



Characteristics of SARS-CoV-2 patients dying in Italy Report based on available data on October 22nd, 2020

1. Sample

The present report describes characteristics of 36,806 SARS-CoV-2 patients dying in Italy.* Geographic distribution across the 19 regions and 2 autonomous provinces of Trento and Bozen is presented in the table below. Data are update to October 22nd, 2020.

Table 1. Geographic distribution of deceased patients SARS-CoV-2 positive

REGION	N	%
Lombardia	17,122	46.5
Emilia Romagna	4,531	12.3
Piemonte	4,121	11.2
Veneto	2,287	6.2
Liguria	1,690	4.6
Toscana	1,206	3.3
Lazio	1,110	3.0
Marche	994	2.7
Puglia	645	1.8
Campania	508	1.4
Abruzzo	501	1.4
Sicilia	420	1.1
Trento	420	1.1
Friuli Venezia Giulia	374	1.0
Bolzano	295	0.8
Sardegna	178	0.5
Valle d'Aosta	146	0.4
Calabria	103	0.3
Umbria	95	0.3
Basilicata	34	0.1
Molise	26	0.1
Total	36,806	100.0

* SARS-CoV-2 related deaths presented in this report are those occurring in patients who test positive for SARS-CoV-2RT by PCR, independently from pre-existing diseases.

2. Demographics

Mean age of patients dying for SARS-CoV-2 infection was 80 years (median 82, range 0-109, IQR 74-88). Women were 15,719 (42.7%). *Figure 1* shows that median age of patients dying for SARS-CoV-2 infection was about 30 years higher as compared with the national sample diagnosed with SARS-CoV-2 infection (median age 52 years). *Figure 2* shows the absolute number of deaths by age group. Women dying for SARS-CoV-2 infection had an older age than men (median age women 85 - median age men 79).

Figure 1. Median age of patients with SARS-CoV-2 infection and SARS-CoV-2 positive deceased patients

