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Statistics on multiple causes of death

Annually, around 90,000 people die in Sweden. A death certificate is issued by a physician for each death. The official statistics on causes of death in Sweden mainly provide data on the underlying causes of death, but usually several causes of death are registered on the certificate. This is known as multiple causes of death. This fact sheet presents an overview of the occurrence of multiple causes of death among deaths in Sweden in 2021.

Background

For each death in Sweden, a death certificate is issued by a medical doctor. The certificate is then sent to the National Board of Health and Welfare in accordance with Chapter 4, Section 5, of the Burial Ordinance (1990:1144) and Section 16 of the Funeral Regulation (1990:1147).

On the certificate, the doctor records the causes of death, including all diseases, pathological conditions or injuries that either caused or contributed to the death, as well as any circumstances related to accidents or violent acts that led to injuries. Multiple causes of death refer to all the causes listed on the death certificate (see Definitions box). The information is classified and coded by the National Board of Health and Welfare using the international version of ICD-10 and WHO's guidelines before being entered into the Cause of Death Register. The register is used to produce statistics on causes of death.

The annual official statistics on causes of death are primarily based on the underlying cause of death (unless specified otherwise). If more than one cause of death is registered, the underlying cause of death is selected from the certificate through the application of international classification rules. The reason the underlying cause of death is the main basis for official statistics is that is it has the greatest potential to prevent deaths through preventive measures. This is because all causes of death in the causal chain that would otherwise have occurred are prevented. By presenting statistics on multiple causes of death, insights can be gained into the co-occurrences of diseases in society, beyond that presented by the official statistics which mainly provide data on the underlying causes of death.

Definitions
Multiple causes of death: All causes of death that have been reported on the death certificate.
Underlying cause of death: The disease or injury that initiated the chain of events leading directly to death or the circumstances of an accident or violent act that caused the fatal injury.
Causal chain: The disease or injury process that led to death.
Contributing causes of death: Other diseases or injuries that contributed to the death.

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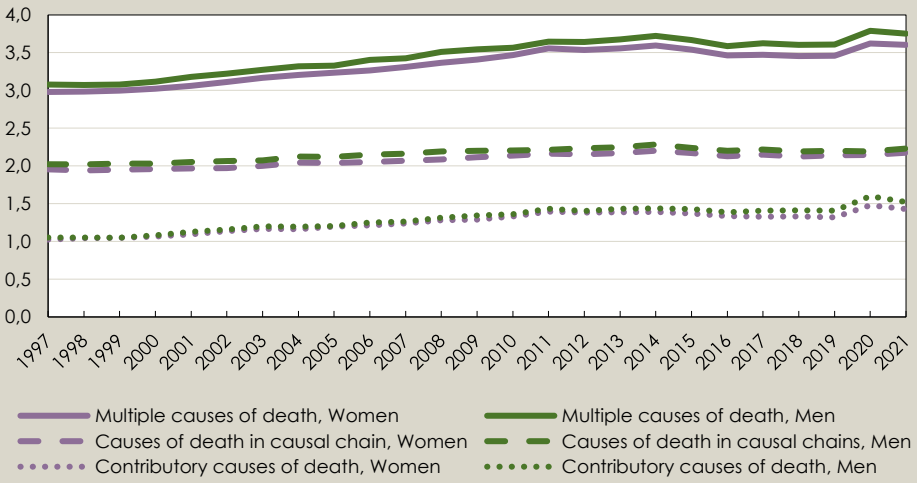
The number of reported causes of death has increased over time

Between 1997 and 2021, the average number of reported causes of death on death certificates increased from 3.0 to 3.6 for women and from 3.1 to 3.8 for men (Figure 1). On average, the number of causes of death that occurred in the causal chain was higher than the number of contributory causes. For women and men, the average number of causes of death in the chain was 2.2 in 2021, an increase of 0.2 since 1997 for both sexes. The number of contributory causes of death increased slightly more, from 1.0 cause in 1997 to 1.4 for women and 1.5 for men in 2021.

