



Ministero della Salute



Centro Nazionale Prevenzione
e Controllo Malattie

Trend of the Daily Mortality (SiSMG) in Italian cities in relation to the Covid-19 epidemic

Report February 1 - March 21

By:

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1. Introduction

- A new human coronavirus, named 2019-nCoV, has been reported since December 2019 in the Chinese city of Wuhan. On January 30, 2020, after the second meeting of the Security Committee, the Director General of the World Health Organization (WHO) declared the international outbreak of the new coronavirus 2019-nCoV an emergency of public health of international relevance (Public Health Emergency of International Concern - PHEIC). On February 21, 2020, the ISS confirmed the first autochthonous case diagnosed at the Sacco Hospital in Milan of COVID-19 (Corona Virus Disease).
- Since the beginning, the data of the Chinese epidemic, which started two months in advance, has been used to draw useful elements to understand the evolution of the Italian picture. However, it is now clear that the Italian epidemic differs in several respects from the Chinese one (Onder et al. 2020). The basic reproductive number of the two epidemics, which characterizes the potential transmissibility of the infection in the early stages of the epidemic, was estimated at 3.15 (95% CI: 1.71–5.21) in Hunan and at 4.10 (95% CI: 2.15–6.77) in Italy (Wangping 2020). The percentage of serious cases also seems higher in Italy, where the percentage of patients admitted to ICU reaches 13% (3600 patients out of about 28,000 hospitalized, data updated to 26 March 2020 source DPC) while in a recent meta-analysis of Chinese studies is around 9% (Jain 2020). <https://coronavirus.jhu.edu/map.html>). A possible explanation for this observed difference was attributed to the different age structure of the two populations, the Chinese one on average younger than the Italian one (population 65+ 11% and 25% respectively).
- Mortality, expressed as a case-fatality ratio, is higher in Italy (7.2%) than in China (2.3%) (Onder et al. 2020). The estimates show a similar case-fatality ratio in the two countries up to the age group 60-69 years (about 3.5%) but a greater increase with increasing age in our country (respectively 12.8% and 8% in the class of age 70-79 years and 20.2% and 14.8% in the class > 80 years) (Riou, 2020). A possible explanation for this observed difference has been attributed to the presence of co-morbidities in the elderly population.
- The Italian epidemic began in Northern Italy, in Lombardy, which to date records about 40% of cases notified at national level and over 60% of deaths, followed by Emilia-Romagna (13% of cases and 14% of deaths), while in the Central-South regions about 19% of national cases and 11% of deaths are recorded (data updated to 26 March 2020, source DPC). The deaths recorded today represent the mortality of the cases of about two weeks before, as it has been estimated that about 9 ± 7 days elapse between infection and death (Cao 2020).

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- The Daily Mortality Surveillance System (SiSMG) is managed by the Epidemiology Department of the SSR Lazio, ASL Roma 1 on behalf of the Ministry of Health (CCM Central Action Project and as a National Competence Center for Civil Protection). The rapid surveillance system, created to provide real-time data during the heat wave emergency, is operational in 33 Italian cities (regional capitals or cities with > 250,000 inhabitants) and is included among the systems of national relevance (DPCM 3 March 2017).
 - SiSMG data represent the only source available in Italy (and one of the few systems in Europe) able to monitor in real time the trend of total mortality⁴ and to estimate, for the main Italian cities, excess mortality daily in relation to the spread of the COVID-19 virus, producing estimates of the number of excesses by age groups, using the historical series of daily mortality data for each city included in the surveillance as reference data. The data in this report will be updated weekly

1.1 Material and methods

- In collaboration with the Municipal Registry Offices, the data relating to the deaths of residents and deaths in the municipalities included in the surveillance are notified daily to the DEPLACE. Daily mortality is reconstructed through the death reports sent in the following 72 hours and compared with a reference historical series (expected value), producing an estimate of the number of excess deaths (n. And%). The data acquisition system uses an online platform. For each city, the expected daily mortality is defined as the average per day of the week and number of the week calculated in the previous 5 years and weighed for the resident population (ISTAT data) to take into account the progressive aging of the population. The estimate of excess mortality is calculated as the difference between the observed mortality values and the expected mortality values. Information on the cause of death is not available.
- In this report, the mortality data for a subgroup of cities are reported, the 19 * cities included in the weekly mortality surveillance bulletin published on the Ministry of Health portal for which daily / weekly updates are ensured. The mortality data are presented by single city and aggregated for the northern cities (Aosta, Bolzano, Trieste, Turin, Milan, Brescia, Verona, Venice, Bologna, Genoa) and for the central-southern cities (Perugia, Civitavecchia, Rome, Frosinone, Bari, Potenza, Messina, Palermo), for all ages, and for the older age groups (65-74, 75-84 and 85+ years.)

* Trento and Trieste have suspended the sending of data

2. Summary of results

- This report reports mortality data from 1 February to the last day available in each city, for surveillance during the COVID-19 epidemic
- Figures 1A and 1B and Figure 2A and B show the trend of weekly mortality for all ages and age classes (65-74, 75-84, 85+) during the period September 26, 2019 - March 17, 2020 for the cities of the north and central-south I. In the cities of the north there has been an increase in mortality in the 75-84 and 85+ age groups since the beginning of March. This increase starting from the second week of March exceeds the expected total mortality value and the estimated confidence intervals. In central-southern cities, a slight increase is observed only in the 65-74 age group. Figure 3 shows the mortality data per week and by age group (0-14, 15-64, 65-74, 75-84, 85+) for the cities of the north and central-south and in both notes that most of the deaths are in the older age groups 75-84 and 85+ years.
- Figure 4 shows the seasonal trend of daily mortality in the last 5 years, with maximum values in the winter period (December-February) and minimum values in the summer period (June-August), months during which the associated mortality peaks are observed to heat waves. The seasonality of mortality is a phenomenon that is accentuated with age. The increase in winter mortality is attributable to low temperatures and influenza epidemics which independently and with synergistic effect, can lead to an increase in mortality especially in the older population groups and in patients with chronic cardiovascular and respiratory diseases (de'Donato et al. 2012; Vestergaard et al. 2017). In the graph, the colored bands indicate the flu epidemic given by ISS flunews. The ISS estimates in Italy about 8,000 deaths per year attributable to the flu epidemic, even if the number of attributable deaths is highly variable, up to 20,000 estimated deaths in winter 2016/17 (Rosano et al. 2019). It should be noted that in the winter of 2019-2020 the observed mortality (black line) in the months preceding the Covid-19 epidemic was lower than the expected value (red line) (Figure 4), with a reduction compared to the expected respectively of - 6% in northern cities and -3% in central-southern cities, attributable to the lower impact of seasonal influence and to particularly mild temperatures and above average climates.
- Seasonal variations in mortality such as that observed in the winter of 2019-2020 have resulted in an increase in the pool of more fragile subjects, with a reduced defense capacity of the organism due to individual factors (advanced age, chronic diseases) that have been exposed to COVID-19 epidemic from the end of February and this phenomenon, as also observed in periods history may have increased the impact of the epidemic on the elderly population.

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- Table 1 describes the mortality data from the beginning of the COVID-19 epidemic until the last available date for each city. The data of the individual cities show increases in mortality in all age groups in various northern cities, especially in the 2 Lombard cities included in the surveillance Milan (+ 36%), Brescia (+ 88%). A significant excess is also observed in Bolzano (+ 34%), Turin (+ 16%), Genoa (+ 38%).
 - There is no significant increase in mortality among central and southern cities except Civitavecchia (+ 54%), even if the figure is based on small numbers. Also in Bari there is an increase that could be, at least in part, attributable to a greater accuracy of the data thanks to the passage in recent months to an automatic method for recording mortality data.
 - The graphs for each city are shown in figure 5 and show the trend of daily mortality (black line), of expected mortality (black dotted line) from 1 February 2020 to the last update. Below the graph, the table shows the data of the observed mortality for each week and the accumulated mortality of the entire period, for all ages and by age group. Each graph indicates the first case report of COVID-19 registered at provincial level (DPC data source). In summary, the first cases of COVID-19 were recorded on 25 February in Bolzano, Turin, Milan, Venice and Palermo , on February 26 in Brescia, on February 27 in Bari, on February 29 in Bologna and Rome, on March 1 in Ancona, Genoa, Perugia, Trieste and Verona, on March 3 in Trento and Potenza, on March 4 in Frosinone, March 5 in Aosta and March 7 in Messina.
 - The highest increases in total mortality are recorded in Milan, Brescia and Genoa respectively from 6, 8 and 10 March. In terms of weekly mortality, in Brescia there is a clear increase in the week of 7-13 March and 14-20 March, especially in the 85+ years age group. In Milan and Genoa, the increase is mainly observed in the week of March 14-20 in the age group 75-84 years. A lower increase in mortality is also observed in Bolzano from 12 March (mainly for the 75-84 year old class), in Turin from 18 March, in Verona from 15 March and, to a lesser extent, in Bologna from 17 March. Between the cities of the center-south, where the first cases were recorded with several days of latency compared to the north, there is an increase in daily mortality in Perugia, Civitavecchia, Rome and Potenza between 16 and 18 March at the expense of the class aged 75-84 years. In Civitavecchia, Rome (especially in the age group 75-84 years) and Potenza (especially in the class 85+ years) there is also an increase in weekly mortality (from 14 to 20 March).

