# CHANGES IN THE CAUSE OF DEATHS STATISTICS

# 1. Changes in 2005

## 1.1. Reasons for the changes

In order to improve the quality of mortality data and to fulfil the International requirements several technical and methodological changes were performed in the production of cause of death statistics in 2005. These changes influence the evolution of cause of death statistics.

1. The Hungarian Central Statistical Office (HCSO) introduced a new form of Death Certificate which suits better the Eurostat and WHO requirements than the former one and promotes a more proper certification than before.
2. An intervention for medical correction of the Death Certificates before data entry has started. This activity is performed by the National Public Health and Medical Officer Service (NPHMOS) and it ensures the systematic correction of those certificates that are filled out improperly.
3. The former manual coding has been replaced by an automated data processing.
4. All updates of ICD X. published since the national introduction of the 10th Revision (1996) were implemented.

### *The new Death Certificate*

The most important change on the Death Certificate is that the indication of the ICD-codes of the reported pathologies is not necessary any more. The cessation of the ICD-codes came into force by International Recommendations. In this way the certifying physician will not be burdened with the coding however he/she will be able to provide more specificity for the diagnoses. Besides the cause of death section of the new Death Certificate was reshaped in order to attract the attention of the certifier to the "sequence-concept". Namely that a sequence of pathologies leading to the death (e.g. diseases being in a due to relation with each other) should be reported in the certificate.

### *Medical control of the Death Certificates*

The medical control of the Death Certificates is performed by means of the co-operation between the HCSO and National Public Health and Medical Officer Service. In the framework of this collaboration the problems of certification accumulated for years are solved. The difficulties come from the fact that the training for certification has not been stressed so far. The problems consist of leaving blank the obligatory fields of the certificate, providing ambiguous information (e.g. medical abbreviations), non-specific diagnoses or inconsistent sequence of pathologies.

### *Automated processing of the cause of death entries*

The automated data processing is carried out by using the logic and the tables of an American software recommended by Eurostat. The software has been implemented in more and more European countries since the '90s. The coding process consists of two parts:

1. At first the causes of death reported on the Death Certificate has to be entered literally into the data entry module by properly keeping the order of reporting.
2. Than the second module takes care for the ICD X. code assignment to each diagnose and for the selection of the underlying cause of death by applying the rules of ICD X. Volume 2.

This procedure ensures the consistency and the uniformity of cause of death coding and the proper comparison of our statistics on European and International level.

The automated data processing covers only the cases where the deceased was older than 6 days. Besides, following the automated processing, all neoplasms, external causes, deaths below the age of 1 year and all maternal deaths are manually controlled and corrected (if needed). The manual intervention is necessary because the cases listed above can be too complicated to apply the general automated algorithm.

### *Official updates for the Classification*

Since the publication of ICD X. in 1992, the concept of a continuous updating process between revisions has been endorsed. In accordance with that the WHO has published the new ICD X. updates every year since 1995. The updates serve for correcting the errors or for precising the previous publication, and new codes can be added or some categories can be deleted as well. The updates also concern the selection rules of the underlying cause of death. In the HCSO the ICD X. updates started from 1995 were introduced all together in 2005. Started from 2005 the recommended schedule is followed in their implementation.

## 1.2. Demonstration of the impact of the methodological changes

### *International guidelines for selection of the underlying cause of death*

The Selection Rules published in Volume 2 of ICD X. are devoted to define from a complex diagnose the single cause of death (underlying cause) which will be published in the statistics.

The main objective of the selection is to find the originating antecedent condition which leaded to the direct cause of death, however this condition can be modified by other causes reported on the Death Certificate. This identification of the underlying cause is performed by checking each causes line by line if it could be due to the next condition reported on the lower line. Thus, it is a very important certification rule to report only that condition on a line which leaded to the upper one. The so called “sequence-concept” should be considered both for certification and for statistics production. If a proper sequence is reported, it can be proved that the condition reported for the originating cause of death gave rise to all upper listed conditions, consequently it can be selected for statistical tabulation. (If the reported conditions do not constitute a casual sequence since the first condition can not be originated from the condition on the lowest line, the originating condition of the longest sequence terminating in the first condition has to be selected.)

After selecting the underlying cause, all other conditions have to be checked for a more informative cause (from public health point of view) or for a possible combination in order to publish a more specific cause of death. Such Modification Rules have to be applied whenever possible, therefore the published underlying cause of death often differs from the reported originating cause of death.

The manual coding method used before 2005 principally followed the Selection Rules of ICD, however, in some not clearly defined cases, we used to depart from the International practice. The introduction of the automated data processing involves the systematic application of the International coding rules, thus the former differences in the national practice give rise to changes in the cause of death statistics for 2005.

It is important to note, that the automated data processing requires a consistent sequence to be reported on the death certificate. The system is not able to correct an inconsistent sequence, while the manual coding was more flexible in this field.

### *Bridge coding*

The change of the data production method was examined by performing a bridge coding study. It means both manual and automated processing of the same data set. The bridge coding was carried out on the samples selected from the 2005 data set. As a common International methodology of sample selection for a bridge coding study has not been specified yet, we followed two ways:

1) On one hand, the mortality data of 2005 was arranged to a matrix of 7*20 by region and by cause of death main group. Than a random sample of 10 per cent was selected from each cell. By doing so, a sample of 13 551 records was constructed. The elements were retrieved from the data base in electronic form and the diagnoses were coded manually as well.
2) On the other hand, considering that the first sample can not reflect the traditional coding practice, since the electronic records were used instead of the original paper copy of the death certificate, a second sample was

selected too. From the 2005 Death Certificates 21 825 copies were selected for manual coding by taking into account two months of death (January and August).

The results of the bridge-coding study, the classification by ICD X. Chapters and the differences caused by the automated coding in the two samples are shown in Table 1.1.–1.5.

It is important to remind the fact that from all methodological changes of 2005 only the impact of the automated coding introduction can be examined by the bridge coding study. The differences originating from the change of the data collection procedure (new Death Certificate form and medical control before data entry) can not be analyzed this way because the Death Certificates have already included these features. The bridge coding was performed on the new certificates following the medical control.

***Onwards estimation of the 2005 data based on trend computation***

The total effect of the methodological changes implemented in 2005 could not been revealed by the bridge coding method. The reason is that in the same time several changes were introduced which are not quantifiable separately. Therefore we were looking for an other method to present how the cause of death structure of 2005 would become without the implementation of the methodological changes. The cause of death trends between 1996 and 2004 were taken into consideration and the mortality by cause was estimated for 2005. It is important to note that the number of death should have been decreased on the basis of the trend computations, whereas the mortality was increased mainly due to the Influenza epidemic of spring. Linear and exponential trends were used for each causes of death by considering to which trend it suited between 1996 and 2004 based on the residual variances. Than the 2005 cause of death structure estimated by the trends was applied for the actual 2005 mortality data. The results are shown in Table 1.6. The table includes the 2004 cause of death data and presents the differences between the estimated and actual (automatically processed) 2005 cause of death data in percentage and in absolute number.

