

16 July 2020

IMPACT OF COVID-19 EPIDEMIC ON MORTALITY: CAUSES OF DEATH IN COVID-19 LABORATORY CONFIRMED CASES

This report, jointly produced by Istat and the Istituto Superiore di Sanità (ISS), shows an in-depth analysis of conditions reported on medical death records of laboratory-confirmed cases (i.e., by RT-PCR on nasopharyngeal swabs) of COVID-19. While the first three reports focused on the impact of the pandemic on the overall mortality¹, the objective of the current one is to quantify the cases in which COVID-19 is the cause directly leading to death and to analyze the role of conditions, other than COVID-19, in determining the death.

The Istituto Superiore di Sanità (i.e., the Italian National Institute of Health) is responsible for the Italian National integrated Surveillance of cases of COVID-19 (decree 640 of 27/02/2020, Italian Civil Protection), and collects all medical records and Istat cause-of-death records (circular 5889 of 25/02/2020, Ministry of Health) of all deceased confirmed COVID-19 cases.

According to the National Statistical Program, Istat is responsible for official statistics on causes-of-death for Italy. For this purpose, Istat applies the International Classification of Diseases of the World Health Organization (ICD10) for the coding of all medical information reported on cause-of-death records. The ICD10, being used internationally, guarantees reproducibility and comparability of data.

The application of the mentioned classification to death records collected by the ISS Surveillance, including the recent WHO guidelines for the classification of COVID-19², allows a standardized evaluation of causes-of-death in these cases.

The current report includes the results of the analysis carried out on 4,942 death records collected by the ISS, out of 31,573 total deaths reported to the National COVID-19 Surveillance System until May 25th, 2020. All records have been coded using ICD-10 standardized criteria, specialized software and expert personnel.

¹ Third joint ISS-Istat report on mortality of the resident population <https://www.istat.it/it/archivio/245415>

² [https://www.who.int/classifications/icd/covid19/en/..](https://www.who.int/classifications/icd/covid19/en/)