Figure 1A. Northern city * Italy.
Average daily total mortality
a week.
Period 25
September 2019-
March 17, 2020

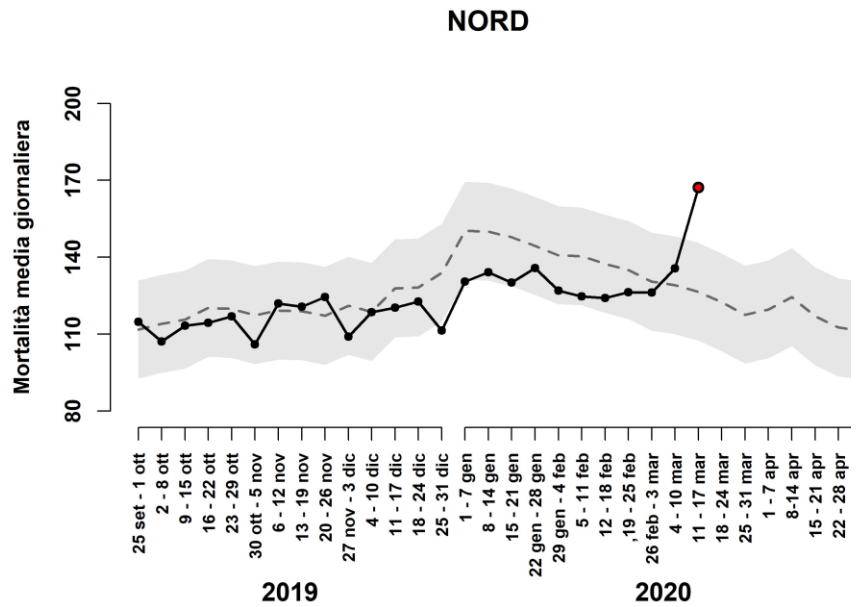
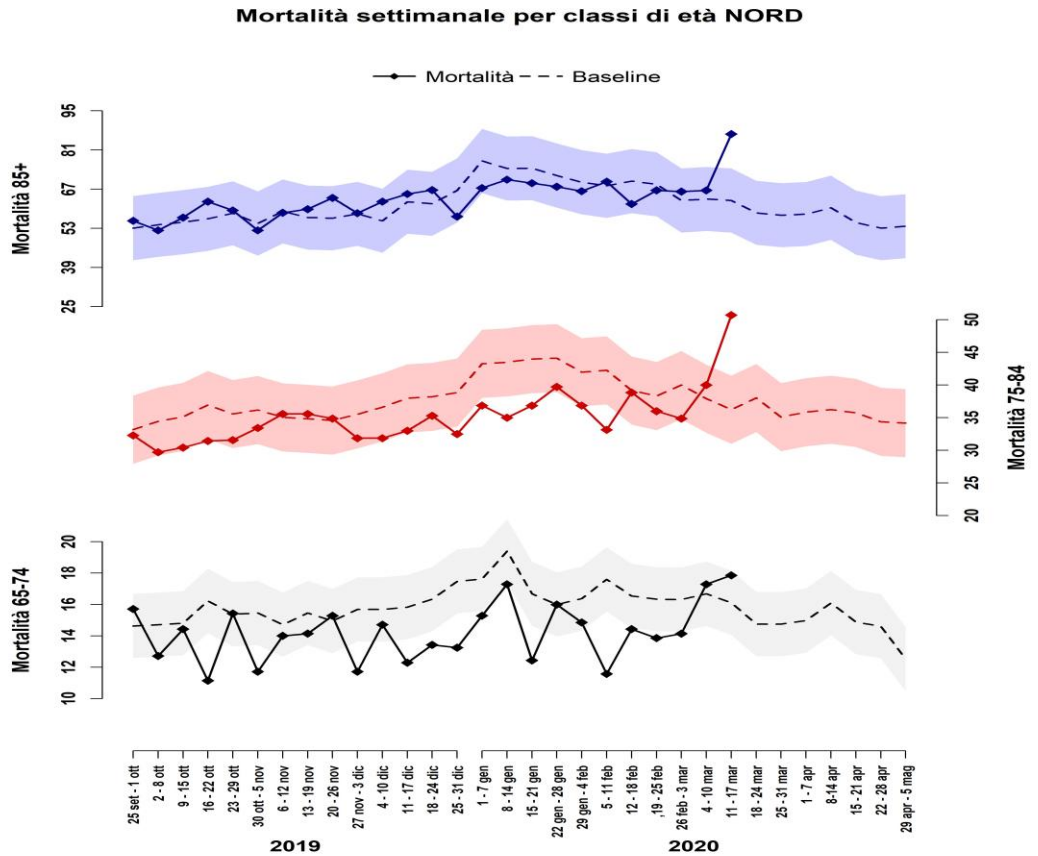


Figure 1B. City
Northern Italy.
Average mortality
daily for
week and class
aged (65-74, 75-
84, 85+). Period
September 25, 2019
- March 17, 2020



* Aosta, Bolzano, Trieste, Turin, Milan, Brescia, Verona, Venice, Bologna, Genoa

Figure 2A. City south-central * Italy. Mortality daily average total for week. Period September 25, 2019 - March 17, 2020

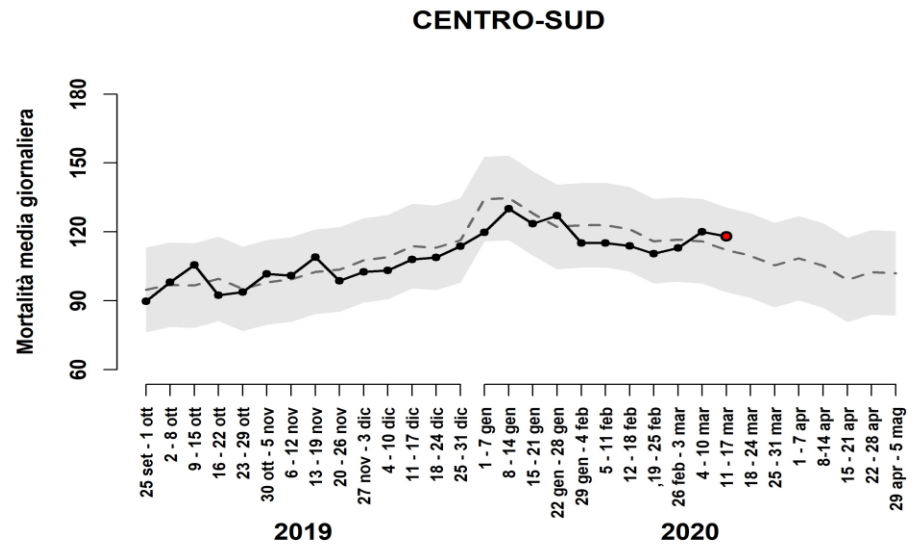
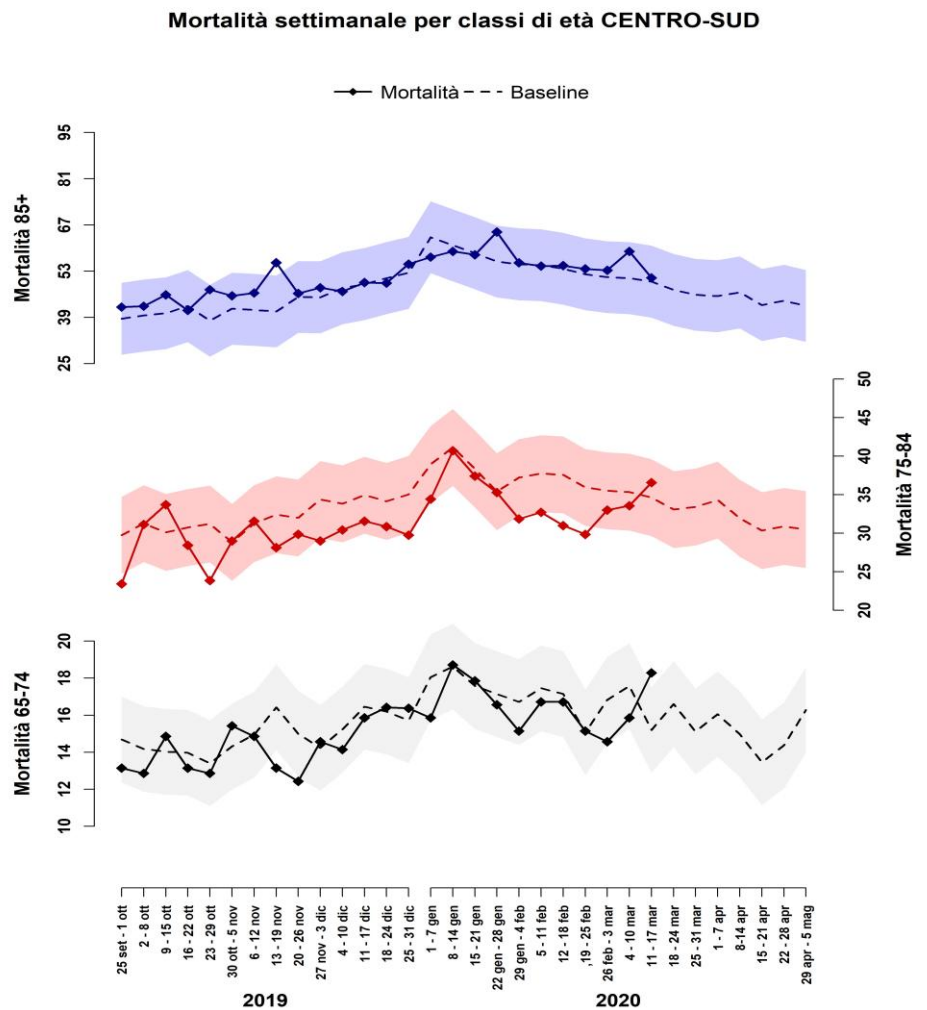


Figure 2B. City south-central * Italy. Average mortality daily for week and class aged (65-74, 75-84, 85+). Period September 25, 2019 - March 17, 2020



* Perugia, Civitavecchia, Rome, Frosinone, Bari, Potenza, Messina, Palermo

Figure 3. Deaths by age group (0-14, 15-64, 65-74, 75-84, 85+) and week for northern and central-southern cities.

