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IMPACT OF COVID-19 ON THE MORTALITY RATES FOR THE RESIDENT POPULATION OF THE UMBRIA REGION IN ITALY

ABSTRACT

BACKGROUND

Mortality surveillance provides a crucial method for monitoring disease activity.

Coronavirus disease 2019 (COVID-19) can cause excess mortality both directly and indirectly by increasing deaths from other diseases.

The aim of this study was to investigate the effects of COVID-19 on mortality in Umbria (Italy) .

OBJECTIVES

In this paper, we have discussed the mortality figures in the Umbria region after analyzing the data from the national Health registry between December 2019 to April 2020; the period of infection and its comparison with the data from previous five years.

METHODS

The factors governing these figures were studied including temperature, standard mortality rates, territorial distribution, death due to all cases as well as the non-COVID deaths.

A cross-sectional retrospective analysis of mortality data from 1 december 2019 to 30 April 2020 was undertaken. Baseline mortality estimated using the Farrington flexible model and excess mortality were calculated for the pandemic period according to cause of death, place of death and age group.

CONCLUSION

A sharp increase in mortality figures was observed for the month of march and low temperature also had a role to play.

However the difference when compared to previous 5 years was not significant as was expected at the start of the study.

A single factor cannot be responsible for the total mortality figures in a region as is frequently predicted.

INTRODUCTION

One of the most debated aspects of the Coronavirus disease (COVID-19) pandemic period has been the mortality due to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection. There has been a lot of discussion about the actual number of deceased, considering underestimation of reporting, as all the deaths have not been RT-PCR tested for COVID-19.

This is an indicator influenced not only by the methods of classification of causes of death, but also by the availability of tests to detect the novel coronavirus. ⁽¹⁾

This pandemic might have several repercussions, both positive and negative, on the mortality figures. On one hand, we can hypothesize an increase in deaths due to RT-PCR confirmed COVID-19 cases in addition to the number of deaths due to symptomatic COVID-19 cases that were not tested. Furthermore, it needs to be understood that, the cases that die from coronavirus disease are not the only victims of COVID-19 but also people who did not seek treatment because of a fear of catching the virus or the ones who did not receive the care they required because the health systems were overstretched. On the other hand, there might also be a reduction in the number of deaths from road traffic accidents owing to the lockdown and increased awareness. ⁽²⁾

When we talk about global assessments of both direct as well as indirect impact of COVID-19, the number of excess deaths, that is, the number of deaths above the expected figure at that time of the year serves to be a better measure. Nevertheless, a clearer picture of the situation can only be obtained after the initial phases of the pandemic have passed and more detailed data of the death figures can be accessed.

METHODS

In this paper, we have discussed the mortality figures of the Umbria Region in Italy based on the figures by the Regional Health Registry data, Italy from December 2019 to April 2020 (the period hypothetically linked with the spread of the virus during the first/initial wave of the pandemic) and comparing the same with the previous five years (2015-2019).

The impact of the pandemic on the mortality of the population can be explained by comparing the deaths due to all causes, during the same period, with the average deaths during the previous five years assuming that the spread of the infection could, due to its complexity, produce an increase in deaths that may not be directly attributable to COVID-19 positive deaths.

This information partially manages to fill a heavy information gap in reading the Umbrian mortality data, considering the fact that, to date, the Prevention Departments do not have the regularly computerized mortality data, named Registered Register of Causes of Death.

RESULTS

There was a reduction in the mortality figures for December, January, February, and April 2020 respectively of 11%, 13%, 8%, and 6% and an increase of 6% in March 2020.

An increase in the number of deaths was observed in months with lower temperatures; starting from March.

The standardized mortality rate for March was significantly higher than in February and April for females and in April for males.

As per the territorial distribution, the districts of Orvieto and Narni-Amelia experienced a higher mortality rate compared to the other regions. Considering the deaths that did not occur due to COVID-19, there were no significant differences as compared with the previous five years.

DISCUSSIONS

The World Health Organization (WHO) swiftly published international guidelines on coding and certification of deaths due to COVID-19, which recommended the inclusion of suspected/probable cases in data reporting on deaths. Some countries have adapted their coding practices accordingly. ⁽³⁾

Comparison of deaths in Umbria Region between 1 December - 30 April, 2015-2020

To compare the mortality, reference was made to a baseline value determined by an average of daily deaths that occurred between 2015-2019.

(Since 2020, as well as 2016, is a leap year, it has been decided to ignore the deaths that occurred on February 29 for these two years due to ensure comparability between the years considered.)

