



Liguria
Digitale

Genoa population Monitoring in Covid Emergency



COMUNE DI GENOVA



Genoa population Monitoring in Covid Emergency

- As almost all over the world, also in Liguria and in the city of Genoa Covid-19 has spread, completely changing our way of life.
- Health and social emergency management has seen a massive use of the most modern technologies, both in health and in e-government sector.
- In this context, data related to population and mobility have been a fundamental support for competent authorities' decisions.
- In order to better understand the size of the emergency and take appropriate measures to contrast its spread, the Municipality of Genoa could rely on Liguria Digitale's technological support, the regional ICT in-house company, involved in various operational phases of emergency management since the beginning.



- Thanks to all the efforts made and thanks to investments in highly qualified technologies and human resources, Liguria Digitale, in collaboration with **TIM** (an Italian telecommunications company), could make available a **Big Data Analytics Platform** that allows, in full compliance with GDPR, to have a population monitoring systems with particular reference to:
 - All incoming movements from other regions;
 - All outward movements towards other regions;
 - All movements that originate and go to internal municipalities of Liguria region;
 - Movements between provinces in the region;
 - Movements within a specific province (inbound and outbound);
 - Movements between the “ACE” (Census Area) of the same city (in and out).





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- In addition, thanks to the collaboration of our Data Scientists with TIM technicians, we worked on some interactive digital reports that allow us to highlight, in relation to the city of Genoa:
 - All travels between the Census Areas of the municipality (ACE to ACE, attributable to the city districts);
 - All the movements inside the Census Area of the municipality.
- This way we will have anonymous monitoring of the residents and we will be able to identify areas of anomalous aggregation by time slot, managing to highlight not only where people are concentrated incorrectly but also from which area / neighborhood they come from. This will provide innovative planning tools, unthinkable until some time ago, useful for better defining controls and monitoring on the territory.



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A world map where several countries are highlighted in a teal color. These include the United States, Canada, Mexico, Brazil, Argentina, Chile, Peru, Colombia, Venezuela, Ecuador, and several countries in Europe, Africa, and Asia. The rest of the world is shown in light grey.

Definitions & Guidelines



- Introduction to the concept of Movement and Unique Presence used:
 - Origin / Destination (O / D) and ACE matrix;
 - «Stop Time» greater than 30 minutes;
 - TIM data (market share TIM);
 - Single Daily Presence;
 - «Residents» and Nomads.
- Analysis and dashboards created for the Regions:
 - Displacements (outgoing, incoming, internal);
 - KPI (% , delta last 14 days / previous day, hourly and daily trends, etc.);
 - Municipal details.

- In an Origin / Destination (O / D) matrix, on each intersection between the area of origin and the destination area, are shown the total of users who, in the reference time interval, made a shift between the origin and the destination area.
- There is a shift between two areas (Origin and Destination) when a user has been detected "stationary" (stop) for a certain period in the Origin area and subsequently has been detected "stationary" (stop) in the destination area. This way, the user detections that existed along the path between the origin and destination areas are filtered.
- For example, if a user stands still for a certain time (longer than the stop time) in municipality A, then he starts moving towards municipality B and does not stop during the journey or makes short stops (less than the stop time), arrived at common B stops for a longer time than the stop time, in the O / D matrix we will have a shift between A and B.
- All users who use the TIM network are detected and therefore also those who have a

SINGLE DAILY PRESENCE

The network produces every 15 minutes the counter of the number of SIM cards certified on the TIM network hooked to the cells (TIM).

Every day we therefore receive 96 photographs of presence - equal to the number of quarter of an hour a day.

The presence at the quarter of an hour is a **UNIQUE PRESENCE**.

Under the quarter of an hour there is no detection of presence.

In the case of Genoa, the presence is unique **DAILY**, so there is no double counting of the same SIM at different times of the day (the 96 "photographs" at the quarter of an hour have been cleaned up of duplicates).