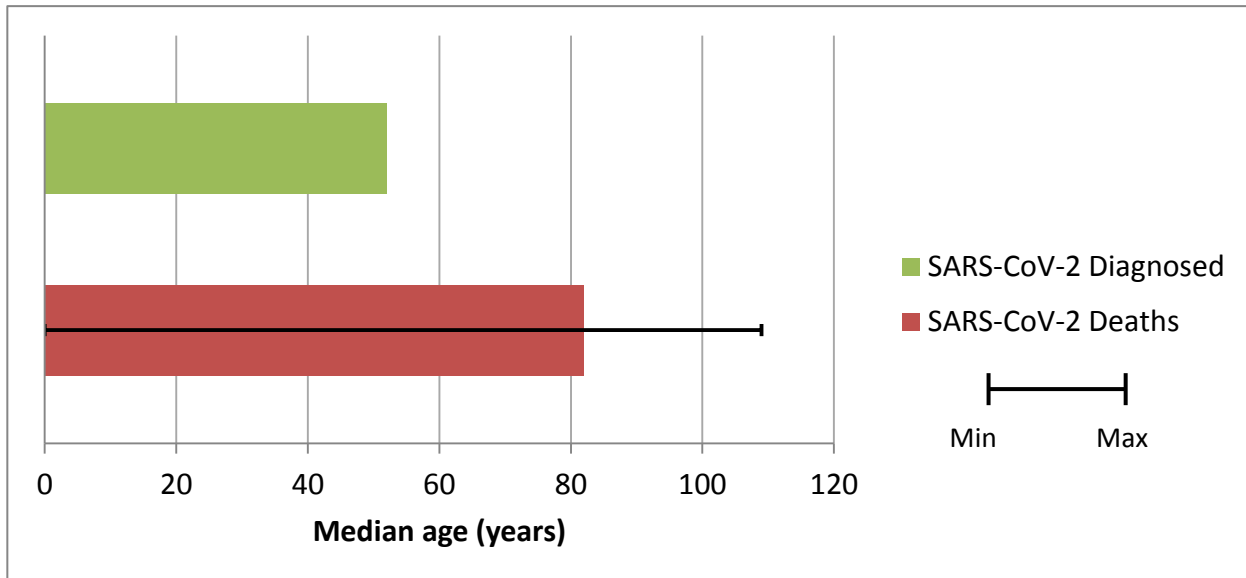
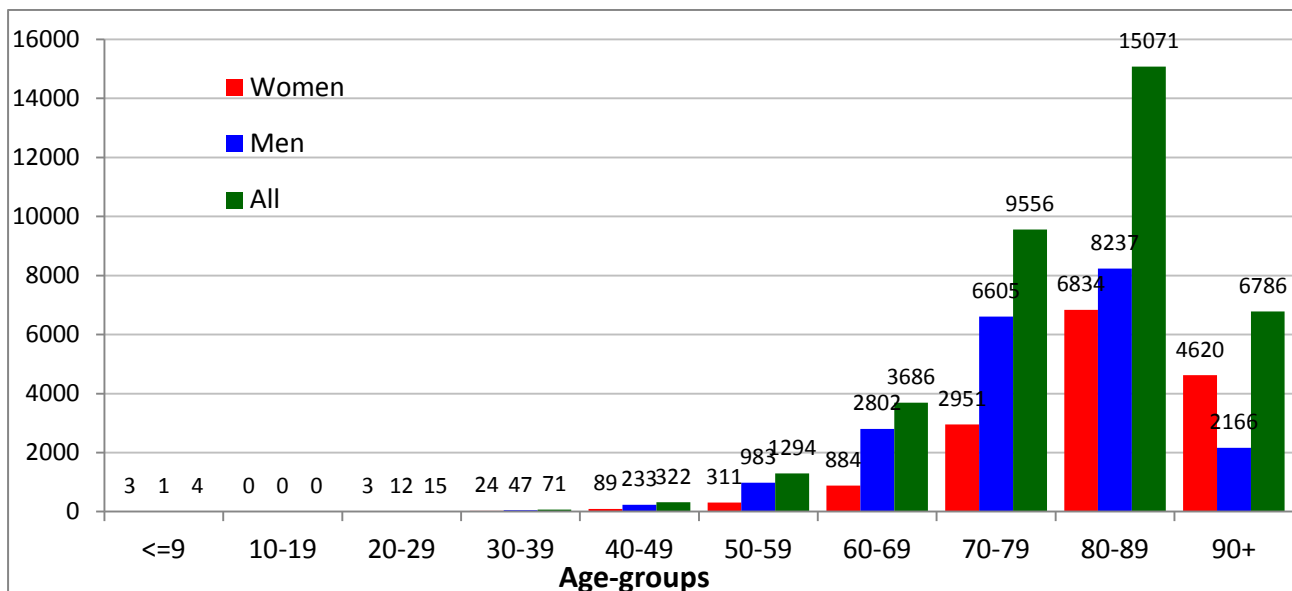


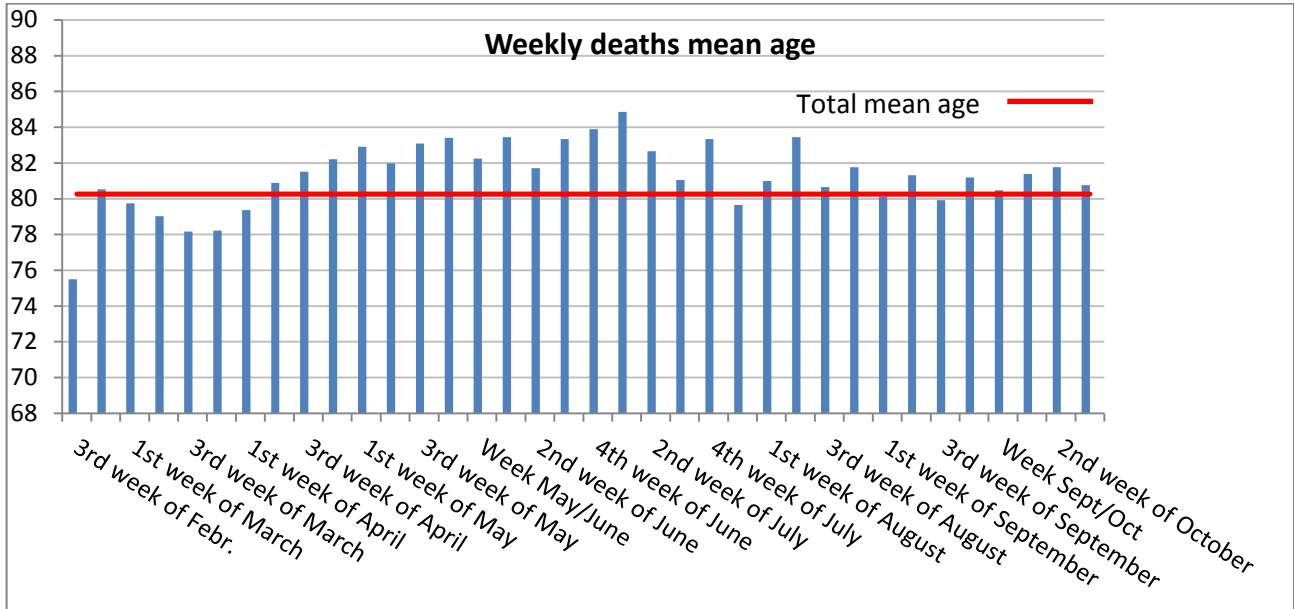
Figure 2. Absolute number of deaths by age group