## 1.3. Comparability study of the automated (software based) and traditional (manual) coding of causes of death

***Results and conclusions***

At first, it has to be stated that the introduction of automated coding has not changed basically the structure of cause of death main groups, the weight and the rank of the main causes of death. The selection of the underlying cause of death turned more precise, the mortality data become more harmonized with the morbidity data. The methodological changes broke the time series of some causes of death, therefore the dynamics of the respective causes should be considered from a different aspect started from 2005. One segment of the variance between the manual and automated coding reflects the well-known certification problems.

Tables 1.1.–1.3. present the rearrangements of the cases between ICD Chapters by switching from manual coding to automated. It is important to know that this kind of rearrangements between or inside the Chapters concern only the underlying cause of death, e.g. the single cause published in the statistics. Very similar changes were observed in those countries where the manual coding was replaced by an automated system. Increase or decrease of the death causes against each other can be examined by a multiple cause analysis. Therefore, started from 2005 all causes reported on the Death Certificate have been processed and publication of multiple causes is planned. In this way a comprehensive analysis of the complex cause of death diagnose and of the changes in the underlying causes for 2005 would be possible.

Table 1.4. shows the correspondence rate of manual and automated coding in each cause of death main group, Table 1.5. represents the correspondence rate by counties. The final results are in line with the International experiences.

In the following paragraphs the changes in some relevant ICD X. Chapters are published.

***Infectious diseases***

Number of deaths caused by infectious diseases did not changed a lot, in 2005 it was 501, compared to 490 in the previous year. However the distribution inside the Chapter was slightly shifted: Tuberculosis caused 256 deaths in 2005 which was less by 14.7 per cent than in 2004. The decrease was nearly equal at both sex compared with the average of

the years 2003-2004. According to the bridge coding analysis the decrease by automated coding is more moderate than the change in the 2005 national data. Infectious diseases, other than tuberculosis, caused 190 deaths in 2004 and 28.9 per cent more (245) in 2005. The increase was 21.8 per cent at men and 30.5 per cent at women compared with the average of 2003-2004. The bridge coding shows similar results, the automatically coded deaths were more by 28.1 per cent than the manually coded. For other infectious diseases the correspondence of manual and automated coding is rather low. However deaths by the most important infectious diseases are usually checked against the data of the National Public Health and Medical Officer Service and also corrected as needed. The manual coding of the sample preceded the correction which could cause discrepancies.

***Neoplasms***

Number of deaths caused by neoplasms was 32 057, it is a decrease of 6.1 percent for men and 5.6 per cent for women compared to the 2003-2004 average neoplasm mortality. Considering that the estimation for 2005 forecasted a slight increase, presumably the decrease is due to he methodological changes. The bridge coding verifies this assumption in both samples. Tables 1.1.–1.3. clearly show that the reduction of the neoplasm mortality is caused by the rearrangement of the cases to the Diseases of the cerebrovascular system. There is also a significant movement to the Diseases of the respiratory system and to the Diseases of digestive system. On one hand, these rearrangements reflect the problems of death certification. Namely that hypertension, ischemic heart disease and general atherosclerosis are frequently reported due to malignant neoplasms, however, except of some very rare cases, these are not acceptable sequences according to the rules of ICD. The same problem arises with chronic respiratory and digestive diseases. While manual coding could correct such inconsistencies, automated coding is rather strict in acceptance or rejection of a sequence. On the other hand, behind the rearrangement of some neoplasm cases to the Diseases of the circulatory system one specific feature of the national manual coding can be revealed: Malignant neoplasms reported in Part II of the Death Certificate were often selected for being an underlying cause.

At some neoplasm sites the decline in 2005 reaches 15-18 per cent. In turn, the mortality of uncertain and unknown neoplasms increased at each localization. The bridge coding also verifies that by using automated coding the distribution is shifted for the benefit of the uncertain and unknown neoplasms. It was difficult for manual coding as well that the information on the behaviour of a neoplasm was only indicated in the ICD-codes used by the certifier. In automated processing only the diagnose text is used for coding, thus the precise indication of a neoplasms' behaviour would be necessary.

One type of the rearrangements inside the Neoplasm Chapter is the decrease of the single localisations for the benefit of Malignant neoplasms of independent (primary) multiple sites (C97). This category was not used in our national statistics before, but the application is verified from oncological point of view.

Analysis of data shows that the decline in the statistics for neoplasm deaths in 2005 does not reflect the actual decrease of neoplasm mortality but the change for automated data processing. The impact of automated coding is obviously different at each neoplasm types. The 2005 statistics prepared by the automated coding reflects the neoplasm morbidity and mortality more precisely than the traditional manual coding. Further quality improvements of the statistics depend on the quality of certification. When the data for 2005 are accounted the above remarks should be considered.

***Endocrine diseases***

In this ICD X. Chapter we expected an increase of 10.2 per cent for 2005 without the change of data processing method. Automated coding brought in a much more significant growth of 58.6 per cent. The break affects the different types of diabetes the most and it is due to the change of methodology. As before that when the underlying cause was selected the complications (mainly diseases of the circulatory system) were preferred to the diabetes itself. However the International rules suggest the selection of diabetes for tabulation.

***Diseases of the Circulatory System***

In 2005 the number of deaths caused by Diseases of the circulatory system was 70 938, this is more by 3773 cases (5.6 per cent) than in 2004. The estimations based on the data of the previous years predicted some less significant increase. Through the bridge coding almost the same number of cases are coded to this Chapter by manual and by automated coding in both samples. The tables show that rearrangements occurred in almost all chapters by using any of the coding methods, but the changes equalize each other.

In spite of the slight change in the number of deaths by Diseases of the circulatory system in 2005, at some diseases the change is rather significant. Therefore the proportion by causes inside this Chapter has altered and the cause of death structure has changed. The followings are the most important differences (the percentages refer to the change in the number of deaths by the listed causes compared to the average of 2003 and 2004):

- Hypertension: increased by 42.4 per cent at men and by 42.1 at women;
- Ischemic heart disease (without acute myocardial infarction): increase of 21.5 per cent at men and 22.9 per cent at women;
- Cerebrovascular diseases (all types): decrease of 15.0 per cent at men and 12.8 per cent at women;
- Atherosclerosis: decreased by 19.7 per cent at men and 20.4 per cent at women.

The alterations mentioned above are not because of radical changes in the morbidity conditions (as it is not possible in a one-year period) but it is due to the introduction of automated coding and the proper application of the International coding rules. In our national practice the interpretation of the coding rules for the circulatory system used to be different: Where a cerebrovascular disease was reported as a complication of other vascular diseases we selected cerebrovascular one for the underlying cause, however the International practice gives preference to the originating cause. Similarly we used to select Atherosclerosis if it was stated to be the originating cause against its complication, the Hypertension. Whereas the WHO recommends selecting hypertension, since it is a more informative condition from public health point of view.

The results of the bridge coding study show that most of the changes in causes of death statistics in 2005 were caused by the introduction of an automated coding system. But it is also clear that there were other alterations playing a role, e.g. the improvement in the quality of certifying and the medical control of the Death Certificates.

Altogether, the cause of death statistics for 2005 in the Chapter of circulatory system reflects more precisely the situation of morbidity and mortality than the statistics of the previous years. The International comparison is more realistic by using the uniform coding rules. On the other hand, it is important to emphasize that in the majority of the circulatory diseases the time series have broken, thus drawing a conclusion about the trends is not possible from morbidity or mortality point of view.