ACE Residence

It is calculated from events carried out in the last 30 days, in particular on the following days of the week and hours: Monday, Tuesday, Wednesday and Thursday from 00:00 to 06:00 and from 22:00 to 24:00; Friday from 00:00 to 06:00.

The prevailing ACE is the ACE of residence

Resident

Presence event held in the Residence ACE

Nomadic

Who is resident outside the city of Genoa

The following KPI are used in the analysis and in the dashboard that supports it:

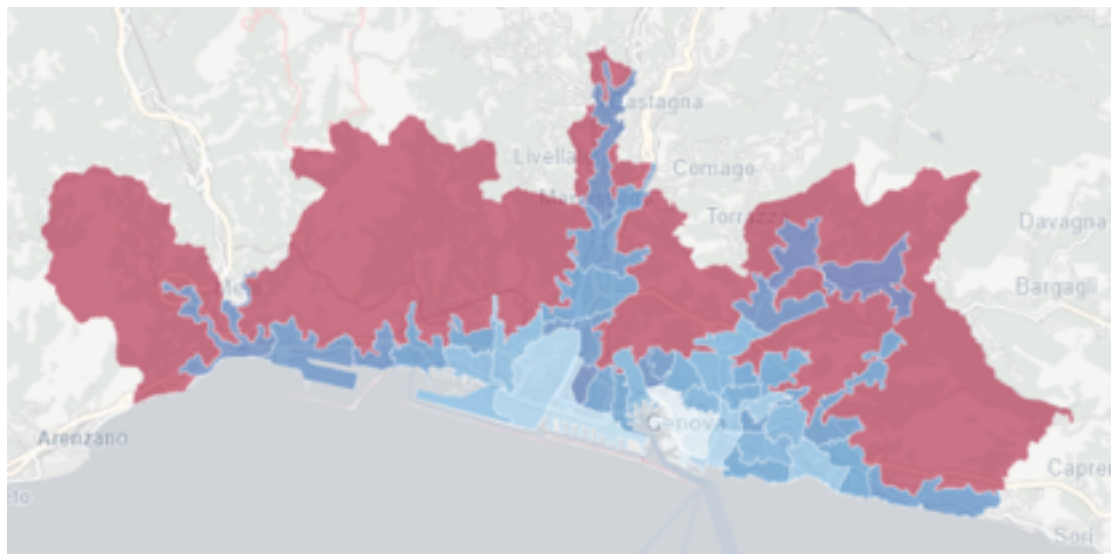
- **Outbound displacements:** represents the sum of all displacements that originate from an area of the region and as destination an area outside the region, will be marked with the color in **red**.
- **Inbound displacements:** represents the sum of all displacements that originate from an area outside the region and as destination an area within the region, will be co-distinguished with the color in **green**.
- **Internal displacements:** represent all those displacements that originate and destination any area within the region. Intra-municipal (within the same municipality) or extra-municipal (if both municipalities are from the same region) as well as intra and extra-provincial movements are included as long as the provinces are from the same region. They will be marked by the **orange** color



Genoa population Monitoring in Covid Emergency

- In the following slides you will see some real examples of population monitoring in the City of Genoa.
- Data related to population and mobility have been a fundamental support for competent authorities' decisions.

This will provide innovative planning tools useful for better defining controls and monitoring on the territory.



