17 July, 2020

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

COVID-19: What distinguishes the 19 parishes in a state of calamity from the rest of the AML?

The expression of the pandemic on national territory continues to be characterised by a high degree of heterogeneity, which has led to the declaration of differentiated territorial public policy measures. The continuing state of calamity in a group of 19 contiguous parishes of the Metropolitan Area of Lisboa (AML) - AML concentrated 64% of the new cases of the country in the 14 days ended on 13 July - motivated an in-depth analysis of this territory:

- The resident population in 2019 was estimated at 740 911 inhabitants, representing 25.9% of the approximately 2.9 million residents of the AML.
- The territory in a state of calamity has a higher settlement density. The population density in the territory in a state of calamity (5 232.1 inhabitants per km^2) is seven times higher than in the rest of the AML territory and the proportion of buildings with 7 or more dwellings is also higher (30.6% vs. 13.9%).
- Residents of the territory in a state of calamity use public transport more often. In the territory in a state of calamity the proportion of trips outside the municipality using public transport is 14.0%, more than double than what is observed in the rest of the AML (6.7%).
- The territory in a state of calamity shows a lower value housing market. The value of dwellings' prices and rents is lower in the state of calamity territory (1 330 €/m^2 and 7.5 €/m^2, respectively) than in the rest of the AML (1 540 €/m^2 and 8.4 €/m^2).

As usual in this series of press releases, the demographic context and the recent evolution of the pandemic throughout the country were analysed:

- The preliminary number of deaths between March 1 and July 5, 2020 was 3,103 higher than the number registered in the same period of 2019. This variation resulted mainly from the significant increase in deaths of people aged 75 and over (+ 2,718).
- On July 13, the date of the last information update at municipality level by the Directorate-General of Health, there were 45.7 cases of COVID-19 per 10 thousand inhabitants in Portugal and 4.7 new cases (last 14 days) per 10 thousand inhabitants. The analysis of the relationship between the number of confirmed cases and the number of new cases (last 14 days) per 10 thousand inhabitants showed ten municipalities in the Metropolitan Area of Lisboa with values above the national average in both indicators, which concentrated 54% of the total new cases in the country and 85% of the total new cases in the AML.

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. On March 19, the first period of the State of Emergency was declared in Portugal, which would be renewed on April 3 and April 18. On May 3rd, the State of Calamity was declared, which was followed

by three phases of deconfinement. On July 1st, the State of Alert was declared for most of the country, the State of Contingency for the Metropolitan Area of Lisboa and the State of Calamity for 19 parishes of five municipalities in the Metropolitan Area of Lisboa.

This press release is organized in three sections. The first section highlights specific characteristics observed in the territory of the 19 parishes of the Metropolitan Area of Lisboa that maintained the state of calamity in relation to the rest of the territory of the Metropolitan Area of Lisboa, considering indicators associated with territorial settlements, mobility patterns, the labour market and the level of income and value of the housing market.

The second section includes the usual analysis of the results of general mortality, based on the data of deaths (all causes of death) that occurred in the national territory up to July 5th. Information on deaths is obtained through the Civil Register collected under the Integrated Civil Registration and Identification System (SIRIC) until July 14th. 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.

The last section analyses the pandemic situation in Portugal, focusing on the municipality level and the territorial differentiation of the disease incidence and its most recent evolution, based on the number of COVID-19 confirmed disseminated by the Directorate-General for Health (DGS). This press release includes the information available up to July 16 (data on the situation up to July 15 for the country and up to July 13 for municipalities). Taking into account the limitations in the spatialization of information by municipality in SINAVE (National System of Epidemiological Surveillance of the DGS) - absence of data for the situation from July 4 to July 12 - in this press release the analysis of the new confirmed cases is based on the last 14 days and not the last 7 days as usual.

Additionally, 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 next press release of this special series is expected to be released on September 11, without prejudice to the updating of indicators on the Statistics Portugal website.

I. The 19 parishes in a state of calamity in the context of the Metropolitan Area of Lisboa

The figures presented in this section show differences between the territory of the 19 parishes of AML that maintain the state of calamity (corresponding to all the parishes of the municipalities of Amadora and Odivelas and six parishes of Sintra, two of Loures and one parish of Lisboa) and the remaining territory of AML (99 parishes) in terms of territorial settlements, mobility patterns, labour market and the level of income and value of the housing market.

For those indicators which it is not possible to obtain results at parish level, the maps show the results for each municipality, with data being classified in order to show the municipalities with results above and below the average of the AML. However the maps also include the territorial limits of the 19 parishes in a state of calamity, thus suggesting distinctive aspects of this territory. Whenever data is available at parish level, in addition to the map, a graph with the same indicator is made available, including the value for the whole territory in a state of calamity and for the rest of the AML. These graphs also present position measures (Median, 1st and 3rd Quartile, and Percentiles 10 and 90) based on the results of the parishes in their respective territories.

At the end of each point of analysis, the matrix of correlations between the analyzed socioeconomic indicators and those directly associated with the pandemic is presented, based on the data obtained at the municipality level.

Territory in a state of calamity with a higher settlement density and lower average number of rooms per dwelling than the rest of the AML territory

The population living in 2019 in the territory in a state of calamity was estimated at 740,911 inhabitants, representing 25.9% of the approximately 2.9 million residents in the AML.

The analysis of population density shows three municipalities in the territory in a state of calamity with values exceeding 5 thousand inhabitants per km^2: Amadora (7 740.5 inhabitants per km^2), Odivelas (6 094.7) and Lisboa (5 092.4). The graph, which compares the territory in a state of calamity with the rest of AML, highlights its higher population density (5 232.1 vs. 738.6) and lower levels of relative dispersion[1] between the parishes of this territory.

The proportion of buildings with 7 or more dwellings allows an approximation to the structure of the built space. In this context, six municipalities with a value higher than the AML average in this indicator (16%) - Amadora (41.1%), Lisboa (34.1%), Oeiras (26.7%), Barreiro (24.6%), Odivelas (23.2%) and Vila Franca de Xira (22.8%) - stand out, with three belonging to the territory in a state of calamity. The proportion of buildings with 7 or more dwellings is higher in the territory in a state of calamity than in the rest of the AML (30.6% vs. 13.9%), with a smaller relative dispersion of the values obtained in this indicator for the parishes of the territory in a state of calamity. In about half of the parishes of the territory in a state of calamity, the proportion of buildings with more than 7 dwellings was higher than 39.9% and in 10% of the parishes this proportion was higher than 67.3% (these results contrast, respectively, with 11.2% and 47.5% in the rest of the AML).

The average number of rooms per dwelling and the usable area of the dwellings per inhabitant are *proxy* indicators of the housing stock structure and living conditions. This line of analysis shows that four of the municipalities associated with the territory in a state of calamity (the exception is Lisboa) had the lowest values in both indicators. The average number of rooms per dwelling and the usable area of rooms per inhabitant in the territory in a state of calamity (3.4 rooms and 32 m^2 per inhabitant) is lower than in the rest of the AML (3.7 rooms and 39 m^2 per inhabitant), and there is also greater homogeneity between the values of the parishes in the calamity territory.

[1] The dispersion was evaluated using the following ratios: [(3rd Quartile - 1st Quartile) / Median] and [(Percentile 90 – Percentile 10) / Median].

Figure 1 – Population density, 2019

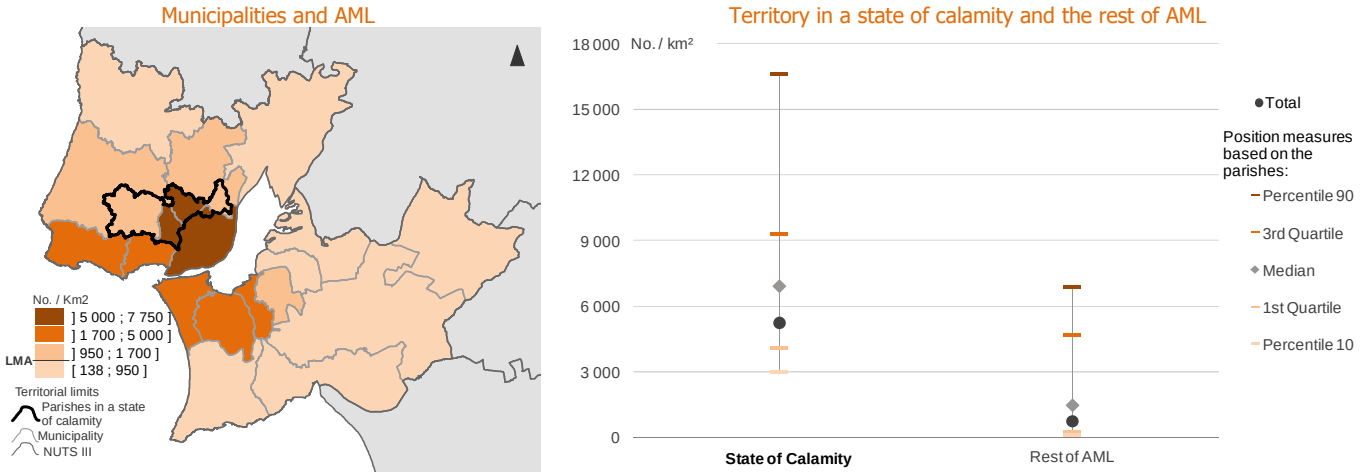


Figure 2 – Proportion of buildings with 7 or more dwellings, 2011

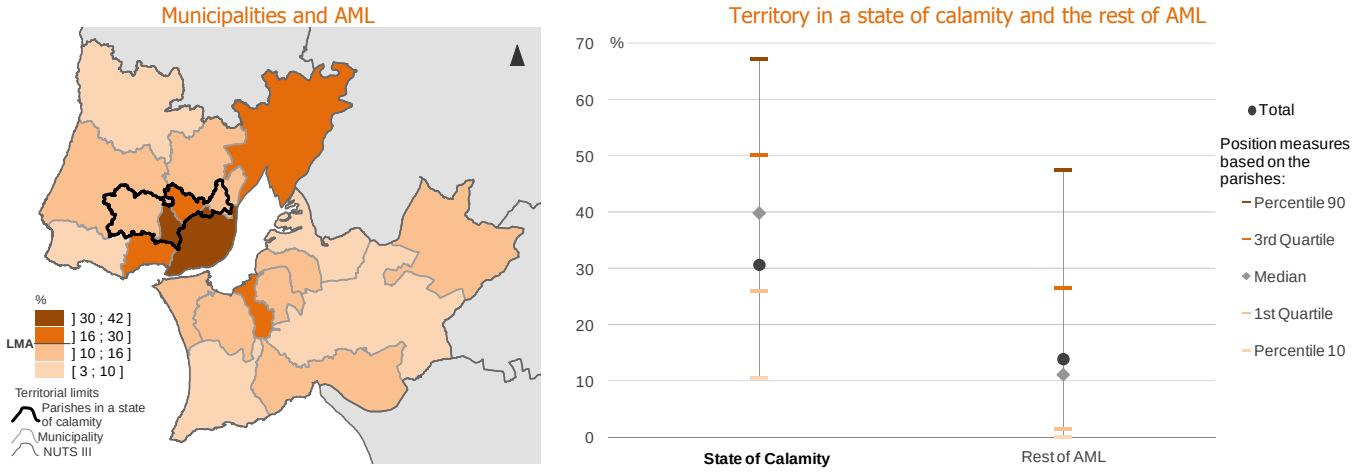


Figure 3 – Average number of rooms per conventional dwellings of usual residence, 2011