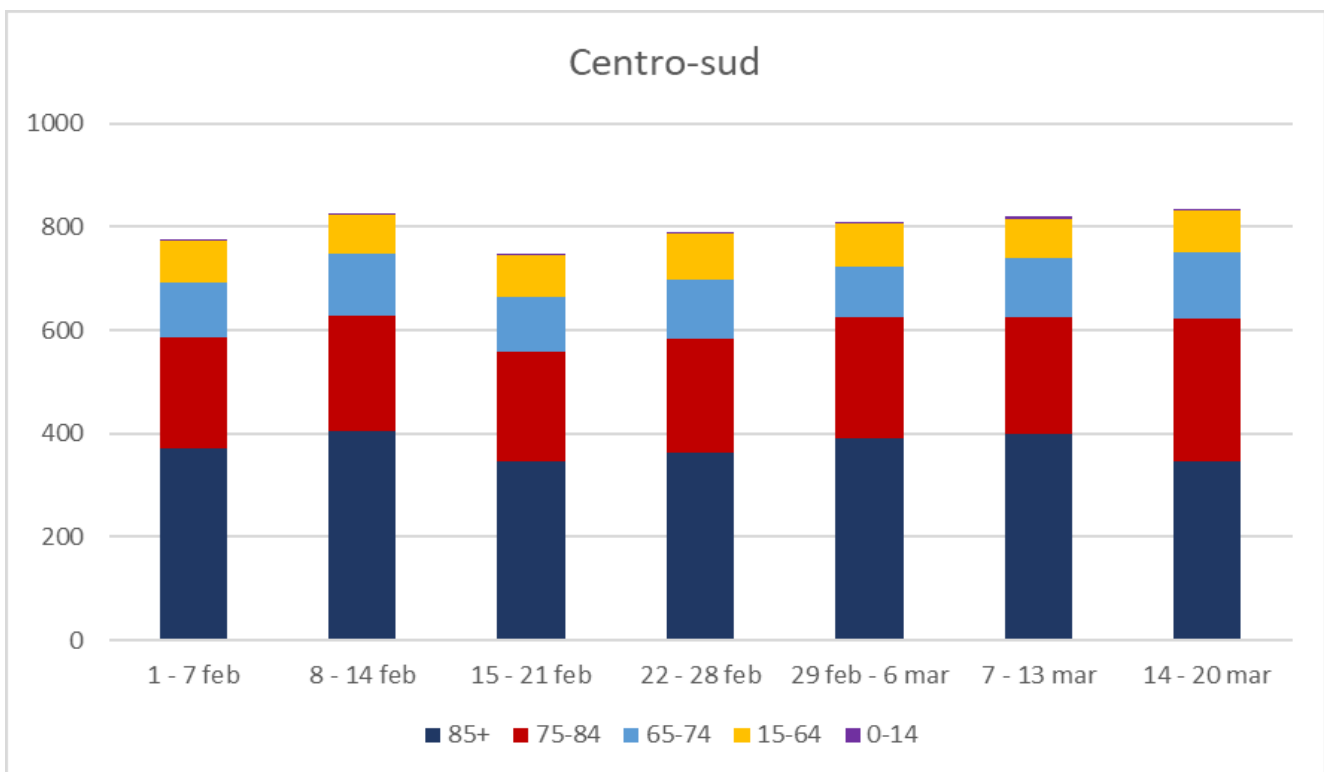
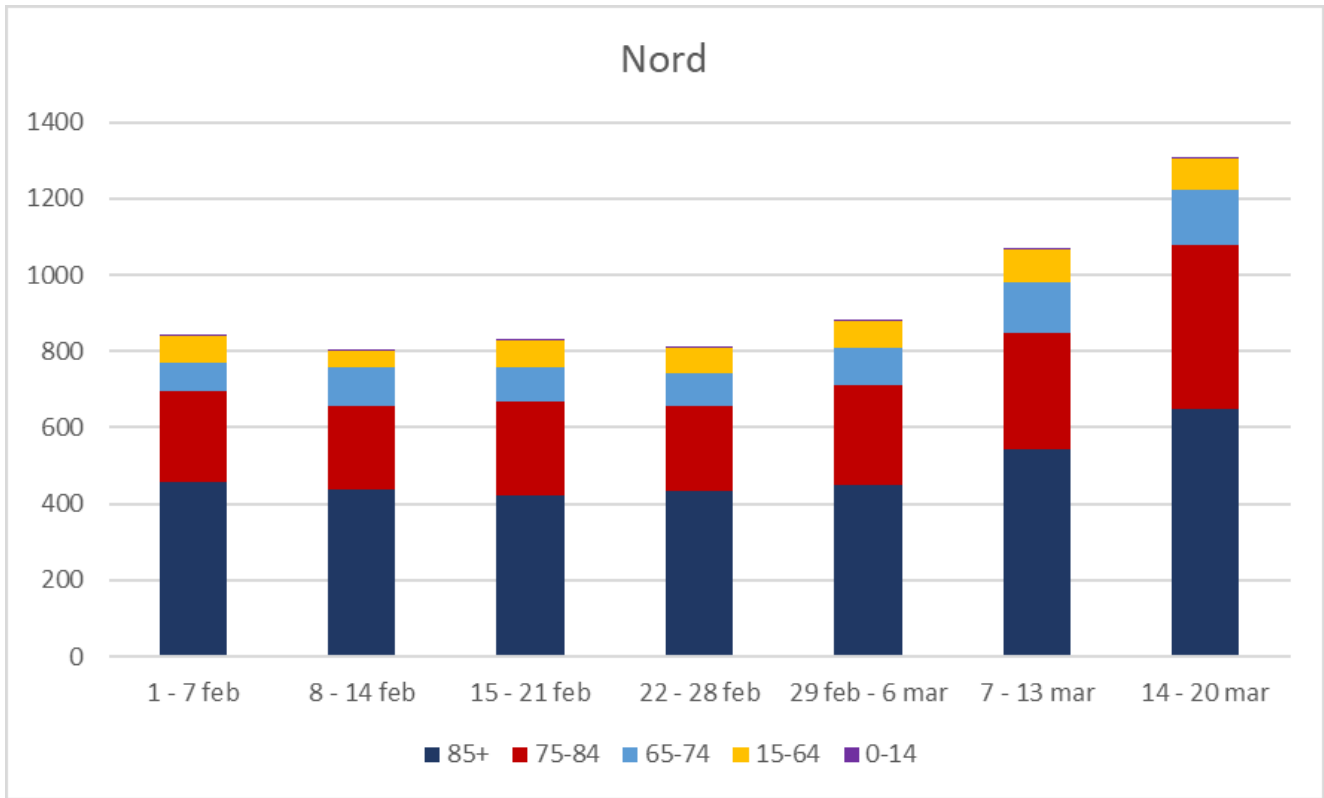
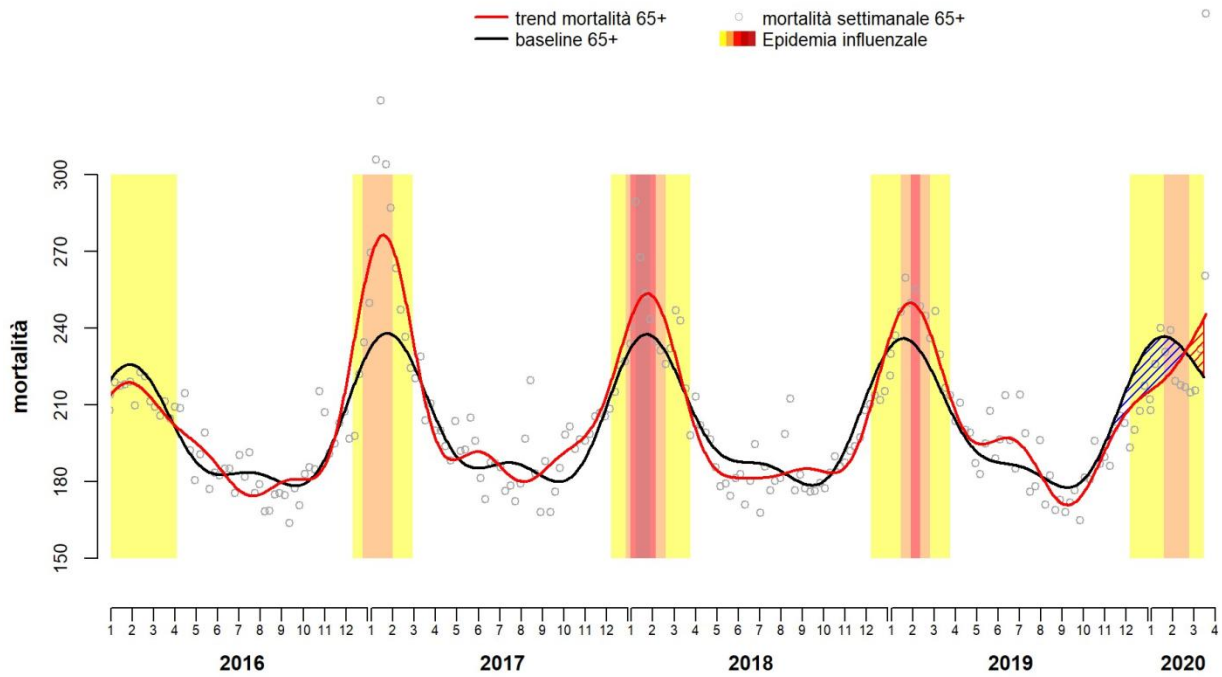