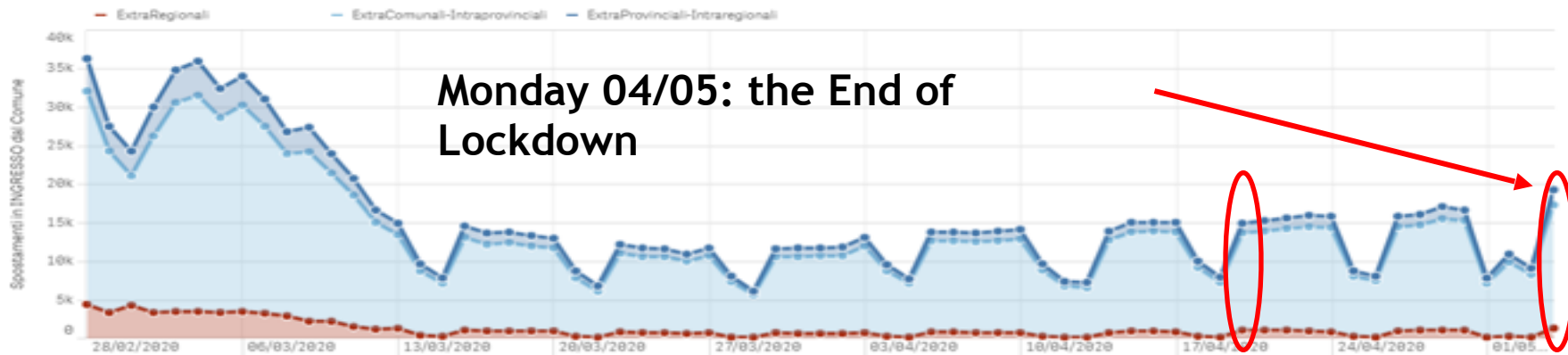
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Movements (extra municipal) in entrance to Genoa (Mon. 04/05 VS. Mon. 20/04)

DO NOT consider the absolute values but only the trend, for example the extra municipal and extra provincial (intraregional) approx. + 30%

= ((displacements 04/05) - (displacements 20/04)) / (total displacements of 20/04) = (19.5k - 15k) / 15k = 0.3

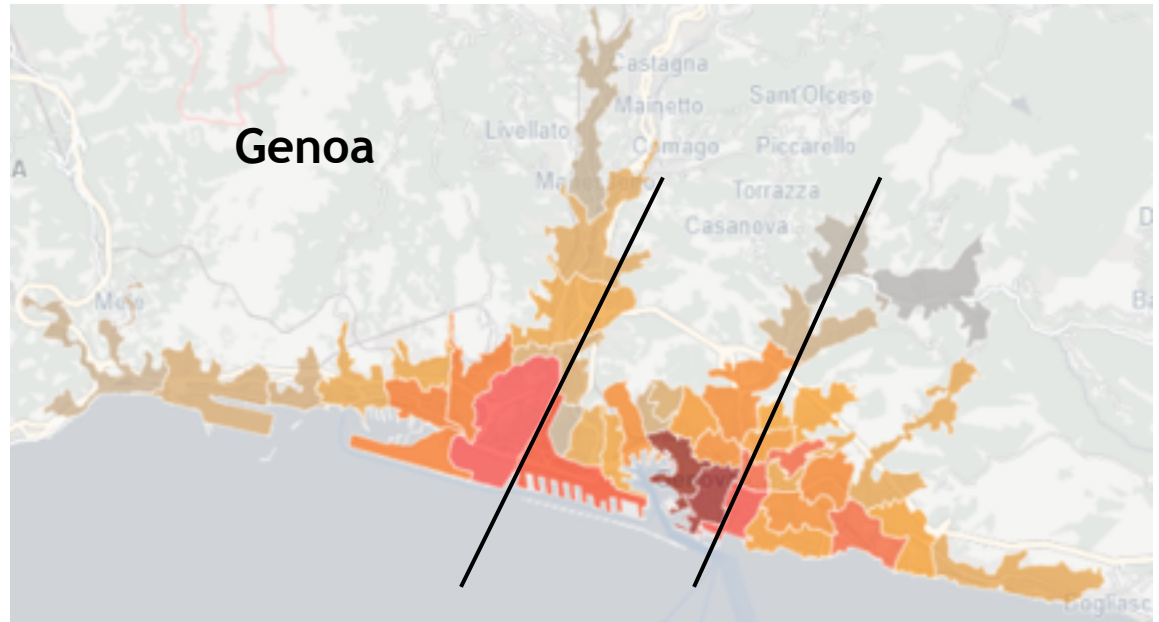
Trend Giornaliero Spostamenti IntraExtra