MAIN FINDINGS

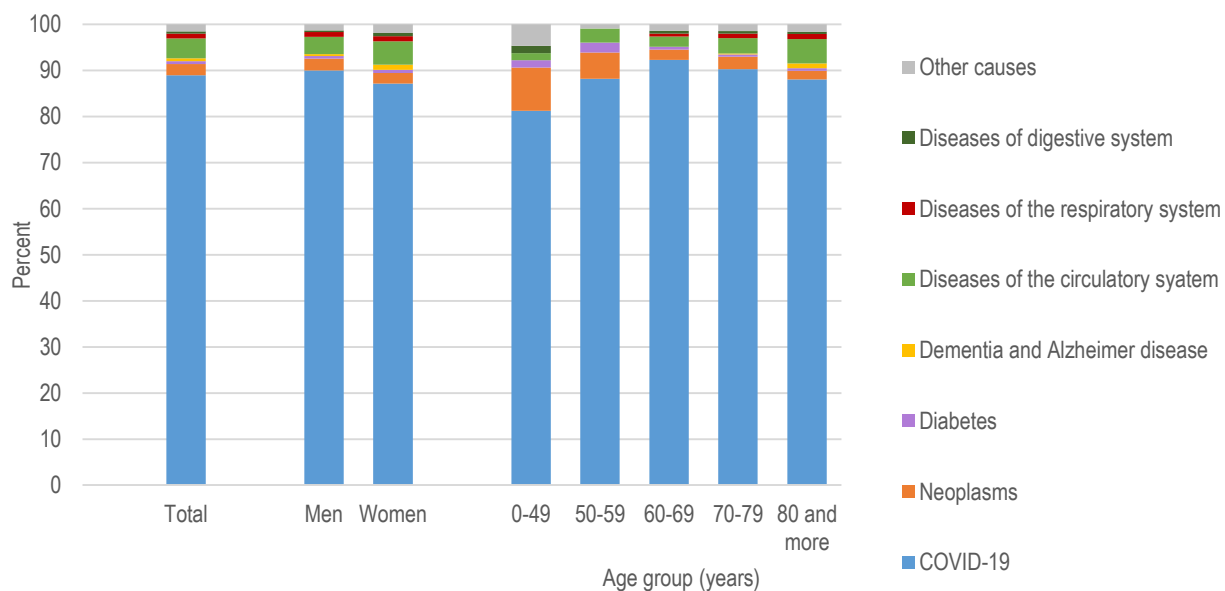
- Causes of death reported on 4,942 death records of patients with a positive test to SARS-CoV-2 were analyzed (15.6% of total deaths reported to the COVID-19 Surveillance System of the ISS until May 25th). The records include, besides COVID-19, all conditions and diseases that, according to the certifying physician, contributed in determining the death.
- COVID-19 is the cause directly leading to death, i.e. the underlying cause, in 89% of deaths of people with a positive test to SARS-CoV-2. The main causes in the remaining 11% of cases are diseases of the circulatory system (4.6% of total deaths analyzed), neoplasms (2.4%), diseases of the respiratory system (1%), diabetes (0.6%), dementia (0.6%) and diseases of the digestive system (0.5%).
- The proportion of deaths in which COVID-19 is directly responsible for the death varies by age ranging from 82% in people under 50 years to 92% in the 60-69 years.
- COVID-19 can prove fatal even in the absence of coexisting causes-of-death: in 28.2% of cases analyzed there was no mention on the death record of other causes contributing to death besides COVID-19. This percentage is similar in both genders with no variation among age groups, except for 0-49 years where the percentage of deaths without coexisting causes drops to 18%.
- In 71.8% of deaths of people with a positive test to SARS-CoV-2, there is at least an extra cause contributing to death besides COVID-19: in 31.3% there is only one coexisting cause, in 26.8% there are two and in 13.7% there are three or more.
- Coexisting causes found more frequently associated with COVID-19 are hypertensive heart disease (present in 18% of the death records analyzed), diabetes mellitus (16%), ischemic heart diseases (13%) and neoplasms (12%). Besides, with frequencies below 10%, chronic lower respiratory diseases, dementia and Alzheimer disease and obesity are also reported.
- The most frequent COVID-19 complications leading to death are pneumonia (found in 79% of death records), and respiratory failure (55%), but besides these appear the shock (6%), acute distress respiratory syndrome (6%), heart complications (3%), sepsis and unspecified infections (3%).

Table 1 – Deaths by gender and age group. Absolute numbers and percent distributions.

Age group (years)	Men		Women		Total	
	N	%	N	%	N	%
0-49	47	1.5	17	0.9	64	1.3
50-59	178	5.7	50	2.7	228	4.6
60-69	374	12.0	117	6.4	491	9.9
70-79	985	31.7	374	20.4	1,359	27.5
80 and more	1,501	48.3	1,259	68.6	2,760	55.8
Unknown	23	0.7	17	0.9	40	0.8
Total	3,108	100.0	1,834	100.0	4,942	100.0