**Diseases of the Respiratory System**

In 2005 the number of deaths caused by the Diseases of the respiratory system was 6502, higher by 1287 (24.7 per cent) than in the previous year. The extent of the increase was near the same at both sex (25.2 per cent for men and 24.0 per cent for women). Whereas the opposite was expected through the onwards estimation for 2005, a decrease of 6.0 per cent.

There are significant differences in the number of deaths at certain respiratory organs in 2005. The highest increase can be observed at the chronic diseases of the lower respiratory tract, 31.1 per cent at men and 33.0 per cent at women. There are considerable differences at the different types of the diseases of the lower respiratory tract. The number of deaths caused by chronic bronchitis doubled, it is 107.0 per cent more for men and 95.5 per cent more for women than the average of 2003-2004. The emphysema cases raised by 14.1 per cent at men and by 17.7 per cent at women. The other forms of lower respiratory diseases increased by 9.9 per cent at men and by 24.4 per cent at women. These high increases can not be due to the change of the morbidity conditions from one year to the next.

The bridge coding shows similar tendencies in both sample, but the changes are less significant. The introduction of the automated coding system could cause less than half of the increase in the number of all respiratory and lower respiratory system deaths. The conclusion is that some other factors could contribute to the increase as well in 2005. For chronic bronchitis also the bridge coding back up this large increase, thus the change in methodology had an important role here. It is important to emphasize that the algorithm of the automated coding checks the sequence consequently, while the certifiers disregard the sequence-concept for chronic bronchitis very frequently.

**Diseases of the Digestive System**

The number of deaths caused by the diseases of the digestive system was 8504 in 2005, 640 less than the recent years, whereas a slight increase was anticipated by the onwards estimation for 2005. The decrease was near the same at both sex (7.7 per cent for men and 9.8 for women compared to the average of the years 2003 and 2004).There are important differences in the number of deaths at the single types of these diseases. The most significant change can be

observed in the group of alcohol induced and other liver diseases. The number of alcoholic liver diseases dropped considerably (37.7 per cent decrease at men and 41.6 per cent at women), while the other types of liver diseases increased (by 127.6 per cent at men and 61.2 per cent at women). The reason is that the indication of the alcoholic origin is frequently left out from the diagnose text. Recently this information was hidden behind the ICD-codes, but the automated data processing does not take into account the reported codes just the literal text. The bridge coding also proves that the majority of the changes in this ICD X. Chapter were caused by the introduction of the automated coding system.

***Conditions Originating in the Perinatal Period***

Regarding infant deaths caused by conditions originating in the perinatal period some changes can be discovered inside the Chapter in 2005 compared to the statistics of the pervious years. The infant death cases at the age of 0 to 6 days are still coded manually, but there is an effort to follow the International coding rules more precisely which give preference to the most specific conditions. Therefore the proportion of deaths caused by low birth weight (prematurity) decreased for the benefit of some more specific perinatal conditions.

***External causes of morbidity and mortality***

In 2005 the number of deaths caused by accident, suicide, homicide or other undetermined external cause was 7990, this is less by 7.9 per cent at men and by 20.1 per cent at women than in 2004. Only some very slight changes were proved by the bridge coding study and we did not expected such a significant decrease (12 per cent in total) considering the recent mortality trends either. The change, which exceeds 30 per cent in the group of accidental falls, is due to the medical control of the Death Certificates started in 2005. Before that mixing of natural death causes and injuries, non-stating if the manner of death was natural or accidental were very common problems in the certification, and the manual coding selected the accidents more frequently. The medical control for the validity of the reported diagnose resulted in a considerably improved quality, thus the unjustified high number of deaths from accidental falls were reduced.

***Conclusion***

Each of the methodological changes implemented in 2005 has a different impact on mortality statistics but the overall influence is very significant. The new forms of the Death Certificate are filled out more properly, however it is important to note that a lot of old forms were still in use in 2005. The medical control performed by the NPHMOS improved the quality of cause of death data in a great extent: there was a leap forward in supplying the missing information and in the correction of improper diagnoses. In 2005 one third of the certificates needed a correction, however the intervention was different in each region, consequently the quality improvement is not consistent.

The most important benefit of the automated coding system is the uniform and objective selection of the underlying cause of death which follows more properly the WHO recommendations. The consequent application of the rules can not be ensured by manual coding, moreover in some group of diseases national coding rules differed from the International ones.

In 2005 a new epoch was marked in cause of death statistics. Now the data reflects more precisely the national epidemiological conditions and International comparison become more reliable. The implemented changes in methodology did not altered neither the proportion among the ICD X. Chapters, nor the weight and nor the rank of the main causes of death. However the single death causes are affected in a different extent, in certain Chapters the time series break and all these facts have to be considered when the mortality data are analyzed.

## 1.1. REARRANGEMENT OF THE DEATH CAUSES BETWEEN THE ICD-10 CHAPTERS IN THE SAMPLE FROM JANUARY AND AUGUST

| Manual / Automated | Infectious and parasitic diseases | Neo-plasms | Diseses of the blood and blood-forming organs | Endokrin, nutritional and metabolic diseases | Mental and beha-vioural disorders | Diseases of the nervous system | Diseases of the circulatory system | Diseases of the respiratory system | Diseases of the digestive system | Diseases of the skin and the subcuta-neous tissue | Diseases of the musculo-skeletal system and connective tissue | Diseases of the genito-urinary system | Diseases of pregnancy chilbirth and the purperium | Conditions originating in the perinatal period | Congenital malfor-mations | Symp-tomes and signes, not elsvere classified | External causes of morbidity and mortality | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Infectious and parasitic diseases | **46** | 1 | 1 | 2 | 1 | 4 | 9 | 4 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 73 |
| Neoplasms | 0 | **5 200** | 3 | 1 | 0 | 0 | 25 | 6 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 5 248 |
| Diseses of the blood and blood-forming organs | 0 | 5 | **14** | 0 | 0 | 0 | 2 | 1 | 4 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 29 |
| Endokrin, nutritional and metabolic diseases | 1 | 8 | 1 | **358** | 3 | 2 | 253 | 3 | 8 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 641 |
| Mental and behavioural disorders | 1 | 4 | 0 | 1 | **109** | 8 | 51 | 4 | 28 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 3 | 213 |
| Diseases of the nervous system | 2 | 5 | 0 | 0 | 8 | **191** | 37 | 3 | 13 | 0 | 1 | 1 | 0 | 1 | 2 | 0 | 3 | 267 |
| Diseases of the circulatory system | 14 | 208 | 4 | 25 | 35 | 68 | **10 835** | 100 | 126 | 1 | 5 | 27 | 0 | 0 | 0 | 1 | 20 | 11 469 |
| Diseases of the respiratory system | 1 | 31 | 2 | 8 | 18 | 7 | 146 | **679** | 10 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 4 | 912 |
| Diseases of the digestive system | 14 | 24 | 0 | 3 | 7 | 6 | 46 | 1 | **1 256** | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 2 | 1 363 |
| Diseases of the skin and the subcutaneous tissue | 2 | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 0 | **4** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 13 |
| Diseases of the musculoskeletal system and connective tissue | 0 | 1 | 0 | 5 | 0 | 2 | 8 | 3 | 2 | 0 | **37** | 1 | 0 | 0 | 0 | 0 | 3 | 62 |
| Diseases of the genitourinary system | 1 | 3 | 0 | 1 | 1 | 0 | 21 | 2 | 1 | 0 | 0 | **120** | 0 | 0 | 0 | 1 | 0 | 151 |
| Diseases of pregnancy, chilbirth and the purperium | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** | 0 | 0 | 0 | 0 | 2 |
| Conditions originating in the perinatal period | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **7** | 0 | 0 | 0 | 9 |
| Congenital malformations | 0 | 1 | 0 | 0 | 0 | 2 | 9 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | **27** | 0 | 0 | 41 |
| Symptomes and signes, not elsvere classified | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **24** | 0 | 26 |
| External causes of morbidity and mortality | 0 | 6 | 0 | 0 | 1 | 1 | 12 | 4 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | **1 276** | 1 306 |
| **Total** | 84 | 5 498 | 25 | 404 | 183 | 291 | 11 460 | 811 | 1 463 | 7 | 47 | 169 | 2 | 8 | 29 | 29 | 1 315 | **21 825** |

