



Methodological explanations

Official statistics on deaths, excess mortality, causes of death and notifiable diseases

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1 Introduction

The Federal Statistical Office (FSO) compiles three different statistics enabling conclusions to be drawn about the number of deaths over a given period of time in Switzerland.

- Swiss Vital Statistics (BEVNAT)
- Mortality monitoring (excess mortality)
- Cause of Death Statistics

In addition, further statistics from other federal offices contain data on specific causes of death. These include, in particular, the statistics from the notification system for infectious diseases (FOPH), which were important during the COVID-19 pandemic.

The FSO's Vital Statistics (BEVNAT), provide annual and provisional monthly results for the number of deaths as well as births, marriages and divorces as they are reported in the electronic civil register (computerised civil status register, Infostar) via the civil registry offices to the FSO. Due to the increased need for figures to measure the extent of the pandemic, on 24 April 2020, the FSO also began publishing a weekly series based on the provisional number of deaths in BEVNAT.

The mortality monitoring, compiled by the FSO based on the daily deaths reported to the civil registry offices from Infostar enables the timely observation of periods with excess mortality.

The FSO's Cause of Death Statistics are based on the medical cause of death certificates, which it records according to the regulations of the International Classification of Diseases (currently ICD-10). Results are usually published annually. It currently takes about one year to compile the Cause of Death Statistics, which record all reported causes of death. The main causes are listed in the standard publications. In these standard publications, the underlying disease is reported as the cause of death; this is also referred to as main cause of death. Most publications do not report any concomitant disease that may have contributed to death.

Due to increased public interest in 2021 due to the COVID-19 pandemic, the coding was accelerated in order to publish more up-to-date data. Further acceleration is being developed. Since the end of 2021, provisional statistics with monthly results based on the latest coding results have been published regularly, in order to give a clearer picture of the pandemic situation.

The statistics of infectious diseases is compiled by the FOPH from the compulsory notification system for dangerous infectious diseases. Notifications from doctors, hospitals and labor-

atories, are primarily used to record cases of infection and additionally, deaths. The FOPH records the deaths with the "Clinical reports after death" (as required for Covid-19) or using an "Additional reporting" (such as for tuberculosis) but not for all notifiable diseases (e.g. not for influenza). These statistics are completely separate from the FSO statistics and are based on an independent data flow.

2 Methodology

2.1 FSO Vital Statistics (BEVNAT)

In [BEVNAT](#), based on civil status notifications, the FSO publishes figures on births, deaths, marriages and divorces as well as on registered same-sex partnerships and their dissolution. Since 24 April 2020, provisional demographic figures, with a nine-day turnaround, have been published weekly on the number of deaths, broken down by sex, age group, major region and canton. Provisional figures on the natural population change for a whole year are usually published in April of the following year, followed by the final figures in June.

Prior to publication of the final figures, the Vital Statistics are consolidated with the Population and Households Statistics (STATPOP). STATPOP is part of the population census system and provides information on the size and structure of the resident population at the end of the year as well as population change throughout the calendar year. Together with the structural survey, it forms the foundation of the household statistics. The statistics record persons from the permanent and non-permanent resident population (at their main, and if relevant, secondary residence), linked with geo-referenced buildings and dwellings. The comparison of BEVNAT with STATPOP consolidates the permanent resident population.

BEVNAT, the mortality monitoring, and the Cause of Death Statistics are based on people belonging to Switzerland's permanent resident population.

2.2 FSO Mortality monitoring (excess mortality)

Through its mortality monitoring, the FSO observes excess mortality, i.e. the weekly number of deaths above the usual value for the season. To do this, the number of deaths in a given year are estimated based on the trends seen in the previous five years; distribution across individual weeks is estimated on the basis of the median value for each individual calendar week of the previous ten years.

These estimates were carried out for the under-65 age group and the age group 65 and above. In the past there were several

periods with "excess mortality". The causal trigger is not directly mentioned in the data. It was always possible to attribute the trigger to a cause, such as the flu or a heatwave or more recently to the COVID-19 pandemic.