Note: For 1 deceased person, age was not possible to be evaluated

Figure 3 shows the trend in the average age of SARS-CoV-2 positive deceased patients per calendar week, starting from the 3rd week of February 2020 (the date of the first death dates back to 21st February 2020). The average age of weekly deceased persons has substantially increased up to 85 years (1st week of July) and then dropped slightly.

Figure 3. Mean age of SARS-CoV-2 positive deceased patients by week of death



3. Pre-existing conditions

Table 2 presents most common comorbidities diagnosed before SARS-CoV-2 infection. Data on diseases were based on chart review and was available on 4,7380 patients dying in-hospital for whom it was possible to analyse clinic charts. Mean number of diseases was 3.5 (median 3, SD 2.0). Overall, 3.5% of the sample presented with a no comorbidities, 13.3% with a single comorbidity, 19.6% with 2, and 63.6% with 3 or more.

Before hospitalization, 22% of SARS-CoV-2 positive deceased patients followed ACE-inhibitor therapy and 14% angiotensin receptor blockers-ARBs therapy. This information can be underestimated because data on drug treatment before admission were not always described in the chart.

Table 2. Most common comorbidities observed in SARS-CoV-2 positive deceased patients

Diseases	N	%
<i>Ischemic heart disease</i>	1316	27.8
<i>Atrial Fibrillation</i>	1126	23.8
<i>Heart failure</i>	762	16.1
<i>Stroke</i>	524	11.1
<i>Hypertension</i>	3108	65.6
<i>Type 2-Diabetes</i>	1386	29.3
<i>Dementia</i>	995	21.0
<i>COPD (Chronic Obstructive Pulmonary Disease)</i>	801	16.9
<i>Active cancer in the past 5 years</i>	813	17.2
<i>Chronic liver disease</i>	220	4.6
<i>Chronic renal failure</i>	983	20.7
<i>Dialysis</i>	101	2.1
<i>Respiratory failure</i>	301	6.4
<i>HIV Infection</i>	10	0.2
<i>Autoimmune diseases</i>	200	4.2
<i>Obesity</i>	491	10.4
Number of comorbidities		
<i>0 comorbidities</i>	168	3.5
<i>1 comorbidity</i>	631	13.3
<i>2 comorbidities</i>	928	19.6
<i>3 comorbidities and over</i>	3011	63.6

Table 3 presents the most common pre-existing chronic pathologies in patients who died, separately in men (n = 2,958 and women (n = 1,780). The average number of pathologies observed in women is 3.6 (median 3, Standard Deviation 2.0). In men the average number of pathologies observed is 3.4 (median 3, Standard Deviation 2.0).

