Age- and Gender-Specific Excess Mortality during the Covid-19 Pandemic in Hungary in 2020

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March 2021

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Abstract:

The excess mortality indicator is able to capture how an epidemic affects a country's mortality processes, taking into account direct and indirect, as well as possible effects in different directions. From the point of view of mortality processes in Hungary, the main feature of the first months of 2020 was that seasonal flu claimed fewer victims than in previous years, for this reason we examined last year's excess mortality for the period between weeks 12 and 52 related to the coronavirus epidemic using a stochastic mathematical model. According to our calculations, excess mortality related to the coronavirus epidemic in Hungary was 13,700 people in 2020, which means a 14% excess in the period under review. Eighty-six percent of those who died were over the age of 65, 10 percent were between the ages of 50 and 64, and the proportion of those aged 49 or younger was 4 percent. In almost all age groups, the excess mortality rate was nearly twice as high for men as for women. According to our calculations, excess mortality was roughly one and a half times the number of victims claimed by the epidemic in 2020 according to official statistics, and we also found a significant difference between the time course of the two indicators.

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The coronavirus epidemic appeared in Europe at the beginning of 2020 and has since been concentrated in successive waves in individual countries and regions.[2] Although the launch of the vaccine has brought the end of the epidemic within a foreseeable distance, it will be several years before we can get a relatively accurate picture of how the epidemiological crisis has affected Hungarian mortality processes in the short and long term. Accordingly, the study below cannot undertake to scrutinize the entire epidemic. Last year's closing, however, provides an opportunity to analyze the mortality processes in Hungary in 2020, and within this to identify the effects of the coronavirus.

The impact on mortality of an epidemic, virus, or any other event that significantly affects life expectancy should be measured via the development of excess mortality, which is often used in the literature of demographics. The essence of this indicator is to compare the actual mortality processes with a hypothetical (counterfactual) situation, based on the assumption of what would have happened if the event under study, in our case the coronavirus epidemic, had not occurred. It is important to stress that the indicator is the result of an estimate, as it requires a forecast of how many would have died in 2020 if mortality had been in line with previous years. Comparing this with last year's actual mortality data, we get the results for excess mortality.

One of the two important features of the indicator is that it aggregates all the effects that divert the development of mortality from its previous trajectory. In the case of the coronavirus epidemic, this means that it includes both direct and indirect, as well as positive and negative effects. Direct effects include cases where a death can be traced back to a coronavirus infection, that is, when someone dies due to the direct adverse health effects of the epidemic. The spectrum of indirect effects is much wider than this (Beaney et al., 2020). The overburdened health care system, psychological harms associated with the crisis, restrictions on hospital operations deemed as deferred, as well as postponed or permanently failed medical visits due to the risk of infection all substantially increase health risks. However, the impact of all these adverse consequences may be mitigated by increased funding for health care, stronger protection against flu due to the general use of masks, and restrictions on more risky (outdoor) activities from the point of view of various accidents. It is important to emphasize that the division line between direct and indirect effects is rather blurred, as it is not always clear, especially in the case of elderly and chronic patients who are most at risk, whether the coronavirus alone causes a death or other triggers also play a role in it. Moreover, the practice

[2] I am grateful to Lajos Bálint, who helped with both data collection and the display of the results.

