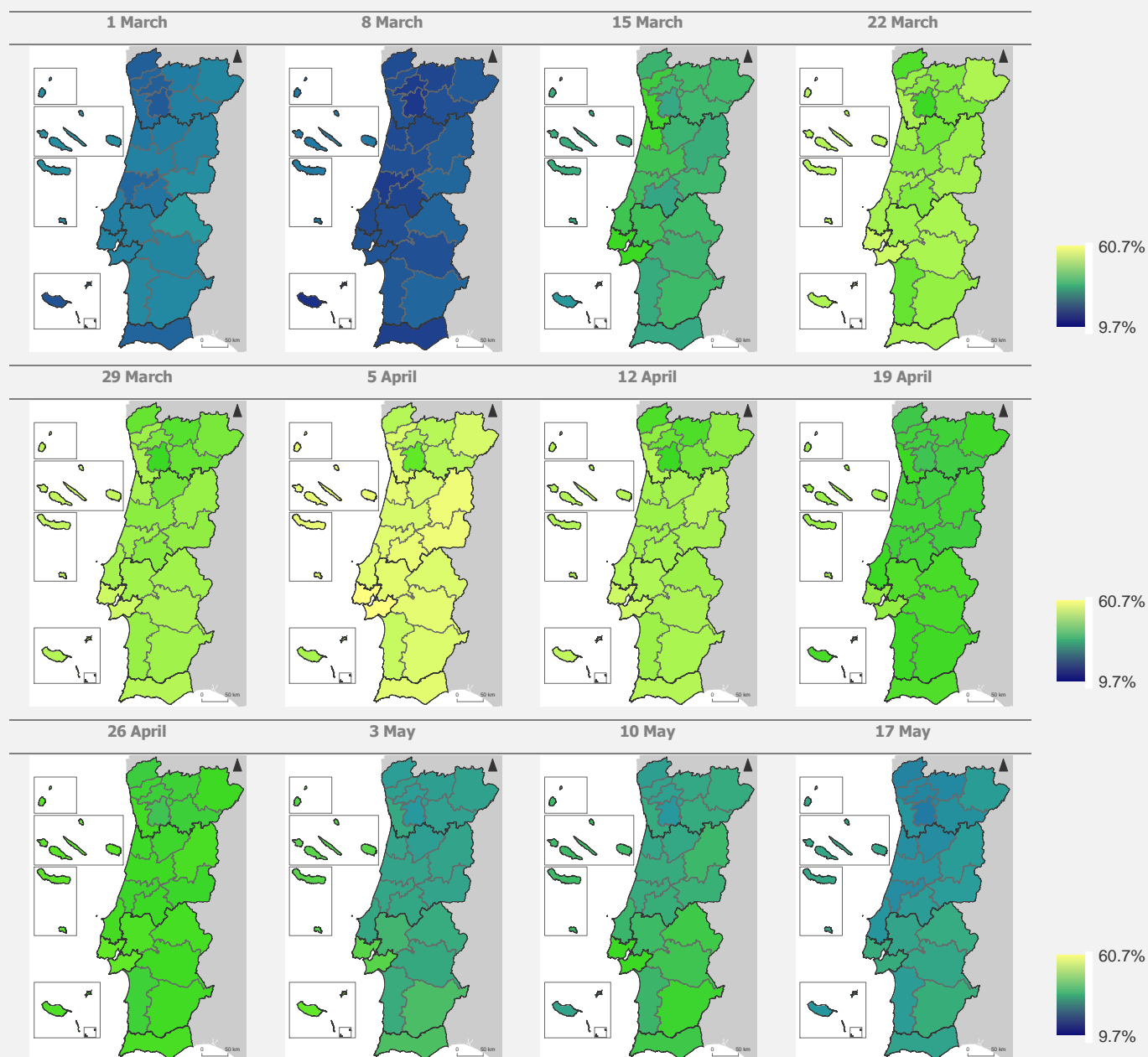

Source: Facebook's "Data for Good" Initiative. Data provided by Carnegie Mellon University.
Note: The dates marked on the graph axis correspond to the first days of the month and Sundays.

The following figures show this indicator at NUTS 3 level for the days corresponding to Sundays [Figure 12] and Mondays [Figure 13], since the beginning of March. It can be seen that the days corresponding to Sundays indicate, overall, less mobility of the population than the days corresponding to Mondays. In particular, there is a reduction in mobility levels with the beginning of the State of Emergency on March 19 (maps of March 22 and 23) and the transition from the State of Emergency to the State of Calamity on May 3 (maps of May 3 and 4).

Figure 12: Proportion of the population "staying put" on Sundays between March 1st and May 17th by NUTS 3

Source: Facebook's "Data for Good" Initiative. Data provided by Carnegie Mellon University.