## 1.2. REARRANGEMENT OF THE DEATH CAUSES BETWEEN THE ICD-10 CHAPTERS IN THE 10 PER CENT SAMPLE

| Manual / Automated | Infectious and parasitic diseases | Neo-plasms | Diseses of the blood and blood-forming organs | Endokrin, nutritional and metabolic diseases | Mental and beha-vioural disorders | Diseases of the nervous system | Diseases of the circulatory system | Diseases of the respiratory system | Diseases of the digestive system | Diseases of the skin and the subcuta-neous tissue | Diseases of the musculo-skeletal system and connective tissue | Diseases of the genito-urinary system | Diseases of pregnancy chilbirth and the purperium | Conditions originating in the perinatal period | Congenital malfor-mations | Symp-tomes and signes, not elsvere classified | External causes of morbidity and mortality | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Infectious and parasitic diseases | **28** | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 35 |
| Neoplasms | 0 | **3 233** | 0 | 0 | 0 | 0 | 15 | 0 | 7 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 3 258 |
| Diseses of the blood and blood-forming organs | 0 | 3 | **9** | 1 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 |
| Endokrin, nutritional and metabolic diseases | 0 | 3 | 0 | **204** | 2 | 1 | 153 | 3 | 4 | 1 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 377 |
| Mental and behavioural disorders | 0 | 2 | 0 | 1 | **68** | 4 | 9 | 5 | 14 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 105 |
| Diseases of the nervous system | 0 | 2 | 0 | 1 | 4 | **104** | 26 | 4 | 7 | 0 | 5 | 0 | 0 | 1 | 0 | 1 | 1 | 156 |
| Diseases of the circulatory system | 2 | 90 | 5 | 9 | 40 | 61 | **6 792** | 47 | 64 | 3 | 4 | 19 | 1 | 0 | 4 | 1 | 6 | 7 148 |
| Diseases of the respiratory system | 2 | 13 | 1 | 4 | 12 | 4 | 96 | **496** | 8 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 3 | 642 |
| Diseases of the digestive system | 2 | 6 | 0 | 1 | 6 | 4 | 32 | 2 | **791** | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 846 |
| Diseases of the skin and the subcutaneous tissue | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | **5** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| Diseases of the musculoskeletal system and connective tissue | 0 | 0 | 0 | 2 | 0 | 0 | 4 | 1 | 1 | 0 | **27** | 1 | 0 | 0 | 0 | 0 | 0 | 36 |
| Diseases of the genitourinary system | 1 | 2 | 0 | 0 | 1 | 0 | 12 | 2 | 3 | 0 | 0 | **87** | 0 | 0 | 0 | 0 | 0 | 108 |
| Diseases of pregnancy, chilbirth and the purperium | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 | 0 |
| Conditions originating in the perinatal period | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | **10** | 0 | 0 | 0 | 12 |
| Congenital malformations | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | **22** | 0 | 0 | 29 |
| Symptomes and signes, not elsvere classified | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **14** | 0 | 15 |
| External causes of morbidity and mortality | 0 | 2 | 0 | 0 | 2 | 0 | 11 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **734** | 754 |
| **Total** | 35 | 3 359 | 15 | 223 | 135 | 179 | 7 167 | 563 | 905 | 9 | 38 | 119 | 1 | 12 | 27 | 17 | 747 | **13 551** |

## 1.3. MANUAL AND AUTOMATED CLASSIFICATION OF DEATHS BY ICD-10 CHAPTERS AND THE DIFFERENCE IN PERCENTAGE

| Causes of death | Sample from January and August | | | Sample of 10 per cent | | |
|---|---|---|---|---|---|---|
| | manual | automated | automated/manual (%) | manual | automated | automated/manual (%) |
| Infectious and parasitic diseases | 84 | 73 | 86,9 | 35 | 35 | 100,0 |
| Neoplasms | 5 498 | 5 248 | 95,5 | 3 359 | 3 258 | 97,0 |
| Diseses of the blood and blood-forming organs | 25 | 29 | 116,0 | 15 | 21 | 140,0 |
| Endokrin, nutritional and metabolic diseases | 404 | 641 | 158,7 | 223 | 377 | 169,1 |
| Mental and behavioural disorders | 183 | 213 | 116,4 | 135 | 105 | 77,8 |
| Diseases of the nervous system | 291 | 267 | 91,8 | 179 | 156 | 87,2 |
| Diseases of the circulatory system | 11 460 | 11 469 | 100,1 | 7 167 | 7 148 | 99,7 |
| Diseases of the respiratory system | 811 | 912 | 112,5 | 563 | 642 | 114,0 |
| Diseases of the digestive system | 1 463 | 1 363 | 93,2 | 905 | 846 | 93,5 |
| Diseases of the skin and the subcutaneous tissue | 7 | 13 | 185,7 | 9 | 9 | 100,0 |
| Diseases of the musculoskeletal system and connective tissue | 47 | 62 | 131,9 | 38 | 36 | 94,7 |
| Diseases of the genitourinary system | 169 | 151 | 89,3 | 119 | 108 | 90,8 |
| Diseases of pregnancy, chilbirth and the purperium | 2 | 2 | 100,0 | 1 | – | – |
| Conditions originating in the perinatal period | 8 | 9 | 112,5 | 12 | 12 | 100,0 |
| Congenital malformations | 29 | 41 | 141,4 | 27 | 29 | 107,4 |
| Symptomes and signes, not elsvere classified | 29 | 26 | 89,7 | 17 | 15 | 88,2 |
| External causes of morbidity and mortality | 1 315 | 1 306 | 99,3 | 747 | 754 | 100,9 |
| **Total** | **21 825** | **21 825** | **100,0** | **13 551** | **13 551** | **100,0** |