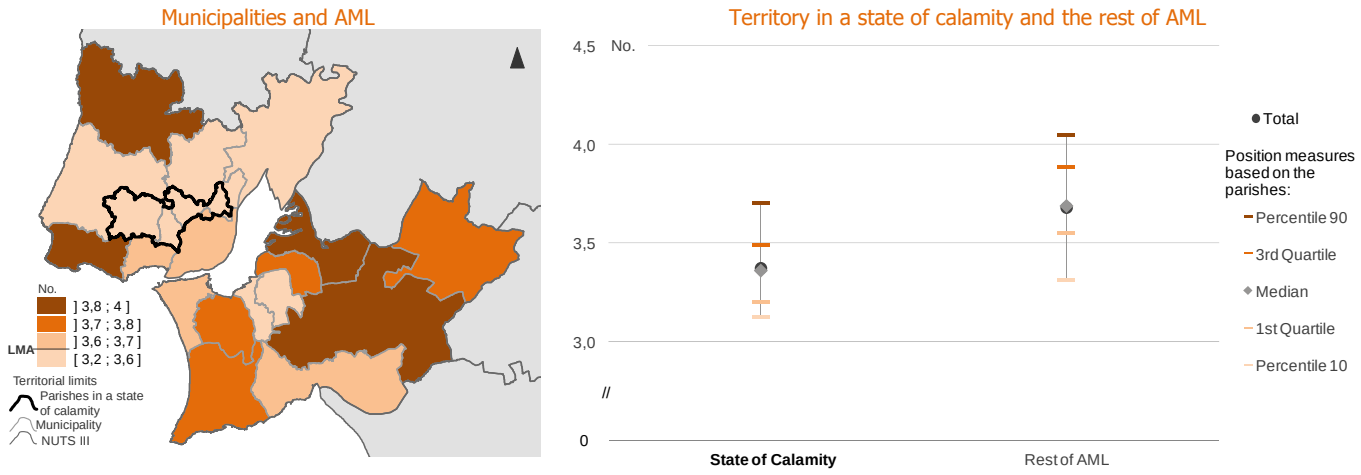
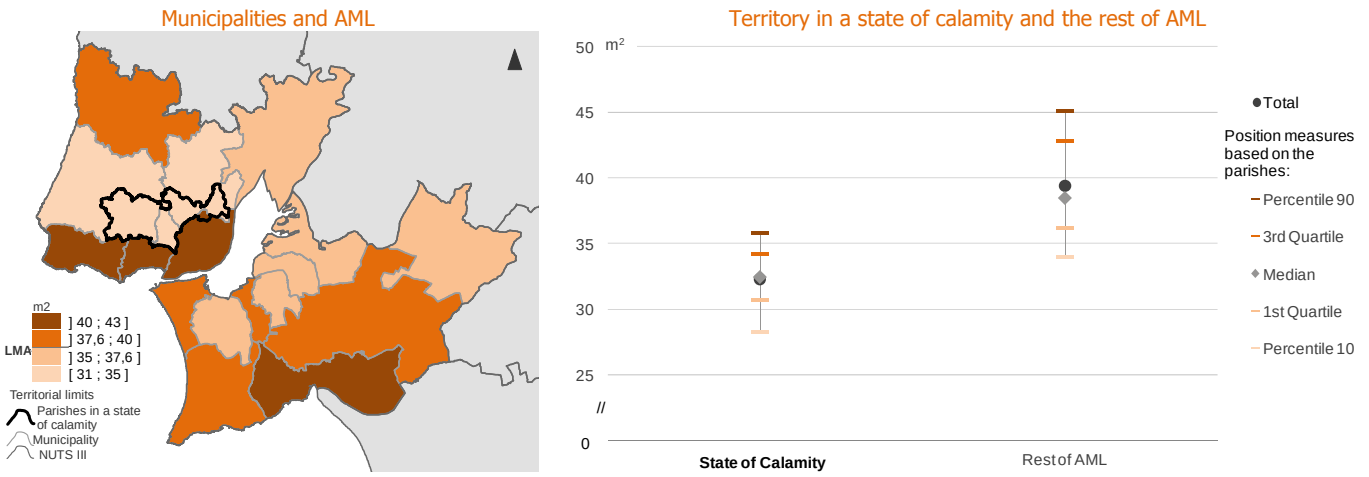


Figure 4 – Useful area of conventional dwellings of usual residence (2011 Census) per inhabitant, 2019



The following table shows the degree of linear association between the indicators analyzed and the pandemic situation in the municipalities of AML[2]. The positive associations with the number of confirmed cases per 10 thousand inhabitants - the proportion of buildings with 7 or more dwellings and the population density - and negative - the average number of divisions per dwelling - are highlighted. The association of the number of new cases on July 13 (last 14 days) with these three indicators is more moderate, as well as for the number of new cases registered on April 13 (last 14 days), with the exception of the average number of rooms per dwelling which shows a weak association.

Figure 5 - Correlation matrix between indicators of territorial settlement and the pandemic situation in the municipalities of AML

Label	Indicator name	New cases 13/04	New cases 13/07	Cases 13/07	Pop. Density	Buildings 7 + dwellings	Rooms per dwelling	Area of dwellings per inhabitant
New cases 13/04	Number of new confirmed cases per 10 thousand inhabitants on April 13 (last 14days)	1,00						
New cases 13/07	Number of new confirmed cases per 10 thousand inhabitants on July 13 (last 14days)	0,58	1,00					
Cases 13/07	Number of confirmed cases of COVID-19 disease per 10 thousand inhabitants until July 13	0,73	0,87	1,00				
Pop. Density	Population density, 2019	0,59	0,62	0,70	1,00			
Buildings 7 + dwellings	Proportion of buildings with 7 or more dwellings, 2011	0,66	0,53	0,73	0,84	1,00		
Rooms per dwelling	Average number of rooms per conventional dwellings of usual residence, 2011	-0,44	-0,53	-0,78	-0,63	-0,79	1,00	
Area of dwellings per inhabitant	Usable area of conventional dwellings of usual residence (2011 Census) per inhabitant, 2019	-0,02	-0,45	-0,56	-0,26	-0,19	0,59	1,00

[2] The association between indicators was estimated with Pearson's correlation coefficient. The strong positive or negative correlations (≥0.7 or ≤-0.7) are marked in a darker color, the moderate correlations in a lighter color (≥0.5 and <0.7 or >-0.7 and ≤-0.5).

Residents of the territory in a state of calamity with greater use of public transport and with greater potential accessibility to passenger train stations than residents of the rest of the AML territory

The analysis of the map with the proportion of trips to outside the municipality of the resident population using public transport shows four municipalities with values above 12% - Odivelas (15.2%), Amadora (14.1%), Loures (12.9%) and Barreiro (12.8%) - the three with higher proportions belonging to the territory in a state of calamity. There is a higher proportion of trips outside the municipality using public transport in the territory in a state of calamity (14.0% vs. 6.7%) and lower levels of relative dispersion between the parishes of this territory. It should also be noted that in 90% of the parishes in the territory in a state of calamity, the proportion of trips to outside the municipality using public transport is higher than the average for the rest of the AML (7.9% vs. 6.7%).

In the case of the proportion of trips using public transport of the resident population (regardless of the territorial scope of the trip) the conclusions are similar. With values above AML average (14.4%) in this indicator, six municipalities stand out - Lisboa (20.8%), Almada (18.2%), Odivelas (18.1%), Amadora (17.4%), Loures (16.6%) and Barreiro (16.4%) - with four belonging or partially integrating the territory in a state of calamity. The proportion of trips of the resident population using public transport is greater in the territory in a state of calamity than in the rest of AML (17.5% vs. 13.4%), although the relative difference is greater when trips outside the municipality are considered.

The analysis of the proximity indicator to a train station for passengers (up to 15 minutes on foot) highlights four municipalities where more than 50% of the resident population is in this situation - Moita (61.5%), Barreiro (57.4%), Amadora (55.7%) and Sintra (52.2%) - with two belonging or partially integrating the territory in a state of calamity. The proportion of the population living 15 minutes walking distance from a train station is higher in the territory in a state of calamity (42.9% vs. 29.6%).

Figure 6 – Proportion of trips of the resident population outside the municipality of residence using public transport (bus, train metro and boat) as the main mean of transport, 2017

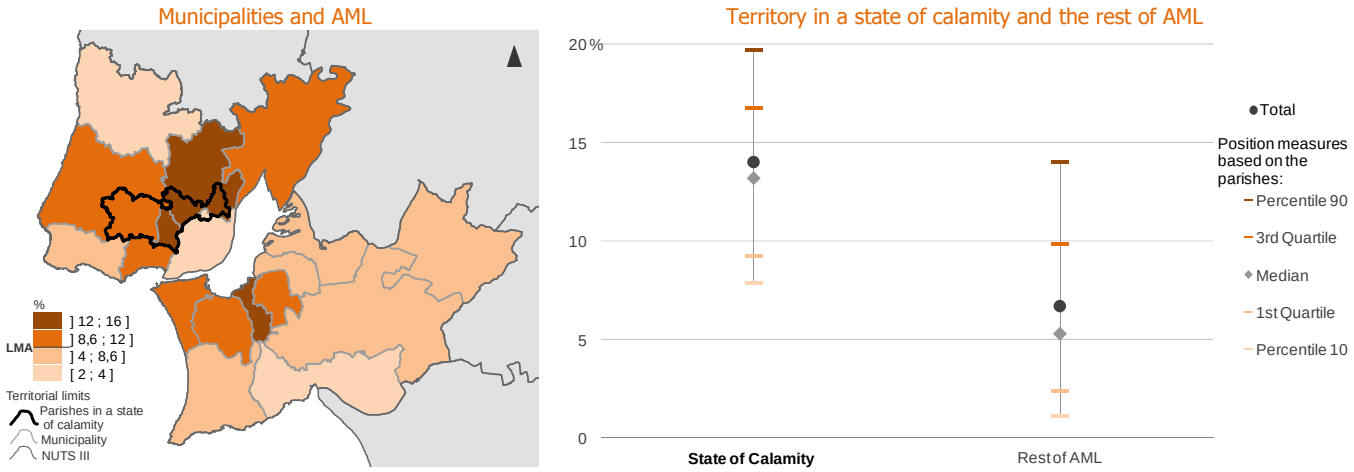


Figure 7 – Proportion of trips of the resident population using public transport (bus, train, metro and boat) as the main mean of transport, 2017

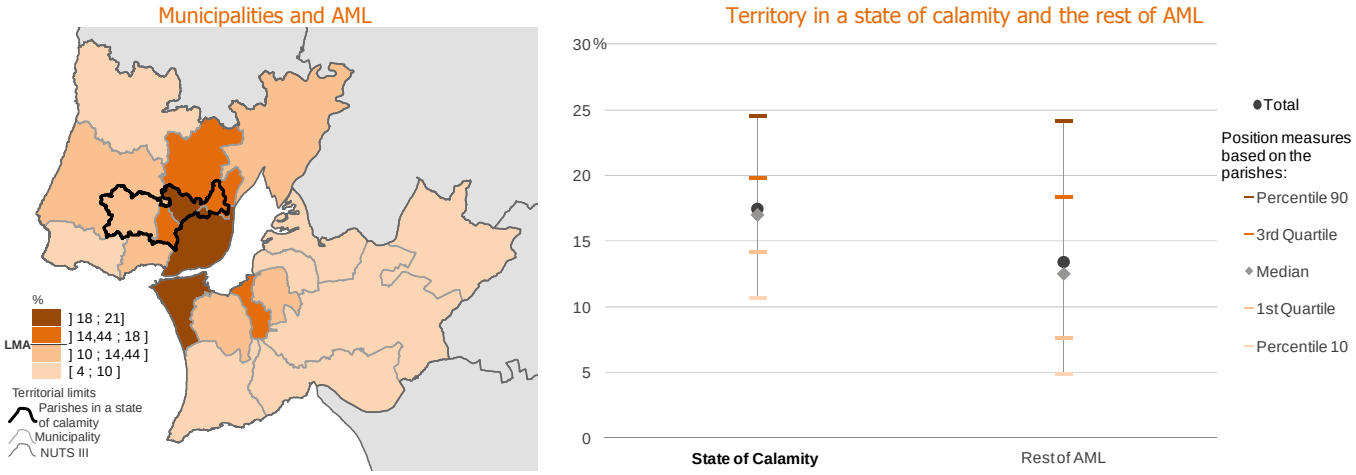
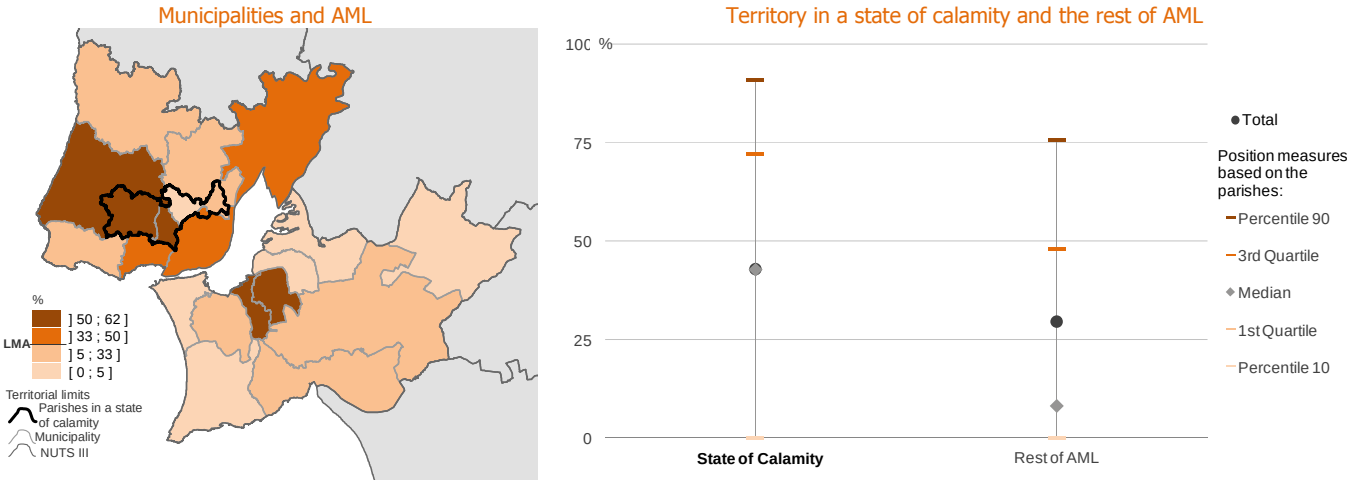


Figure 8 – Proportion of resident population (2011 Census) at 15 minutes walking distance from a train station for passengers



The following table presents the degree of association between the analyzed mobility indicators and those of the pandemic situation, suggesting a strong and positive association between the proportion of trips of the resident population using public transportation with the number of confirmed cases per 10 thousand inhabitants, this relationship being only moderate with the number of new confirmed cases (last 14 days) per 10 thousand inhabitants and higher on April 13 (compared to July 13).