Figure 4. Seasonal trend of mortality per week in Italian cities *. Period January 2016 - March 17 2020



* Aosta, Bolzano, Trieste, Turin, Milan, Brescia, Verona, Venice, Bologna, Genoa, Perugia, Civitavecchia, Rome, Frosinone, Bari, Potenza, Messina, Palermo

Table 1. Estimated percentage change in mortality from the date of notification of the first case of covid-19 to the latest data available in Italian cities.

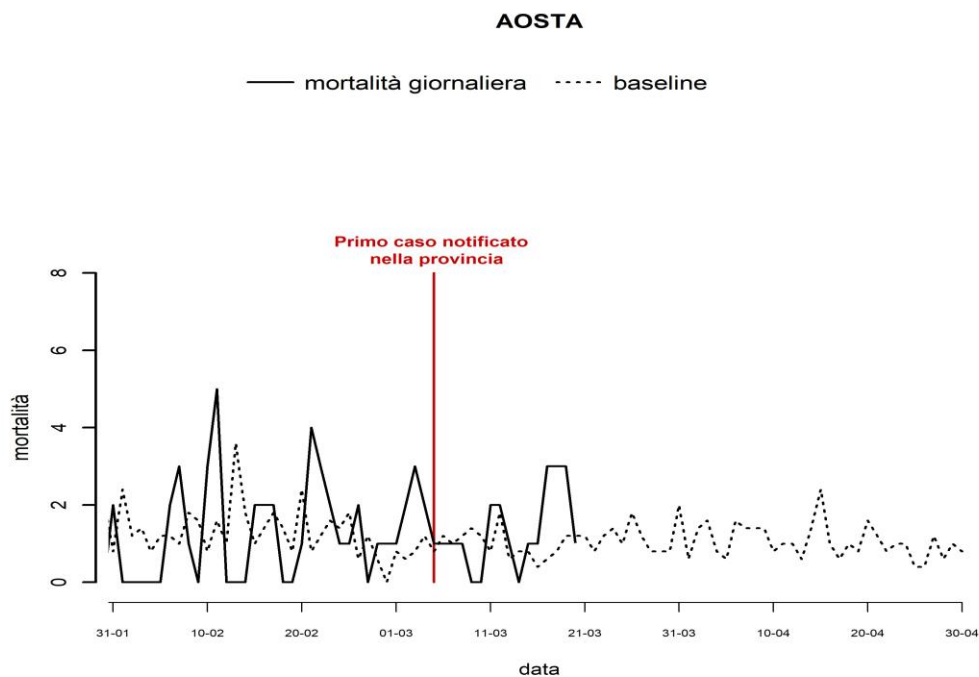
Città	dato aggiornato al	giorni	Decessi				
			Osservati	Attesi	Osservati-Attesi	Var%	p value
BOLZANO	19 marzo	24	87	65	22	34	0.018
AOSTA	19 marzo	15	20	15	5	33	0.264
TORINO	21 marzo	26	763	658	105	16	<0.001
MILANO	19 marzo	24	1102	813	289	36	<0.001
BRESCIA	18 marzo	22	210	112	98	88	<0.001
VERONA	19 marzo	19	145	129	16	12	0.184
VENEZIA	18 marzo	23	230	214	16	7	0.291
GENOVA	20 marzo	20	634	459	175	38	<0.001
BOLOGNA	20 marzo	21	261	236	25	11	0.122
PERUGIA	18 marzo	18	107	87	20	23	0.053
ROMA	18 marzo	19	1364	1366	-2	0	0.957
CIVITAVECCHIA	20 marzo	21	37	24	13	54	0.033
BARI	19 marzo	22	211	141	70	50	<0.001
POTENZA	20 marzo	18	37	32	5	16	0.411
MESSINA	21 marzo	15	131	122	9	7	0.432
PALERMO	18 marzo	23	483	471	12	3	0.585
TOTALE			5822	4944	878	18	<0.001

3. Specific city results

Daily Mortality Surveillance System

Figure 5. Daily trend of the number of observed and expected deaths * in total

AOSTA



Deaths for week, all ages and ages age class (65-74, 75-84, 85+).

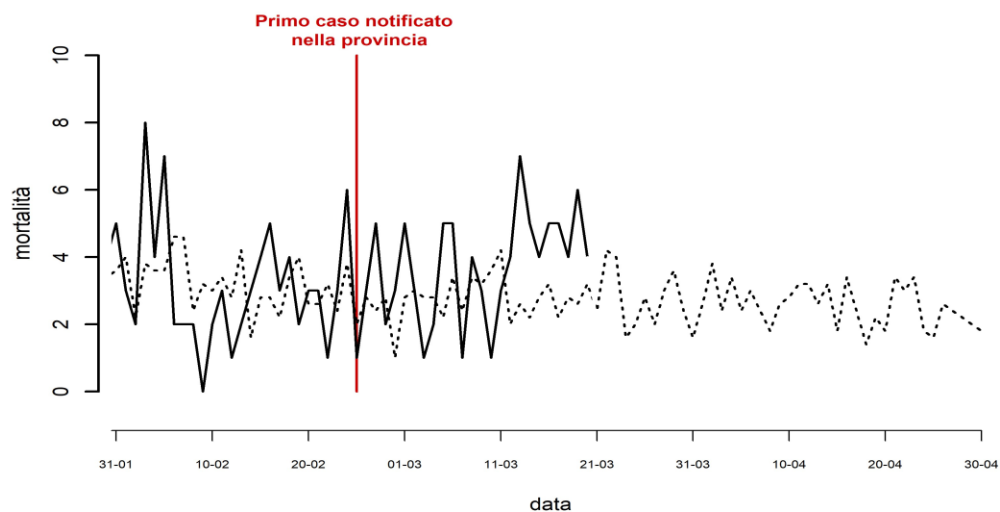
Periodo	Totale	65-74	75-84	85+
1 - 7 feb	5	2	0	3
8 - 14 feb	9	1	2	6
15 - 21 feb	11	3	3	5
22 - 28 feb	10	2	1	6
29 feb - 6 mar	11	1	3	6
7 - 13 mar	7	0	4	2
14 - 20 mar	12	0	6	5
TOTALE	65	9 (14%)	19 (29%)	33 (51%)

* expected deaths calculated as the average per day of the week and number of the week of the year weighed for the population in the period (2014-2018)

BOLZANO

BOLZANO

— mortalità giornaliera - - - - baseline

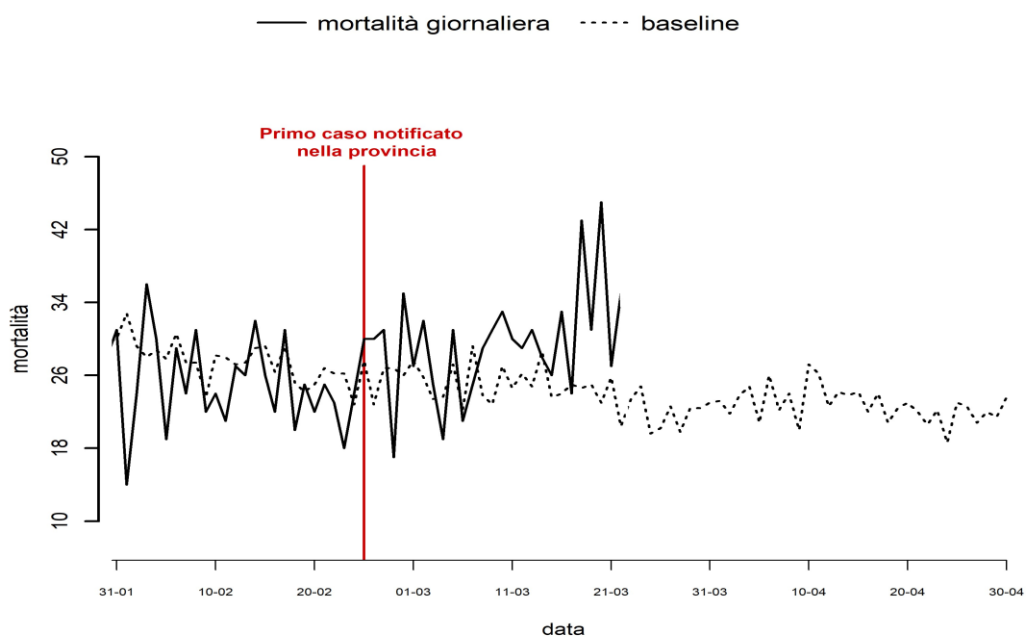


Deaths for week,
all ages
by class of
age (65-74, 75-
84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	28	2	8	11
8 - 14 feb	13	2	1	10
15 - 21 feb	24	4	3	14
22 - 28 feb	21	1	11	8
29 feb - 6 mar	24	1	5	15
7 - 13 mar	23	4	3	14
14 - 20 mar	33	7	13	10
TOTALE	166	21 (13%)	44 (27%)	82 (49%)