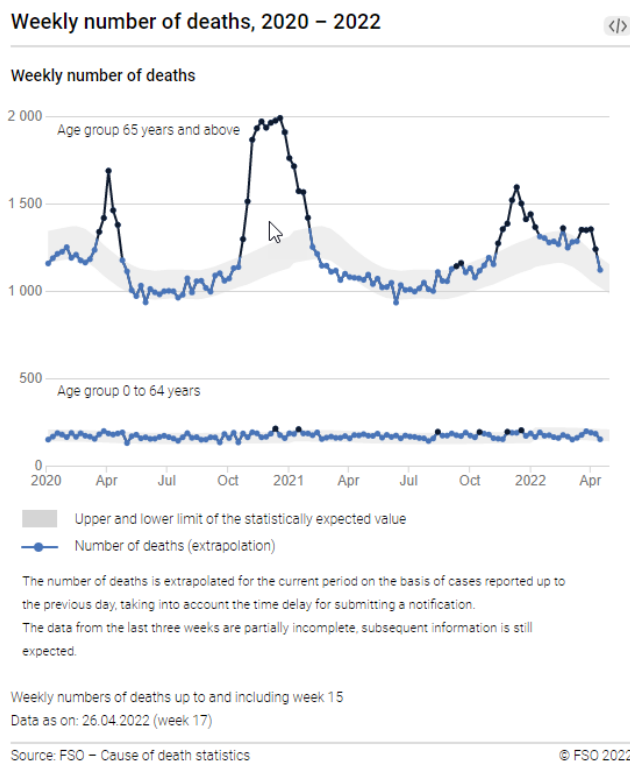
Due to random variation, not every divergence from the expected number of deaths actually constitutes excess mortality. Excess mortality is only determined when a deviation can no longer be explained by chance. To determine this, a 99% band-width is used around the expected value. Without systematic cause, the actual deaths should be beyond this range in only one out of 100 weeks by chance. The degree of excess mortality is calculated based on the difference between the estimated and expected number of deaths. It is therefore an estimate itself.

Due to the pandemic-related events in 2020, the expected numbers for 2021 could not be calculated in the usual way, as the excess mortality in 2020 would have led to a forecast of deaths in 2021 that was too high. For this reason, due to a lack of time and resources, the predictions for 2020 were reused for 2021. To calculate the forecast for 2022, a new method was developed to take into account the excess mortality during the pandemic. Because the pandemic took place in waves and not at the same time in all regions and age groups, the observed values for the three periods with excess mortality in 2020 and 2021 were replaced with the expected value in the age group 65 and above if they were more than one standard error above the expected value. This allows a stable prediction for 2022 to be made at national, major region and cantonal level.

The mortality monitoring figures are based on the daily civil registry notifications, which are sent to the FSO for its Vital Statistics (BEVNAT) by the civil registry offices. The processing of notifications takes time. A sufficiently large percentage (> 85%) of deaths are usually registered after nine days. This allows an estimate to be made of the actual number of deaths based on a solid data base.

When the statistical year is finalised in the following year, BEVNAT and STATPOP are realigned with one another in order to consolidate the permanent resident population and consequently also the number of deaths. For this reason, minor adjustments may be necessary retroactively until the statistical year is completely finalised.

In the [FSO's mortality monitoring](#) the number of deaths expected each week is estimated during the current year using the statistical model described above. This estimate is compared with the actual number of deaths in that same week. The diagram below illustrates the situation on 26 April 2022.



Figures are usually updated on Tuesday at 14:00; due to the way in which the data are processed, the published figures refer to the period up to nine days earlier. The data status of Tuesday 26 April 2022 is thus based on deaths up to and including Sunday 17 April 2022.

The mortality monitoring itself does not contain any diagnoses. The reason for temporary excess mortality must be deduced from other data sources and clinical reports. There is no doubt that the excess mortality in spring 2020 and autumn/winter 2020/2021 was due to the Covid-19 pandemic.