## 1.4. CONCORDANCE OF MANUAL AND AUTOMATED CODING BY ICD-10 CHAPTERS

| Causes of death | Percentage of cases classified to the same category | | | | | |
|---|---|---|---|---|---|---|
| | Sample from January and August | | | Sample of 10 per cent | | |
| | Concordance in Chapter | Concordance to 3rd digit | Concordance to 4th digit | Concordance in Chapter | Concordance to 3rd digit | Concordance to 4th digit |
| Infectious and parasitic diseases | 54,8 | 41,7 | 31,0 | 80,0 | 60,0 | 45,7 |
| Neoplasms | 94,6 | 83,1 | 67,9 | 96,2 | 86,5 | 84,2 |
| Diseses of the blood and blood-forming organs | 56,0 | 40,0 | 36,0 | 60,0 | 46,7 | 40,0 |
| Endokrin, nutritional and metabolic diseases | 88,6 | 52,5 | 34,4 | 91,5 | 87,0 | 69,5 |
| Mental and behavioural disorders | 59,6 | 55,7 | 43,2 | 50,4 | 46,7 | 43,0 |
| Diseases of the nervous system | 65,6 | 59,5 | 51,5 | 58,1 | 52,0 | 47,5 |
| Diseases of the circulatory system | 94,5 | 75,1 | 64,2 | 94,8 | 78,9 | 73,4 |
| Diseases of the respiratory system | 83,7 | 67,1 | 52,2 | 88,1 | 71,6 | 62,3 |
| Diseases of the digestive system | 85,9 | 66,8 | 58,5 | 87,4 | 82,0 | 76,5 |
| Diseases of the skin and the subcutaneous tissue | 57,1 | 57,1 | 57,1 | 55,6 | 55,6 | 44,4 |
| Diseases of the musculoskeletal system and connective tissue | 78,7 | 57,4 | 38,3 | 71,1 | 55,3 | 50,0 |
| Diseases of the genitourinary system | 71,0 | 53,8 | 49,7 | 73,1 | 62,2 | 58,8 |
| Diseases of pregnancy, chilbirth and the purperium | 100,0 | 50,0 | – | – | – | – |
| Conditions originating in the perinatal period | 87,5 | 37,5 | 37,5 | 83,3 | 50,0 | 50,0 |
| Congenital malformations | 93,1 | 69,0 | 62,1 | 81,5 | 74,1 | 66,7 |
| Symptomes and signes, not elsvere classified | 82,8 | 79,3 | 79,3 | 82,4 | 70,6 | 70,6 |
| Extemal causes of morbidity and mortality | 93,7 | 69,0 | 57,3 | 97,4 | 76,9 | 67,6 |
| **Total** | **92,3** | **74,7** | **62,7** | **93,1** | **79,7** | **74,4** |

## 1.5. CONCORDANCE OF MANUAL AND AUTOMATED CODING BY COUNTY

| County | Percentage of cases classified to the same category | | | | | |
|---|---|---|---|---|---|---|
| | Sample from January and August | | | Sample of 10 per cent | | |
| | Concordance in Chapter | Concordance to 3rd digit | Concordance to 4th digit | Concordance in Chapter | Concordance to 3rd digit | Concordance to 4th digit |
| Budapest | 91,7 | 73,6 | 59,8 | 92,1 | 78,7 | 73,9 |
| Baranya | 94,5 | 78,1 | 68,5 | 96,3 | 82,6 | 77,9 |
| Bács-Kiskun | 92,2 | 73,8 | 58,2 | 95,0 | 83,1 | 78,8 |
| Békés | 91,8 | 73,0 | 62,8 | 92,4 | 78,8 | 74,4 |
| Borsod-Abaúj-Zemplén | 93,3 | 70,2 | 58,9 | 95,3 | 77,9 | 71,6 |
| Csongrád | 91,2 | 75,9 | 66,2 | 93,6 | 80,0 | 75,9 |
| Fejér | 93,6 | 72,9 | 60,1 | 91,6 | 76,4 | 71,9 |
| Győr-Moson-Sopron | 90,2 | 70,8 | 58,4 | 88,7 | 71,4 | 65,3 |
| Hajdú-Bihar | 94,5 | 80,4 | 73,0 | 96,9 | 84,1 | 79,8 |
| Heves | 92,5 | 73,1 | 61,4 | 93,0 | 77,6 | 71,6 |
| Komárom-Esztergom | 93,8 | 73,7 | 62,5 | 94,5 | 84,3 | 80,1 |
| Nógrád | 94,7 | 78,8 | 66,3 | 95,1 | 83,1 | 72,3 |
| Pest | 91,2 | 75,2 | 63,4 | 92,6 | 80,7 | 76,1 |
| Tolna | 92,2 | 76,9 | 60,7 | 92,7 | 82,2 | 75,1 |
| Szabolcs-Szatmár-Bereg | 90,1 | 74,8 | 65,9 | 91,9 | 77,1 | 71,8 |
| Jász-Nagykun-Szolnok | 93,9 | 79,8 | 71,7 | 94,4 | 82,3 | 76,8 |
| Somogy | 93,8 | 76,2 | 58,9 | 91,7 | 80,6 | 76,4 |
| Vas | 89,0 | 71,7 | 61,8 | 92,1 | 79,1 | 75,1 |
| Veszprém | 91,9 | 74,3 | 58,8 | 90,0 | 74,1 | 67,6 |
| Zala | 93,4 | 79,7 | 68,0 | 92,8 | 85,1 | 76,3 |
| **Total** | **92,3** | **74,7** | **62,7** | **93,1** | **79,7** | **74,4** |