TORINO

TORINO

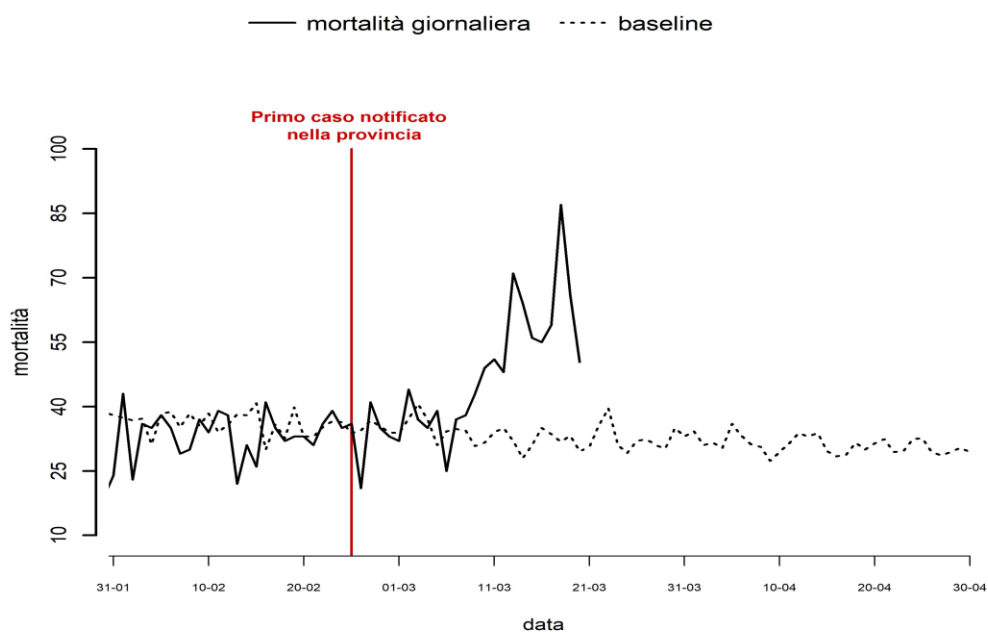


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	176	21	55	84
8 - 14 feb	183	28	53	86
15 - 21 feb	171	11	63	82
22 - 28 feb	173	21	55	82
29 feb - 6 mar	190	23	59	91
7 - 13 mar	208	32	64	95
14 - 20 mar	230	22	77	115
TOTALE	1331	158 (12%)	426 (32%)	635 (48%)

MILANO

MILANO

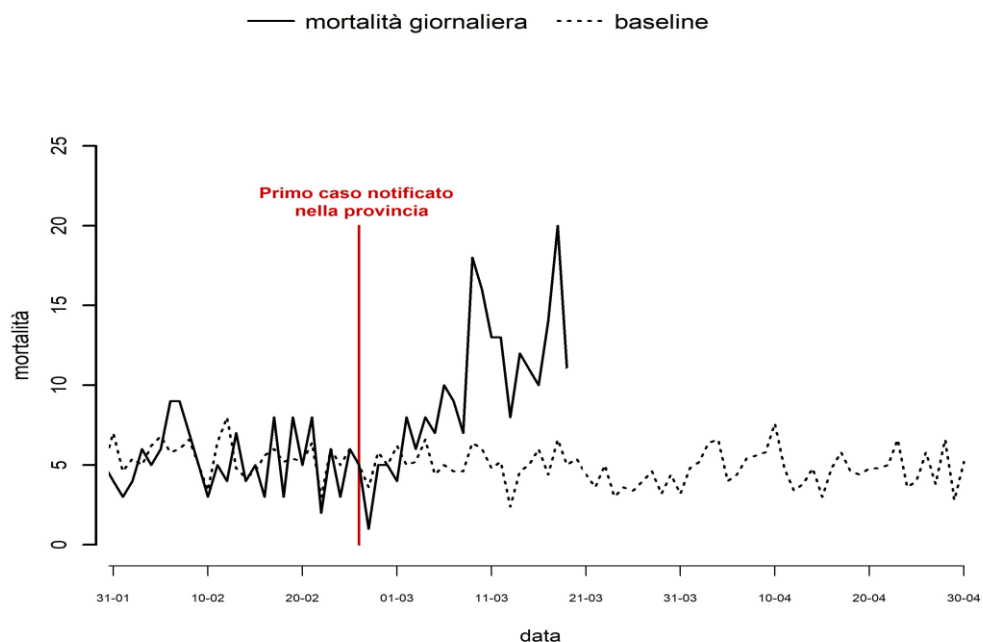


Deaths for week, all ages by class age (65-74, 75-84, 85+)

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	239	17	70	131
8 - 14 feb	231	28	53	135
15 - 21 feb	231	28	58	119
22 - 28 feb	243	31	62	130
29 feb - 6 mar	245	21	67	133
7 - 13 mar	337	36	94	174
14 - 20 mar	437	55	135	216
TOTALE	1963	216 (11%)	539 (27%)	1038 (53%)

BRESCIA

BRESCIA

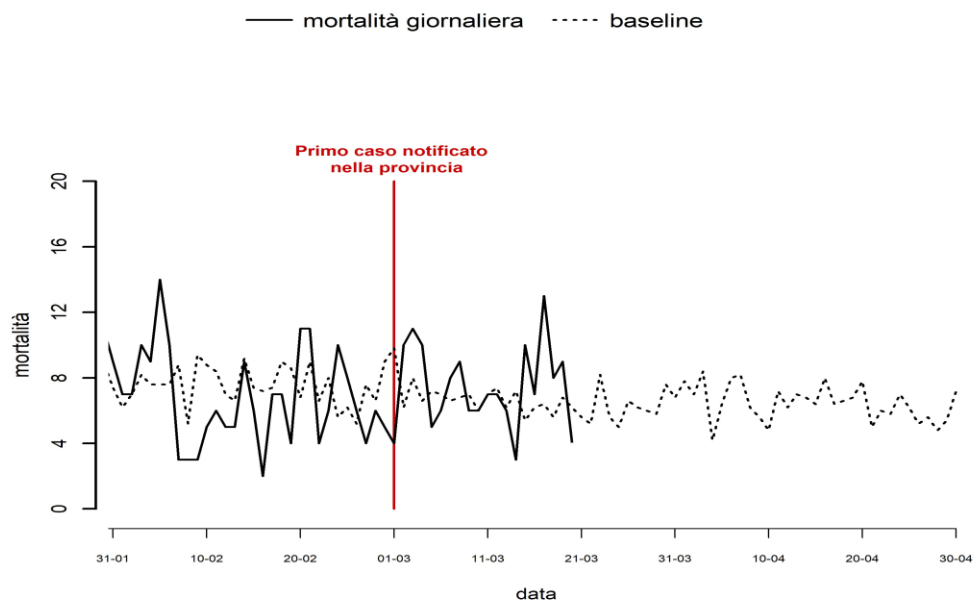


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	42	1	10	27
8 - 14 feb	35	3	14	18
15 - 21 feb	40	6	13	19
22 - 28 feb	28	5	7	13
29 feb - 6 mar	48	8	20	15
7 - 13 mar	84	13	30	37
14 - 20 mar	89	17	34	31
TOTALE	366	53 (14%)	128 (35%)	160 (44%)