In addition, since 28 April 2020, the FSO has provided by its [experimental mortality monitoring](#) a regional report of excess mortality in the [seven major regions](#) as defined by the FSO (Eastern Switzerland, Zurich, Central Switzerland, Northwestern Switzerland, Espace Mittelland, Lake Geneva region and Ticino).

Since the start of 2021, the FSO has also published data and graphics at cantonal level for both the under-65 age group and the age group 65 and above with data as of 1 January 2020. The accuracy of the estimates depends on the number of cases, i.e. for smaller cantons the range of the expected values is greater in relation to the number of deaths.

The different graphs of the experimental mortality monitoring reveal the evolution of excess mortality from 2020 onwards in a particular region or canton. These figures are also updated every Tuesday at 14:00, following the same procedure as described above.

The final excess mortality figures for a given year are available in the second quarter of the following year. In general, however, the comparison of entire years is not fully suited to the assessment of the pandemic's evolution because it takes into account not only periods with pandemic-related excess mortality but also periods without excess mortality.

The main difference between the mortality monitoring and the weekly figures of the BEVNAT statistics is the mortality monitoring's estimate of the expected number of weekly deaths. This takes into account the effect of longer-term trends in mortality rates, population structure and seasonal effects. Another difference with regard to the BEVNAT statistics is that they also record deaths abroad of persons residing in Switzerland. In contrast, the mortality monitoring records only people residing in Switzerland and who have died in Switzerland.

2.3 FSO Cause of Death Statistics

In the [Cause of Death Statistics](#), the FSO records the underlying, secondary and concomitant diseases that led to death. The underlying disease is the one that was present at the start of the course of the disease and not the immediate cause that ultimately led to death. Should a chronically ill person also catch an acute infection, the infection is recorded as a concomitant disease (provided it has been identified). However, in the standard publication, since 1995 usually only the underlying disease has been reported, in line with the rules of the World Health Organization (WHO). In the cause of death coding, this is also indicated as the main cause of death.

Likewise, in the event of comorbidities, customarily only one underlying disease is reported in cause-of-death tables published worldwide. The reporting physician decides which diagnosis was the main causal contribution to death and records this on the medical cause of death certificate. This is consistent with the monocausal character of the publication of the Cause of Death Statistics. Due to the extraordinary effort involved, a multicausal analysis of the causes of death has hitherto only been carried out sporadically.

Diagnoses are written out in words on these certificates. Coding is based on the ICD-10 and is conducted by the FSO according to the rules defined by the WHO. For the sake of comparability between countries, all WHO member states adopt the same procedure.

Compilation of Cause of Death Statistics according to the principle of annuality takes approximately one year. Since 2021, provisional statistics with monthly results have been published based on the current coding progress. These provisional statistics take into account the pandemic and COVID-19 deaths are shown along with comorbidities. To give a clear picture of the pandemic, the COVID-19 deaths from the FSO Cause of Death Statistics are compared with the COVID-19 deaths reported in the FOPH's notification system.

With its mortality monitoring during the pandemic year 2020, the FSO reports excess mortality of several thousand people in the age group 65 and above.

ICD-10 COVID-19 coding

In February 2020, the WHO introduced the ICD-10 codes U07.1 and U07.2 to code deaths associated with a COVID-19 infection. In September 2020 the WHO made further ICD-10 codes available (U08.9, U09.9 and U10.9).

- U07.1 Covid-19, virus identified
- U07.2 Covid-19, virus not identified
- U08.9 Personal history of COVID-19, unspecified
- U09.9 Post COVID-19 condition, unspecified
- U10.9 Multisystem inflammatory syndrome associated with COVID-19, unspecified

These codes cannot all be used in the same way to code the underlying disease. According to WHO guidelines, only the codes U07.1, U07.2 and U10.9 can be used for this purpose. Code U08.9 is used to code a previously occurring COVID-19 infection as a concomitant condition. A post COVID-19 condition (U09.9) is coded as a secondary disease in the presence of another underlying disease. If no other disease is reported that could have led to death, the post COVID-19 condition is classified as the underlying disease, but according to WHO guidelines is coded as U07.1.

