

## LETTER TO THE EDITOR

# Informing the global COVID-19 response by estimating excess deaths in Italy during the COVID-19 and 1918 influenza pandemics

Coronavirus disease-2019 (COVID-19) is an unprecedented health crisis in modern times, with an estimated 2.89 million deaths worldwide as of April 2021.<sup>1</sup> Italy was one of the first countries outside of Asia to experience a wave of COVID-19 cases, and in response instituted national limits regarding movement and closures of schools, recreational activities, and shops.<sup>2</sup> To help illustrate the power of a robust and consistent public health response and illustrate the need for a continued robust response worldwide as we face the threat of new COVID-19 variants, we analyzed data from Italy to examine the excess mortality during the COVID-19 pandemic, compared with the 1918 influenza pandemic.

We compared all-cause mortality in Italy during July–December 1918 and January–June 2020, when the first pandemic peaks occurred, using publicly available data from the Italian National Institute of Statistics.<sup>3</sup> All-cause mortality rates were calculated overall and monthly using the 1911 and 2011 census populations as the denominator. Overall and monthly mortality rate ratios (MRR) and 95% confidence intervals (CI), calculated as  $e^{(\log(MRR) \pm [1.96 \times SE(\log(MRR))])}$ ,<sup>4</sup> for each pandemic were calculated, using the average mortality rates during the same period in the five preceding years as a reference, using R Studio (version 1.2.5042) (PBC, Boston, MA).

Italy experienced a much lower MRR during the COVID-19 pandemic than it did during the 1918 influenza pandemic. The overall MRR in 1918 was 2.56 (95% CI: 2.55–2.57), in 2020 it was 1.12 (95% CI: 1.12–1.13) (Table 1). The difference in MRR between the 1918 flu and COVID-19 was particularly stark during the fourth month of the pandemics (Figure 1). In October of 1918, the MRR was 5.78 (95% CI: 5.73–5.84), compared with 1.39 (95% CI: 1.37–1.40) in April of 2020.

The elderly appear to be a particularly vulnerable group during the ongoing COVID-19 pandemic. There were 219,110 deaths in those over the age of 65 years from March to June of 2020 from a population of 1,618,837, while the average deaths from the same period from 2015 to 2019 were 176,336 from a population of 1,623,559. When age groups are considered, the MRR was 1.18 (95% CI: 1.16–1.20) for those aged 65–74 years, 1.30 (95% CI: 1.28–1.31) for those aged 75–84 years, and 1.22 (95% CI: 1.21–1.23) for those aged 85 and older.

The results of this study show that excess mortality in Italy during the 1918 influenza pandemic was much higher than the excess mortality during the COVID-19 pandemic. Although these

results might be expected due to the increase in public health infrastructure and advancements in medical science in the intervening century, it is noteworthy that a recent study in New York City (NYC) showed similar MRR between the 1918 influenza outbreak and the COVID-19 pandemic.<sup>5</sup> Reasons for the unexpected results in NYC could be the slow public health response, lack of testing,<sup>6</sup> inadequate or delayed implementation of masks and social distancing guidelines,<sup>7,8</sup> and incomplete and intermittent lock-downs. Unlike NYC, Italy had universal access to medical care, a well-organized, capillary public health system,<sup>9</sup> and underwent a complete eight weeks lock-down.<sup>10</sup> These results also show that the excess mortality during the COVID-19 pandemic was much higher in the elderly, particularly among those 85 years of age or older, while previous data suggest that during the 1918 pandemic, younger ages were more affected.<sup>11</sup>

Limitations of this study include the fact that there were delays in reporting and underreporting of deaths among soldiers during WWI, and therefore final estimates for 1918 may be higher than shown here. In addition, statistics for deaths in 2020 are still partial. Results indicate that the United States and other countries without a robust public health system should strengthen their public health network responses, particularly after a second wave of deaths during the winter holiday season.

Ultimately, the results of this study illustrate that even with the vast improvements in the fields of technology and medicine that have occurred over the last 100 years, without clear public policy, robust public health infrastructure, and universal access to medical care, excess mortality rates remain consistent. When these services are available to the public, however, mortality rates can be much lower. This information should also serve as an illustration of the importance of robust data collection that can be used to guide both continued global responses to COVID-19 and prepare countries to combat future pandemics.

## CONFLICT OF INTERESTS

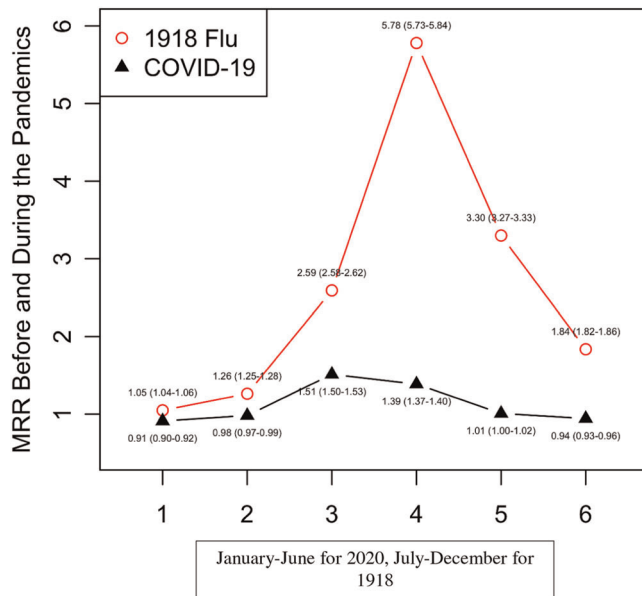
All the authors declare that there are no conflict of interests.

## AUTHOR CONTRIBUTIONS

Raja Flores and Emanuela Taioli conceived of the study. Marcantonio Caltabiano provided mortality data from the 1900s and guidance on limitations and interpretations using that data. Christina Gillezeau

Time period	Population	Deaths*	Deaths per 100,000 persons	MRR (95% CI)
July–December 1913–1917	220,028,262	331,685	150.74	REF (1.00)
July–December 1918	215,532,000	831,857	385.95	2.56 (2.55–2.57)
January–June 2015–2019	363,472,952	317,454	87.34	REF (1.00)
January–June 2020	361,467,834	353,978	97.93	1.12 (1.12–1.13)

\*For years 1913–1917 and 2015–2019 deaths are averages of the total deaths for the 6 month time period of each year.



**FIGURE 1** Mortality rate ratio (MRR) in Italy during the 1918 Flu and coronavirus disease pandemics, compared with the corresponding 5 previous years

and Naomi Alpert completed statistical analysis. Christina Gillezeau and Emanuela Taioli drafted the manuscript. All authors reviewed and approved the manuscript before the submission.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in Istituto Nazionale di Statistica (ISTAT) at <https://www.istat.it/en/>, reference number 2.

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**TABLE 1** Population, deaths, and mortality rate ratios (MRR) in Italy for July–December of 1913–1917 and 1918 and January–June of 2015–2019 and 2020

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