Figure 9 - Correlation matrix between mobility indicators and the pandemic situation in the municipalities of AML

Label	Indicator name	Newcases 13/04	Newcases 13/07	Cases 13/07	Trips out municip. public transp.	Trips public transport	Train 15 minutes
Newcases 13/04	Number of new confirmed cases per 10 thousand inhabitants on April 13 (last 14days)	1,00					
Newcases 13/07	Number of new confirmed cases per 10 thousand inhabitants on July 13 (last 14days)	0,58	1,00				
Cases 13/07	Number of confirmed cases of COVID-19 disease per 10 thousand inhabitants until July 13	0,73	0,87	1,00			
Trips out municip. public transp.	Proportion of trips of the resident population outside the municipality of residence using public transport, 2017	0,25	0,45	0,61	1,00		
Trips public transport	Proportion of trips of the resident population using public transport , 2017	0,68	0,53	0,74	0,63	1,00	
Train 15 minutes	Proportion of resident population at 15 minutes walking distance from a train station for passengers	0,47	0,35	0,48	0,30	0,37	1,00

Proportion of working age population in the territory in a state of calamity slightly higher than in the rest of the AML

The analysis of the proportion of the working age population shows 13 municipalities with a value above the AML reference (62%) of which three municipalities - Sintra (66.4%), Odivelas (62.4%) and Loures (62.2%) - belong or partially integrate the territory in a state of calamity. The proportion of working age population is higher in the territory in a state of calamity than in the rest of the AML (63.7% vs. 61.5%), with lower levels of relative dispersion between the parishes of the territory in a state of calamity.

The analysis of the indicator on the proportion of employees with higher education in establishments shows three municipalities with values above 30% - Oeiras (41.7%), Lisboa (40.7%) and Amadora (31.9%) - with two of these municipalities belonging or partially integrating the territory in a state of calamity. Among the eight municipalities in AML with a higher number of new unemployed registered in unemployment centres per thousand inhabitants than in AML, the municipalities of Lisboa (10.0), Amadora (9.2) and Sintra (8.9) stand out.

Figure 10 – Proportion of working age population (15 - 64 years), 2019

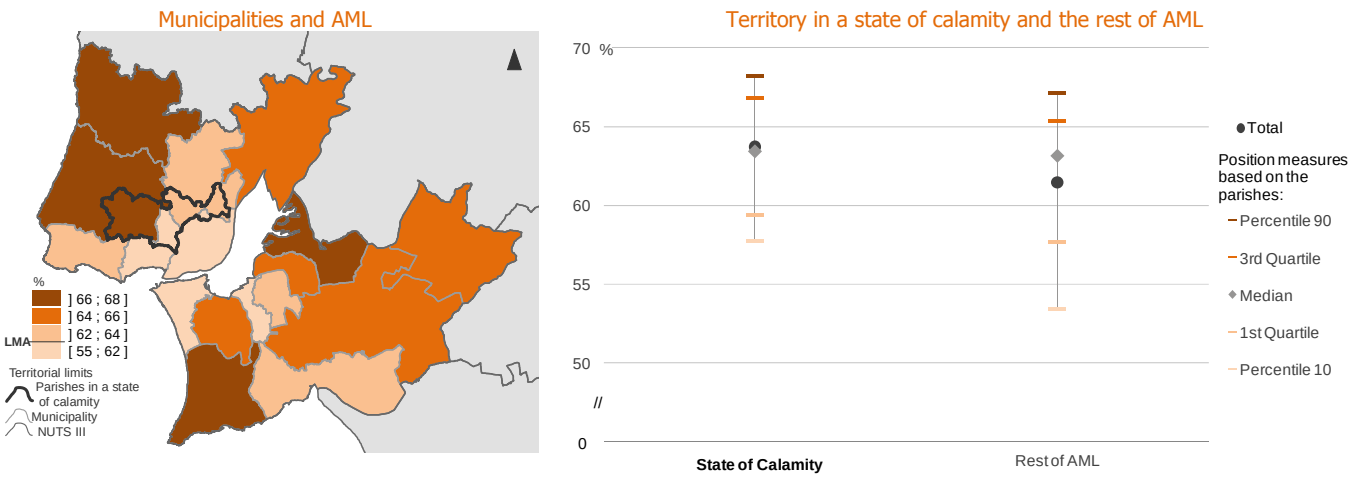


Figure 11 – Proportion of employees with tertiary education in establishments, 2017

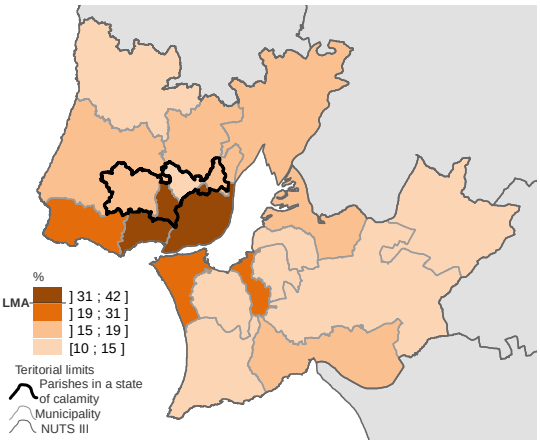
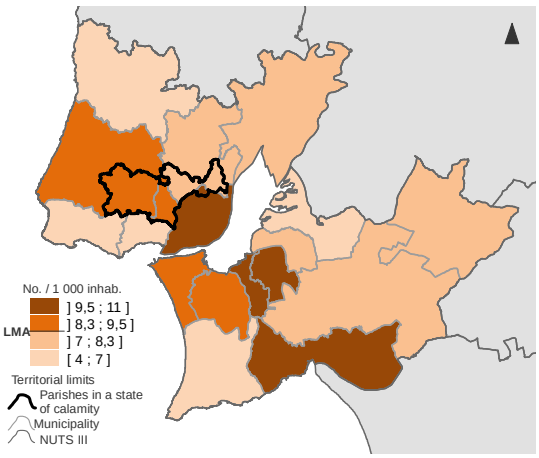


Figure 12 – Unemployed registered at IEFP employment centres throughout the month per thousand inhabitants between 15 and 64 years old, May 2020



The following table shows the degree of association between the indicators analysed and those of the pandemic situation, highlighting, in this context, the strong relationship with the number of new cases per 10,000 inhabitants registered on April 13 (last 14 days): positive, with the proportion of employees with higher education in the establishments; negative, with the proportion of working age population. The association of these two indicators with the number of confirmed cases on July 13 and with the number of new cases on July 13 (last 14 days) is weak.

Figure 13 - Correlation matrix between labor market indicators and those of the pandemic situation in the municipalities of AML

Label	Indicator name	Newcases 13/04	Newcases 13/07	Cases 13/07	%population working age	%employees with tertiaty education	Unemployed IEFP flow
Newcases 13/04	Number of new confirmed cases per 10 thousand inhabitants on April 13 (last 14days)	1,00					
Newcases 13/07	Number of new confirmed cases per 10 thousand inhabitants on July 13 (last 14days)	0,58	1,00				
Cases 13/07	Number of confirmed cases of COVID-19 disease per 10 thousand inhabitants until July 13	0,73	0,87	1,00			
%population working age	Proportion of working age population (15 - 64 years), 2019	-0,70	-0,25	-0,46	1,00		
%employees with tertiaty education	Proportion of employees with tertiary education in establishments, 2017	0,71	0,30	0,43	-0,77	1,00	
Unemployed IEFP flow	Unemployed registered at employment centres throughout the month per 1000 inhabitants with 15-64 years old, May 2020	0,38	0,04	0,33	-0,59	0,21	1,00

Territory in a state of calamity with lower value housing market and with greater homogeneity of values between parishes than the rest of the AML territory

Analysis of the median value of gross reported income deducted from personal income paid tax per taxable person shows four of the five municipalities with parishes in a state of calamity with values lower than those of AML (10 397 €): Loures (9 588 €), Amadora (9 749 €), Sintra (9 859 €) and Odivelas (10 078 €).

The median value of dwellings sales and house rents allows an approximation to the economic level of the population in the different territories. In this context, it can be seen that the median value of dwellings sales and rents is lower in the territory in a state of calamity (1 330 €/m^2 and 7.5 €/m^2 respectively) than in the rest of the AML (1 540 €/m^2 and 8.4 €/m^2), and there is also greater homogeneity between the values of the parishes in the territory of the calamity.

Figure 14 – Median value of gross reported income deducted from personal income paid tax per taxable person, 2017

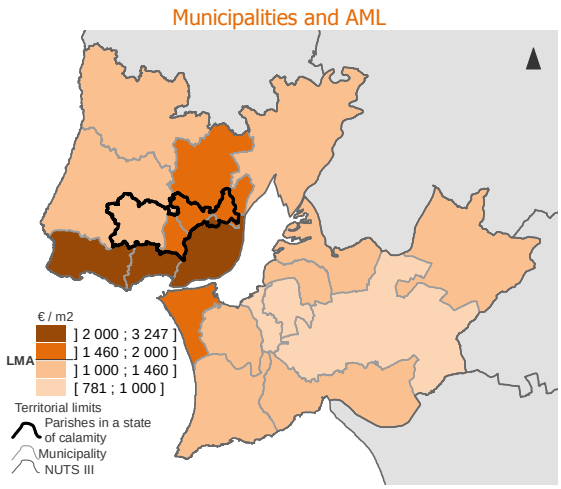


Figure 15 – Median value per m² of dwellings sales, 4th quarter 2019 (last 12 months)

