

Population and Welfare Department

# Information about the statistics on mortality

*This document describes some of the challenges that Statistics Sweden has faced in the production of the statistics on mortality.*

## Background

Some time at the end of 2019, a new coronavirus (SARS-CoV-2), which leads to the disease COVID-19, was identified in China. While it was initially largely limited to the city of Wuhan in China, the disease soon began to spread around the world. On 11 March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic<sup>1</sup>. The first cases in Sweden were observed as early as February 2020 and the first confirmed death related to COVID-19 in Sweden occurred on 11 March 2020<sup>2</sup>.

As more and more people in Sweden were affected by the disease, there was an increased need for detailed and frequent statistics on the number of deaths in Sweden to complement the Public Health Agency's reports on the number of COVID-19 cases and deaths. In late March 2020, Statistics Sweden decided to start publishing provisional statistics on all deaths, regardless of cause of death, reported to Statistics Sweden from the Swedish Tax Agency's population register. On 3 April, these statistics were published for the first time, and contained all deaths reported up to and including 30 March. Since then, Statistics Sweden has published provisional statistics every week on the number of deaths in Sweden, including information on date of death and region.

Statistics Sweden has opted to focus mainly on producing statistics on excess mortality. There are different ways to measure excess mortality; which method is best suited varies over time and between countries, and different measures of excess mortality are being used during the pandemic.

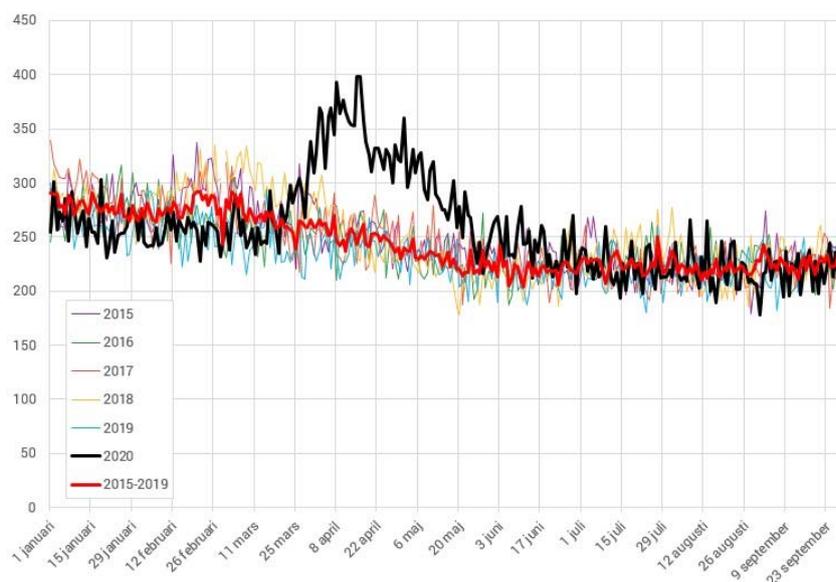
<sup>1</sup>Public Health Agency of Sweden, <https://www.folkhalsomyndigheten.se/nyheter-och-press/nyhetsarkiv/2020/mars/spridningen-av-covid-19-ar-en-pandemi/>.

<sup>2</sup>Public Health Agency of Sweden, <https://www.folkhalsomyndigheten.se/smittskydd-beredskap/utbrott/aktuella-utbrott/covid-19/statistik-och-analyser/bekraftade-fall-i-sverige/> (accessed 2020-10-14)

## Introduction

There were relatively few deaths noted in early 2020, which can be explained, in part, by a mild flu season in 2019/2020<sup>5</sup>. From mid-March, the number of deaths began to increase, and between 29 March and 25 May 2020, there was a higher number of deaths every day than in each corresponding day in 2015-2019.

*Figure 1. The number of reported deaths per day, 2015-2019, 1 January to 30 September*



To compare the number of deaths to a normal mortality rate, we often use the concepts of excess mortality and mortality deficit. Excess mortality arises when there are more deaths than in the comparison period, and mortality deficit arises when there are fewer deaths than in the comparison period. Excess mortality normally arises when many deaths occur in a short period caused by an influenza epidemic or, as in 2020, a pandemic. A high concentration of deaths in a short period leads to a displacement of deaths that would have been more evenly distributed over time had the epidemic not occurred. This may lead to somewhat fewer deaths than normal for a period after the end of the epidemic. Statistics Sweden has chosen a simple method to calculate excess and deficit mortality by comparing the number of deaths in the current period with the five-year average in the same region and period.