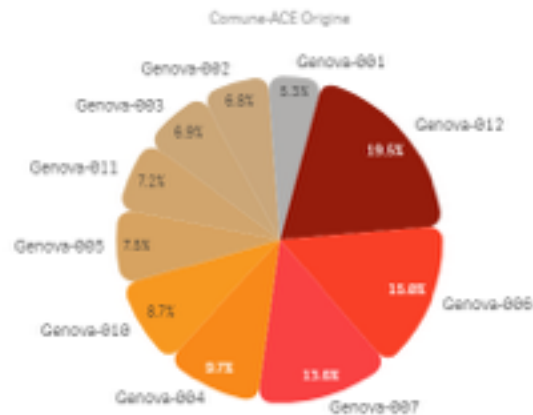
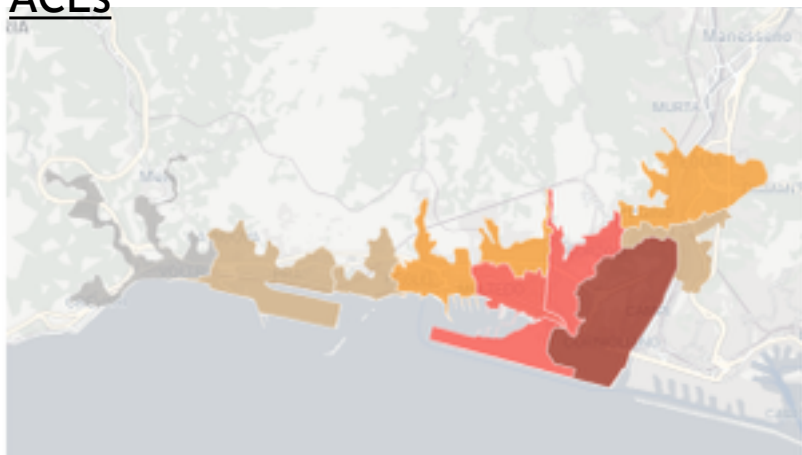
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In order to better understand city's phenomena and peculiarities, the city itself has been divided in 3 areas:

- West
- Center
- East



EXTRA ACE transfers with Origin in the Genoese West and destination in all ACEs



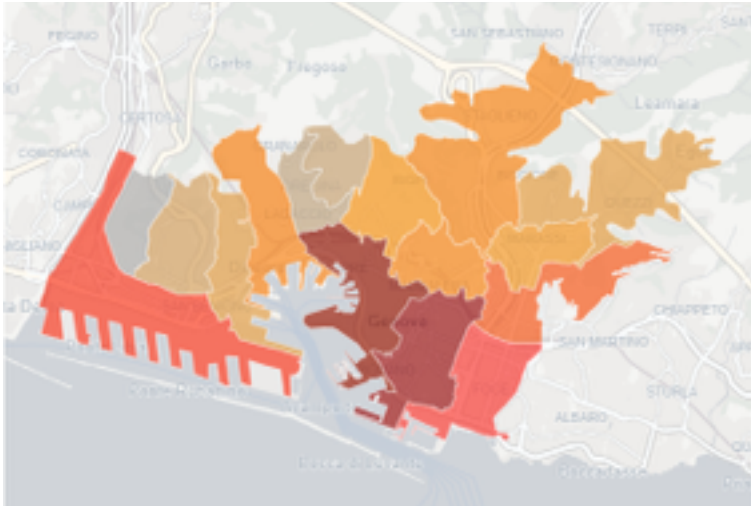
Analysis period: comparison between 09/03, 06/04 and 04/05/2020:

- 09/03 → 45.108 Extra ACE Transfers
- 06/04 → 30.459 Extra ACE Transfers: - 32%
- 04/05 → 39.854 Extra ACE Transfers: + 30%