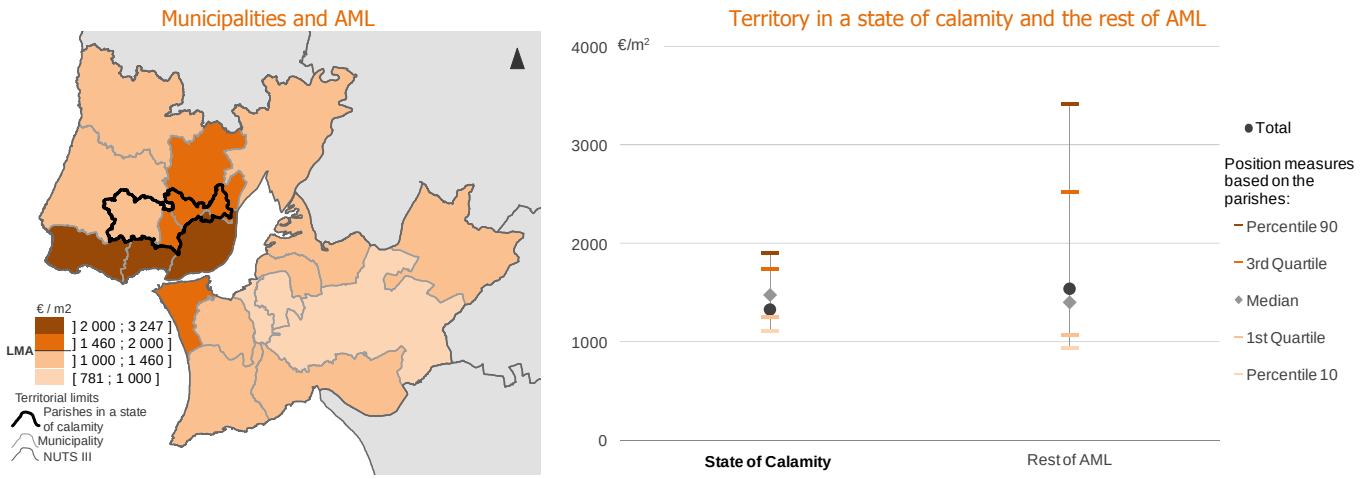
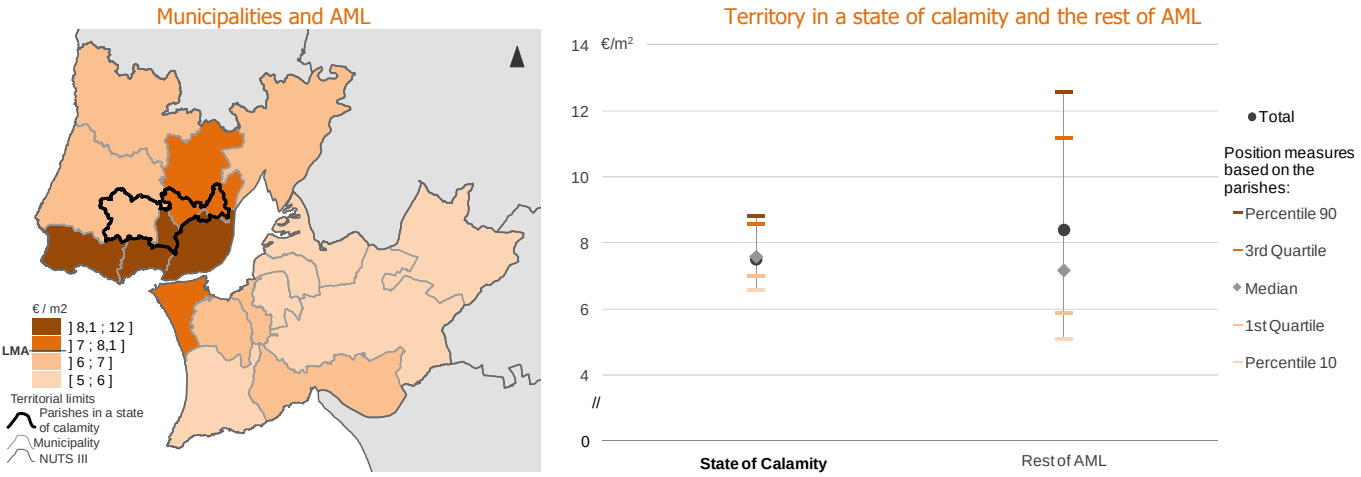


Figure 16 – Median house rental value per m² of new lease agreements of dwellings, 4th quarter 2019 (last 12 months)



The following table shows the degree of association between the indicators analysed and the pandemic situation, highlighting the positive association between the number of new cases confirmed on 13 April and the housing market indicators: strong association with the median house rental values and moderate, with the median value of housing prices. For the indicators that portray the most recent situation of the pandemic (July 13), the association with housing market indicators is, however, weak. Only the positive and very strong association between median house rental values and dwellings sales and, as expected, between house rental values and dwellings sales and income per taxpayer are flagged.

Figure 17 - Correlation matrix between economic level indicators and the pandemic situation in the municipalities of AML

Label	Indicator name	Newcases 13/04	Newcases 13/07	Cases 13/07	Income 2017	Prices housing 4T2019	Rents housing 2S2019
Newcases 13/04	Number of new confirmed cases per 10 thousand inhabitants on April 13 (last 14days)	1,00					
Newcases 13/07	Number of new confirmed cases per 10 thousand inhabitants on July 13 (last 14days)	0,58	1,00				
Cases 13/07	Number of confirmed cases of COVID-19 disease per 10 thousand inhabitants until July 13	0,73	0,87	1,00			
Income 2017	Median value of gross reported income deducted from personal income paid tax per taxable person, 2017	0,43	0,08	0,03	1,00		
Prices housing 4T2019	Median value per m² of dwellings sales, 4th quarter 2019 (last 12 months)	0,68	0,37	0,36	0,69	1,00	
Rents housing 2S2019	Median house rental value per m² of new lease agreements of dwellings, 4th quarter 2019 (last 12 months)	0,77	0,46	0,48	0,73	0,95	1,00

II. Demographic and territorial context indicators

Number of deaths between March 1st and July 5th, 2020 higher than in the same period in 2019 and 2018

The preliminary total number of deaths between March 1st (the first cases of COVID-19 were registered on March 2 and the first death on March 16) and July 5th 2020 was 3,103 higher than the number registered in the same period in 2019 and 1,629 cases higher than number of deaths registered in 2018. The positive variation in relation to 2019 was due mainly to the increase of deaths of people aged 75 and over (+ 2,718).

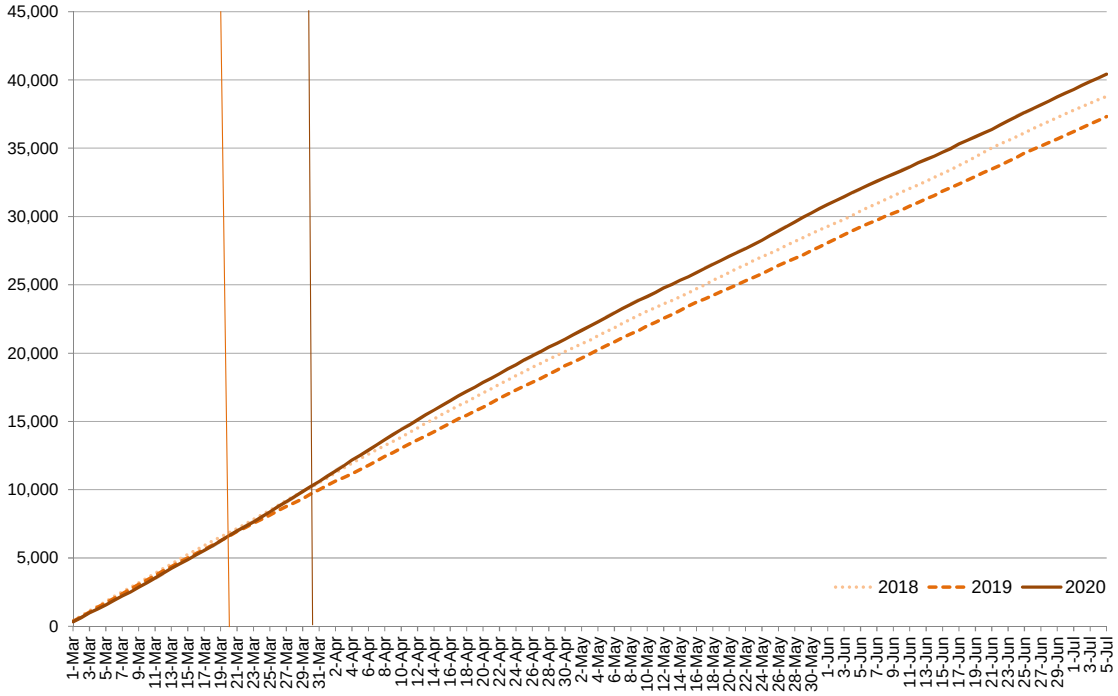
Figure 18 - Cumulative number of deaths in Portugal from March 1st to July 5th (2018-2020)

	Number of deaths			Number of deaths per 100 thousand inhabitants		
	2018	2019	2020	2018	2019	2020
Total	38,802	37,328	40,431	377.0	363.2	392.7
Males	19,445	18,588	20,054	399.5	383.1	412.6
Females	19,357	18,740	20,377	356.9	345.5	374.9
Under 64 years	5,633	5,512	5,636	69.7	68.6	70.3
65 to 69 years	2,338	2,384	2,445	377.2	385.7	392.5
70 to 74 years	3,276	3,187	3,382	628.2	591.9	615.4
75 to 79 years	4,533	4,183	4,607	1,066.6	981.6	1,066.3
80 to 84 years	6,943	6,462	6,980	1,987.4	1,840.1	1,975.9
85 years and over	16,076	15,597	17,373	5,403.0	5,026.8	5,385.2
65 years and over	33,166	31,813	34,787	1,498.5	1,417.5	1,525.5
75 years and over	27,552	26,242	28,960	2,570.4	2,412.8	2,613.9

Source: Statistics Portugal, Deaths and Annual estimates of resident population.
Notes: a) 2020 data: preliminary data based on information registered by the Civil Register Offices and sent to Statistics Portugal until July 14th 2020. b) The total number of deaths may not correspond to the sum of the partial figures due to the existence of records with unknown age.

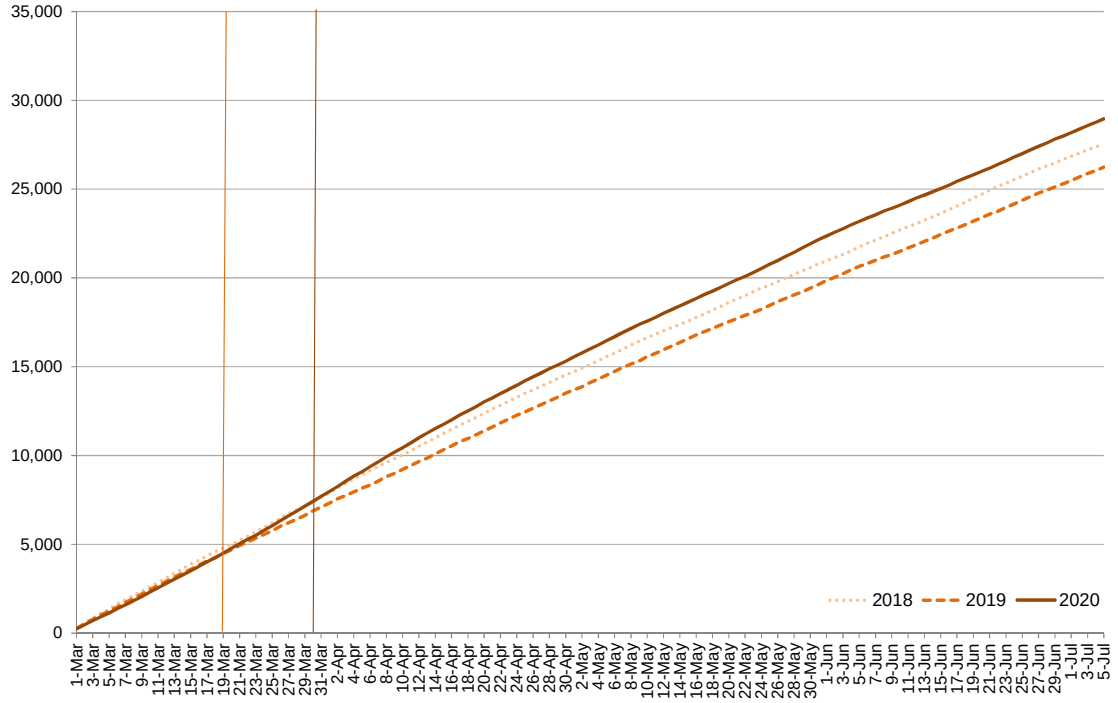
Figures 19 and 20 allow the comparison of the cumulative number of deaths from March to July 5th 2020 with that observed in the same period in 2019 and 2018. The total number of deaths registered in 2020 surpassed those registered in 2018 and 2019 on March 20th and 30th, respectively, dates identified by the vertical lines inserted in the figures. Regarding deaths of people aged 75 and over these dates were March 19th and 30th, respectively.

Figure 19 - Cumulative number of deaths, by day of death, March 1st to July 5th (2018-2020)



Source: Statistics Portugal, Deaths.
Note: 2020 data: preliminary data based on information registered by the Civil Register Offices and sent to Statistics Portugal until July 14th 2020.