This average value was described along with standard deviation, to identify any deviation from the trend (FIG. 1A).

The 5-day daily average trend of the number of deaths from December 2019 - April 2020 remained substantially below the baseline except for March wherein the values exceeded the baseline, even above the upper limit of the standard deviation (FIG. 1B).

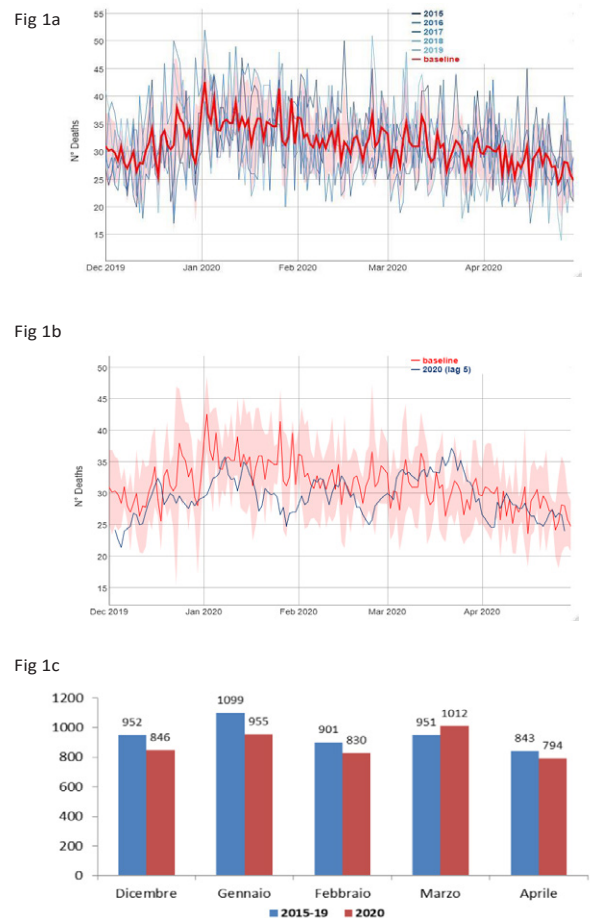
The same comparison with the monthly average of deaths that occurred in the five-year period, 2015-19 confirms what has been observed, showing a percentage reduction for the months of December, January, February, and April respectively of 11%, 13%, 8% and 6% and an increase of 6% in March (FIG. 1C).

Factors influencing the measurement of COVID-19 related deaths

1. The influence of death reporting guidelines

The adoption of the WHO guidelines on coding and certification of deaths by countries could provide

Fig. 1



Source: Health Registry

FIGURE 1

Fig.1a Annual trend and daily average of deaths for all causes. December 1 to April 30. Umbria 2015-19 ;

Fig.1b The 5-day daily deaths average from all causes from December 1st - April 30th in Umbria. Comparison 2020 and baseline 2015-2019;

Fig.1c Monthly deaths for all causes from December to April. Umbria. Comparison 2020 and average years 2015-19.

uniformity in reporting the mortality figures and hasten the workflow process.

In Italy, electronic registers are used for monitoring the surge of deaths in “almost real-time” for many but not all localities. In some areas, however, there is still a considerable delay in obtaining data on registered mortality figures because they have not yet been digitalized.

Also, Belgium, France, and Italy, among others developed an improved and faster reporting process at the initial stages of the pandemic to include

deaths occurring in other settings; eg: care homes, which were accounted for a “significant and growing proportion” of overall.

2. The influence of temperature

One of the factors that should be considered while comparing mortality between infra-annual periods is the seasonal trend of deaths, for which weather acts as one of the elements that determine these oscillations. This influence can be demonstrated by observing the relationship between the average daily temperature and daily mortality for the same period. ⁽⁴⁾

From the available data (FIG. 2a) an increase in the number of deaths was observed in months with lower temperatures; starting from March.