Darker colors indicate ACEs that generate more outgoing traffic

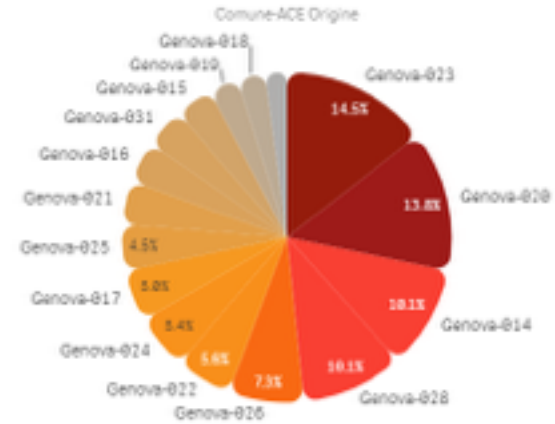
Transfers between 09/03 and 04/05:
→ - 12 %

EXTRA ACE transfers with Origin in the Genoese Center and destination in all ACEs



Analysis period: comparison between 09/03, 06/04 and 04/05/2020:

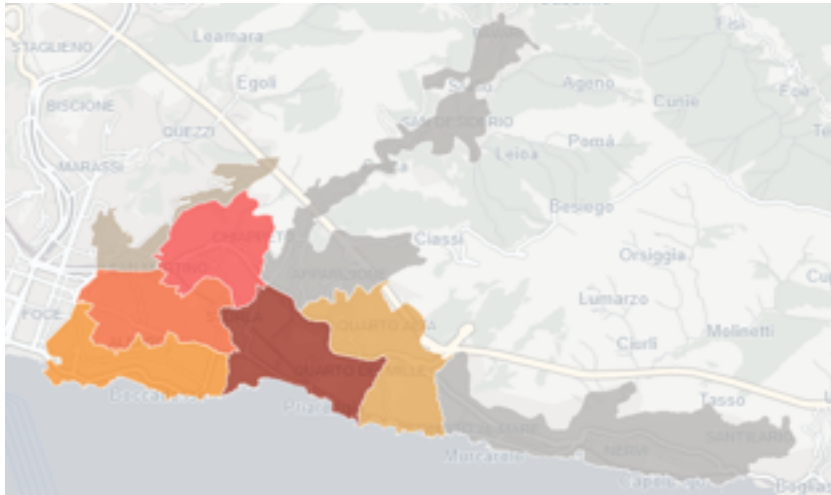
- 09/03 → 95.601 Extra ACE Transfers
- 06/04 → 60.472 Extra ACE Transfers: - 37%
- 04/05 → 63.709 Extra ACE Transfers: + 5%



Darker colors indicate ACEs that generate more outgoing traffic

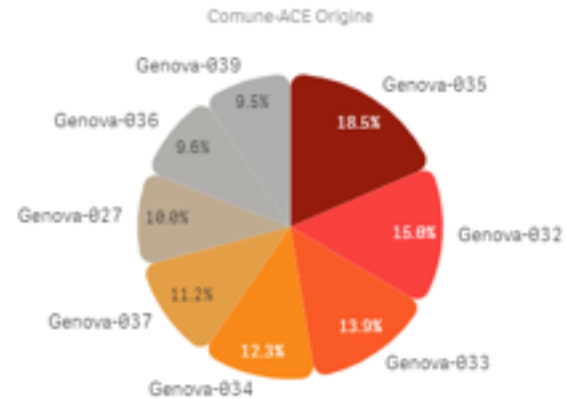
Transfers between 09/03 and 04/05:
→ - 33 %

EXTRA ACE transfers with Origin in the Genoese East and destination in all ACEs



Analysis period: comparison between 09/03, 06/04 and 04/05/2020:

- 09/03 → 36.988 Extra ACE Transfers
- 06/04 → 25.417 Extra ACE Transfers: - 31%
- 04/05 → 26.048 Extra ACE Transfers: + 2%