Table 3. Most common comorbidities observed in SARS-CoV-2 positive deceased patients by gender

Diseases	Women		Men	
	N	%	N	%
<i>Ischemic heart disease</i>	406	22.8	910	30.8
<i>Atrial Fibrillation</i>	454	25.5	672	22.7
<i>Heart Failure</i>	333	18.2	429	14.3
<i>Stroke</i>	211	11.9	313	10.6
<i>Hypertension</i>	1202	67.5	1906	64.4
<i>Type 2-Diabetes</i>	477	26.8	909	30.7
<i>Dementia</i>	534	30.0	461	15.6
<i>COPD (Chronic Obstructive Pulmonary Disease)</i>	235	13.2	566	19.1
<i>Active cancer in the past 5 years</i>	290	16.3	523	17.7
<i>Chronic liver disease</i>	74	4.2	146	4.9
<i>Chronic renal failure</i>	338	19.0	645	21.8
<i>Dialysis</i>	29	1.6	72	2.4
<i>Respiratory failure</i>	122	6.9	179	6.1
<i>HIV Infection</i>	0	0.0	10	0.3
<i>Autoimmune diseases</i>	109	6.1	91	3.1
<i>Obesity</i>	186	10.4	305	10.3
Number of comorbidities				
<i>0 comorbidities</i>	40	2.2	128	4.3
<i>1 comorbidity</i>	207	11.6	424	14.3
<i>2 comorbidities</i>	333	18.7	595	20.1
<i>3 comorbidities and over</i>	1200	67.4	1811	61.2

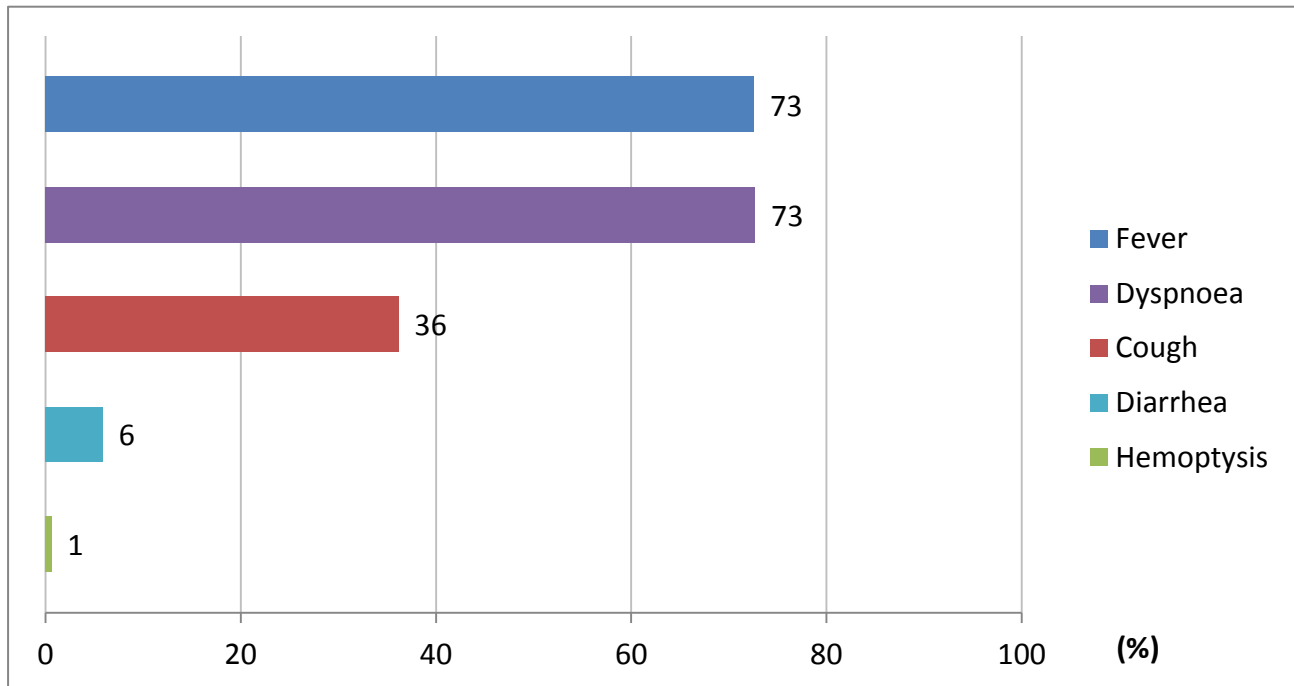
4. Diagnosis of hospitalization

In 91.1% of hospitalizations, conditions (e.g. pneumonia, respiratory failure) or symptoms (e.g. fever, dyspnoea, cough) compatible with SARS-CoV-2 were mentioned. In 387 cases (8.9% of cases) the diagnosis of hospitalization was not related to the infection. In 57 cases the diagnosis of hospitalization concerned exclusively neoplastic pathologies, in 131 cases cardiovascular pathologies (for example Acute Myocardial Infarction-AMI, heart failure, stroke), in 52 cases gastrointestinal pathologies (for example cholecystitis, perforation of the intestine, intestinal obstruction, cirrhosis), in 147 cases other pathologies.