Figure 20 - Cumulative number of deaths aged 75 and over, by day of death, March 1st to July 5th (2018-2020)

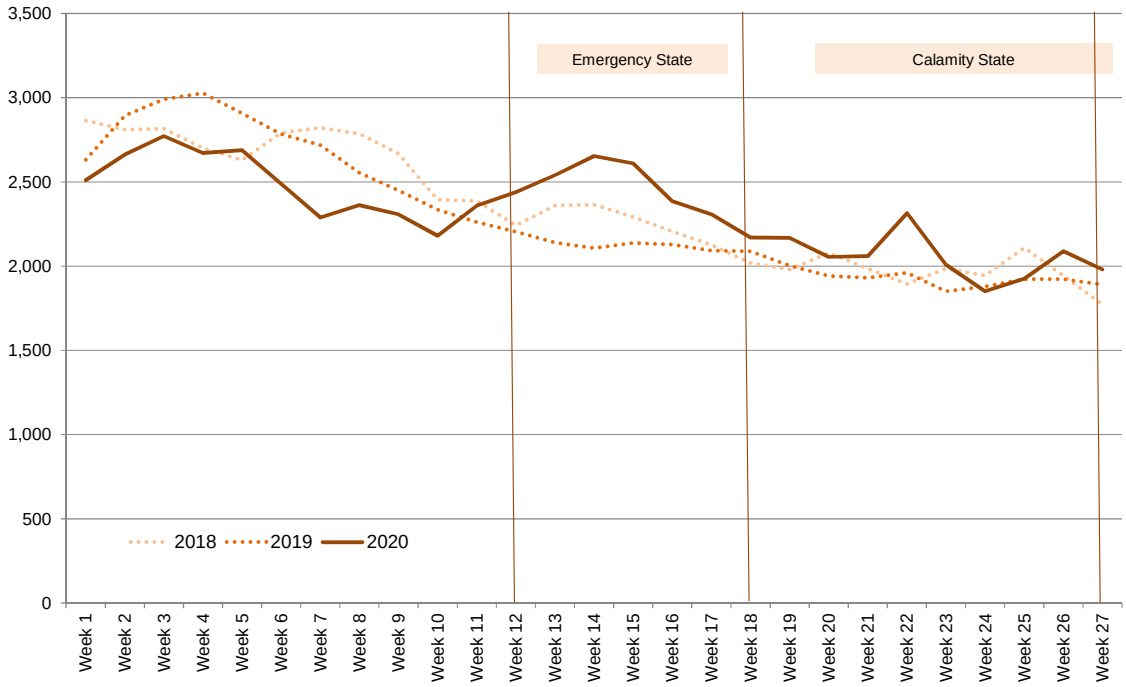


Source: Statistics Portugal, Deaths.
Note: 2020 data: preliminary data based on information registered by the Civil Register Offices and sent to Statistics Portugal until July 14th 2020.

Figures 21 and 22 compare the total number of deaths and the number of deaths of people aged 75 and over, registered in Portugal, per week until the 27th week of 2020 (week from June 29th to July 5th), with the same weeks of 2018 and 2019. These show that, between weeks 12 (March 16th to 22nd) and 23 (June 1st to 7th), the number of deaths

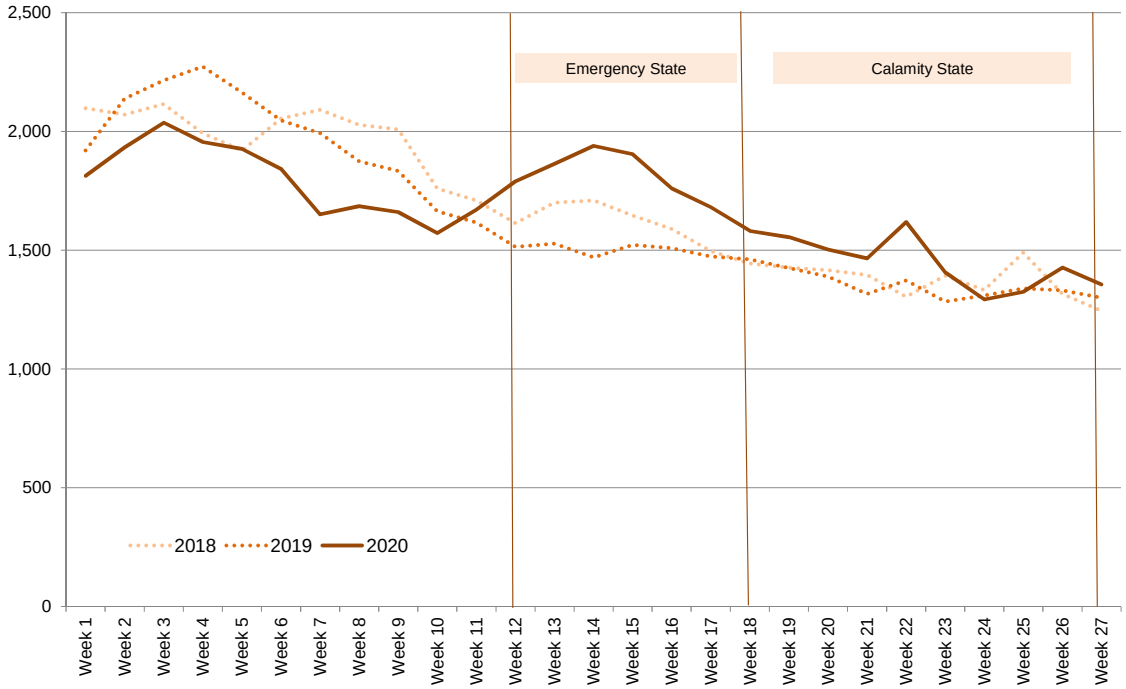
in 2020 exceeds the number of deaths registered in the same weeks of 2018 and 2019, resuming lower values in the weeks 24 and 25 (June 8th to 21st). In the last two weeks (26th and 27th) the number of deaths again exceeds the observed number of deaths in the same weeks of 2018 and 2019.

Figure 21 – Number of deaths by week of death, weeks 1 to 27 (2018-2020)



Source: Statistics Portugal, Deaths.
Note: 2020 data: preliminary data based on information registered by the Civil Register Offices and sent to Statistics Portugal until July 14th 2020.

Figure 22 – Number of deaths ages 75 and over by week of death, weeks 1 to 27 (2018-2020)

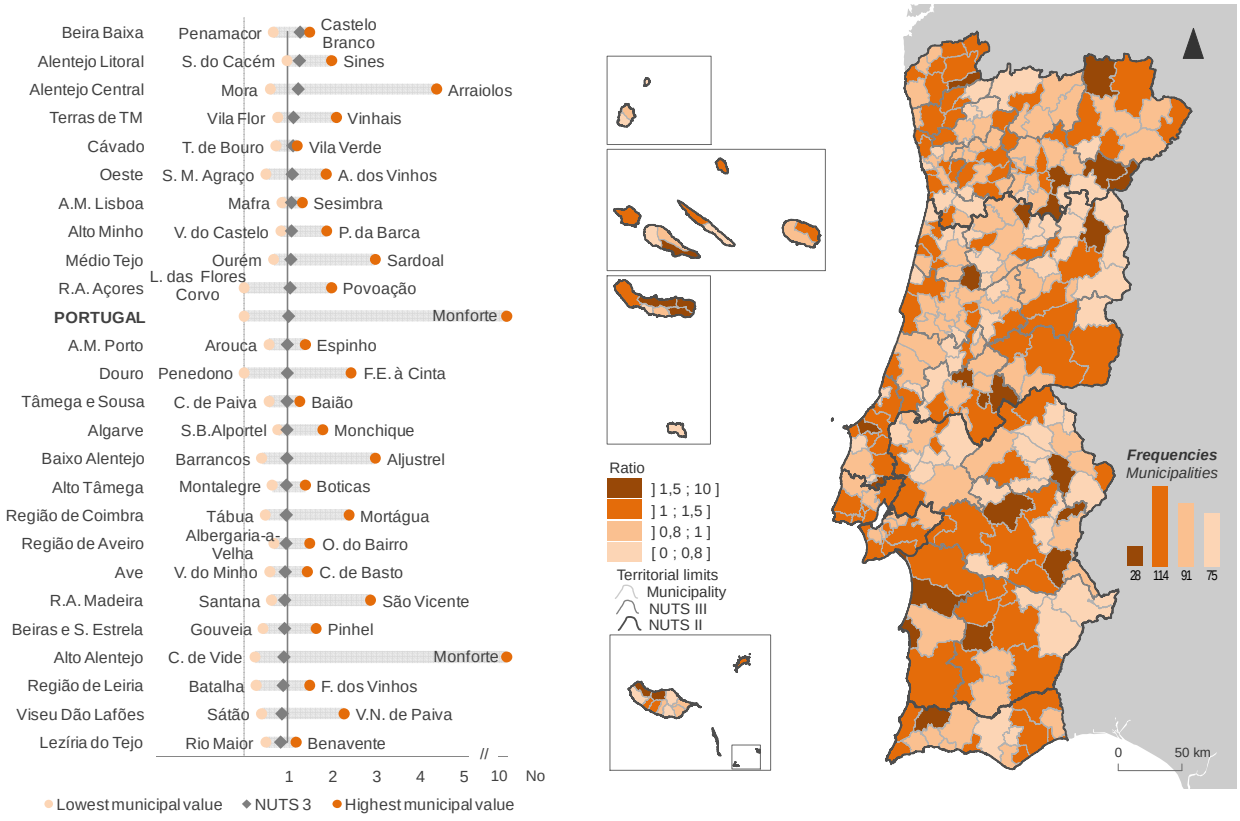


Source: Statistics Portugal, Deaths.
Note: 2020 data: preliminary data based on information registered by the Civil Register Offices and sent to Statistics Portugal until July 14th 2020.

In 142 municipalities the number of deaths registered in the last four weeks (between 8 June and 5 July, 2020) was higher than the corresponding reference value

In 142 out of the 308 Portuguese municipalities the number of deaths registered in the last four weeks (between 8 June and 5 July, 2020) was higher than the corresponding reference value (average for the same period in 2018 and 2019). Of this total, 28 municipalities registered a number of deaths 1.5 times higher than in the same period of reference. For the remaining 166 municipalities the number of deaths registered in the last four weeks was equal or lower than the number observed in the reference period [Figure 23].

Figure 23- Number of deaths in the last four weeks (8 June to 5 July) 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)).
Note: The lowest municipal values for Portugal correspond to the values of the municipalities of Corvo, Lajes das Flores and Penedono.

III. The expression of the pandemic in the municipalities

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

On July 15, 2020, in Portugal, for every 10 thousand inhabitants there were 46.4 confirmed cases of COVID-19, which represents an increase of 12% compared to July 1, the reference date of the last press release.

On July 13, 2020, the date of the last data update at municipality level, there were 45.7 confirmed cases of COVID-19 per 10 thousand inhabitants in the country.The number of confirmed cases with COVID-19 disease per 10 thousand inhabitants was higher than the national value in 42 municipalities. In the Norte region, 21 municipalities registered a value above the country, with nine contiguous municipalities in the Metropolitan Area of Porto (AMP) and neighbouring territories standing out, with more than 60 confirmed cases per 10 thousand inhabitants: Valongo, Matosinhos, Maia, Gondomar and Porto in the AMP; the municipalities of Felgueiras, Lousada and Paços de Ferreira in Tâmega e Sousa; and Vizela in the sub-region of Ave.

In the Metropolitan Area of Lisboa (AML) 10 municipalities presented values above the national reference: Cascais, Moita, Oeiras and Barreiro, and Amadora, Loures, Odivelas, Sintra, Lisboa and Vila Franca de Xira stood out with more than 60 cases confirmed by 10 thousand inhabitants. Also some municipalities in the Centro (7), Alentejo (the municipalities of Reguengos de Monsaraz, Moura and Azambuja) and in Região Autónoma dos Açores (the municipality of Nordeste) had values higher than the national value [Figure 24].

Despite this differentiation, the estimated location coefficient[3] for March 23 and July 13 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 25].

[3] 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.