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Figure 13: Proportion of the population "staying put" on Mondays between March 2nd and May 18th by NUTS 3
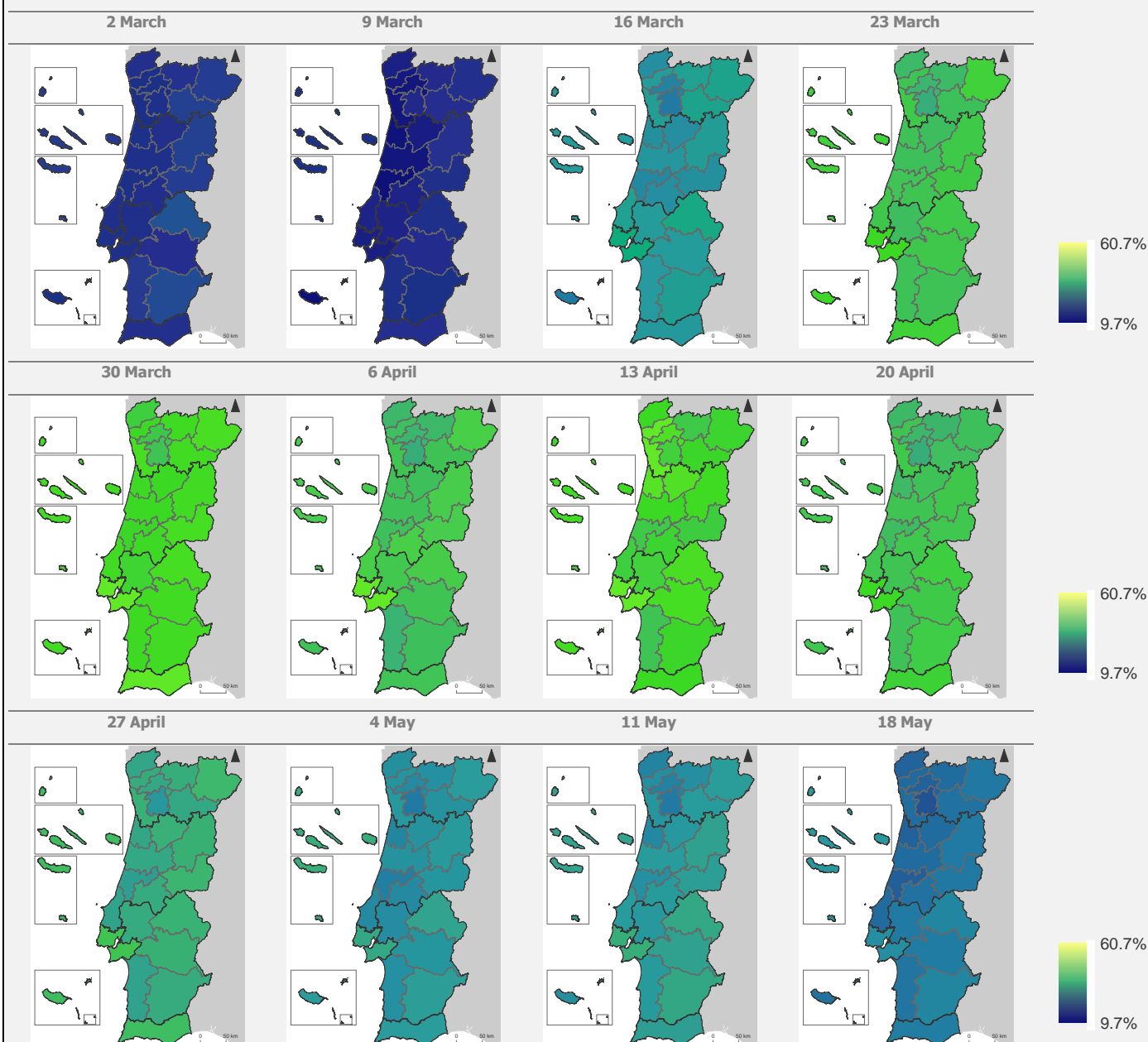
Source: Facebook's "Data for Good" Initiative. Data provided by Carnegie Mellon University.
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Technical Note:

The mobility data from Facebook's "Data for Good" Initiative correspond to location updates collected from mobile devices of Facebook application users that have the "location history" option turned on. Only location accuracy (GPS) data of less than 200 meters is considered and if a user has multiple locations resulting from more than one associated mobile device, Facebook only considers the data with the highest location accuracy. Obtaining results for the NUTS 3 level implies a minimum of 300 unique users per sub-region.

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The proportion of the population "staying put" is measured by the number of Facebook users associated with a single 600mx600m reference grid during 8am and 8pm on day x, requiring at least three occurrences during that time period. The reference grid, as a "residence" proxy, is measured daily based on the largest number of locations observed between 8pm and midnight on day x-1 and between 0 am and 8 am on day x, requiring at least three occurrences during that time period.

The information associated with the 600mx600m grids is allocated to the respective NUTS 3 sub-region. Since a grid can intercept more than one sub-region, 9 sample points are generated in each grid, assigning 1/9 of the grid population to each point in the sample.