VERONA

VERONA

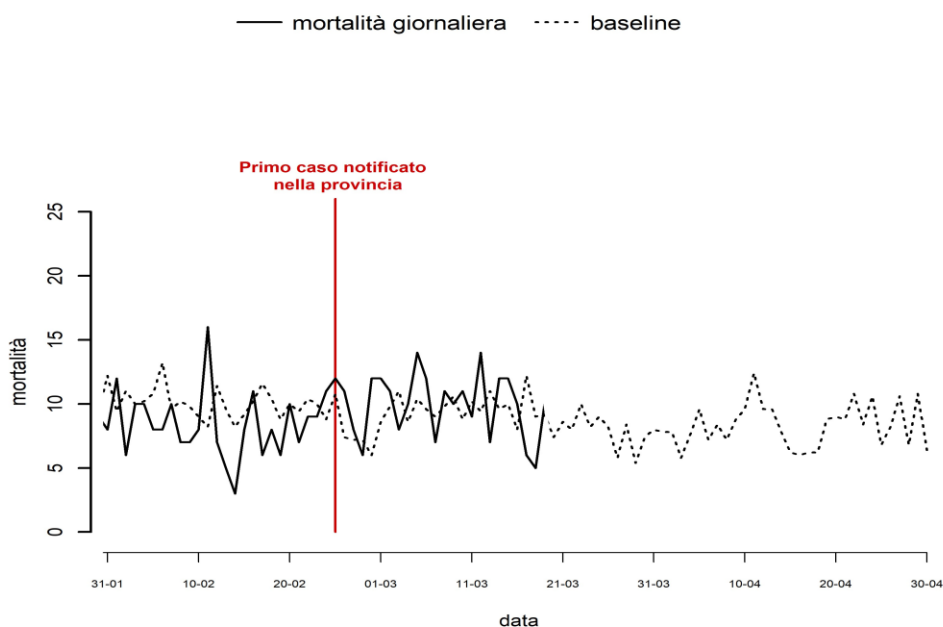


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	60	5	15	36
8 - 14 feb	36	4	11	21
15 - 21 feb	48	6	16	24
22 - 28 feb	44	6	9	26
29 feb - 6 mar	51	6	14	25
7 - 13 mar	49	6	15	25
14 - 20 mar	54	1	17	30
TOTALE	342	34 (10%)	97 (28%)	187 (55%)

VENEZIA

VENEZIA

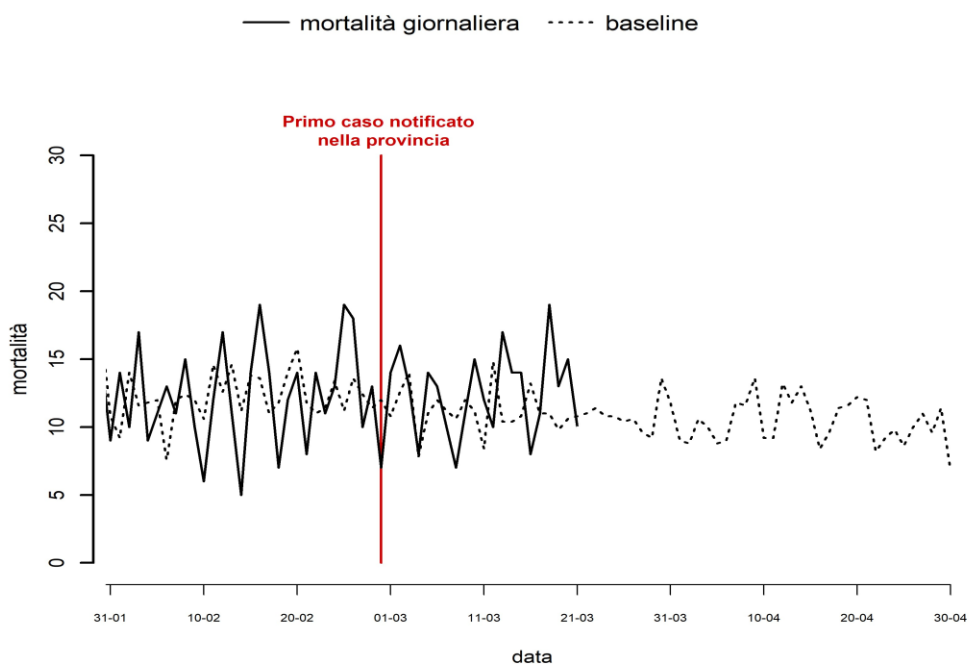


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	64	7	19	32
8 - 14 feb	53	5	19	27
15 - 21 feb	56	3	20	29
22 - 28 feb	66	6	23	32
29 feb - 6 mar	79	14	20	42
7 - 13 mar	69	9	19	37
14 - 20 mar	60	5	22	31
TOTALE	447	49 (11%)	142 (32%)	230 (51%)

BOLOGNA

BOLOGNA

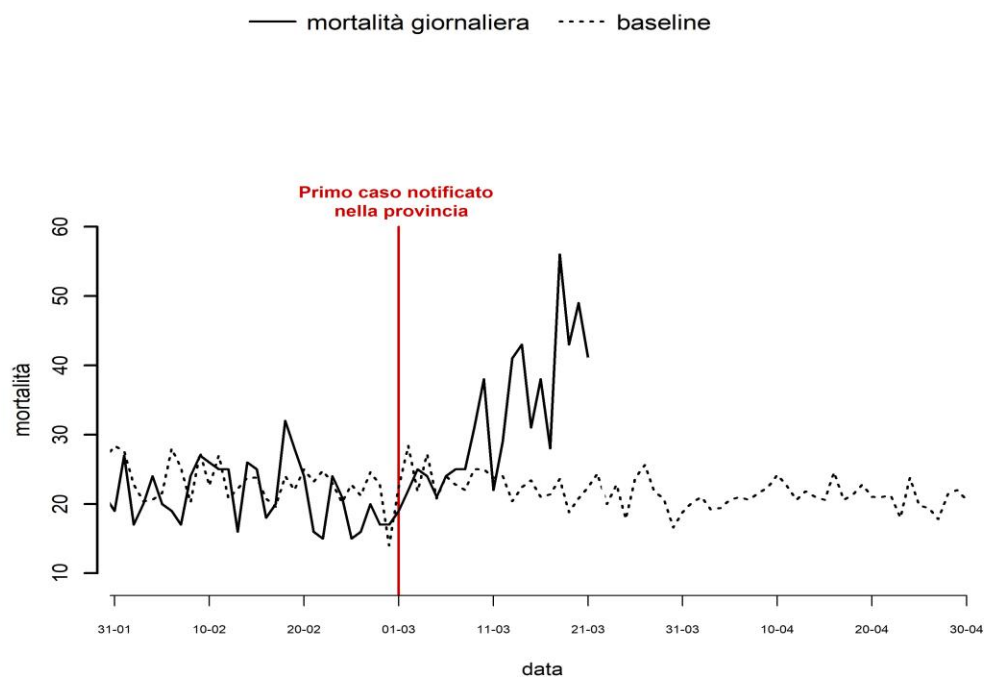


Deaths for week,
all ages
by class of
age (65-74,
75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	85	7	20	49
8 - 14 feb	76	6	18	47
15 - 21 feb	88	12	25	45
22 - 28 feb	98	5	23	62
29 feb - 6 mar	85	7	31	44
7 - 13 mar	82	8	20	47
14 - 20 mar	94	12	20	56
TOTALE	608	57 (9%)	157 (26%)	350 (58%)

GENOVA

GENOVA

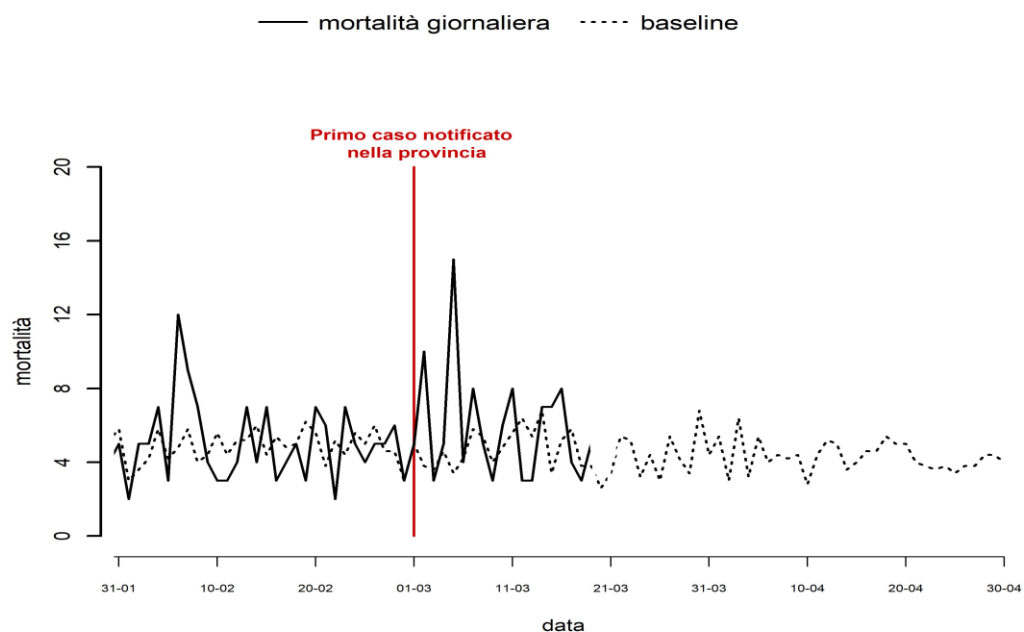


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	144	14	39	85
8 - 14 feb	169	22	49	88
15 - 21 feb	163	17	46	86
22 - 28 feb	128	9	33	74
29 feb - 6 mar	152	17	45	77
7 - 13 mar	211	25	54	114
14 - 20 mar	288	26	102	148
TOTALE	1255	130 (10%)	368 (29%)	672 (54%)