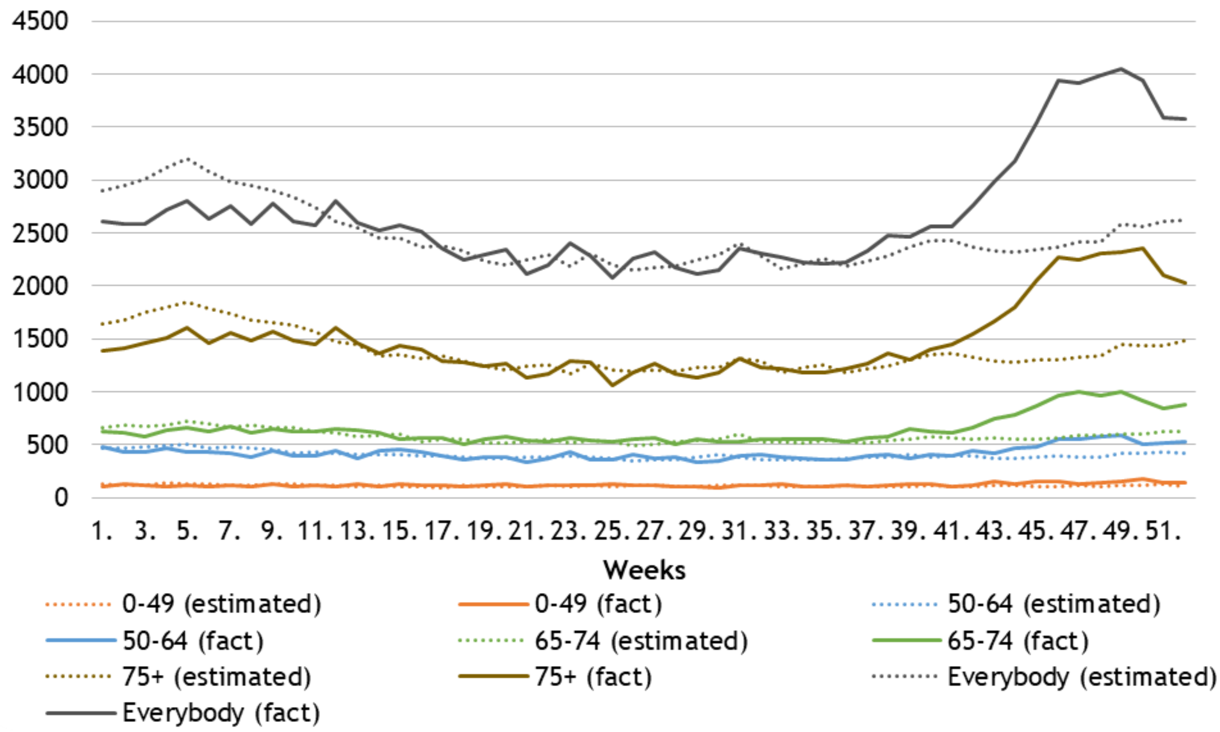
of individual countries is not uniform in how to categorize those who are infected but whose death can be traced back to another underlying disease.

Another important feature of excess mortality as a measure is that, contrary to its name, it does not necessarily measure excess, but the balance in general. The indicator may also be negative in cases where the number of deaths in the year under review is lower than in previous years due to some reason, such as a milder than usual course of a flu epidemic, as it was the case in Hungary in the first months of the 2020, which is the subject of the study.

In order to calculate excess mortality related to the coronavirus in Hungary, we used a stochastic mathematical model published by Lee-Miller (2001) to make a prediction by age and gender using data from 2010–2019 on how mortality would have developed in 2020 (Tóth, 2021). This method has two important advantages over the simpler and therefore very widespread practice of comparing last year's deaths only with the mortality data of the preceding one or two years and with some sort of their average. On the one hand, this way we can take into account the more or less continuous improvement of the mortality situation: life expectancy at birth in Hungary, for example, increased from 74.4 years to 76.2 years between 2010 and 2019. On the other hand, this method can also be used to manage the change in the number of people born in different years, which is especially significant for the age group around 65 due to the Ratkó era. For example, between 2019 and 2020, the number of people aged 60-64 fell from 695,000 to 651,000, that is, more than 6 percent, in one year. The improvement of mortality trends and the differences in the headcount of generations are the peculiarities of the Hungarian demographic processes that should be taken into account when analyzing excess mortality. 2020 consisted of 53 weeks, but the decade before that only had one such year (2015), so for the sake of comparability, we only considered the first 52 weeks throughout our calculations.

According to our model calculations, following the mortality processes of the last decade, 128,700 people would have died in Hungary in 52 weeks in 2020, if the coronavirus epidemic had not appeared. In contrast, there were actually 139,000 deaths last year. Annual excess mortality is accordingly 10,300 people. However, as we have already pointed out, our results are distorted by the fact that the flu epidemic, which claimed an average of 2-3 thousand victims per year (Pakot–Kovács, 2020), was relatively mild in 2020, so our model overestimated expected mortality for this period. In order to exclude this from our calculation, in accordance with international practice, the Hungarian coronavirus-related excess mortality (hereinafter: excess mortality) is calculated from week 12, namely when the first victim of the coronavirus died in Hungary according to official statistics (16 March).

Figure 1: Estimated and actual mortality in 2020 by age groups (persons)