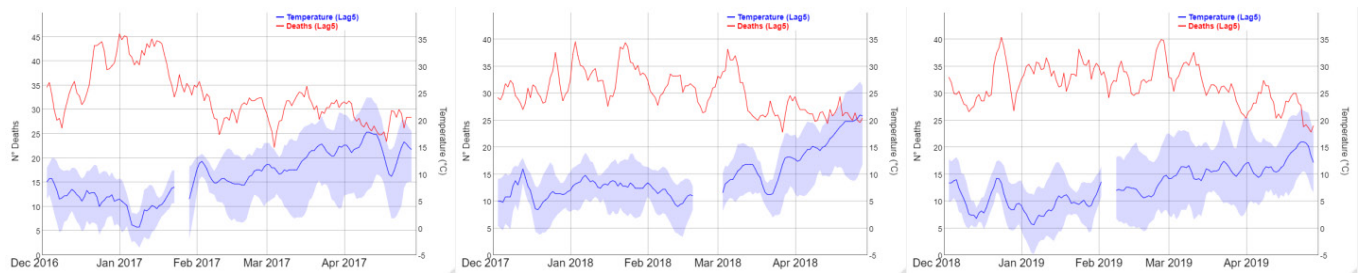


Fig 2a

Every year, a progressive decrease in the number of deaths was observed corresponding to the rise in average temperatures every day (*Data relating to average, minimum, and maximum daily temperatures, made available by www.ilmeteo.it from 1st December 2016 to 30th*). For the month of March 2020, on the other hand, there was an increase in the number of deaths despite the rise in temperature (FIG. 2B).

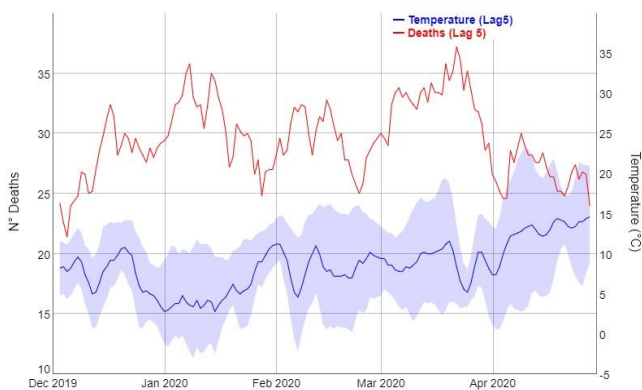


Fig 2 b

This trend, therefore, shows a direct causal effect of the epidemic in the regional territory.

The comparison between deaths for all causes and for COVID-19

Umbria region encountered the pandemic a little later when compared with other regions, with a few weeks of delay. i.e, the first group of cases were detected at the end of February.

This further lead to a delay in the recording of deaths, i.e starting from mid-March.

The comparison of average daily deaths to 5 days for COVID-19 for all causes during March-April 2020 showed no significant correspondence in the performance of the two curves (FIG 2C). However, it should be remembered that deaths from COVID-19 are a limited number (N = 67).

Comparison of standardized mortality rate

In consideration of the fact that in March there is greater mortality from all causes compared to the previous five years, to verify the hypothesis that even in our region the number of deaths linked to COVID-19 infection may be underestimated, the standardized monthly mortality rate for all causes was calculated for the two periods under review.

The comparison between the standardized mortality rates in March does not show any differences for both sexes between 2020 and the average for the five-year period 2015-19.

In comparison between the two periods, however, a lower standardized mortality rate is observed in January 2020. On the other hand, in the comparison between the five months of 2019-20, we observe for March, a standardized mortality rate that is significantly higher than in February and April for females and in April for males (TAB.1).

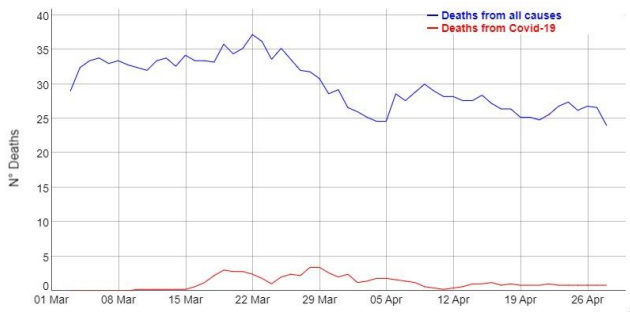


Fig 2 c

FIGURE 2

Fig.2a Trend of the 5-day daily average of deaths for all causes and the 5-day average of average T ° C (minimum and maximum) 1 Dec - 30 Apr. Umbria. Years 2017,2018 and 2019 ;
 Fig.2b Trend of the 5-day daily average of deaths for all causes and the 5-day average of average T ° C (minimum and maximum) 1 Dec - 30 Apr. Umbria. Years 2017, 2018 and 2019 ;
 Fig.2c Daily average of 5 days of deaths for all causes and for COVID-19 March 1st - April 30th 2020. Umbria.