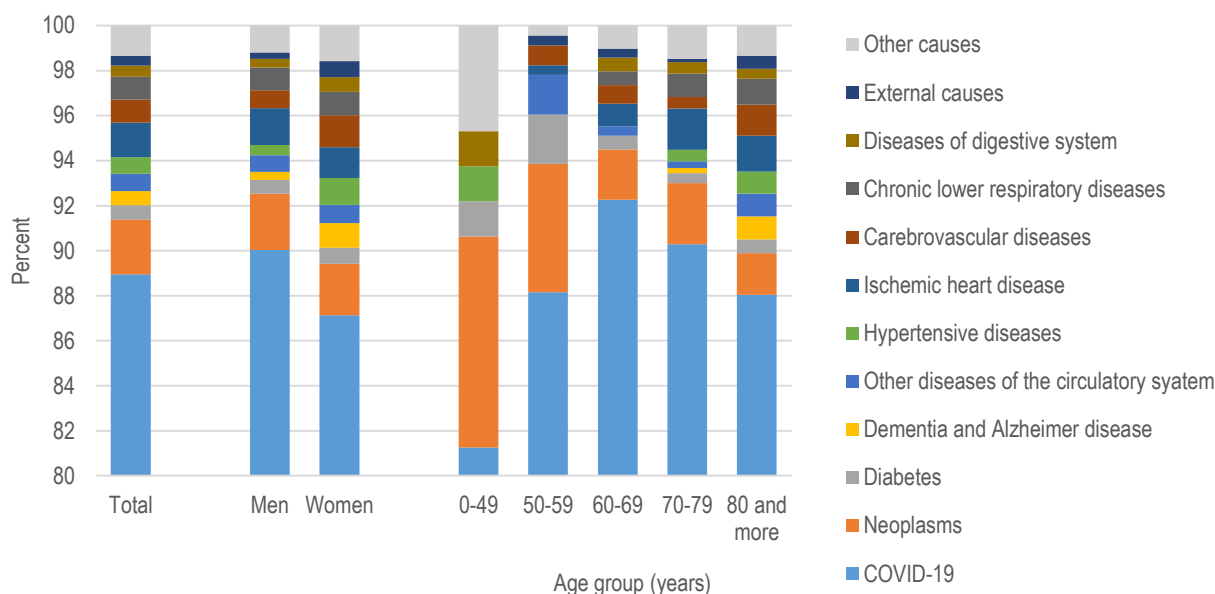
Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

Figure 1 – Deaths of laboratory-confirmed cases of COVID-19 by underlying cause of death. Percent distribution by age group and gender.



Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

Figure 2 – Deaths of laboratory-confirmed cases of COVID-19 by underlying cause of death, with detailed underlying causes. Percent distribution by age group and gender.



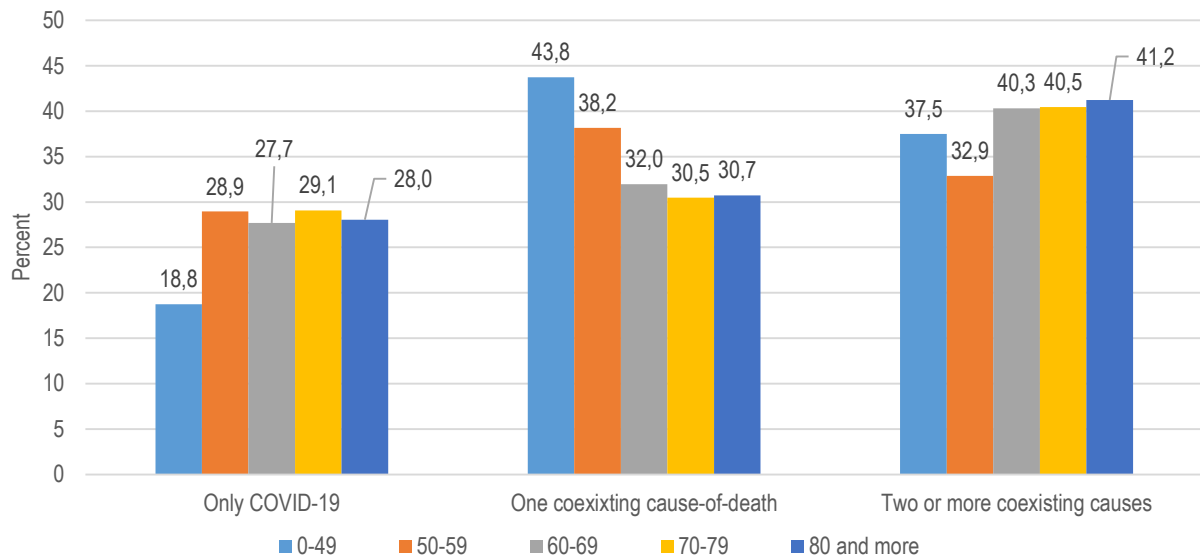
Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

Table 2 – Number of coexisting causes-of-death (besides COVID-19) in deaths of laboratory-confirmed cases of COVID-19 and average number, by gender.