5. Symptoms

Figure 4 shows symptoms most commonly observed at hospital admission. Fever, dyspnoea and cough were the most commonly observed symptoms, while diarrhoea and haemoptysis were less commonly observed. Overall, 7.5% of patients did not present any symptoms at hospital admission.

Figure 4. Most common symptoms observed in SARS-CoV-2 positive deceased patients



6. Acute conditions

Acute Respiratory Distress syndrome was observed in the majority of patients (94.2% of cases), followed by acute renal failure (23.3%). Superinfection was observed in 18.9% and acute cardiac injury in 10.7% of cases.

7. Treatments

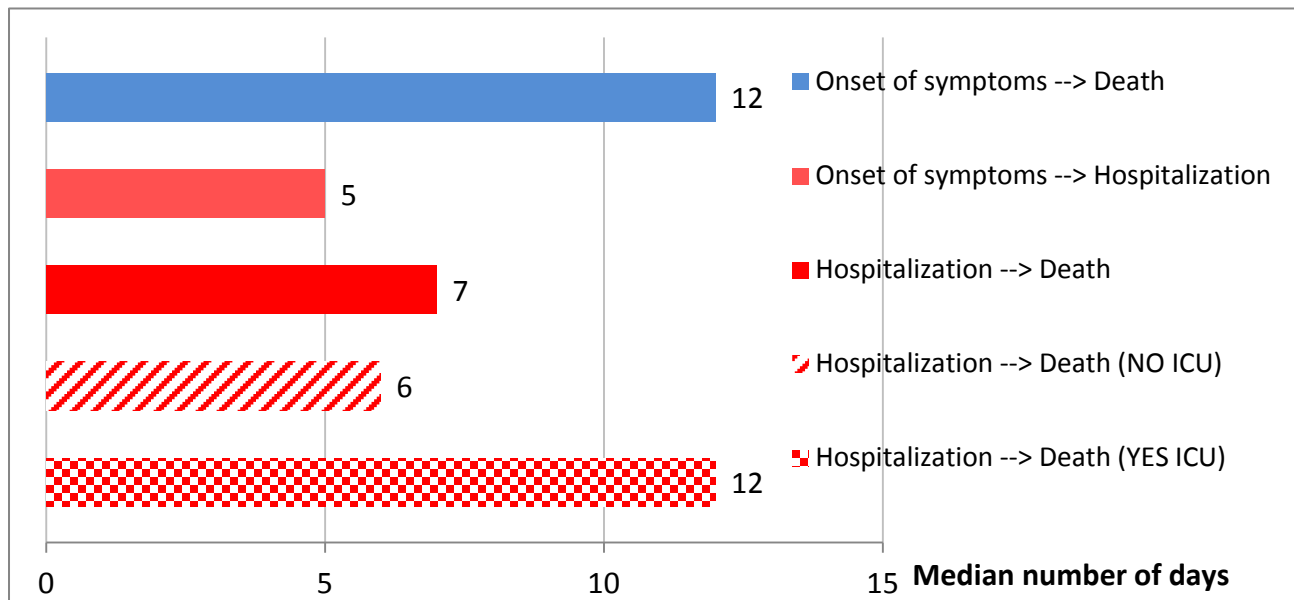
Antibiotics were used by 86.5% of patients during hospital stay, while less used were antivirals (56.6%) and corticosteroids (45.2%). Concomitant use of these 3 treatments was observed in 26.5% of cases.

Out of SARS-CoV-2 positive deceased patients, 4.6% were treated with Tocilizumab during hospitalization.