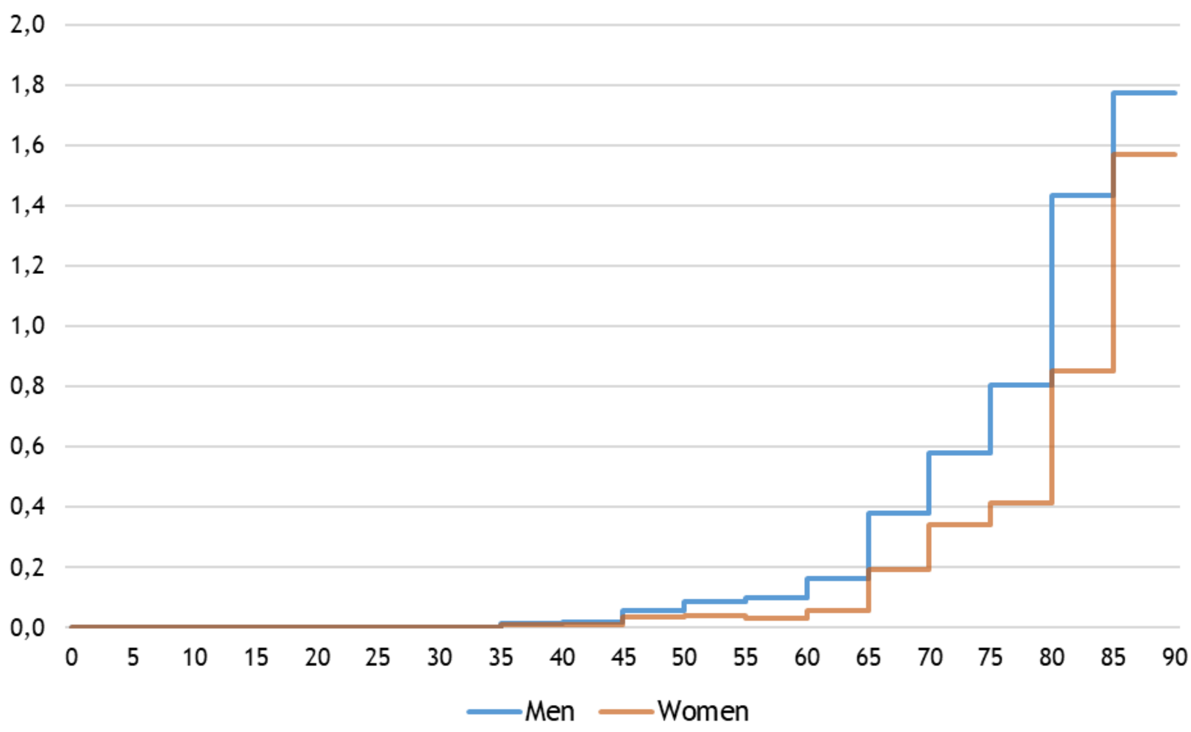
Source: Own calculation based on CSO data

According to our calculations, excess mortality between week 12 and 52 was 13,700 people, in total, meaning that so many more people died since the appearance of the coronavirus until the end of the year, compared to the assumed situation if there had been no such epidemic in Hungary. Percentually, the excess mortality rate in Hungary was 18, 61 and 46 percent in the most intensive periods, that is October, November and December, respectively. Over the entire period under review, i.e. between March and December, the average monthly excess mortality (excluding negative months) was 14 percent. This is exactly the average of the 22 EU Member States in the relevant EUROSTAT statistical data. The indicator was above 20 percent in six countries (Spain, Poland, Slovenia, Belgium, the Czech Republic and Bulgaria) and below 6 per cent in four countries (Denmark, Finland, Latvia and Estonia).

Our estimate of excess mortality was 86 percent of deaths over the age of 65, 10 percent between the ages of 50 and 64, and 4 percent of 49 years of age or younger. The number of deceased women and men is roughly the same, which can be traced back to two processes with opposite effects. Men are generally at higher risk in terms of the coronavirus, but there are a lot more women than men in the older age groups. As women's life expectancy at birth in Hungary is more than six years more than that of men (Kovács–Bálint, 2018), for example, the proportion of men over the age of 85 is only 27 percent. These processes are best captured by the age-specific mortality rate (Figure 2), which shows excess mortality as a percentage of the population in a given age group.

This reveals that the mortality rate for men between the ages of 55 and 59 reached 0.1 percent, so roughly one in a thousand men in this age group fell victim directly or indirectly to the coronavirus, according to the excess mortality we calculated between week 12 and 52. The rate rises sharply from here, with a coronavirus-related (excess) mortality rate of 0.4 per cent between the ages of 65 and 70, 0.8 per cent between 75 and 80 years, and 1.8 per cent over the age of 85. The indicator is just over half that among women in almost all groups: 0.2 percent for those aged 65-70, 0.4 percent for those aged 75-79, and rose to 1.6 for women over 85, approaching the age-specific mortality rate of men. The significant difference between the excess mortality rates of men and women in the same age group is consistent with the experience of other countries, for example Kontopalis et al (2020) found similar proportions when examining the experiences of the first wave of the epidemic in England and Wales.

