**History in the making: Excess mortality in Switzerland during the second coronavirus pandemic wave in fall/winter 2020 was at its highest level since 1918**

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**Abstract**

Text.

**Introduction** *[The order and depth of the individual parts can still change at any time]*

In the wake of the coronavirus pandemic, which has had a firm grip on the world since the beginning of 2020, the concept of excess mortality is increasingly being used to monitor the overall impact of the pandemic on a given society 1. According to the Centers for Disease Control and Prevention (CDC), estimates of excess deaths provide information about the burden of mortality related to the COVID-19 pandemic, including also deaths that are indirectly linked to COVID-19 2.

The concept of excess mortality is based on a comparison between expected and observed values. As such, it was already used by demographers in the 1830s to describe, for example, the fluctuations in the seasonality of mortality by month in Belgium or Geneva 3,4. In the 1850s, William Farr used the concept of expected vs. observed values to identify population subgroups to benefit from sanitary interventions in England 5. The concept of excess mortality was probably first applied to a pandemic in the wake of the “Russian flu” in 1890, when, for example, in Switzerland, monthly mortality figures for the pandemic year 1890 were compared with the years before and after, additionally broken down by region, sex and age groups 6. In recent decades, the concept has been used in Switzerland primarily to analyse the impact of heat waves on the population 7,8.

According to the Federal Statistical Office's mortality monitoring 9,10, significantly more people died in Switzerland in 2020 as a result of the coronavirus pandemic than in previous years: after the 67,800 deaths in 2019, the figure was around 12% higher in 2020 at 76,000. Overall, life expectancy decreased between 2019 and 2020: For men, a life span of 81.1 years is calculated at birth (-0.8 years) in 2020, for women 85.2 (-0.4 years). The fact that both excess mortality 11 and the drop in life expectancy 12 were high in a European comparison is primarily due to the strong and comparatively long autumn wave from mid-October 2020 in Switzerland, which might be associated with a comparatively low Stringency Index (a score indicating the strictness of response policy) from summer 2020 13. So far, mainly drops in life expectancy during the first coronavirus wave in spring 2020 have been scientifically investigated 14.

Looking backwards, Switzerland has been hit by several global influenza pandemic outbreaks in the last 140 years: The “Russian flu” 1889, the “Spanish flu” in 1918, the “Asian flu” in 1957, the “Hong Kong flu” in 1968, the “Chinese-Russian flu” in 1977, and the “Swine flu” in 2009. Also, corona viruses caused pandemics: SARS in 2002, MERS in 2012, and COVID-19 since 2019/2020. Of all these pandemics, the 1918 influenza pandemic is the best researched, also in Switzerland, where it is considered as the largest demographic disaster in 20th century (causing ca. 25’000 deaths, about 0.67% of the population of that time) 15,16. The other past pandemics, or trends in mortality due to influenza in general, have received less research attention in Switzerland 17,18.

To date, there is no study that compares all historical pandemics in Switzerland on the basis of a uniform comparative measure, and adds the 2020 coronavirus pandemic for comparison. Switzerland is an ideal case study for such a long-term investigation because the neutral country was not actively involved in the world wars and has not experienced any territorial shifts since the 19th century. The main aim of this study was to contextualize monthly excess deaths during the coronavirus pandemic in Switzerland in 2020 with equivalent data since 1877 in order to assess the historical dimension of the current events.

**Material and methods**

*Data sources and availability*

Since 1877, the Federal Statistical Bureau has also reported monthly statistics in addition to the annual statistics on deaths 19. This data series is public and freely accessible via the website of the Federal Statistical Office.

*Data preparation*

Text.

*Statistical analyses*

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**Results**

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**Discussion**

*[takes on more form as soon as the results are in, the following are individual text modules which can be used, but do not have to be.]*

The aim of this study was to assess the historical dimension of the current events during the coronavirus pandemic in Switzerland in 2020. Relying on excess mortality and using monthly death records from 1877 to 2020, we found that the Swiss population in 2020, and especially in the months of November and December, experienced the highest level since 1918 and the second highest level since 1877.