Number of coexisting causes-of-death	Men		Women		Total	
	N	%	N	%	N	%
None	881	28.3	512	27.9	1,393	28.2
At least one	2,227	71.7	1,322	72.1	3,549	71.8
of which:						
1	970	31.2	575	31.4	1,545	31.3
2	810	26.1	516	28.1	1,326	26.8
3	368	11.8	184	10.0	552	11.2
4 or more	79	2.5	47	2.6	126	2.5
Total	3,108	100.0	1,834	100.0	4,942	100.0
Average number	1.3		1.3			1.3

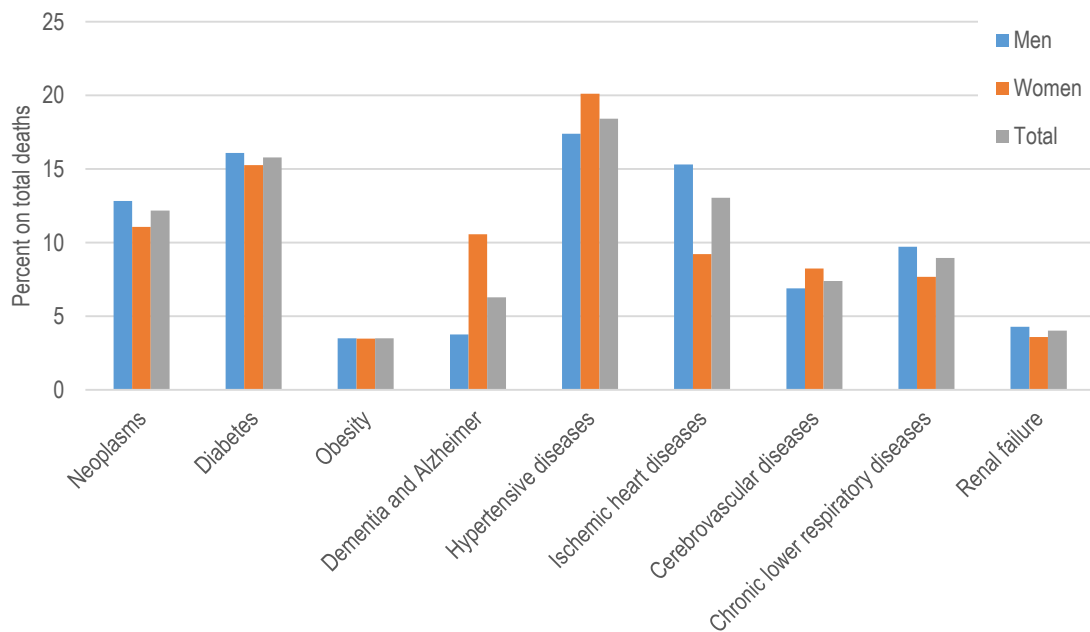
Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

Figure 3 – Percent distribution of deaths of laboratory-confirmed COVID-19 cases by number of coexisting causes-of-death and age group.



Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

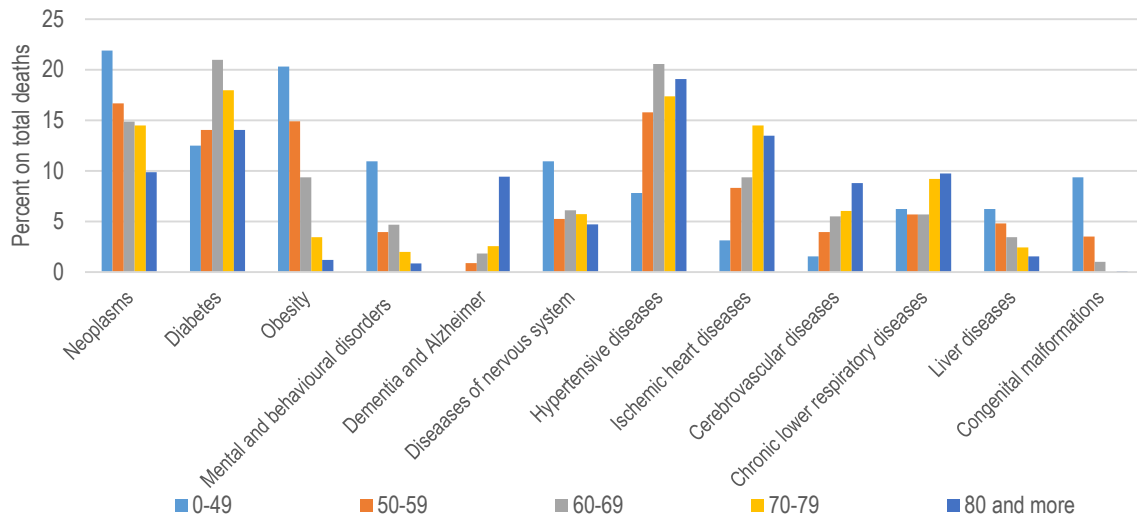
Figure 4 – Coexisting causes (besides COVID-19) in deaths of laboratory-confirmed COVID-19 cases, percent on total deaths by gender^(a).



Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

^(a) Only the most frequent causes are represented. The percent do not sum up to 100 since each death can have more than one coexisting cause-of-death.

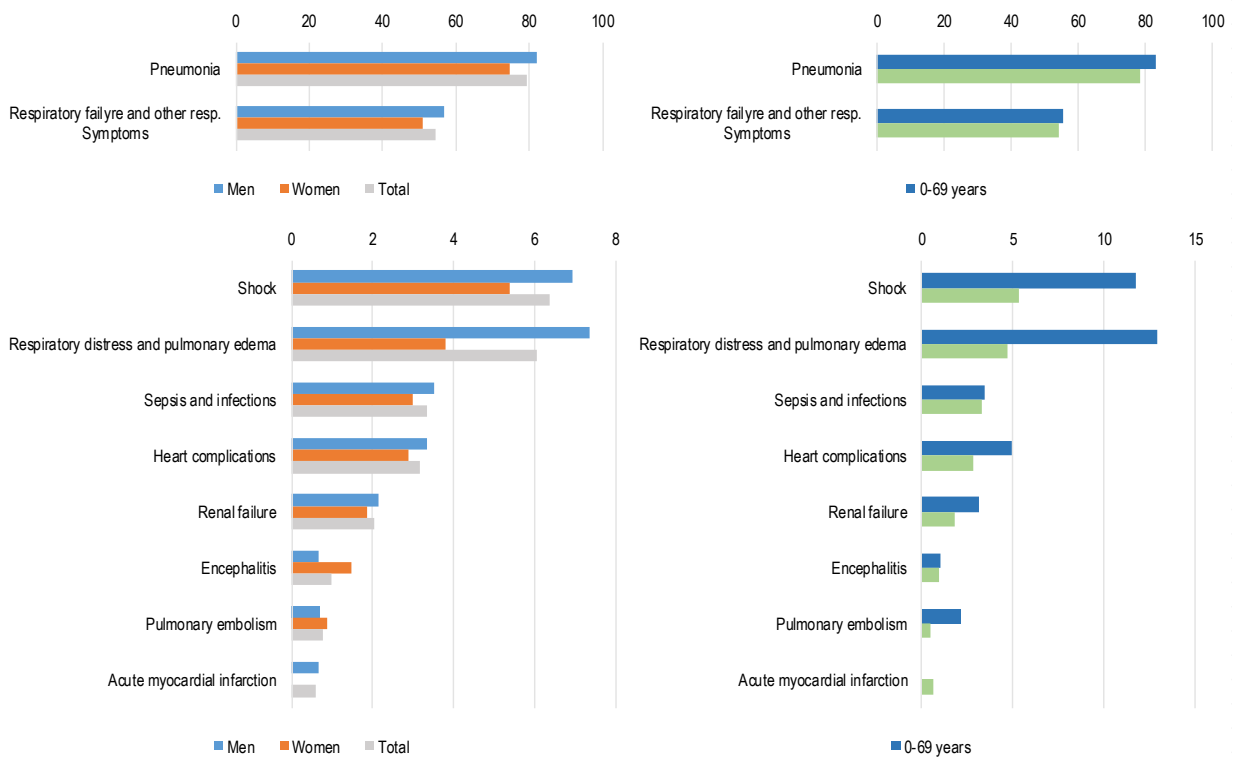
Figure 5 - Coexisting causes (besides COVID-19) in deaths of laboratory-confirmed COVID-19 cases, percent on total deaths by age group^(a).



Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

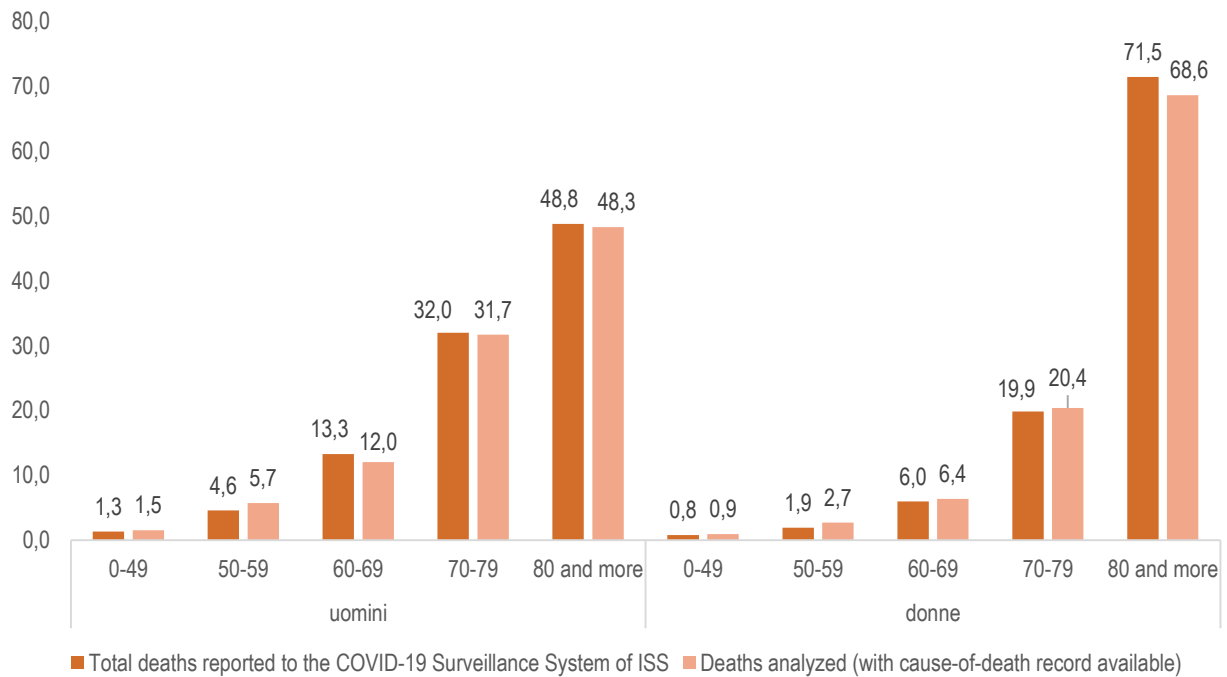
^(a) Only the most frequent causes are represented as well as some that show variation by age group.

Figure 6 – Conditions more frequently reported as complications of COVID-19 in deaths of laboratory-confirmed COVID-19 cases by gender and age group.



Source: Istat elaboration on data from Iss, COVID-19 Integrated Surveillance System.

Figure 7 – Comparison of age and gender distribution of deaths analyzed in the present report and the total deaths of laboratory-confirmed COVID-19 cases reported to the Surveillance.



Source: Iss, COVID-19 Integrated Surveillance System.