Figure 1. Average number of causes of death per death certificate over time. Women and men, 1997-2021

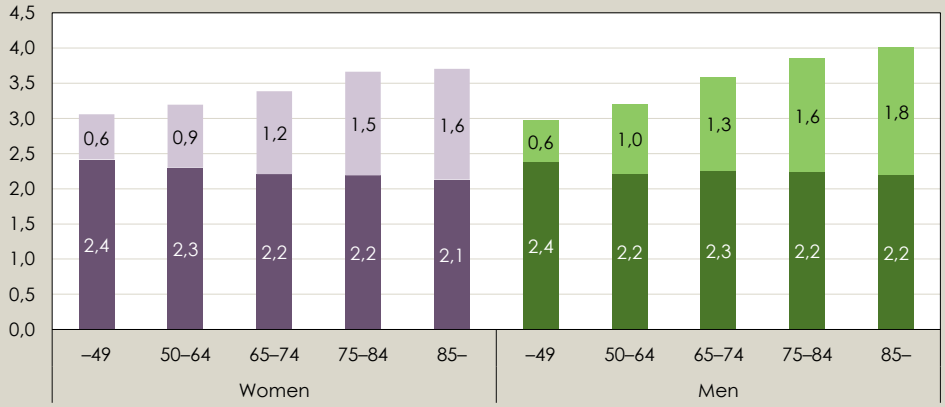


The calculation of the number of causes in the causal chain does not take into account the order of events, only whether the cause of death occurs somewhere in the causal chain on the death certificate. Source: Cause of Death Register, The National Board of Health and Welfare

Multiple causes of death among the elderly

The number of multiple causes of death was higher in the older age groups among both women and men (Figure 2). Women and men who died at the age of 49 or younger had an average of 3.0 causes of death, of which 2.4 were included in the causal chain and 0.6 were contributing causes. With increasing age, the number of causes in the causal chain decreased while the number of contributing causes increased. In absolute numbers, the number of causes in the causal chain decreased by 0.3 for women and 0.2 for men, while the number of contributing causes increased by 1.0 and 1.2 for the respective groups.

Figure 2. Average number of causes of death on the death certificate.