Previous studies in the field of historical demography have looked in detail at changes in mortality and life expectancy in Switzerland since the 19th century, albeit mostly on the basis of annual figures 20–23. Our study is the first to analyse a continuous series of 140 years of monthly deaths in Switzerland.

The concept of excess mortality has often been used in recent decades to assess the overall impact of historical pandemics on specific populations: International comparisons have been made for individual pandemics 24–27, or different historical pandemics have been compared with each other 28–30. Recently, some studies have been published comparing excess mortality in 2020 during the coronavirus pandemic with the Spanish flu 31–33. A study similar to this one produced a very similar result for Sweden: In terms of the number of excess deaths, COVID-19 is the worst outbreak in Sweden since the 1918 influenza pandemic 34.

During new pandemic outbreaks, such as the 2009 swine flu pandemic and especially the 2020 coronavirus pandemic, public and scientific interest in past pandemics has increased markedly 35. However, these comparisons of the current pandemic with previous pandemics must be made with caution; as there are both parallels and important differences 36–38, and thus lessons from the past cannot be transferred unadopted to today's challenges. Especially when comparing the 2020 coronavirus pandemic with the 1918 influenza pandemic, it must be emphasised that the historical living context after the First World War was substantially different, the causing virus was a different one with different biological and epidemiological characteristics, and the mortality pattern concerning age groups was different between the two pandemics. And yet there are also significant parallels between the two pandemics, for example in the management of subsequent waves by the authorities, as was recently demonstrated using the example of the Swiss Canton of Bern 39.

The analysis of excess mortality over the last 140 years presented in this study confirms our earlier observations, which show that since 1918 Switzerland has been largely spared the fatal mortality effects of the other pandemics of the 20th and 21st centuries until 2019 40. This absence of recent epidemics in Switzerland (pandemic disaster gap) has led to a loss of pandemic disaster memory, and consequently an increasing disregard of immediate epidemic risks in the wider population and among policy makers. That means that the experiences of past epidemics are insufficiently present in the public at large. To a certain extent, this is also reflected in the Swiss Influenza Pandemic Plan (5th edition 2018) 41, which worked relatively well in managing the first coronavirus wave in spring 2020, but hardly addresses subsequent waves and their specific challenges.

One of the study's strengths is that Switzerland is an ideal case for such long-term historical contextualisation. This is because the territory of Switzerland has not changed since the mid-19th century, and because the neutral country has been spared the devastating mortality effects of the two world wars in the 20th century. However, this study has also important limitations. First, weekly death numbers as well as sex-, age-, and cause-specific monthly information is not available before 1970 on a national level 42. Second, current analyses during the coronavirus pandemic show that not all regions within Switzerland are always equally affected 9,14. We assume that this was also the case in earlier pandemics, but the monthly figures of deaths by canton are not yet digitally accessible before 1970, and so far this has only been documented for the 1918 influenza pandemic 15,43. Thirdly, it is known that the age-specific mortality pattern during the 1918 influenza pandemic deviated from the otherwise typical U-shape (high mortality among younger and older persons), when, for reasons that have not yet been conclusively explained, a disproportionately large number of young and healthy adults died from the “Spanish flu” 43,44. Such age-specific mortality patterns, which differ depending on the pandemic, have not yet been researched sufficiently with regard to their medium- and long-term effects on a society.

**Conclusions**

Our results indicate that historical contextualization is beneficial to put current events during the coronavirus pandemic in perspective. An accepted method to estimate the overall impact of pandemics on a society is excess mortality. Measured by this concept, the Swiss population in 2020, and especially in the months of November and December, experienced the highest level since 1918 and the second highest level since 1877. The 2020 coronavirus pandemic is thus a truly historic event. While excess mortality in Switzerland was moderate in the first wave in spring 2020, when intervention was relatively rapid, centralised and strong, it was especially the second wave in autumn/winter - as in 1918 - that left the greatest mark. Future pandemic planning should necessarily take better account of the specific challenges of subsequent waves and how to cope with them.

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**Conflict of interest**

The authors declare that they have no conflicts of interest.

**Author contributions**

Follows.

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**Tables and figures**

**Appendix material**