A clear distinction between clinical, epidemiological cases and laboratory-confirmed ones can only be achieved with the codes U07.1 and U07.2. The COVID-19 deaths published by the FOPH are exclusively laboratory-confirmed cases. To compile the provisional Cause of Death Statistics with monthly results and to make a comparison with the deaths from the FOPH notification system, the codes U08.9, U09.9 and U10.9 are initially classified as clinical, epidemiological cases. Should a case be identified as laboratory-confirmed when consolidation with the FOPH figures takes place, it will also be classified as laboratory-confirmed in the analysis.

On 19 October 2020, Swissmedic approved the first COVID-19 vaccine in Switzerland and the first vaccination in Switzerland was administered on 22 December 2020. For the coding of deaths associated with a COVID-19 vaccination, in January 2021 the WHO introduced an additional ICD-10 code, U12.9.

- U12.9 COVID-19 vaccines causing adverse effects in therapeutic use, unspecified

With the first results of the provisional Cause of Death Statistics for 2020, it could already be seen that the number of persons who died of and with COVID-19 reflected the observed excess mortality in the corresponding months.

- [Latest press release on provisional figures for the Cause of Death Statistics 2020](#)
- [Deaths: main causes of death \(CoD\) and COVID-19 as concomitant disease \(conc.\), by month and sex](#)
- [Concomitant diseases of all deaths with COVID-19 as main cause of death, by month and sex](#)
- [COVID-19 deaths according to the Cause of Death Statistics \(FSO\) and Notification system \(FOPH\), by month, age group and sex](#)
- A publication with the final figures for 2020 is planned for 29 August 2022

As a general standard, WHO member states report their Cause of Death Statistics according to a principle known as the principle of annuality, i.e. the statistics are produced for one year at a time. Consequently, the Cause of Death Statistics cannot be used to assess rapidly occurring epidemiological events requiring swift health policy action on the basis of current data.

An important reason for the FSO to continue producing the definitive Cause of Death Statistics on an annual basis, is the comparability over time. The Cause of Death Statistics are one of the FSO's oldest statistics, providing reliable data on the most frequent causes of human death in Switzerland since 1876.

The evolution of causes of death is based on changes in the prevalence and the lethality of diseases over years and decades. This enables the evolution of causes of death to be considered from a more general perspective. Accordingly, decision makers can act in ways that preserve and improve the health of the population.

It should be mentioned that the methodology underlying the Cause of Death Statistics must remain unchanged over the years as this is the only way to guarantee longitudinal comparability. However, diagnoses change with scientific progress in medicine which also need to be taken into account. This is why the WHO regularly updates the International Classification of Diseases.

To make comparisons between population groups and over time, the number of deaths in one year is considered in proportion to the mid-year population size. As the likelihood of dying rises exponentially with increasing age, age-specific rates are calculated. If a comparison is to be made based on a single figure, the impact of different population age structures must be taken into account. For population comparisons over time and space, this is achieved by age-specific rates being standardised. For the “direct standardisation”, the age-specific rates are multiplied by the population proportions of the ‘European standard population’ before being added up to a single figure. The standardised rates calculated in this way are expressed per 100 000 inhabitants to improve readability.

The following graph shows the changes in the standardised mortality rates by the most important causes over time since 1876.

2.4 Statistics from the notification system for infectious diseases (FOPH)

Outbreaks of infectious diseases require timely measures to contain them.

The FOPH’s statistics of infectious diseases are designed to provide a quantitative basis for such measures. Through reporting from doctors, laboratories and hospitals to the cantons and the FOPH, reports on people infected with Covid-19 are updated on a daily basis. The FOPH records deaths related to Covid-19 based on the “Clinical notification after death”, which is issued for all people who died with a positive Corona test. No distinction is made as to whether Covid-19 was the underlying disease or whether there was comorbidity, i.e. whether someone died ‘of’ or ‘with’ the Coronavirus.

The main causes of death since 1876 (deaths per 100 000 inhabitants)