December 2014-18	0.000907	4.33E-05	0.000822	0.000992
January 2015-19	0.001038	4.62E-05	0.000947	0.001128
February 2015-19	0.000859	4.21E-05	0.000777	0.000942
March 2015-19	0.000926	4.37E-05	0.000840	0.001012
April 2015-19	0.000832	4.15E-05	0.000751	0.000914
Female				
Month	Rate st.	Error st.	Lower LC	Upper LC
December 2014-18	0.000960	4.27E-05	0.000877	0.001044
January 2015-19	0.001107	4.58E-05	0.001018	0.001197
February 2015-19	0.000906	4.15E-05	0.000825	0.000988
March 2015-19	0.000941	4.23E-05	0.000858	0.001023
April 2015-19	0.000826	3.96E-05	0.000748	0.000904
Male				
Month	Rate st.	Error st.	Lower LC	Upper LC
December 2019	0.000758	3.85E-05	0.000683	0.000834
January 2020	0.000875	4.15E-05	0.000794	0.000957
February 2020	0.000760	3.86E-05	0.000685	0.000836
March 2020	0.000902	4.19E-05	0.000819	0.000984
April 2020	0.000728	3.79E-05	0.000654	0.000802
Female				
Month	Rate st.	Error st.	Lower LC	Upper LC
December 2019	0.000816	3.86E-05	0.000741	0.000892
January 2020	0.000898	4.02E-05	0.000819	0.000977
February 2020	0.000783	3.77E-05	0.000709	0.000857
March 2020	0.000974	4.21E-05	0.000891	0.001056
April 2020	0.000743	3.66E-05	0.000672	0.000815

TABLE 1

The Standardized mortality rate per month

3. Influence of Territorial distribution

To further understand this phenomenon, the rate was calculated as crude mortality for all causes by the territorial district in the first quarter. (January-April 2020).

From the map, it can be inferred that the districts of Orvieto and Narni-Amelia have a higher rate compared to the others. (FIG.3 - TAB.2)

Fig.3

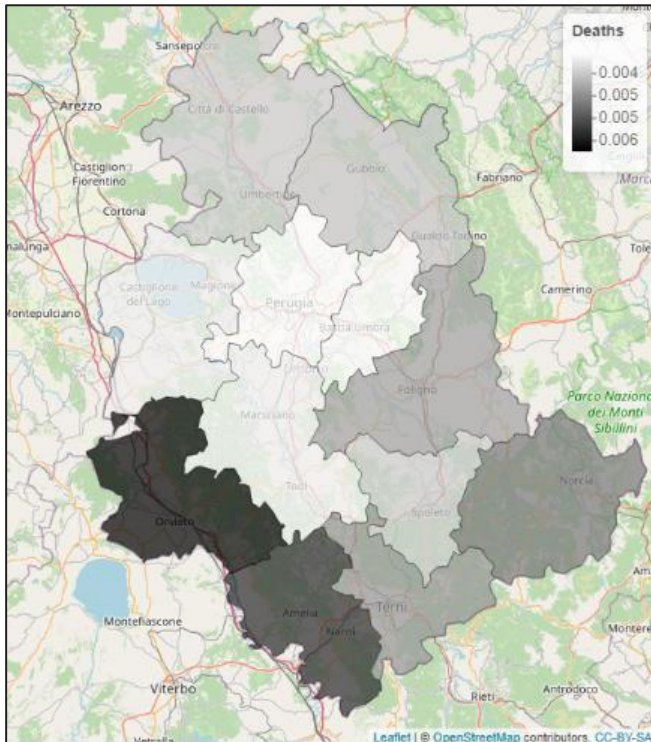


FIGURE 3 Crude mortality rate by district. Umbria. Quarter January-April 2020

The comparison with the previous five years shows in 2020 for the same districts higher mortality than the average of the previous years, highlighting an increase in deaths for these territories compared to the expected 4.4x10,000 inhabitants. The increase in deaths persists even by subtracting the number of deaths attributed to COVID-19 from the total for the four months (TAB, 2).

This could in part support the hypothesis that in these two districts the number of deaths linked to COVID-19 infection may have been underestimated. The interpretation of mortality figures and comparisons differ across countries as the duration of the initial phase of the pandemic might differ across countries.

The national aggregates do not necessarily reflect the local impact of covid-19. For example, Lombardy in Italy and New York City in the United States reported larger figures in terms of excess mortality than the national recorded mortality.

Unintended Mortality

“Unintended” mortality⁽⁵⁾ due to road accidents and occupational accidents during the lockdown period, 11 March - 30 April, was considered to affect the total number of deaths occurring due to all causes.