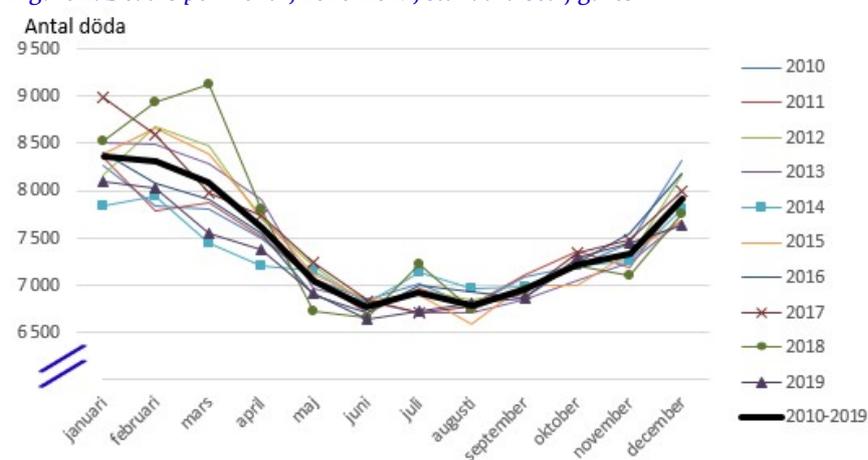
The number of deaths normally follows an annual cycle, in which there are more deaths in the cold (winter) season than in the warm (summer) season. This is partly due to influenza epidemics, which are usually more intense during the cold winter months. Variations between years are usually slightly greater during the cold winter season

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<sup>3</sup>Influensasäsongen 2019–2020, <https://www.folkhalsomyndigheten.se/globalassets/statistik-uppfoljning/smittsamma-sjukdomar/veckorapporter-influensa/2019-2020/influensasasongen-2019-2020-sasongssammanfattning-final-v3.pdf> (Public Health Agency of Sweden 2020, in Swedish, accessed 2020-10-14).

depending on the extent of the flu season, which may vary between years.

*Figure 2. Deaths per month, 2010-2019, standardised figures*



Note: The mortality rates per month have been converted to 30-day months to facilitate comparison between months of different lengths.

In this document, the focus lies on the total number of deaths. There are some differences between the sexes, in part because women have a higher average life expectancy and because they account for more deaths in higher ages than men.

## Comparison between regions

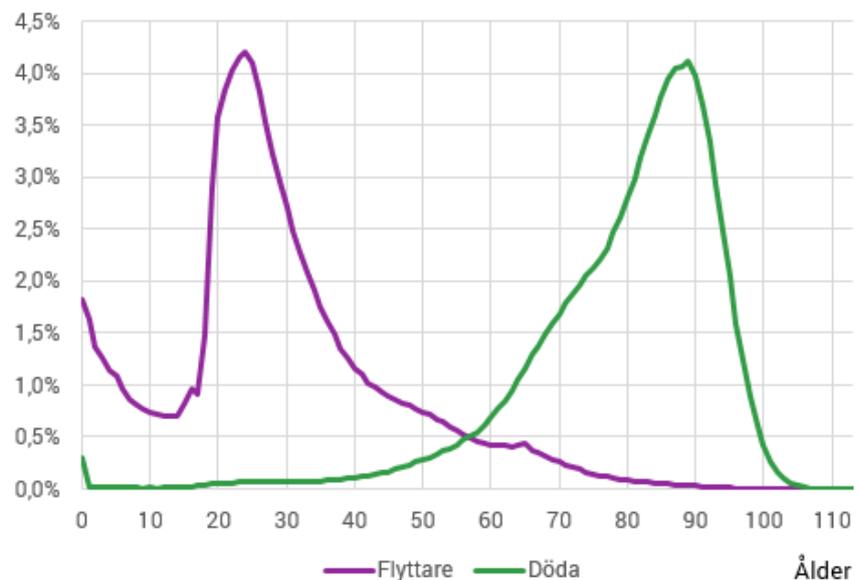
When comparing the number of deaths between different regions, there are many factors that need to be taken into account. For example, there may be large differences in population size, age structure, and sex distribution. In regions with a large population, there are usually more deaths than in regions with a small population, and in regions with an older population there are usually more deaths than in regions with a younger population. There may also be other differences between regions that affect mortality by age and sex.

## Comparison over time

The number of deaths is affected by factors such as the size of the population, the age structure, and sex distribution. Over a long period, these factors may change considerably depending on migration and how a population ages. A region with a large migration surplus, that is,

more people moving in than moving out, will note a population increase, while in the short term the number of deaths will not change significantly. This is because people who move between regions and countries are generally young, and form part of a group with a low mortality rate. The same applies to regions with a large migration deficit. Despite a decreasing population, the number of deaths is not significantly affected in the short term, as people who migrate are generally young.

Figure 3. Migration and deaths, by age, 2010-2019, percent



Note: Based on migration across municipal borders and immigration and emigration.

Previous baby booms affect how mortality rates develop over time. In Sweden, deaths are mainly concentrated at the highest ages, and when a large birth cohort reaches higher ages, this will mean that more people have a high risk of dying.

The size and structure of the population changes only marginally over the course of a calendar year. Despite this, the number of deaths varies greatly during the year. This is due to seasonal variations, as more people die during the winter months than during the summer months.

### Comparison of absolute numbers

The number of deaths in a region can be compared with the number of deaths in another region. Comparisons can also be made between different periods.

### Benefits

- It is clear where or when most deaths occurred.
- It is possible to compare regions with a similar population size and structure.
- It is possible compare neighbouring periods.