8. Time-line

Figure 5 shows, for SARS-CoV-2 positive deceased patients, the median times, in days, from the onset of symptoms to death (12 days), from the onset of symptoms to hospitalization (5 days) and from hospitalization to death (7 days). The time from hospitalization to death was 6 days longer in those who were transferred to intensive care than those who were not transferred (12 days vs. 6 days).

Figure 5. Median hospitalization times (in days) in SARS-CoV-2 positive deceased patients



9. Deaths under the age of 50 years

As of October 22nd, 412 out of the 36,806 (1.1%) positive SARS-CoV-2 patients under the age of 50 died. In particular, 90 of these were less than 40 years (60 men and 30 women), age range between 0 and 39 years. For 12 patients under the age of 40 years no clinical information is available; out of the remaining ones, 64 had serious pre-existing pathologies (cardiovascular, renal, psychiatric pathologies, diabetes, obesity) and 14 had no major pathologies.

10. Comparison of death characteristics in the 2 quarters March-May and June-August 2020

Table 4 summarizes the main characteristics of deaths with COVID-19 that occurred in 3 periods of time from the beginning of the pandemic in 2020: the initial quarter, March-May, the second quarter, June-August, and the third period September-October. In this analysis, **only patients who died in hospital, with complete medical records and death certificates and whose death certificates included COVID-19 among the causes responsible for death (part 1 of the death certificate)** were included. Overall, the sample represents 10.1% of all deaths from the beginning of the pandemic; in particular, the 10.1% of those who died between March and May, 14.5% of those who died between June and August, and 4.3% of those who died between September and October.

In the second and third periods, the average age of deaths and the proportion of women slightly increased (particularly in the second period) in comparison to the first period; deaths of people with 3 or more pre-existing pathologies increase and those of persons with fewer pathologies or none decrease: this seems to indicate that in the second and third period deaths concern older people and persons with a pre-existing health condition worse than those dying in the first quarter (table 4).

Table 4. Mean age, prevalence of women, number of pre-existing diseases, complications and treatments in deaths with COVID-19 by death period of time

	All (n=3700)	March-May 2020 (n=3448)	June-August 2020 (n=201)	September- October 2020 (n=51)	<i>p</i> - value*
Age (years)	78.0	77.8	81.0	82.0	<0.001
	n (%)	n (%)	n (%)		
Women	1282 (34.6)	1156 (33.5)	106 (52.7)	20 (39.2)	<0.001
N of comorbidities					
0	147 (4.1)	146 (4.3)	1 (0.5)	0 (0.0)	<0.001
1	499 (13.8)	476 (14.1)	18 (9.0)	5 (9.8)	
2	756 (20.8)	722 (21.4)	27 (13.6)	7 (13.7)	
3 or more	2225 (61.3)	2033 (60.2)	153 (76.9)	39 (76.5)	
Complications during hospitalization					
Acute Respiratory Distress Syndrome	3439 (96.8)	3210 (97.2)	180 (90.5)	49 (96.1)	<0.001
Acute renal failure	825 (23.2)	757 (22.9)	53 (26.6)	15 (29.4)	0.276
Acute cardiac injury	368 (10.4)	354 (10.7)	14 (7.0)	0 (0.0)	0.013
Superinfection	629 (17.7)	520 (15.7)	98 (49.2)	11 (21.6)	<0.001
Treatments					
Antibiotics	2968 (87.2)	2914 (87.1)	178 (90.4)	44 (86.3)	0.410
Antivirals	2039 (59.9)	2039 (61.0)	80 (40.6)	15 (29.4)	<0.001
Steroids	1425 (41.9)	1388 (41.5)	133 (67.5)	44 (86.3)	<0.001
Tocilizumab	150 (4.6)	133 (4.4)	15 (7.5)	2 (3.9)	0.088

* *p*-value for difference between the two quarters

For deaths occurred in the second period, all pre-existing co-morbidities increase, except for obesity; deaths of persons with atrial fibrillation and dementia show a statistically significant increase; in the third period of time, persons with autoimmune diseases increase in a statistically significant way (Figure 6).