Darker colors indicate ACEs that generate more outgoing traffic

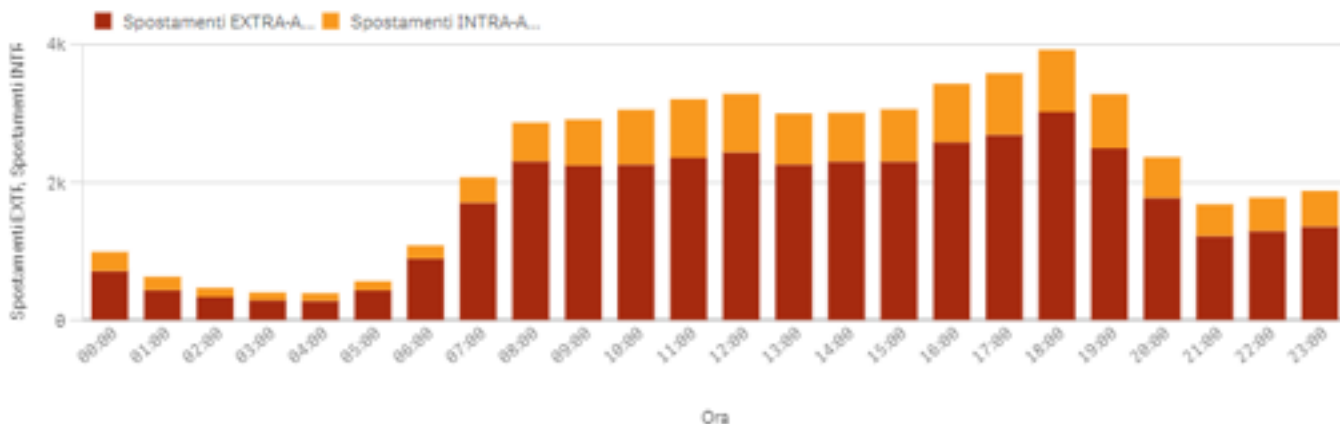
Transfers between 09/03 and 04/05:
→ - 30 %

EXTRA ACE transfers with Origin in the West and destination in all ACFs

TIME BANDS: 04/05/2020

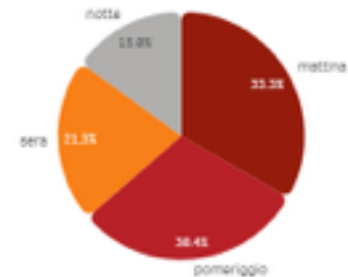
Distribuzione Spostamenti ...

Distribuzione Spostamenti ...