Facebook's "Data for Good" initiative aims to provide data for research on humanitarian issues and has allowed results to be published in scientific articles particularly in the United States. Obviously, Statistics Portugal's use of this data source in the Statslab domain is not motivated by any publicity motive, but by the public interest of the information. Statistics Portugal thanks researcher Miguel Godinho Matos[1] for his support in the analytical preparation of this information

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[1] Associate Professor at Católica Lisbon School of Business & Economics and visiting research scholar at the Carnegie Mellon University.

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Technical note

Data sources

Data on **Deaths** correspond to general deaths (all causes of death) occurring in the national territory since March 1st, 2020 and until the Tuesday of the week prior to publication. The information is preliminary and is obtained from statistical operations of direct and exhaustive collection on deaths occurring in Portuguese territory using facts that are subject to compulsory civil registration (death) in the *Sistema Integrado do Registo e Identificação Civil* (SIRIC). In addition to administrative information obtained from Civil Register Offices, Statistics Portugal collects an additional set of variables identified as statistically relevant to the National Statistical System (NSS) and the European Statistical System (EES). Data are recorded and sent electronically, in compliance with the requirements set out by Statistics Portugal and laid down in liaison with the *Instituto de Registos e Notariado* (IRN) and the *Instituto de Gestão Financeira e Equipamentos da Justiça* (IGFEJ).

Data on the number of confirmed cases are based on those published daily in the **Directorate-General of Health COVID-19 Status Report** for the entire country and by municipality. The confirmed cases are referenced to the municipality of occurrence and correspond to the total of clinical notifications in the SINAVE (National System of Epidemiological Surveillance) system. When the confirmed cases by municipality are fewer than 3, for confidentiality reasons, data are not disclosed by the Directorate-General of Health. For the reference dates considered in this press release –May 20 – data by municipality corresponded, respectively, to 90% of confirmed cases in the national territory. This proportion reflects data confidentiality by municipality, but also limitations in the process of spatial referencing of information.

Data on dwellings sales are based on the use of administrative procedures, namely from anonymised administrative tax data obtained from the Portuguese Tax and Customs Authority (AT) under an agreement signed with Statistics Portugal, on the Municipal Property Transfer Tax (IMT) and the Municipal Property Tax (IMI). The calculation is based on the linking of information from IMT with that from IMI and only sales where the IMT destination code is "Housing" are used and the associated information from IMI is defined as "Housing". The calculations follow the methodology described in the Methodological Document "**House Price Statistics at Local Level**". As part of the monitoring of the impact of the COVID - 19 pandemic, Statistics Portugal anticipates the dissemination calendar and calculates the indicator of the number of dwellings sales for each month corresponding to the information recorded in the reference month and the two previous months, i.e. with a reference period of 3 months.

Data on new lease agreements are based on the use of administrative procedures, namely from anonymised administrative tax data provided by the Portuguese Tax and Customs Authority (AT) under an agreement signed with Statistics Portugal, on the Statement of Stamp Duty Model 2 - Communication of lease agreements (Model 2) and the Municipal Property Tax (IMI).The calculation is based on the linking between Model 2 information with that of IMI. The first declarations and declarations of substitution of new lease agreements for urban buildings, with a monthly rent period, for which the purpose is permanent housing, and the associated information from IMI is defined as "Housing", are used. The calculations follow the methodology described in the Methodological Document of "**House Rental Statistics at Local Level**". As part of the monitoring of the impact of the COVID - 19 pandemic, Statistics Portugal anticipates the dissemination calendar and calculates the indicator of the number of new lease agreements for each month corresponding to the information on the new lease agreements registered in the reference month and the two previous months, i.e. with a reference period of 3 months.

The resident population data referenced to December 31, 2019 correspond to preliminary estimates, not yet disseminated.

Disseminated Indicators

Number of total deaths, by sex or age group

Number of deaths in the last 4 weeks per deaths in the same reference period

Number of confirmed cases of COVID-19 disease per 10 thousand inhabitants

Population density

Proportion of resident population with 75 or more years old

Number of new lease agreements per one thousand conventional dwellings

Number of dwellings sales per one thousand conventional dwellings

Relation between the number of dwellings sales in March 2020 (last 3 months) and sales in the same reference period

Location coefficient

The location coefficient (LC) is obtained using the following formula:

$$LC = \left(\frac{1}{2} \sum_{j=1}^{n} \left| x_j - y_j \right| \right) \times 100 \qquad \text{where:}$$

x_j corresponds to the ratio of the number of confirmed cases of COVID-19 in each municipality j to the number of confirmed cases of COVID-19 for the total country;

y_j corresponds to the ratio between the resident population in each municipality j and the total resident population in the country.

The Location coefficient varies between 0 and 100, with values closer to 100 reflecting greater inequality in the distribution of confirmed cases of COVID-19 against the total resident population and, in this sense, indicates situations of greater territorial concentration.

The location curve (or Lorenz concentration curve) corresponds to a graphical representation that relates the cumulative distribution of two variables. This representation also includes the straight line of equal distribution, and the greater the distance from it, the greater is the concentration of the variable represented in the ordinate axis (in this analysis, the confirmed cases of COVID-19, by period of reference) versus the variable represented in the abscissa axis (in this analysis, the total resident population).