## 1.6. NUMBER OF DEATHS BY CAUSE OF DEATH GROUPS

| Cause of death groups | | By traditional (manual) coding | | By new (automated) coding actual data for 2005 | Estimated 2005 data / Actual 2004 data (%) | Actual 2005 data / Actual 2004 data (%) | Actual / Estimated 2005 data (%) | Deffrence of the estimated 2005 and actual 2004 data | Difference of actual and estimated data for 2005 | Real difference of 2004 and 2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Actual data for 2004 | Estimated data for 2005 | | | | | | | |
| | | A | B | C | B/A | C/A | C/B | B-A | C-B | C-A |
| Infectious and parasitic diseases | | 490 | 472 | 501 | 96,3 | 102,2 | 106,1 | –18 | 29 | 11 |
| Neoplasms | | 34 056 | 35 184 | 32 057 | 103,3 | 94,1 | 91,1 | 1 128 | –3 127 | –1 999 |
| Diseases of the circulatory system | | 67 165 | 68 663 | 70 938 | 102,2 | 105,6 | 103,3 | 1 498 | 2 275 | 3 773 |
| Diseases of the respiratory system | | 5 215 | 4 871 | 6 502 | 93,4 | 124,7 | 133,5 | –344 | 1 631 | 1 287 |
| Diseases of the digestive system | | 9 144 | 9 451 | 8 504 | 103,4 | 93,0 | 90,0 | 307 | –947 | –640 |
| External causes of morbidity and mortality | | 9 097 | 9 250 | 7 990 | 101,7 | 87,8 | 86,4 | 153 | –1 260 | –1 107 |
| Other causes of death | | 7 325 | 7 841 | 9 240 | 107,0 | 126,1 | 117,8 | 516 | 1 399 | 1 915 |
| **Total** | | **132 492** | **135 732** | **135 732** | **102,4** | **102,4** | **100,0** | **3 240** | **0** | **3 240** |
| **Certain death causes** | | | | | | | | | | |
| C00–C14 | Malignant neoplasms of lip, oral cavity and pharynx | 1 690 | 1 801 | 1 567 | 106,6 | 92,7 | 87,0 | 111 | –234 | –123 |
| C15–C16 | Malignant neoplasm of oesophagus and stomach | 2 606 | 2 593 | 2 308 | 99,5 | 88,6 | 89,0 | –13 | –285 | –298 |
| C18–C21 | Malignant neoplasm of colon, rectum and anus | 4 979 | 5 034 | 4 557 | 101,1 | 91,5 | 90,5 | 55 | –477 | –422 |
| C22–C24 | Malignant neoplasm of liver, gallbladder and bilary tract | 1 808 | 1 731 | 1 536 | 95,7 | 85,0 | 88,7 | –77 | –195 | –272 |
| C33–C34 | Malignant neoplasm of trachea, bronchus and lung | 8 260 | 8 200 | 7 571 | 99,3 | 91,7 | 92,3 | –60 | –629 | –689 |
| C50 | Malignant neoplasm of female brest | 2 285 | 2 267 | 2 109 | 99,2 | 92,3 | 93,0 | –18 | –158 | –176 |
| C61 | Malignant neoplasm of prostate | 1 275 | 1 261 | 1 077 | 98,9 | 84,5 | 85,4 | –14 | –184 | –198 |
| C81–C96 | Malignant neoplasms of lymphoid, haematopoietic and related tissue | 2 010 | 2 003 | 1 695 | 99,7 | 84,3 | 84,6 | –7 | –308 | –315 |
| E10–E14 | Diabetes mellitus | 2 362 | 2 519 | 3 597 | 106,6 | 152,3 | 142,8 | 157 | 1 078 | 1 235 |
| I10–I15 | Hypertensive diseases | 4 407 | 4 399 | 6 429 | 99,8 | 145,9 | 146,1 | –8 | 2 030 | 2 022 |
| I20–I25 | Ischaemic heart diseases | 32 024 | 30 818 | 36 893 | 96,2 | 115,2 | 119,7 | –1 206 | 6 075 | 4 869 |
| I30–I51 | Other forms of heart disease | 4 479 | 4 264 | 4 565 | 95,2 | 101,9 | 107,1 | –215 | 301 | 86 |
| I60–I69 | Cerebrovascular diseases | 17 467 | 17 761 | 15 557 | 101,7 | 89,1 | 87,6 | 294 | –2 204 | –1 910 |
| I70 | Atherosclerosis | 6 103 | 5 994 | 5 150 | 98,2 | 84,4 | 85,9 | –109 | –844 | –953 |
| K70–K76 | Liver diseses | 6 071 | 6 023 | 5 525 | 99,2 | 91,0 | 91,7 | –48 | –498 | –546 |
| W00–W19 | Accidental falls | 3 023 | 2 940 | 2 102 | 97,3 | 69,5 | 71,5 | –83 | –838 | –921 |

# 2. Changes in 2006

In 2006 the medical control of the Death Certificates has been continued, and in the last quarter of the year a training program has started to inform the data suppliers about the best certification practice. Both activities had a positive impact on the quality of the cause of death statistics, but a quantitative analysis has not been performed.

Implementation of Version 2006 of the automated coding system brought in significant and well-discernible changes at some death causes. The Decision Tables, as the core of the programme, are revised each year by the WHO Mortality Reference Group and by the software developers in the US. It is usually completed, the ICD X. updates are incorporated and the occasional errors are corrected. The Decision Tables serve for checking the casual sequence and for selection of the underlying cause of death. In order to promote International comparison of the cause of death statistics, it is necessary to use the appropriate Tables for each data year. With a view to demonstrate the impact of the changes the 2006 data set was processed by the 2005 Tables as well.

From the modifications of the Decision Tables the following caused significant changes in the cause of death statistics for 2006:

1. If vascular dementia is reported as a consequence of atherosclerosis, vascular dementia has to be preferred in the course of the underlying cause selection.
2. If dementia (non-specified) is reported as due to atherosclerosis, vascular dementia has to be selected as an underlying cause.
3. If any form of heart failure is indicated as due to atherosclerosis, heart failure has to be preferred in the course of the underlying cause selection.
4. After application of the Modification rules, selection Rule 3 (Direct sequel) should be reapplied in order to identify the underlying cause of death. (Before 2006 Rule 3 had to be used just once in the course of the underlying cause selection.)

The changes mentioned for first and for second explain the increase of deaths caused by vascular dementia and partly the decrease of deaths due to atherosclerosis. It is important to note that different forms of dementia were reported on the Death Certificates more frequently by 21.7 per cent in 2006. Another considerable portion of the decrease in atherosclerosis deaths can be attributed to the change of rules concerning heart failure. Double application of Rule 3 contributed to the increase of deaths caused by Other forms of heart diseases (I30–I51) for the most part.

# 3. Changes in 2007

Implementation of Version 2007 of the automated coding system brought in significant and well-discernible changes at some death causes. With a view to demonstrate the impact of the changes of the Decision Tables the 2007 data set was processed by the 2006 Tables as well.

From the modifications of the Decision Tables the following caused significant changes in the cause of death statistics for 2007:

1. If mental and behavioural disorders due to use of alcohol is reported with alcoholic brain atrophy on the Death Certificates, alcoholic brain atrophy has to be preferred by application of the Linkage rule (Rule C) in the course of the underlying cause selection. (Before 2007 the Specificity rule (Rule D) had to be used.)
   It has to be used in the same way if mental and behavioural disorders due to use of alcohol is reported with:
   alcoholic epilepsy,
   alcoholic polyneuropathy,
   alcoholic myopathy,
   alcoholic cardiomyopathy,
   alcoholic gastritis,
   alcoholic pancreatitis.
2. If mental and behavioural disorders due to use of alcohol is reported with unspecified brain atrophy on the Death Certificates, alcoholic brain atrophy has to be selected as a combination of the two causes of death by application of the Linkage rule (Rule C). (Before 2007 the combination of the two causes of death could be used by application the Specificity rule (Rule D) if unspecified brain atrophy was reported as a consequence of mental and behavioural disorders due to use of alcohol.)
   It has to be used in the same way if mental and behavioural disorders due to use of alcohol is reported with:
   unspecified epilepsy,
   unspecified polyneuropathy,
   unspecified myopathy,
   unspecified cardiomyopathy,
   unspecified gastritis,
   unspecified pancreatitis.
3. If mental and behavioural disorders due to use of alcohol is reported with non alcoholic liver disease on the Death Certificates, non alcoholic liver disease has to be selected as a combination of the two causes of death by application of the Linkage rule (Rule C). (Before 2007 the combination of the two causes of death could be used by application the Specificity rule (Rule D) if non alcoholic liver disease was reported as a consequence of mental and behavioural disorders due to use of alcohol.)
4. Atrial fibrillation and other cardiac arrhythmia have to be considered as a direct consequence of cerebral infarction (by application of Rule 3).
5. Atrial fibrillation and other cardiac arrhythmia have to be considered as a direct consequence of stroke (by application of Rule 3).

The changes mentioned for first and for second explain the decrease of deaths caused by alcoholic liver disease and the increase of deaths caused by alcoholic brain atrophy, epilepsy and polyneuropathy. The third change explains the decrease of deaths caused by mental and behavioural disorders due to use of alcohol. The nearly 50 percent increases of atrial fibrillation and other cardiac arrhythmia are the consequence of the final two changes.

# 4. Changes in 2008

In 2008, one of the remarkable results of the medical controls of the Death Certificates is that the quality of the report of neoplasm diagnoses improved, therefore the number of neoplasm of uncertain and unknown behaviour decreased.