Figure 24 - Number of confirmed cases of COVID-19 disease per 10 thousand inhabitants until July 13, 2020, by municipality

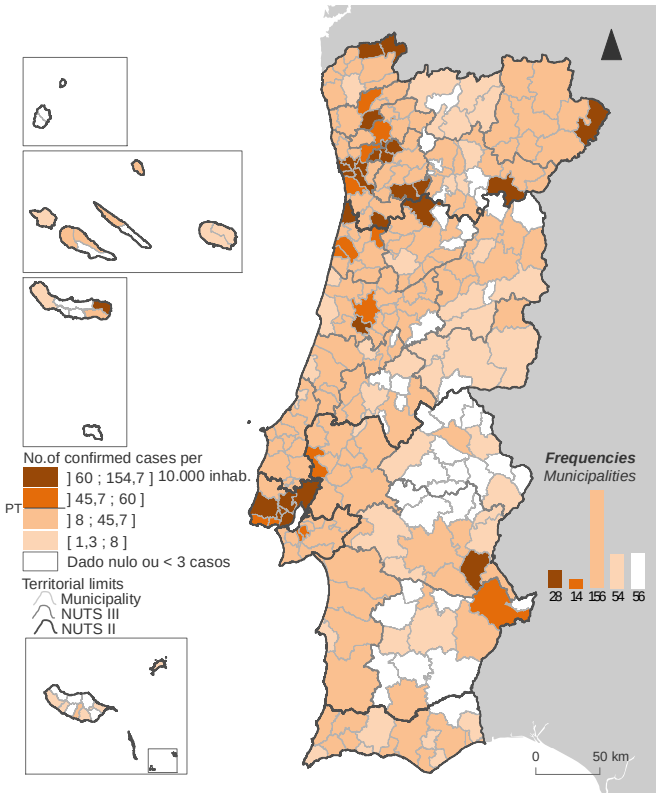
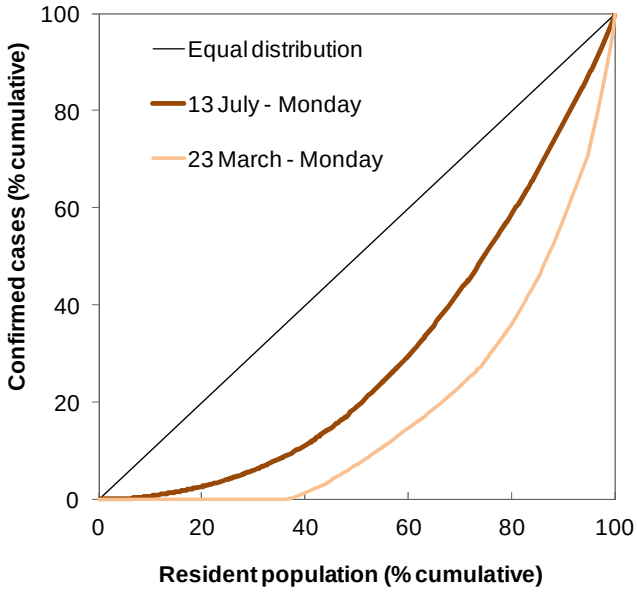


Figure 25 - Territorial concentration of COVID-19 confirmed cases until March 23 and until July 13 in relation to the resident population, based on the distribution by municipality

Location Curve



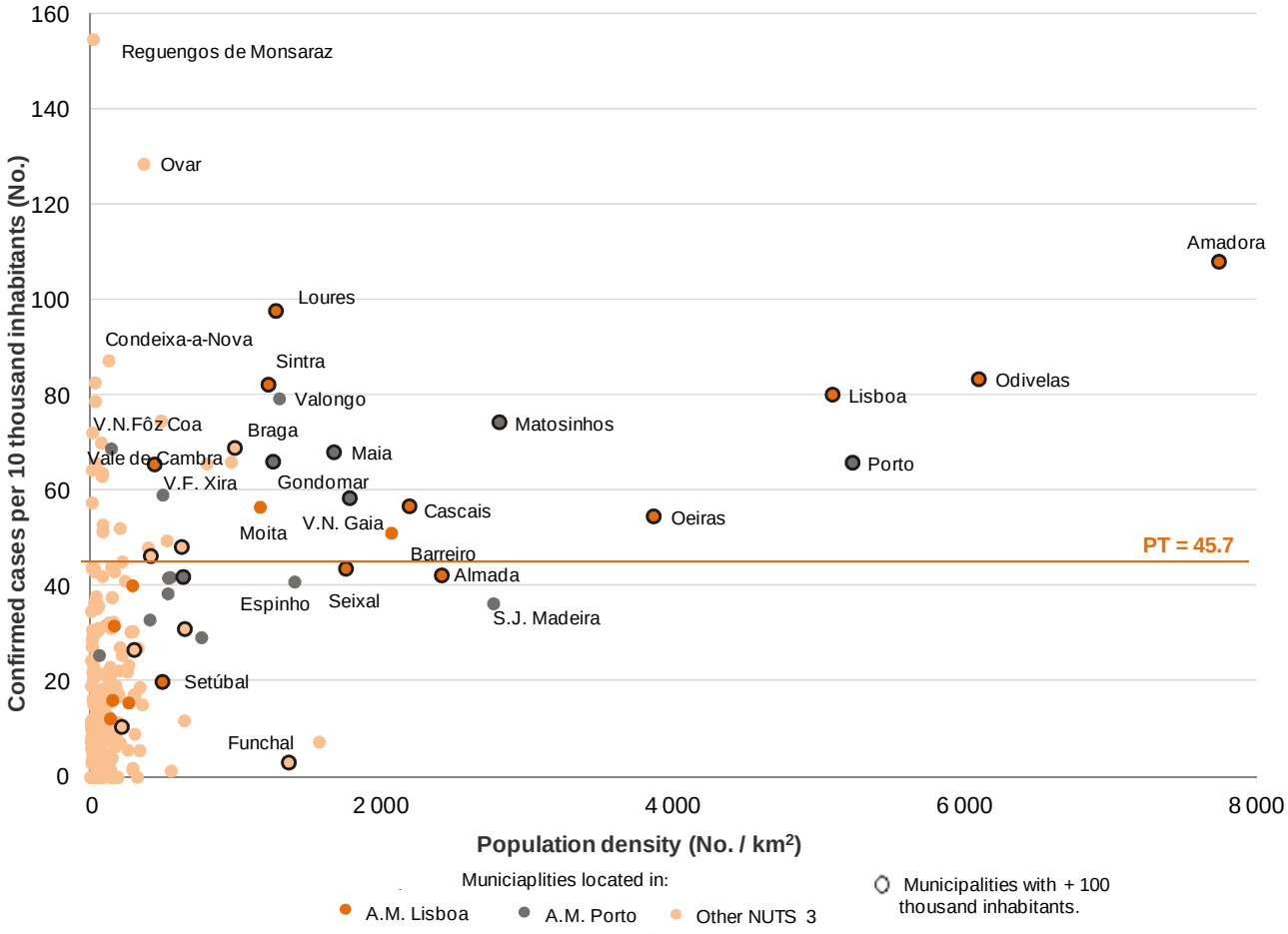
Location coefficient	
July 13 - Monday	31.0
March 23 - Monday	46.8

Source: Directorate-General of Health, Daily COVID-19 Status Report (released on July 16); INE, I.P., Annual estimates of resident population, 31 December 2019. 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 (0 or < 3 cases).

30 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. Of the 42 municipalities with a number of confirmed cases per 10 thousand inhabitants above the value for Portugal, 30 also had population density values above the national average. From this set of 30 municipalities, the municipalities of Ovar (128.6), in Região de Aveiro; Condeixa-a-Nova (87.4) in Região de Coimbra; Amadora (108.0), Loures (97.7), Odivelas (83.4), Sintra (82.2), Lisboa (80.2) and Vila Franca de Xira (65.5), in the Metropolitan Area of Lisboa; Valongo (79.4), Matosinhos (74.4), Vale de Cambra (68.9), Maia (68.1), Gondomar (66.1) and Porto (65.9), in the Metropolitan Area of Porto; Felgueiras (74.8), Lousada (74.6) and Paços de Ferreira (65.8) in Tâmega e Sousa; Braga (69.0) in Cávado; and Vizela (66.1) in the sub-region of Ave stood out with more than 60 confirmed cases per 10 thousand inhabitants. It should also be noted that 184 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 26 - Number of confirmed cases per 10 thousand inhabitants on July 13, 2020 and Population density, by municipality



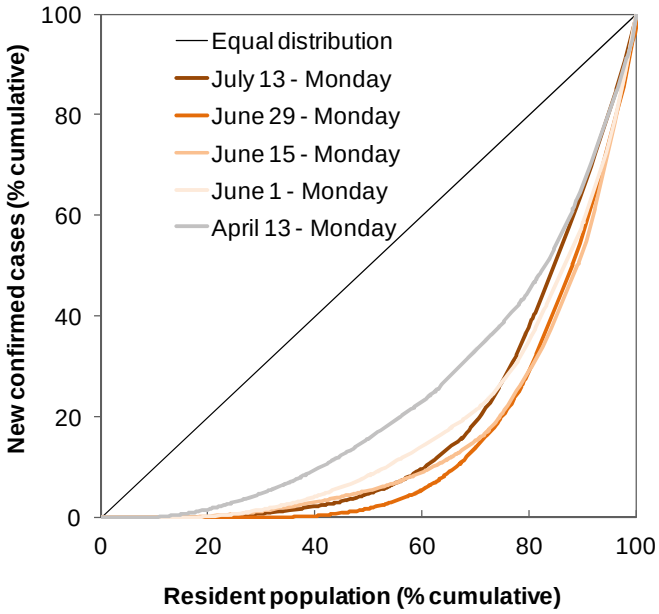
Source: Directorate-General of Health, Daily COVID-19 Status Report (released on July 16); INE, I.P., Annual estimates of resident population, 31 December 2019.

The calculation of the location coefficient considering the new confirmed cases (last 14 days) for April 13 and 29 and June 1, 15 and 29 suggests an increase in the territorial concentration of the new confirmed cases of COVID-19.

In relation to the new cases registered on July 13, and compared to June 29, there is a decrease in the location coefficient, which translates into a slight reduction in the concentration of new cases in relation to the population distribution in the municipalities, with the location curve on July 13 approaching the one registered on June 1 [Figure 27].

Figure 27 – Territorial concentration of new confirmed cases of COVID-19 (last 14 days) for April 13, June 1, 15 and 29 and July 13 relation to the resident population, based on the distribution by municipality

Location curve

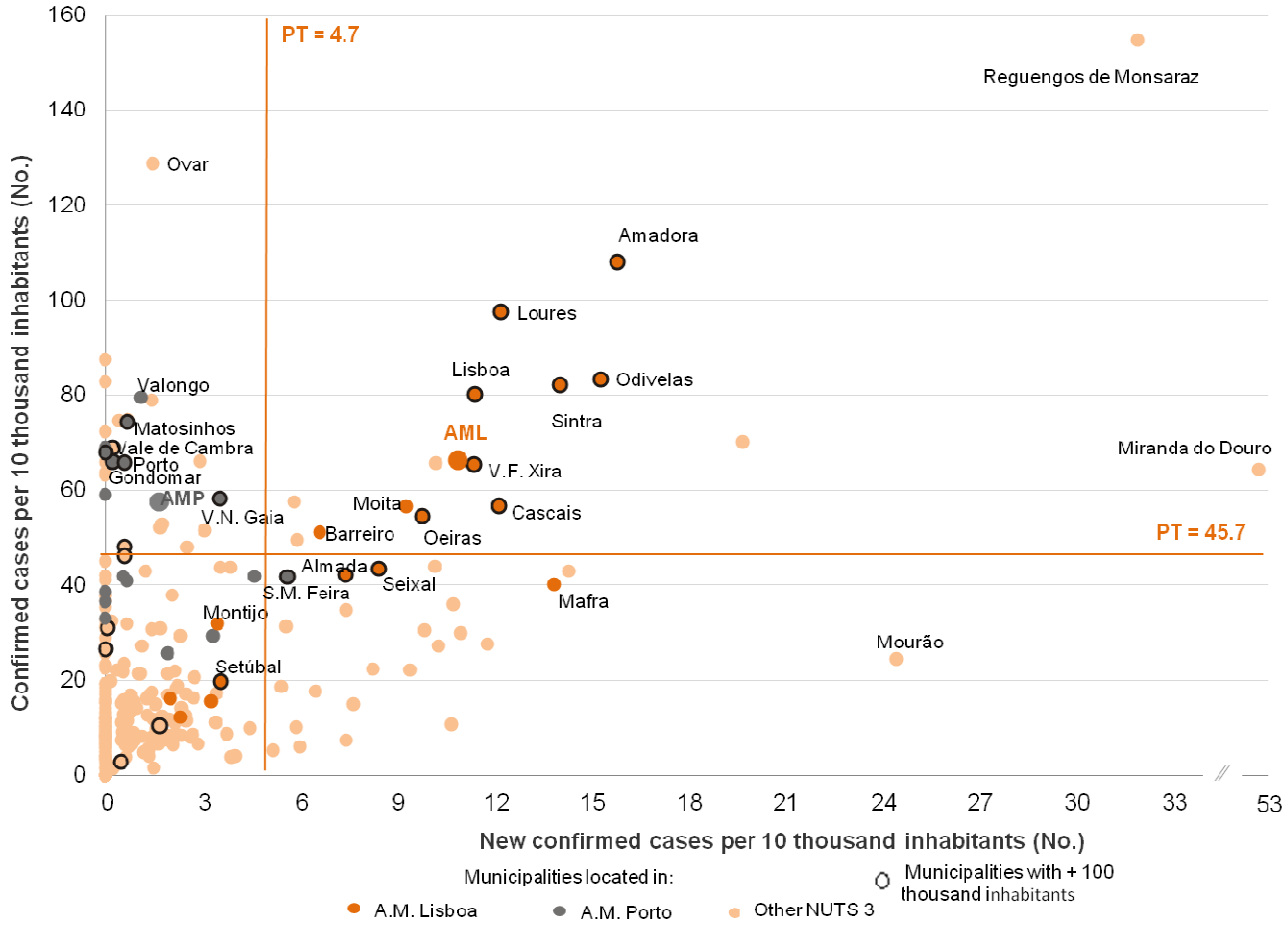


Location coefficient	
13 July - Monday	51.7
June 29 - Monday	56.4
June 15 - Monday	55.2
June 1 – Monday	48.9
April 13 - Monday	37.4

Source: Directorate-General of Health, Daily COVID-19 Status Report (released on July 16); INE, I.P., Annual estimates of resident population, 31 December 2019.
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).