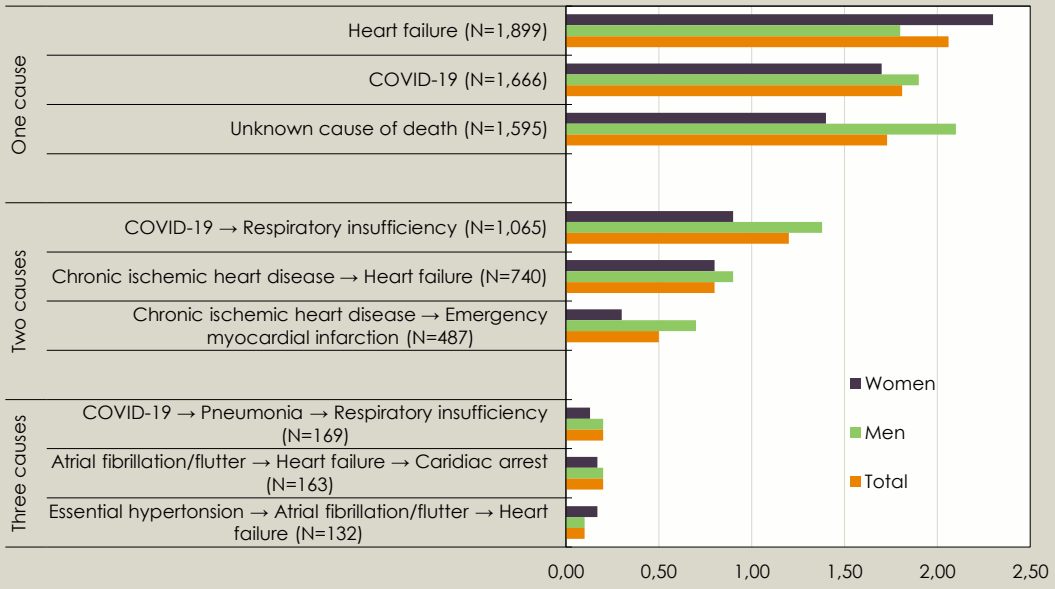


The dark portions of the bars indicate the causal chains; the light portions of the bars indicate the contributing causes of death. The calculation of the number of causes in the causal chain does not take into account the order of the causes, only whether the cause of death occurs anywhere in the causal chain on the death certificate. Source: Cause of Death Register, The National Board of Health and Welfare

Causal chains of death

Over half of all deaths in 2021, 55.1 percent, had more than one registered cause of death on the death certificate. Thus, 44.9 percent had one cause of death, while 31.2 percent and 16.9 percent had two and three causes of death respectively. Deceased women had a single cause of death slightly more often than deceased men, at 45.8 percent compared to 44.0 percent. In cases where the doctor had only noted one cause of death in the causal chain, heart failure was the most common cause (1,899 deceased, or 2.1 percent; Figure 3), followed by COVID-19 (1.8 percent). The most common causal chains among persons with two or three causes of death also involved COVID-19, which either resulted in respiratory insufficiency (1.2 percent) or resulted in pneumonia and then respiratory insufficiency (0.2 percent).

Figure 3. The most common causal chains by length. Total, women and men, 2021



The figure presents causal chains in order. Only one chain per person is reported, even though several chains may appear on the death certificate. Source: Cause of the death Register, The National Board of Health and Welfare

Over two thirds (69.1 percent) of those who died from cardiovascular diseases (the largest group of deaths in 2021) had multiple causes of death. Among those with a single cause of death in this group, heart failure was the most common (6.4 percent, or 1,757 deaths). Heart failure was also often a consequence of another cause in the most common causal chains with two or three causes of death, for example, as a consequence of chronic ischemic heart disease (2.7 percent), or included in the chain of atrial fibrillation and atrial flutter (resulting in) → heart failure (and then resulting in) → cardiac arrest (0.6 percent). Heart failure as a single cause of death was slightly more common among women (7.1 percent for women; 5.7 percent for men).

Among those who died from neoplasms, a smaller proportion, approximately one third (35.5 percent), had multiple causes of death. Among those with only one cause of death, malignant tumours in the bronchus and lung (5.6 percent, or 1,285 deaths) were the most common. In general, those who died from causes within the neoplasms chapter in ICD-10 had few causes of death in a causal chain. For example, the most common chain of causes with two causes consisted of tumours in the bronchus and lung (resulting in) → respiratory insufficiency (93 deaths, 0.4 percent), while the most common chain of causes with three causes (only occurring among women) was a tumour in the breast → secondary malignant tumour (metastasis) in the respiratory and digestive organs → liver failure not classified elsewhere (0.1 percent, 29 deaths).

Tumours in the bronchus and lung as the sole cause of death were more common among women than men (6.3 percent among women; 4.9 percent among

men). The calculation of causal chains shows that the length of the causal chain tends to vary by cause of death chapter and relatively few deaths have an identical course of death.

The most common contributing cause of death was essential hypertension

A contributing cause of death is registered separately, i.e. outside of the causal chain. The majority of deaths in 2021 had at least one contributing cause (59.2 percent). The occurrence of contributing causes was slightly more common among men (59.8 percent) than among women (58.6 percent). The most common contributing causes were related to circulatory diseases, namely essential hypertension (7.5 percent) and atrial fibrillation and atrial flutter (6.5 percent).

Among individuals who died from a disease of the circulatory system, a large proportion (69.8 percent) had at least one contributing cause of death. Essential hypertension and atrial fibrillation/flutter were the most common within this disease group and slightly more prevalent among women (9.9 percent and 8.2 percent, respectively) than among men (7.6 percent and 7.2 percent, respectively).