PERUGIA

PERUGIA

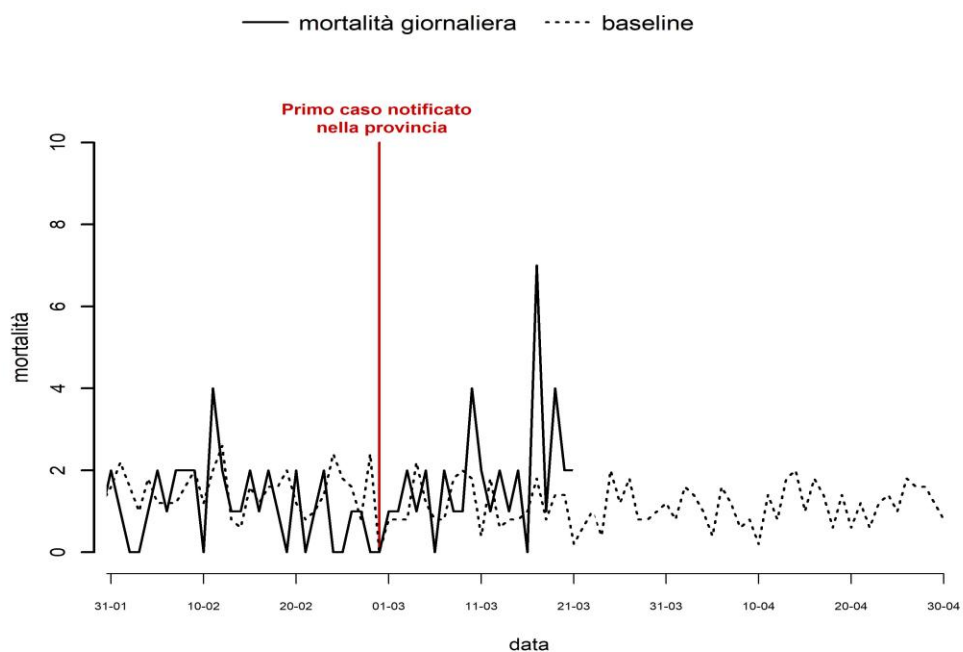


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	43	4	10	24
8 - 14 feb	32	6	5	19
15 - 21 feb	35	3	10	17
22 - 28 feb	34	3	8	20
29 feb - 6 mar	45	6	11	26
7 - 13 mar	36	4	9	17
14 - 20 mar	34	4	14	12
TOTALE	259	30 (12%)	67 (26%)	135 (52%)

CIVITAVECCHIA

CIVITAVECCHIA

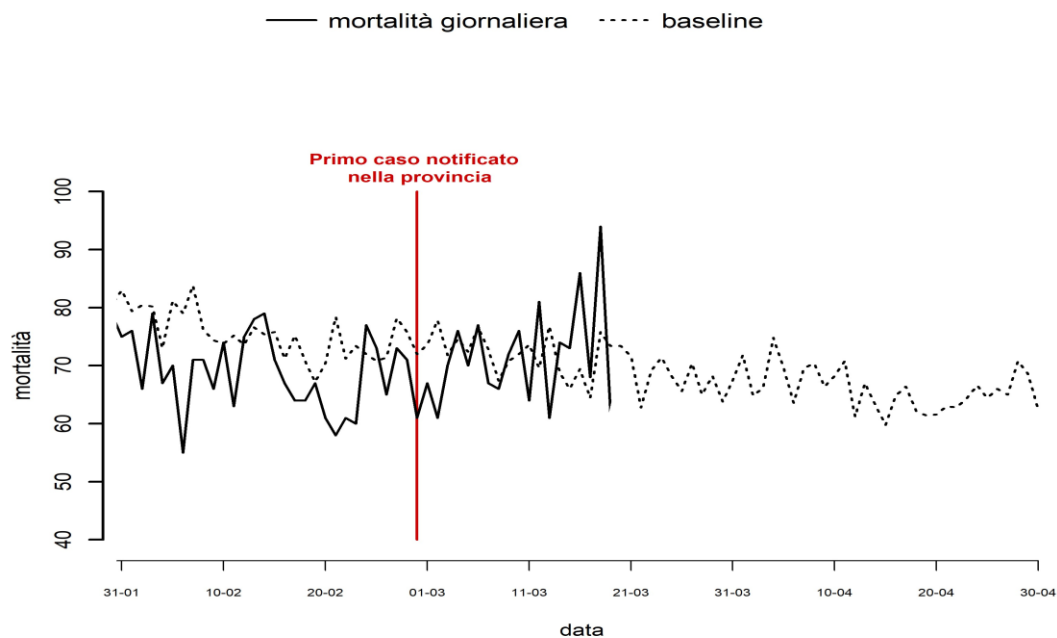


Deaths for week, all age and class aged (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	7	0	2	5
8 - 14 feb	12	1	3	6
15 - 21 feb	8	2	2	3
22 - 28 feb	5	1	1	3
29 feb - 6 mar	7	0	2	5
7 - 13 mar	13	3	3	6
14 - 20 mar	17	2	7	6
TOTALE	69	9 (13%)	20 (29%)	34 (49%)

ROMA

ROMA



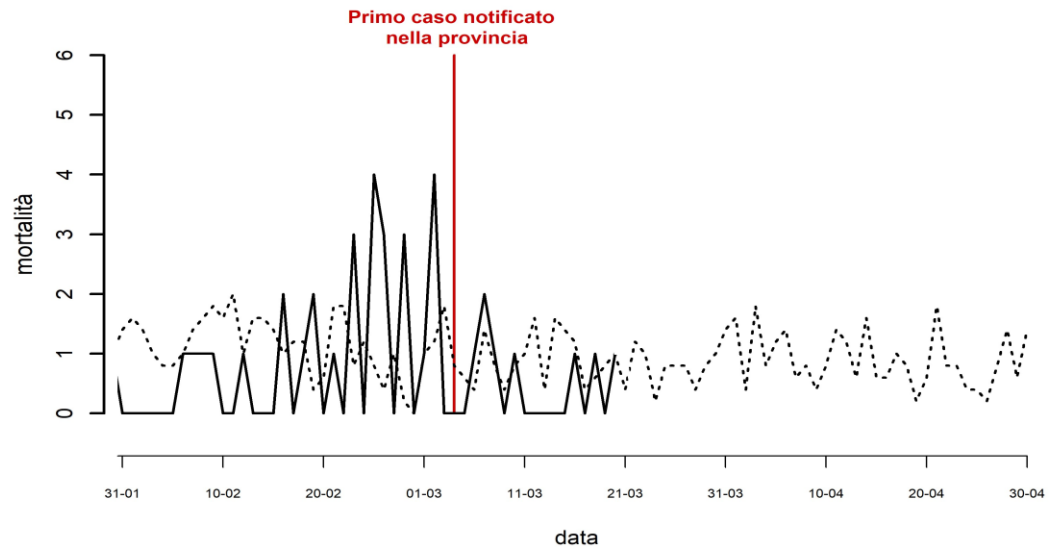
Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	484	62	136	237
8 - 14 feb	506	70	141	248
15 - 21 feb	452	63	119	222
22 - 28 feb	480	63	138	215
29 feb - 6 mar	482	63	137	231
7 - 13 mar	487	64	142	236
14 - 20 mar	527	72	177	232
TOTALE	3418	457 (13%)	990 (29%)	1621 (47%)

FROSINONE

FROSINONE

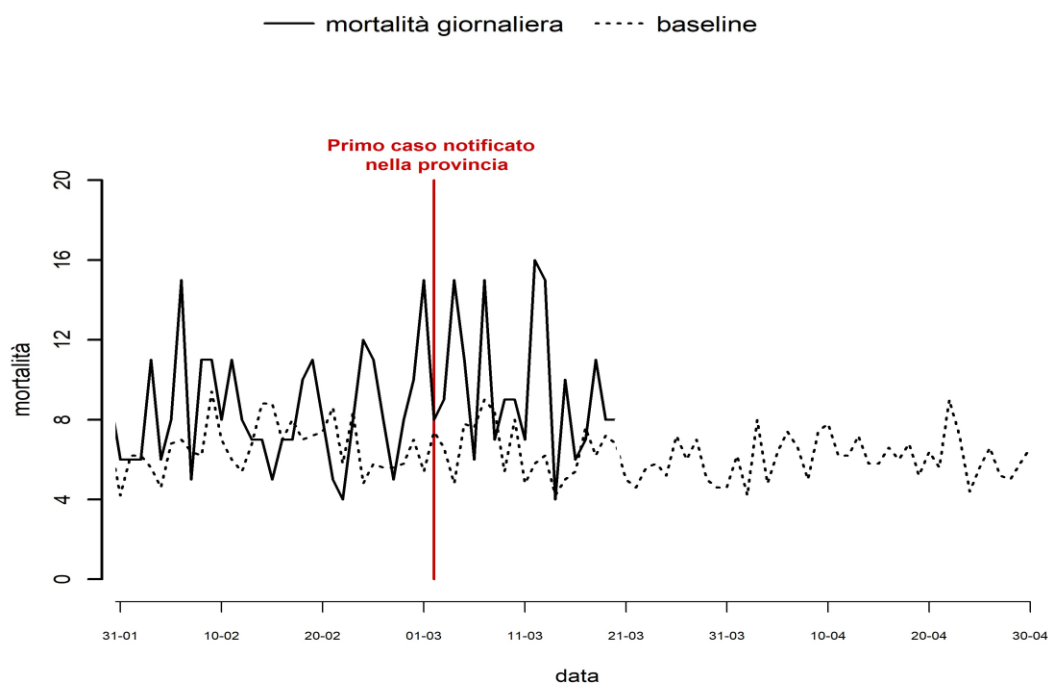
— mortalità giornaliera - - - - baseline



* Frosinone data show a sub-notification starting from the beginning of March 2020.