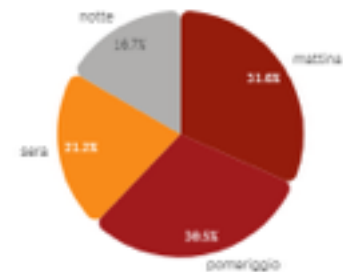
T Spost. EXTRA-ACE
 T Spost. INTRA-ACE

Distribuzione T spostamenti ExtraACE



T Spost. EXTRA-ACE
 T Spost. INTRA-ACE

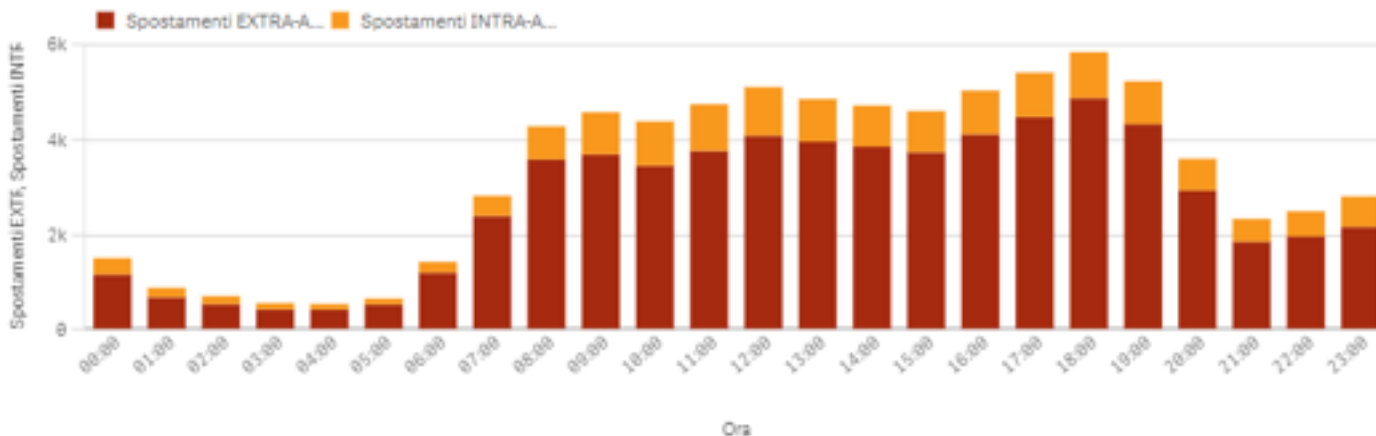
Distribuzione T spostamenti IntraACE



EXTRA ACE transfers with Origin in the Center and destination in all ACEs

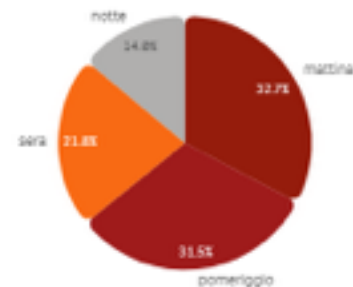
TIME BANDS: 04/05/2020

Distribuzione Spostamenti ... Distribuzione Spostamenti ...