The following figure illustrates the relationship between the total number of confirmed cases per 10,000 inhabitants by July 13 and the number of new cases registered per 10,000 inhabitants on July 13 (last 14 days). Of the 42 municipalities with a number of confirmed cases per 10 thousand inhabitants above the value for Portugal, 16 also had new confirmed cases per 10 thousand inhabitants above the national average and, of this total, 10 municipalities were located in the Metropolitan Area os Lisboa: Amadora (15.9 new cases per 10 thousand inhabitants), Odivelas (15.3), Sintra (14.1), Loures (12.2), Cascais (12.2), Lisboa (11.4), Vila Franca de Xira (11.4), Oeiras (9.8), Moita (9.3) and Barreiro (6.7). In the 14 days ended in July 13, those municipalities represented 54% of the new cases in the country and 85% of the AML.

Figure 28 – Number of confirmed cases per 10 thousand inhabitants on July 13, 2020 and Number of new confirmed cases per 10 thousand inhabitants on July 13 2020 (last 14 days), by municipality

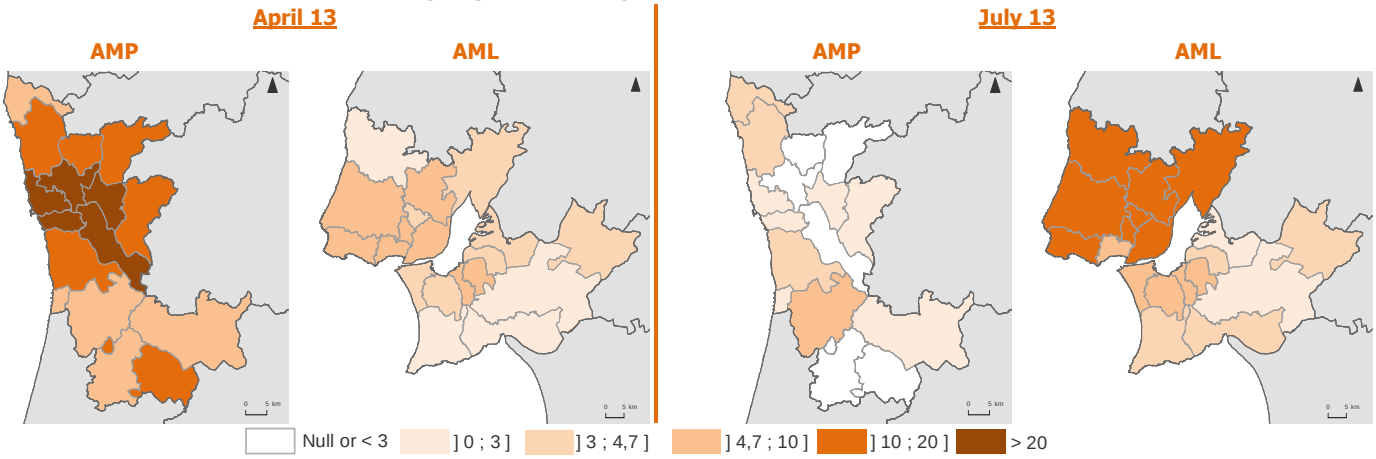


Source: Directorate-General of Health, Daily COVID-19 Status Report (released on July 16); INE, I.P., Annual estimates of resident population, 31 December 2019.

Given the high population density that characterizes the two metropolitan areas, the dynamics of new confirmed cases of COVID-19 in these territories is particularly relevant.

The following figure shows the number of new cases of COVID-19 per 10 thousand inhabitants for the municipalities of the Metropolitan Area of Porto (AMP) and the Metropolitan Area of Lisboa (AML) on April 13 and July 13 (last 14 days), and allows the observation that at the beginning of April the incidence of new cases per 10 thousand inhabitants was more evident in the municipalities of the Metropolitan Area of Porto, particularly the contiguous municipalities of Valongo, Gondomar, Matosinhos, Maia and Porto, and also the municipality of São João Madeira, which reported on April 13 more than 20 new cases per 10 thousand inhabitants. In turn, the most recent situation, as measured on July 13 (last 14 days), shows that the emergence of new cases particularly affects the municipalities on the northern area of the Metropolitan Area of Lisboa, highlighting seven municipalities - Amadora, Odivelas, Sintra, Loures, Cascais, Lisboa and Vila Franca de Xira - which reported more than 10 new cases per 10,000 inhabitants.

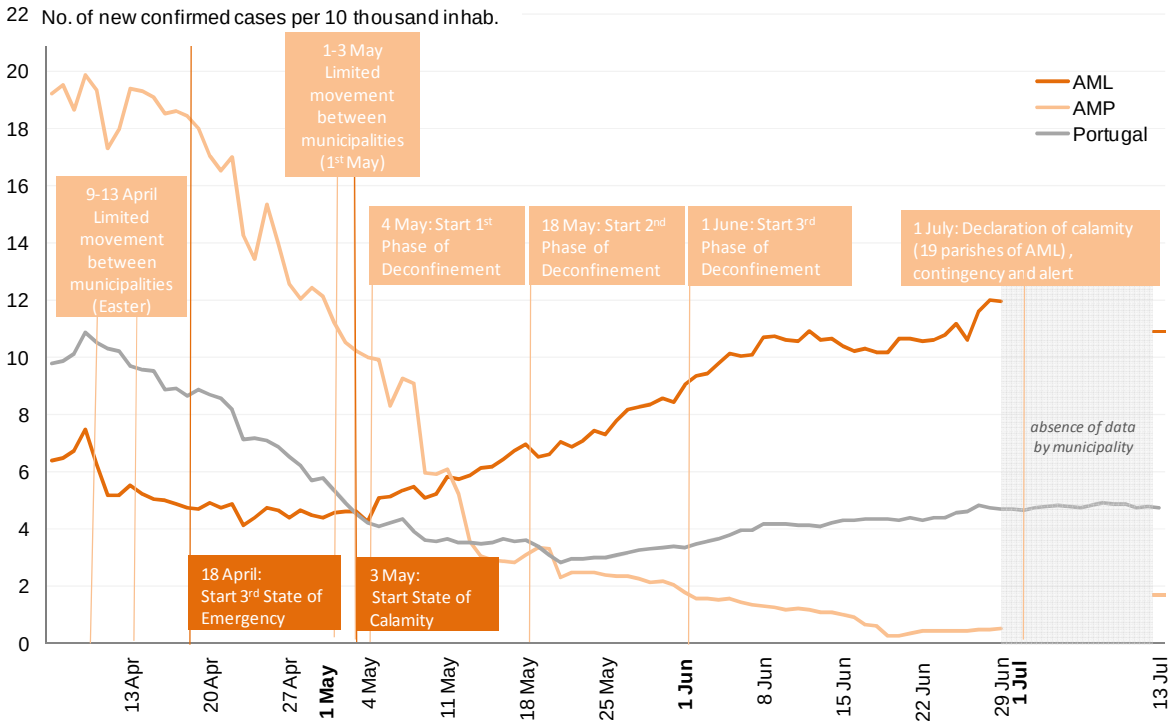
Figure 29 – New confirmed cases of COVID-19 (last 14 days) per 10 thousand inhabitants in the days of April 13 and July 13 by municipality in the metropolitan area of Lisboa and Porto



Source: Directorate-General of Health, Daily COVID-19 Status Report (released on July 16); INE, I.P., Annual estimates of resident population, 31 December 2019.

The following figure shows the number of new cases registered in the last 14 days per 10 thousand inhabitants for the total of the country and for the metropolitan areas of Porto and Lisboa for the period from April 6th to July 13th. In this context, the progressive slowdown in the number of new cases registered in the Metropolitan Area of Porto should be highlighted, and, in turn, the progressive increase in the number of new cases in the Metropolitan Area of Lisboa (AML), with this region registering figures above the national average since 3 May. In the 14-day period ending July 13, AML represented 64% of new cases in the country (28% of the resident population in 2019), compared to 71% on June 29, suggesting a slight decrease in the concentration of new cases in AML.

Figure 30 – New confirmed cases in the last 14 days per 10 thousand inhabitants, by day, Portugal, metropolitan areas of Lisboa (AML) and Porto (AMP)



Source: Directorate-General of Health, Daily COVID-19 Status Report (released on July 16); INE, I.P., Annual estimates of resident population, 31 December 2019.
Note: The dates marked on the graph axis correspond to the first days of the month and Mondays. The absence of values for June 30th to July 12th is due to the interruption in the dissemination of data at the municipality level in the situation reports.

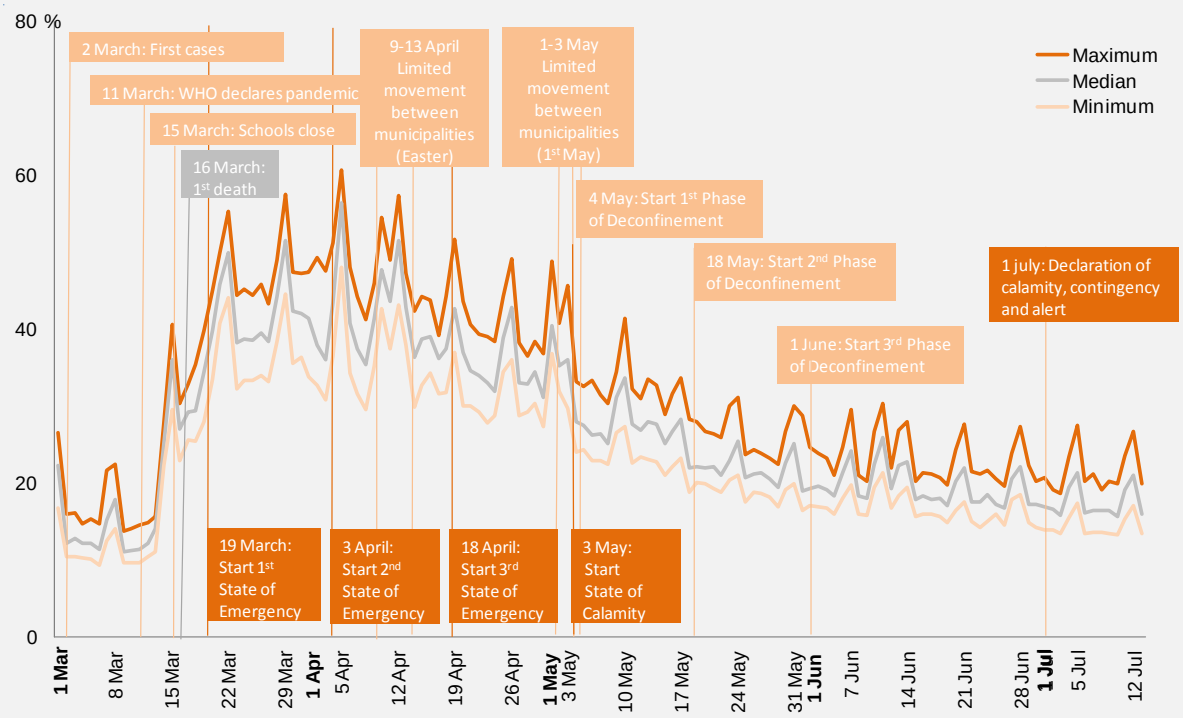
STATS lab

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 July 13th, 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 31: Proportion of the population "staying put" between March 1st and July 13th – minimum, median and maximum values of NUTS 3