BARI

BARI

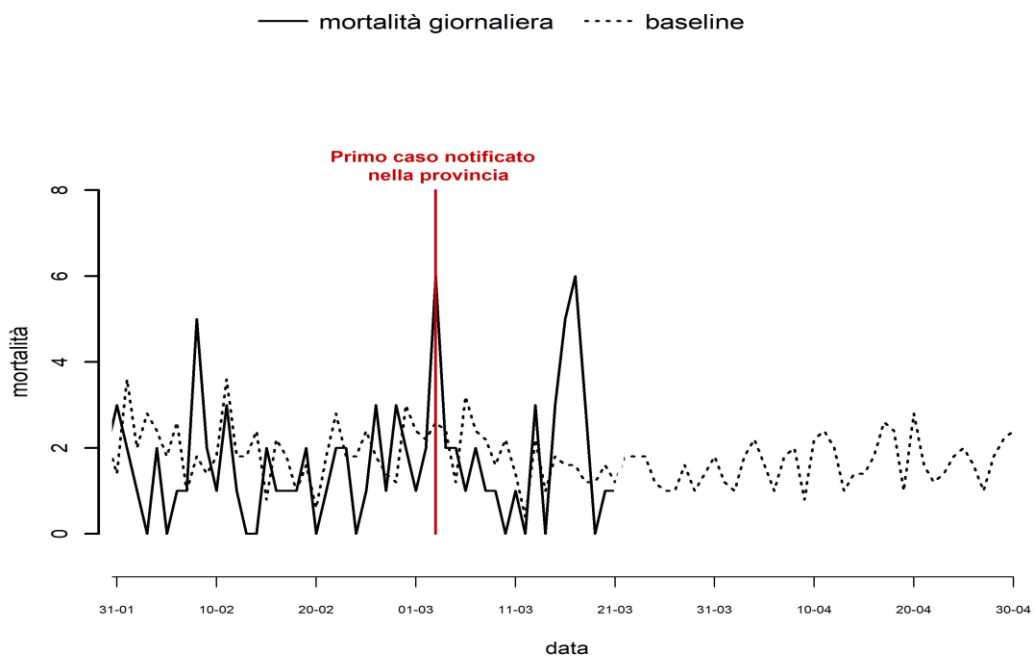


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	57	13	19	19
8 - 14 feb	63	2	18	36
15 - 21 feb	53	8	14	23
22 - 28 feb	56	4	21	26
29 feb - 6 mar	74	3	20	43
7 - 13 mar	78	17	19	35
14 - 20 mar	54	9	21	18
TOTALE	435	56 (13%)	132 (30%)	200 (46%)

POTENZA

POTENZA

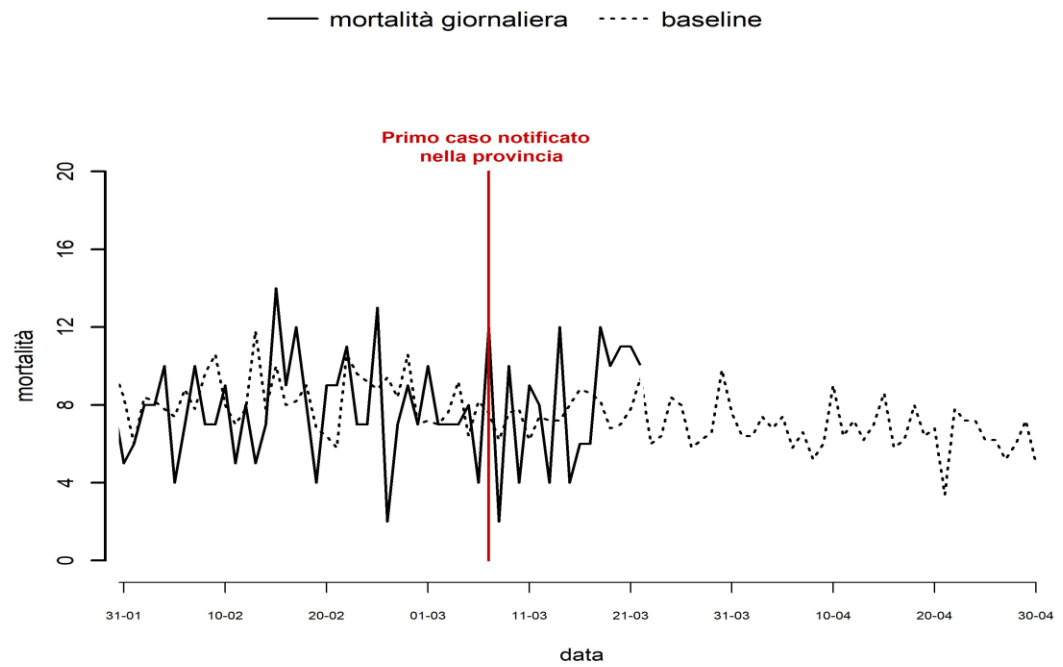


Deaths for week,
all ages
by class of
age (65-74,
75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	7	2	1	3
8 - 14 feb	12	3	4	4
15 - 21 feb	8	0	4	4
22 - 28 feb	12	0	1	10
29 feb - 6 mar	16	1	7	7
7 - 13 mar	8	0	1	7
14 - 20 mar	18	2	3	13
TOTALE	81	8 (10%)	21(26%)	48 (59%)

MESSINA

MESSINA

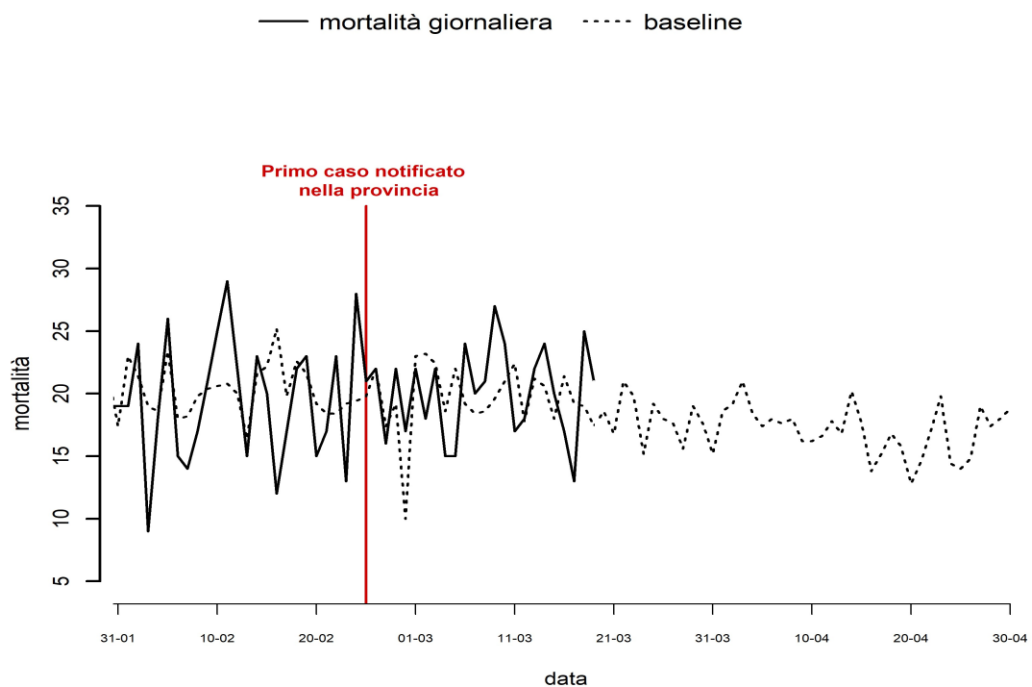


Deaths for week, all ages by class age (65-74, 75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	53	4	13	33
8 - 14 feb	48	9	13	23
15 - 21 feb	65	8	25	30
22 - 28 feb	56	9	9	28
29 feb - 6 mar	50	8	13	23
7 - 13 mar	49	5	12	28
14 - 20 mar	61	9	14	30
TOTALE	382	52 (14%)	99 (26%)	195 (51%)

PALERMO

PALERMO



Deaths for week,
all ages
by class of
age (65-74,
75-84, 85+).

Periodo	Totale	65-74	75-84	85+
1 - 7 feb	125	21	36	49
8 - 14 feb	152	29	39	68
15 - 21 feb	126	22	39	47
22 - 28 feb	145	34	43	60
29 feb - 6 mar	133	18	44	56
7 - 13 mar	149	24	38	71
14 - 20 mar	124	30	40	35
TOTALE	954	178 (19%)	279 (29%)	386 (40%)

APPENDIX

Figure 6. Number of deaths by age group and week.