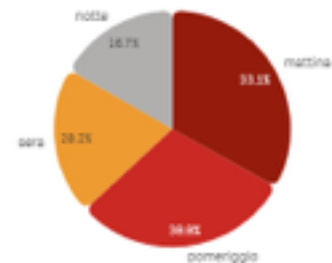
1 Spost. EXTRA-ACE 1 Spost. INTRA-ACE

Distribuzione % spostamenti ExtraACE



1 Spost. EXTRA-ACE 1 Spost. INTRA-ACE

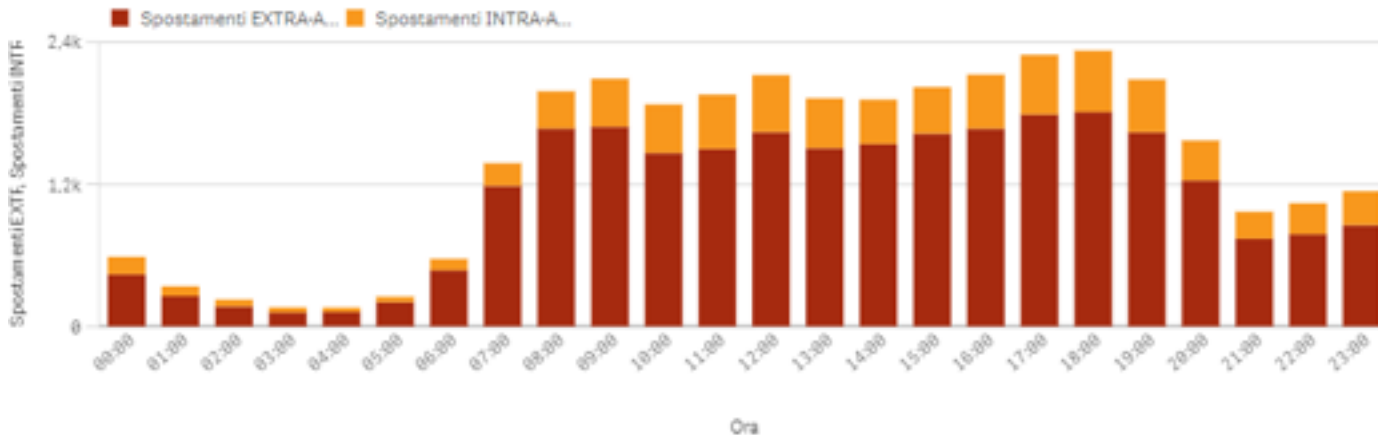
Distribuzione % spostamenti IntraACE



EXTRA ACE transfers with Origin in the Levant and destination in all ACEs

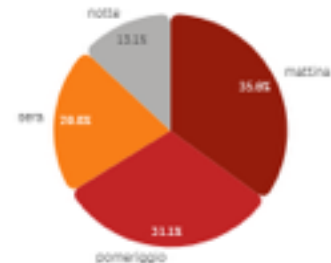
TIME BANDS: 04/05/2020

Distribuzione Spostamenti ... Distribuzione Spostamenti ...



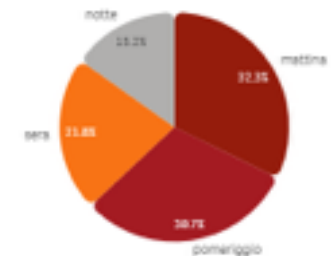
Spost. EXTRA-ACE Spost. INTRA-ACE

Distribuzione % spostamenti ExtraACE



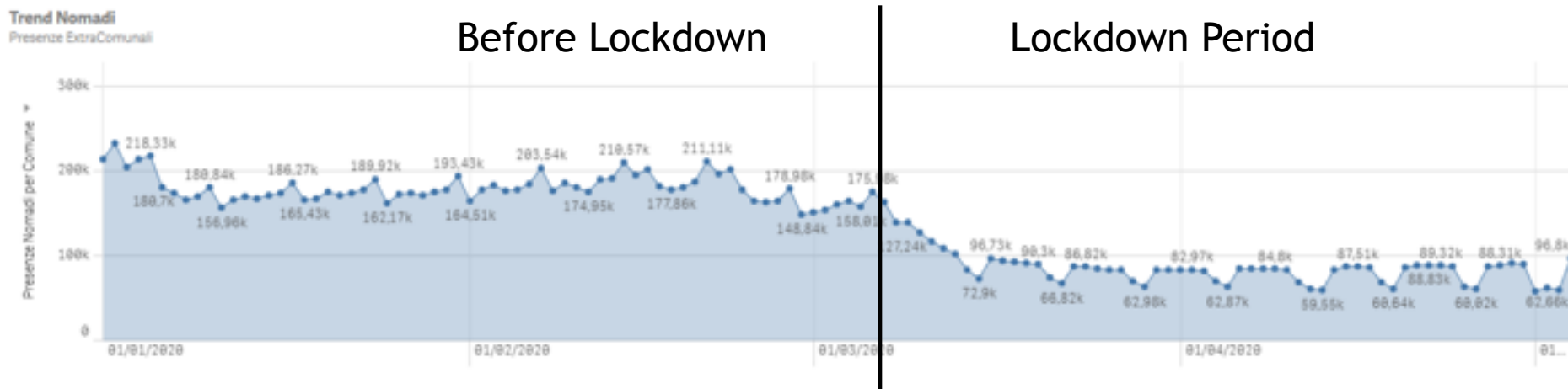
Spost. EXTRA-ACE Spost. INTRA-ACE

Distribuzione % spostamenti IntraACE



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Total daily unique presences NOMADS (all NON-Residents) - GENOA



09/03/2020 Tot NOMADS: ca. 138.990

06/04/2020 Tot NOMADS: ca. 84.320, - 39 %

04/05/2020 Tot NOMADS: ca. 96.800, + 15 %

DO NOT consider absolute values but only the trend

NOMADS reduction between 09/03 and 04/05:
→ - 30 %



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All this wants to be a strong signal of Liguria Digitale and TIM who want to put their know-how and tools at the disposal of institutions with the ambition of being at the forefront even in the face of this emergency call.

Thanks for the attention