Implementation of Version 2008 of the automated coding system brought in significant and well-discernible changes at some death causes. To demonstrate the impact of the changes of the Decision Tables the 2008 data set was processed by the 2007 Tables as well.

From the modifications of the Decision Tables the following caused significant changes in the cause of death statistics for 2008:

1. If vascular dementia is reported as a consequence of cerebral infarction, vascular dementia has to be preferred in the course of the underlying cause selection.
2. If dementia (non-specified) is reported as due to cerebral infarction, vascular dementia has to be selected as an underlying cause.
3. Parkinson's disease could be considered as a consequence of alzheimer's disease, therefore alzheimer's disease has to be selected as an underlying cause.

The first two changes explain the more than 20 per cent increase of deaths caused by vascular dementia.
The third change could explain the increase of deaths caused by alzheimer's disease by 13 per cent and the decrease of deaths caused by parkinson's disease by almost the same proportion.

Since 2005 two changes of the Decision Tables have influenced the number of deaths caused by vascular dementia, one of them in 2006 (see Changes in 2006), the other in 2008, having significant effect on the time series data:

**The number of deaths caused by vascular dementia (F01)**

| Cause of death | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|
| Vascular dementia | 189 | 1 267 | 1 287 | 1 575 |

# 5. Changes in 2009

Implementation of the ICD X. Updates and changeover to Version 2009 of the automated coding system both have affected the cause of death statistics of 2009.

ICD X. Updates for the year 2009:

1. The former category of A09 “Diarrhoea and gastroenteritis of presumed infectious origin” has been modified and has been enlarged by two subcategories:
   Infectious or presumed infectious colitis, enteritis and gastroenteritis has to be classified to A090 “Other and unspecified gastroenteritis and colitis of infectious origin”. The subcategory A090 corresponds with the former category A09.
   Diagnoses to be classified from 2009 to the subcategory A099 “Gastroenteritis and colitis of unspecified origin” formerly were included by K529 “Noninfective gastroenteritis and colitis, unspecified”.
2. The category K529 “Noninfective gastroenteritis and colitis, unspecified” does not include gastroenteritis and colitis of unspecified origin any more.

Among the changes of the Decision Tables the following ones have a significant impact on cause of death statistics:

3. Stroke, cerebrovascular diseases and sequelae of cerebrovascular dieses should not be considered as a direct consequence of dementia any more.
4. Atrial fibrillation and other cardiac arrhythmia should not be considered as a direct consequence of cerebral infarction or stroke.

The above mentioned Change 1. and Change 2. provide an explanation for the 17 per cent increase of deaths caused by infectious and parasitic diseases.
The 13 per cent increase of deaths caused by dementia can be attributed to Change 3.
Deaths caused by atrial fibrillation and other cardiac arrhythmia decreased by 32 per cent due to Change 4.

Since 2005 even two modifications of the Decision Tables have been implemented (in 2007 and 2009) that have had an impact on the number of atrial fibrillation and other cardiac arrhythmia deaths. These are very well reflected in the time series.

**The number of deaths caused by atrial fibrillation and other cardiac arrhythmia (I48, I49)**

| Cause of death | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| Atrial fibrillation | 250 | 274 | 668 | 737 | 528 |
| Other cardiac arrhythmia | 62 | 75 | 199 | 189 | 98 |

# 6. Changes in 2010

The improving report of deaths connected to diseases of pregnancy, childbirth and the purperium was one of the remarkable results of the medical validation of Death Certificates. Due to this progress the data of maternal deaths became more reliable.

The changeover to the latest version of automated coding system also influenced the cause of death statistics in 2010.

From the changes in Decision Tables the following caused traceable deviation:

If mental and behavioural disorders due to use of alcohol is reported together with unspecified brain atrophy on Death Certificates the Linkage rule (Rule C) can applied only in those cases when unspecified brain atrophy is indicated as a consequence of mental and behavioural disorders due to use of alcohol. In this case alcoholic brain atrophy is the main cause of death. (Before 2010 the two causes had to be selected as a combination in every cases irrespectively of their status indicated on Death Certificate.)

It has to be used in the same way if mental and behavioural disorders due to use of alcohol is reported with:
unspecified epilepsy,
unspecified polyneuropathy,
unspecified myopathy,
unspecified cardiomyopathy,
unspecified gastritis,
unspecified pancreatitis.

This change explains the increase of deaths caused by mental and behavioural disorders due to use of alcohol and the decrease of deaths caused by alcoholic brain atrophy, epilepsy and polyneuropathy.

# 7. Changes in 2011

The application of the updates of International Classification of Diseases' (ICD) 10th revision and the implementation of the latest version of the automatic coding programme had effect on the 2011 causes of death statistics.

**ICD X. Updates for the year 2011:**

1. In the "Malignant neoplasms of lymphoid, haematopoietic and related tissue (C81–C96)" a couple of modification were accomplished: deletion of subitems and introduction of new ones, modification of titles, introduction of new codes. E.g. from 2011 the C86.- code was introduced for the coding of other specified types of T/NK-cell Lymphoma.

**Among the changes of the Decision Tables the following ones have a significant impact on cause of death statistics:**

2. In the coding rules of the „Neoplasms (C00–D48)" causes of death group the following updates were implemented:
   2.1 The categories in the „Secondary malignant neoplasms, C77–C79" group can not be used for the coding of the underlying cause of death. E.g. if on the Death Certificate the starting site of the malignant neoplasm is not specified only the secondary neoplasm, than the underlying cause of death is malignant neoplasm, without specification of site (C80.-), instead of the previously used secondary malignant neoplasm (C77-C79).
   2.2 Malignant neoplasms of independent (primary) multiple sites (C97) can not be used for the coding of the underlying cause of death. If on the Death Certificate this cause is reported, than the selection and modification rules must be applied like in other cases. From 2011 the coding of neoplasms does not deviate from the coding of other conditions. E.g. if as a consequence of malignant neoplasm of breast (C50.-), malignant neoplasm of stomach (C16.-) is reported on the Death Certificate, than till 2010 the underlying cause of death was malignant neoplasms of independent (primary) multiple sites (C97). However from 2011 a primary malignant neoplasm can not be accepted as the consequence of an other, so malignant neoplasm of stomach (C16.-) is selected as an underlying cause.
   2.3. If the malignant neoplasm is mentioned as the consequence of diseases, which increase the risk of neoplasm emergence, than the neoplasm must be considered primary even if the location is contained by the common sites of metastases. E.g. if as a consequence of chronic liver desease malignant neoplasms of liver and lung emerge, than instead of the malignant neoplasm of lung malignant neoplasm of liver is the underlying cause of death from 2011.
3. Direct consequences of diabetes mellitus (E10–E14) category is broadened by other disorders of peripheral nervous system (G64), retinal vascular occlusions (H34.-), other proliferative retinopathy (H35.2), unspecified retinal disorder (H35.9), atherosclerosis of arteries of extremities (I70.2), nephrotic syndrome (N03–N05), chronic kidney disease (N18.-), unspecified kidney failure (N19) and persistent proteinuria (N39.1).

The change within the C81–C96 group can be explained by the first modification, i.e. the growth in the number of deceases due to non-follicular lymphoma and the decline in the number of death caused by other and unspecified types of non-Hodgkin lymphoma.