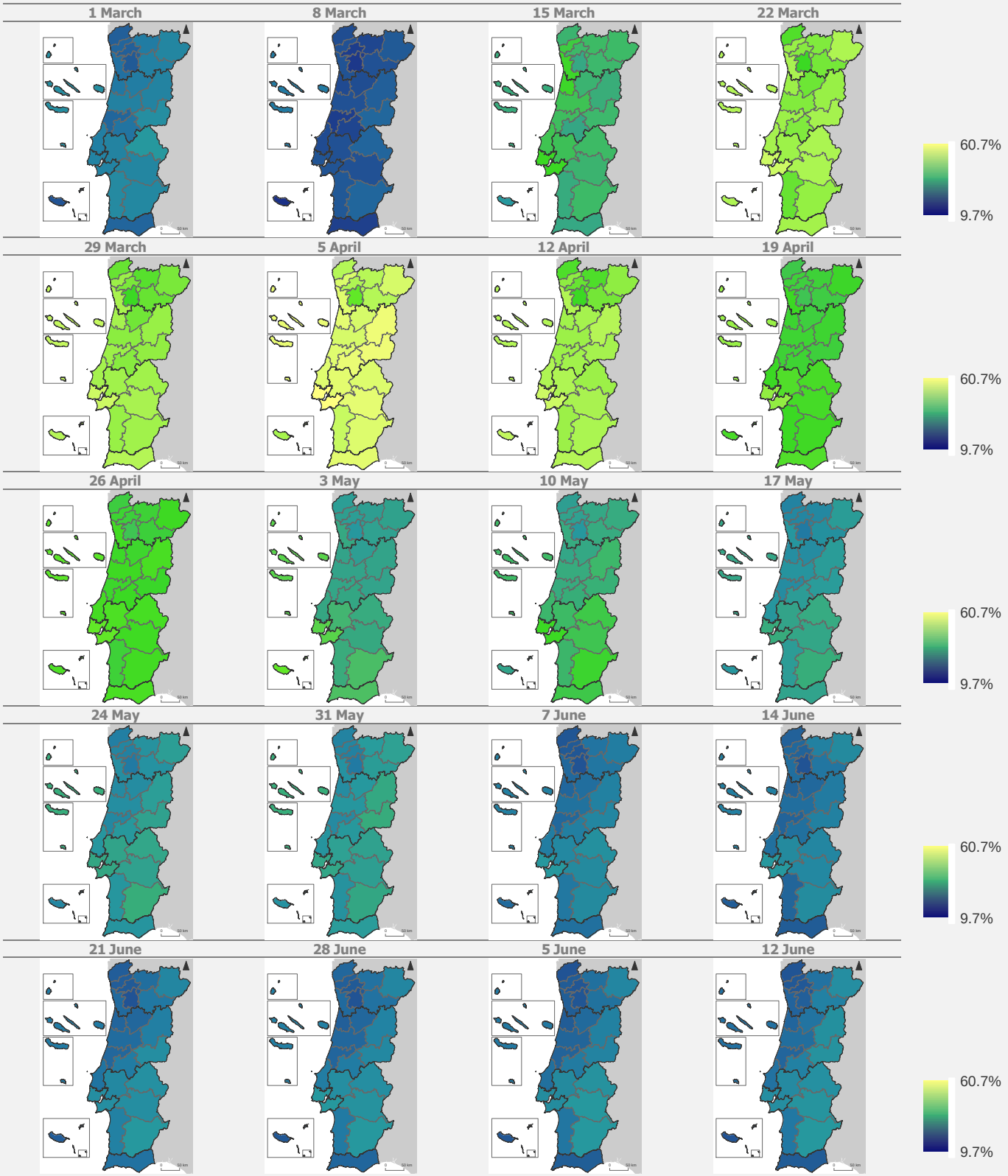


Source: Facebook's "Data for Good" Initiative. Data provided by Carnegie Mellon University.
Note: The dates marked on the graph axis correspond to the first days of the month and to Sundays.

The following figures show this indicator at NUTS 3 level for the days corresponding to Sundays [Figure 32] and Mondays [Figure 33], 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). On the contrary, a progressive increase in mobility has been registered with the transition from the State of Emergency to the State of Calamity on May 3, followed by the first phase of implementation of the deconfinement measures (maps on May 3, 4, 10, 11 and 17 May), by the second phase of deconfinement on May 18 (maps on May 18, 24, 25 and 31 and June 1), by the third phase of deconfinement (maps on June 1, 7, 8, 14, 15, 21, 22, 28 and 29 June), and, more recently, by the passage to the State of Alert in general in the country, the State of Contingency in the AML and the State of Calamity in 19 parishes of the AML (maps 5, 6, 12 and 13 of July).

STATS lab

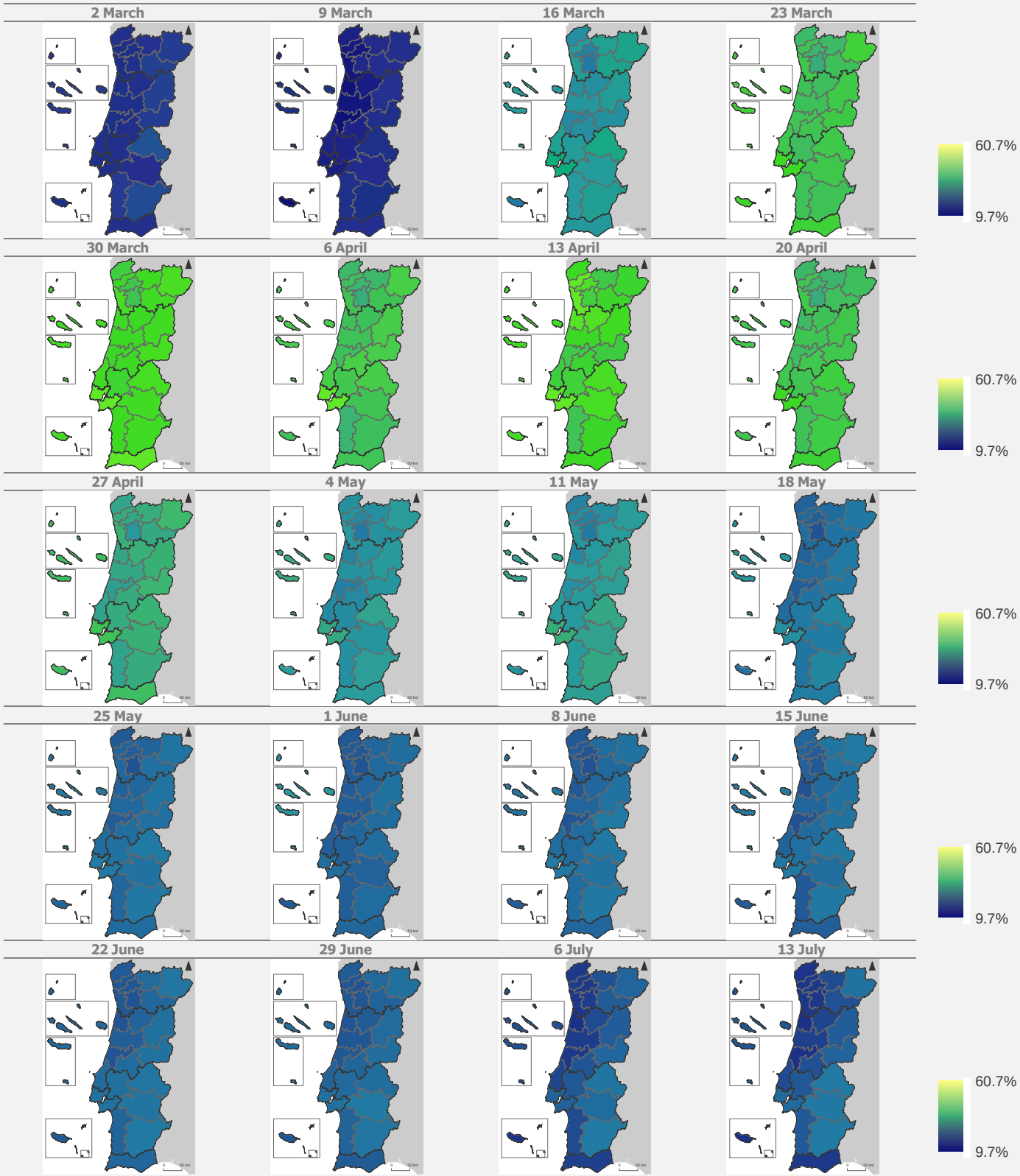
Figure 32: Proportion of the population "staying put" on Sundays between March 1st and July 12th by NUTS 3



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

STATS lab

Figure 33: Proportion of the population "staying put" on Mondays between March 2nd and July 13th by NUTS 3



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

Technical note

Data sources

Data regarding the characterization of the housing stock are based on the results of the **Population and Housing Census - CENSOS 2011**. The 2011 Census geographical scope corresponds to the whole country and it collects data at the level of the statistical subsection. The following statistical units are exhaustively observed: buildings, dwellings, households and individuals.

Data on trips of the resident population using public transport is based on the results of the **Survey on Mobility in Metropolitan Areas of Porto and Lisboa** carried out with reference to Eurostat's Guidelines on Passenger Mobility Statistics, as well as the good practices identified in similar international projects and supported by the Metropolitan Areas of Porto and Lisboa. The reference universe of this survey is the population living in the municipalities of the metropolitan areas, the sample was based on a zoning based on homogeneous areas of accessibility to transport. In the selected dwellings all resident individuals, aged between 6 and 84 years, were observed.

Data on potential accessibility of the resident population to train stations - proportion of resident population in 15 minutes walking distances from train stations for passengers - is within the framework of Statistics Portugal's experimental statistics. It is a project on accessibility indicators financed by the European Commission in the framework of a Eurostat grant for the development of regional and urban statistics. The results are based on the integration of geographical information in relation to the resident population (Census 2011), r train stations for passengers and navigation models.

The data on the level of qualifications of employees are based on the statistical operation **Lists of Personnel**, which is a census-type operation, resulting from an administrative procedure. The obligation to hand over the Lists of Personnel concerns all entities with employees at their service, with the exception of the central, regional and local administration and public institutes (for these entities it is only applicable to employees under individual employment contracts) and employers of domestic service workers. The information relating to the Lists of Personnel is included in Annex A of the Single Report under the responsibility of the Office of Strategy and Planning of the Ministry of Labour, Solidarity and Social Security. The information presented on the basis of the Lists of Personnel concerns full-time and fully paid employees and its spatialisation is based on the location of the establishment.

The information on the labour market is based on the publication **Unemployment Registered by Municipality - Monthly Statistics** of the Institute of Employment and Professional Training (IEFP). Monthly Registered Unemployment data refers to the number of registers during the month for individuals aged 16 or over (subject to the reservations provided by law), registered in the Employment Centres to obtain a job as an employee, who do not have a job and are immediately available for work. The monthly data of Placements refer to Job Vacancies (available jobs reported by employers to the Job Centres) satisfied with candidates submitted by the Employment Centres.

Data on income is based on the publication **Income Statistics at local level** within the StatsLab domain. These statistics result from the use of administrative sources, namely the information from the Personal Income Tax (IRS - Model 3), obtained from the Tax and Customs Authority (AT) under a protocol signed with INE. The geographical scope is the country, the statistical unit being the tax aggregate and the target population the tax aggregates with declared gross income deducted from the personal income paid tax higher than zero. The results disseminated in the Income Statistics at Local Level are based on the values of 'Gross declared income', 'Personal income paid tax ' and the derived variable 'Gross declared income deducted from personal income paid tax ', by tax aggregate and taxable person. The annual value of declared gross income covers only the income that is declared and that is the tax base: Income from employment (Category A), business and professional (Category B), capital (Category E), real estate (Category F), asset increases (Category G) and pensions (Category H).

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**".

Also, data on new lease agreements are based on 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**".

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. For the reference dates considered in this press release 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. In fact, when the confirmed cases by municipality are fewer than 3, for confidentiality reasons, data are not disclosed by the Directorate-General of Health.

This press release includes the resident population data as of December 31, 2019 released on June 15.

STATS lab

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. 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[4] for his support in the analytical preparation of this information.

Disseminated Indicators

Population density

Proportion of buildings with 7 or more dwellings

Average number of rooms per conventional dwellings of usual residence

Usable area of conventional dwellings of usual residence per inhabitant

Proportion of trips of the resident population outside the municipality of residence using public transport (bus, train, metro and boat) as the main mean of transport

Proportion of trips of the resident population using public transport bus, train, metro and boat) as the main mean of transport

Proportion of resident population at 15 minutes walking distance from a train station for passengers

Proportion of working age population

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

Proportion of employees with tertiary education in establishments

Unemployed registered at employment centres throughout the month per thousand inhabitants with 15-64 years old

Median value of gross reported income deducted from personal income paid tax per taxable person

Median value per m^2 of dwellings sales, 4th quarter 2019 (last 12 months)

Median house rental value per m^2 of new lease agreements of dwellings, 4th quarter 2019 (last 12 months)

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

Number of new confirmed cases of COVID-19 disease in the last 14 days per 10 thousand inhabitants

Proportion of resident population with 75 or more years old

Location coefficient

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

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