Among individuals who died from a disease related to tumours, fewer than half had a contributing cause of death (43.3 percent), whereby essential hypertension (6.4 percent) and heart failure (5.6 percent) were the most common. Essential hypertension relating to tumours was slightly more prevalent among women (7.0 percent) than among men (5.8 percent).

Tumours are more commonly reported as the underlying cause of death

A specific cause of death may occur in the causal chain or as a contributing cause, depending on the physician's assessment of the death. By dividing the number of occurrences of a specific cause of death somewhere on the death certificate by the occurrences as the underlying cause of death, a ratio is obtained. The ratio describes the extent to which different causes of death tend to occur on death certificates over and above the times they are classed as the underlying cause of death. For example, the occurrence of a tumour was more commonly reported as the underlying cause of death (ratio of 1:2 for women and men, respectively; Table 1), whereas diseases of the urinary and reproductive organs were more commonly reported in the causal chain or as a contributing cause rather than as the underlying cause of death (ratio of 8:6 for women and 9:1 for men).

Table 1. Number of deaths by underlying cause of death and ratios between occurrences of causes of death on the death certificate among multiple causes of death, occurrences only in the causal chain, and occurrences only as contributing causes of death. Women and men, 2021

ICD-10	Underlying causes of death, number		Multiple causes of death, ratio		Causal chain in causes of death, ratio*		Contributing causes of death, ratio	
	Women	Men	Women	Men	Women	Men	Women	Men
Certain infectious and parasitic diseases	1,171	1,208	2:8	3:2	2:3	2:6	1:6	1:7
Tumours	11,205	11,865	1:2	1:2	1	1	1:2	1:2
Endocrine, nutritional and metabolic diseases	1,444	1,577	4:9	4:9	1:5	1:4	4:5	4:6
Mental and behavioural disorders	3,607	2,160	2:8	3:7	1:6	1:7	2:3	3
Diseases of the nervous system	3,239	2,512	1:9	2:2	1:2	1:3	1:7	2
Diseases of the circulatory system	13,587	13,878	1:9	2	1:4	1:4	1:7	1:7
Diseases of the respiratory system	2,506	2,537	4	4:7	2:9	3:5	2:4	2:5
Diseases of the digestive system	1,474	1,579	2:4	2:4	1:6	1:6	1:8	1:9
Diseases of the urinary system and the reproductive organs	662	814	8:6	9:1	3:2	3:2	6:6	7:1
External causes of morbidity and mortality	1,888	3,081	2	1:7	1:3	1:3	1:7	1:4

Chapter groups with less than 500 underlying causes are excluded from the table. If the ratio is equal to 1, the cause of death appears on the certificate as often as the underlying cause of death within the chapter group. * The calculation does not consider the order in the causal chain, only whether the cause of death appears somewhere in the causal chain on the death certificate. Source: National Cause of Death Register, The National Board of Health and Welfare.

Another example is respiratory diseases. Causes of death within this chapter were found among multiple causes of death more than four times more often than as the underlying cause of death (4:0 for women, 4:7 for men). This indicates that the death certificates of over 22,000 deceased persons mentioned a disease within the respiratory organs and that this was classified as an underlying cause of death for approximately 5,000 of the deceased.

Endocrine diseases mainly tended to occur as a contributing cause of death. These were recorded as contributing causes approximately 4:5 times more often than they were classified as underlying causes of death (meaning they were a contributing cause of death for around 10,700 persons over and above those for whom they were the underlying cause of death). Furthermore, endocrine diseases occurred approximately 1:5 times as often in the causal chain as they did as underlying causes of death, meaning they were in the causal chain for around 1,350 additional persons. The overall picture shows that causes of death within specific disease chapters occur as multiple causes of death more often than as underlying causes of death. This pattern is described internationally as complementary information to the burden of mortality, together with the underlying cause of death.

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