For this purpose, the number of deaths from the aforementioned lockdown cases was estimated (50 days), based on the mortality due to cause information available from ISTAT (The National Statistical Institute is an Italian public research body that deals with general censuses of the population, services, and industry, and agriculture, sample surveys on households and general economic surveys at the national level) and fatal accidents from INAIL (The National Institute for Insurance against Accidents at Work is an Italian non-economic public body, subject to the supervision of the Italian Ministry of Labor and Social Policies) in the years 2015-17. This number was then added to the total number of deaths that occurred from 11 March-30 April 2020 and compared with the average deaths for the five-year period 2015-19 referring to the same period.⁽⁶⁾

Average N deaths/year for accidents at work and transport s accidents (years 2015-17) = 75

Estimate N deaths / day = 0.205

Estimated deaths not occurred in the Lockdown = $0.205 \times 50 \text{gg} = 10.3$

N deaths from 11 March to 30 April 2020 = 1494

Average N deaths from 11 March to 30 April 2015-19 (five years) = 1484

$\Delta 3 (2020 - 2015-19) = + 1.35\%$

Even considering the deaths that did not occur due to COVID-19, there were no significant differences with the previous five years.

Table 2.

District	All-cause mortality rate			Covid-19 mortality rate	All-cause no Covid-19 mortality rate		
	2020	2015-19	Δ		2020	2015-19	Δ
Perugino	0,356%	0,368%	-0,012%	0,007%	0,349%	0,368%	-0,019%
Assisano	0,357%	0,368%	-0,011%	0,002%	0,356%	0,368%	-0,012%
Media Valle del Tevere	0,366%	0,418%	-0,052%	0,009%	0,357%	0,418%	-0,060%
Trasimeno	0,367%	0,421%	-0,054%	0,007%	0,360%	0,421%	-0,061%
Alto Tevere	0,398%	0,421%	-0,023%	0,022%	0,375%	0,421%	-0,046%
Alto Chiascio	0,403%	0,464%	-0,061%	0,004%	0,400%	0,464%	-0,065%
LHU UMBRIA 1	0,370%	0,398%	-0,028%	0,008%	0,362%	0,398%	-0,037%
Terni	0,444%	0,453%	-0,009%	0,004%	0,440%	0,453%	-0,013%
Foligno	0,434%	0,437%	-0,003%	0,003%	0,431%	0,437%	-0,006%
Narni-Amelia	0,535%	0,491%	0,044%	0,008%	0,527%	0,491%	0,036%
Spoletto	0,398%	0,437%	-0,040%	0,002%	0,396%	0,437%	-0,042%
Orvieto	0,573%	0,529%	0,044%	0,027%	0,546%	0,529%	0,017%
Valnerina	0,470%	0,487%	-0,017%	0,009%	0,461%	0,487%	-0,026%
LHU UMBRIA 2	0,463%	0,461%	0,001%	0,007%	0,456%	0,461%	-0,005%
UMBRIA Region	0,410%	0,426%	-0,016%	0,008%	0,402%	0,426%	-0,023%

TABLE 2

The crude mortality rate by district and Local Health Unit, four months January-April

CONCLUSION

From the analysis of data from the Health Registry, used to reconstruct the trend of mortality from all causes and all ages in our region, no differences emerged for the four-month period January-April compared to the five-year period 2015-19 used as a reference.

While considering the increase in deaths in March 2020, consistent with the trend of the epidemic in the region, the comparison between the standardized mortality rates does not show significant differences for both sexes compared to the five-year reference period.

The territorial distribution of deaths shows a higher rate for the districts of Orvieto and Narni-Amelia than in the previous period: this could in part support the hypothesis that in these districts the number of deaths linked to COVID-19 may have been underestimated. By restricting the comparison to the lockdown period, also taking into account the estimate of the mortality not occurring due to road accidents and fatal accidents at work in the

same period, no differences are observed with the previous five years.

From the analyzed data, therefore, no elements emerge that suggest a further impact of the COVID-19 epidemic on the total mortality of the population residing in Umbria. Frequent lockdowns impacting people financially may have their own detrimental effects in terms of mental health and physical well-being.⁽⁷⁾

This socio-economic impact might play a major role in determining the mortality rates as we transition from the acute phase of the pandemic to a more chronic “suffering” phase.

A relatively detailed perspective on the cumulative data on deaths will be beneficial in understanding the effects of COVID-19 on the mortality figures of the population.

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