Figure 6. Pre-existing pathologies in deaths with COVID-19 according to the quarter of death

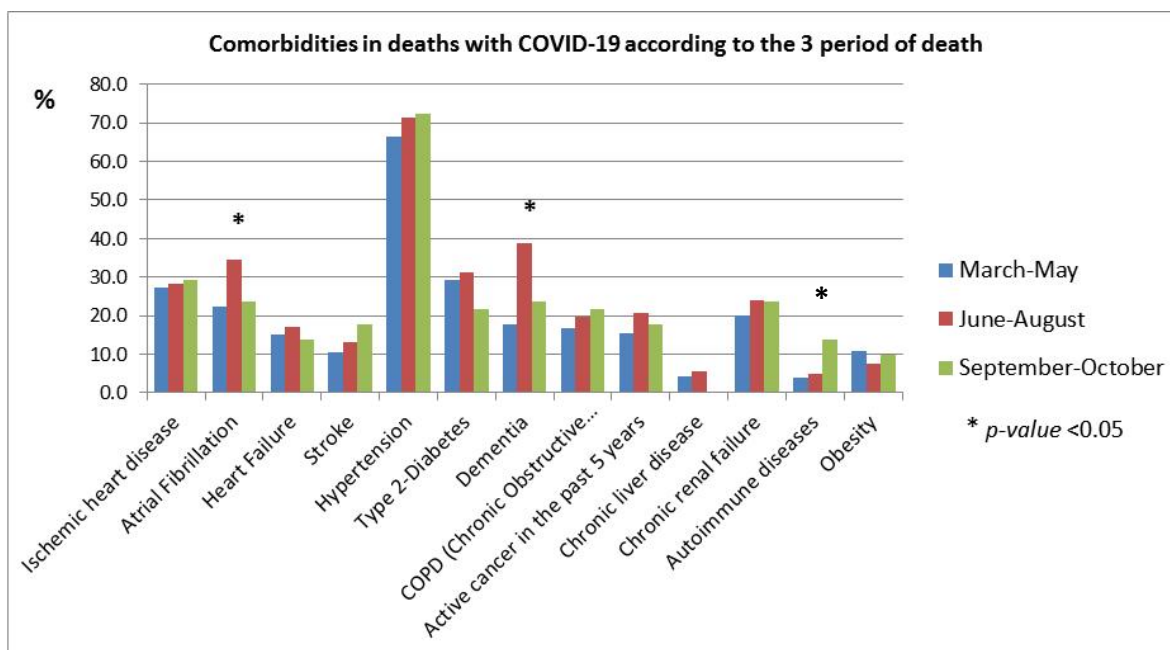


Table 5 shows the durations, as median times (in days), from the symptoms onset to death, SARS-CoV-2 testing, and hospitalization, and from the hospitalization to death, in the first 2 quarters considered. By the moment, comparison is limited to the first 2 quarters only; sufficient data for this analysis are not available for the two-month period September-October yet. The time that elapses from the onset of symptoms to death increases by about 3 times; the time that elapses from the onset of symptoms to the execution of the swab for detection SARS-CoV-2 infection decreases; the median duration in days from hospital admission to death increases by more than 4 times. These results seem to suggest that the timeliness of tests after the symptoms onset has improved and, above all, that survival times have increased from the onset of infection.

Table 5. Median times (in days) between symptoms onset, PCR test, hospitalization and death

	All (n=3439)		March-May 2020 (n=3277)		June-August 2020 (n=162)		p-value*
	Median	IQR	Median	IQR	Median	IQR	
From symptoms onset to death	12	7-19	12	7-18	38	12-63	<0.001
From symptoms onset to SARS-CoV-2 testing	5	3-9	5	3-9	3	1-9	0.004
From symptoms onset to hospitalization	4	2-7	4	2-7	3	1-7	0.18
From hospitalization to death	6	3-13	6	3-12	26	7-54	<0.001

* p-value for difference between the two quarters

IQR=Inter-Quartile Range

The data here presented can be explained by a greater knowledge about the infection and a greater ability and timeliness of treatment in the period June-August in comparison to the previous quarter. In addition, it is likely that in the months of March and April SARS-CoV-2 infection was under-diagnosed in many frail elderly who died (such as those living in RSA). This may have led to an underestimation of the burden of the diseases in persons dying in that period

This report was produced by SARS-CoV-2 Surveillance Group

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