Figure 2: Age-specific mortality rate (percentage, for five-year age groups)

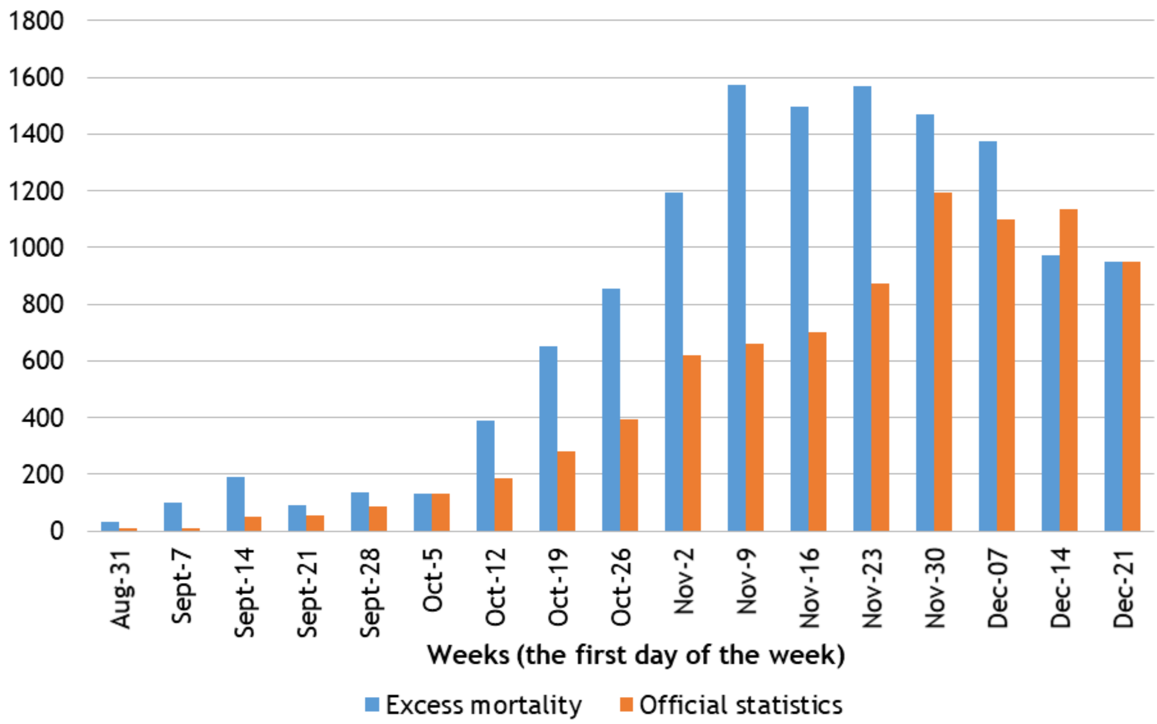


Source: Own calculation based on CSO data

The excess mortality we estimate is roughly one and a half times the number of deaths that official statistics directly related to the coronavirus in 2020. Although there is very little research so far that would allow us to compare the Hungarian undercount rate of 1.5 with data from other countries, based on a recent study, Hungarian practice can be considered to be average. Karlinsky and Kobak (2021) used aggregated national data for the modeling without a breakdown by age and gender, so this may presumably explain that in the case of Hungary, researchers received a value that is a few tenths less. At the same time, their analysis, extended to more than fifty countries, shows that although there were EU Member States with undercount rates below 1 and those with undercount rates above 2, the indicator varied between 1 and 1.7 in most EU countries, and the Community average was 1.5.

The time course of excess mortality shows a different picture of the evolution of the epidemic intensity than what can be read in official statistics (Figure 3). The latter indicates that after the onset of the second wave in mid-September, the effect of the virus was most intense in Hungary in early December, and only then did a slight moderation begin. This is in line with views according to which the beneficial effects of the strict restrictions introduced from 11 November (night curfew, shop closures, compulsory mask-wearing regulations, closure of secondary schools) show a more favorable evolution of mortality data in roughly 4-5 weeks.

Figure 3: Weekly trends in excess mortality and official coronavirus deaths in the last four months of 2020 (persons)



Source: Own calculation based on CSO data

In contrast, our calculations suggest that the surge in excess mortality also began in mid-September, but it peaked in early-mid-November, practically the week the austerity measures came into effect. After this, weekly excess mortality stagnated at a high level for nearly another month, before declining significantly by almost half by the end of the year. The result of the different trends is also that while weekly excess mortality in October and November significantly exceeded the official data, this difference completely disappeared by the end of the year.

There may be a number of reasons for the early peak of excess mortality compared to official statistics. Interpretation also depends in part on what is behind the difference between the two sets of data. If we look at the difference as covering indirect deaths, it is presumably worth looking for an answer by referring to the shrinking capacity of the health system, as it is conceivable that extreme system overload may have caused mortality beyond official statistics for a few weeks. If the difference is due to the difficulty of uniformly recording causes of death and, in fact, excess mortality largely measures direct mortality – but more accurately than official statistics - then early peaking can be explained, among other things, by developments in healing practices or by the deadly victims of the epidemic losing their lives in a shorter time than the 4-5 weeks previously observed.

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