### **Drawbacks**

- The measure is strongly linked to the population size.
- Comparisons with historical statistics should be supplemented with information on difficulties in comparing the present with the past.
- For regions with a small population, normal variations between years and seasons can have a major impact.

### **Number of deaths compared with deaths during a comparison period**

Statistics Sweden has chosen a simple and transparent model to describe excess and deficit mortality. We compared the number of deaths per day, week, and month with the average number of deaths in the same region and period during the most recent five years. The mortality rate during the comparison period constitutes the base mortality rate for normal mortality.

Statistics Sweden has opted to use a five-year comparison period, since the population structure and mortality rate by age and sex do not change substantially during a short comparison period. Besides, the number of deaths in 2015-2019 only varied between just under 89 000 and just over 92 000 deaths.

### **Benefits**

- Relative excess and deficit mortality are comparable between regions and over time.  
Comparison with the immediately preceding period gives a measure that makes it possible to compare relative excess and deficit mortality with previous periods.
- This method takes into account normal seasonal variations when comparing mortality over a certain period.  
Generally, more people die during the cold (winter) season than during the warm (summer) season.

### **Drawbacks**

- If the comparison period contains years that deviate significantly, then the calculated measure may be misleading.  
For example, mortality rates were significantly lower in the years after the Spanish flu, which stemmed from very high mortality rates in the autumn/winter of 1918-1919.
- The calculation does not take into account that mortality per age usually decreases over time.
- If the age structure in the highest ages has changed significantly during the period because of, for example, earlier baby booms, the measure can be misleading.
- The number of years in the comparison period is chosen arbitrarily, which can affect the result. What appears to be an appropriate reference period for the current period may be misleading for other periods.
- For regions with a small population and few deaths, normal variations between the years can make comparison difficult.

- Although relative comparisons with previous periods are possible, we must be aware that variations in the number of deaths were considerable both between years and between seasons mainly during the 1700s and the 1800s.
- This approach works less well when the difference between the reference period and the comparison period is small.
- When calculating excess and deficit mortality per month, special treatment of February might be worth considering, as every four years is a leap year.

To avoid a skewed measure as a result of extreme values, it is possible to use the middle value (the median) instead of the average number of deaths during the comparison period. This might be worth considering, in particular when comparing older statistics, as the fluctuations between and during the years were significantly greater than they have been in the last 40 years.

### **General mortality rate**

The general mortality rate is a measure that shows the number of deaths in relation to the average population, usually the number of deaths per 1 000 people to present the measure as a larger number. This measure is usually used when calculating the number of deaths during a calendar year.

If, instead, you want to calculate the number of deaths per day, week or month in relation to the population, it may be more appropriate to calculate the number of deaths per 100 000 inhabitants in order to obtain larger numbers that are easier to compare. Even in this case, it is preferable to calculate the number of deaths in relation to the average population. However, since the population usually does not change much during a month, instead of using the average population, it is possible to use the region's opening population, that is, the population on the last day of the previous month.

When comparing different months, one must take into account that the months have different numbers of days; or else, months with 31 days would have, as a rule, a higher relative mortality rate than months with fewer days.

### **Benefits**

- Enables comparisons between regions with different population sizes.
- The measure is easy to understand and interpret.

### **Drawbacks**

- The measure does not take into account differences in population composition.  
If everything else being equal, fewer people die in a region with a predominantly young population compared to a region with an older population.
- Comparisons over time are not appropriate as the measure, apart

from differences in population composition, does not take into account medical and social differences between regions and over time.

For example, there may be differences in health care, working conditions and lifestyles that affect the risk of death at different ages.

- For regions with a small population, normal variations between years and seasons can have a major impact.
- Comparisons with historical statistics should be supplemented with information on difficulties in comparing the present with the past.

### **Other statistics on mortality**

Euromomo<sup>4</sup> (European Mortality Monitoring Project) continuously reports on developments in mortality in a number of European countries. The goal is to detect excess mortality at an early stage as a result of influenza, pandemics and other health risks. To calculate excess and deficit mortality, Euromomo uses a model that takes into account normal seasonal variations, delays in reported deaths, and age composition and more. They establish a base mortality rate using a Poisson model based on the mortality rate during a period defined by the user, a maximum of 5 years.

### **Key facts**

At every death in Sweden, a death certificate and a cause of death certificate are to be filled in by a doctor. The death certificate must be sent to the Swedish Tax Agency no later than the first weekday after the date of death and the cause of death certificate must be sent to the National Board of Health and Welfare within three weeks after the date of death. The death certificate contains only certain administrative information about the deceased, while the cause of death certificate contains information about illnesses and other issues that may have contributed to the death.<sup>5</sup>

Statistics Sweden receives information about deaths from the Swedish Tax Agency's population register five days a week. Even if the death certificate is to be reported to the Swedish Tax Agency on the first weekday after the death, there is a backlog. However, the backlog is quite small and after about two to three weeks, 99 percent of all deaths have been registered and reported to Statistics Sweden.

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<sup>4</sup><https://www.euromomo.eu/>

<sup>5</sup>A description of data sources on COVID-19 deaths (National Board of Health and Welfare 2020-04-27).