The more than 27 percent increase in the malignant neoplasms of unspecified site can be traced back to the first update of the coding rules of the neoplasms category. Due to the second modification the number of deaths caused by some primary malignant neoplasms grew. The third update concerning neoplasms explaines the 7 percent increase in the number of deaths due to malignant neoplasms of liver and the 8 percent rise due to malignant neoplasms of brain.

The 9 percent rise in deaths caused by diabetes mellitus and the considerable (9 and 16 percent) decline in deaths caused by atherosclerosis of arteries of extremities as well as the kidney deseases lately classified to the direct consequences of diabetes mellitus are partly originated in the third modification.

# 8. Changes in 2012

The implementation of the latest version of the automatic coding programme had effect on the 2012 causes of death statistics.

**Among the changes of the Decision Tables the following one has a significant impact on cause of death statistics:**

1. Unspecified cirrhosis of liver must be considered as a direct consequence of viral hepatitis.

This change can explain the decrease in the number of deaths caused by unspecified cirrhosis of liver (K74.6), as well as the rise in deceases due to chronic viral hepatitis (B18).

The 50 percent increase year-on-year in the number of persons deceased in infectious deseases in 2012 can be traced back to this change. More than 80 percent of the growth is due to two causes of deaths: the above mentioned chronic viral hepatitis (B18) and the enterocolitis due to clostridium difficile (A04.7).

The number of deaths caused by enterocolitis due to clostridium difficile has been rising since 2010, which can be explained by the inaccurate filling in of Death Certificates. In these cases enterocolitis due to clostridium difficile is a result of anti-biotic treatment, and the doctor who diagnosed the cause of death did not stated the originating cause, which indicated the antibiotic treatment, thus enterocolitis due to clostridium difficile was selected as the underlying cause.
During the medical control of the Death Certificates a part of these errors were corrected with the contribution of the certifiers, and at discussions on the filling in of Death Certificates we drew the attention of physicians participating in the data-service on this problem.

**The number of deaths caused by clostridium difficile (A04.7)**

| 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| 12 | 12 | 15 | 22 | 25 | 85 | 140 | 262 |

# 9. Changes in 2013

The changeover to the Version 2013 of the automated coding system effected the statistics of several causes of deaths for the year 2013. Since the Decision Tables used for the selection of the underlying cause of death were revised and corrected by an International working group of physicians and statisticians. In order to identify the impact of the new version of the system a bridge-coding was conducted as every year: the 2013 data was processed by the former version (Version 2012) of the programme as well. Based on that the following impacts were discovered:

1. The number of deaths caused by Malignant neoplasm of other and ill-defined digestive organs (C26) and Malignant neoplasms of other and unspecified female genital organs (C57) decreased. Since in the recent years if more than one malignant neoplasms of the digestive organs or of the female genital organs were reported in the same time in the Death Certificate, the above mentioned combined categories of ICD X. had to be used. Started from 2013 from the malignant neoplasms of the same organ only one has to be selected according to the selection rules.
2. There was an increase in the number of Hypertensive heart disease (I11) and Hypertensive heart and renal disease (I13) caused deaths, however the number of deaths because of Hypertension (I10) and Hypertensive renal disease (I12) were decreased, since the combination rules regarding hypertension and heart failure or other heart diseases were changed.
3. The number of deaths due to some chronic lower respiratory diseases (J41–J44) increased, because from 2013 these chronic diseases cannot be accepted as a consequence of certain malignant neoplasms, certain heart diseases and some diseases of the musculoskeletal system and connective tissue. Therefore if a chronic lower respiratory disease is reported in the Death Certificate as due to the above mentioned diseases, it has to be selected for statistical tabulation.

The deaths due to pneumonia (J12–J18) and diabetes (E10–E14) increased presumably because of the medical control performed on the Death Certificates. By checking the multiple-cause data for these cases the following conclusions can be drawn:

1. The number of deaths caused by viral or bacterial pneumonia increased, however unspecified pneumonia decreased because this death cause was reported more precisely in 2013.
2. There was a decrease in the number of deaths caused by diabetes, since in the cases where more chronic diseases were present together in 2013 the diabetes was reported more often in Part II (instead of Part I) of the Death Certificate due to the medical control of the certificates.

A special situation to mention: The high number and additional increase of deaths caused by enterocolitis due to Clostridium difficile (A04.7) in 2013. This year the selection rules of ICD X. has been changed: from now the enterocolitis caused by Clostridium difficile has to be considered as a consequence of other causes. Based on that we expected a decrease of the number of deaths due to Clostridium difficile enterocolitis. However this disease was reported more frequently by 44.1 per cent in the Death Certificates in 2013 than in the previous year, therefore there has been no reduction.

**The number of deaths caused by Clostridium difficile (A04.7)**

| 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|
| 12 | 12 | 15 | 22 | 25 | 85 | 140 | 262 | 272 |

# 10. Changes in 2014

For 2014 the WHO did not published any update regarding the causes of death coding rules and there was no significant modification in the Decision Tables used for the automated coding. Therefore any change of the cause of death statistics cannot be explained by the above mentioned reasons.

However inside the chapter of Malignant neoplasms minor realignments can be discovered from 2011: The deaths caused by C80 – Malignant neoplasm without specification of site have been decreased, while the deaths caused by specific malignant neoplasms – affecting especially the liver – slightly increased. These changes can be explained on one hand by the ICD X. official updates introduced in 2011. On the other hand these are due to the trainings organised recently for the certifiers and to the medical control of the death certificates. On these sessions the importance of precise certification, especially in case malignant neoplasms (e.g. indication of the primary site, malignancy and cell-type), was emphasized. Consequently the quality of data supply improved and that facilitated the composition of more precise cause of death statistics.

**Deaths caused by malignant neoplasms of some highlited sites, 2011–2014**

| Code | Cause of death | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| C00–C97 | Malignant neoplasms | 32 670 | 33 224 | 32 748 | 32 748 |
| | Of which: | | | | |
| C22 | Malignant neoplasm of liver and intrahepatic bile duct | 796 | 821 | 832 | 904 |
| C71 | Malignant neoplasm of brain | 567 | 610 | 633 | 635 |
| C80 | Malignant neoplasm without specification of site | 721 | 716 | 698 | 581 |

# 11. Changes in 2015

In 2015, the WHO made only a few changes in the coding rules of causes of death and in the Decision Tables of the automated data processing support program. In order to detect the changes the 2015 data set was processed by the Tables used in 2014 as well, this study showed no difference.

In 2015, there were changes in the C-rules concerning the coding rules. The following code-combinations were introduced:

1. If the ruptured thoracic aortic aneurysm (I71.1) is mentioned together with the ruptured abdominal aortic aneurysm (I71.3), then these two ICD codes must be combinated into the code I71.5, which is the ruptured thoracoabdominal aortic aneurysm.

2. If the thoracic aortic aneurysm (I71.2) is mentioned together with the abdominal aortic aneurysm (I71.4), then these two ICD codes must be combinated into the code I71.6, which is the thoracoabdominal aortic aneurysm without mention of rupture.

In 2015, only two cases occurred, that the underlying cause of death has been defined according to the combination of the above mentioned codes.

# 12. Changes in 2016

In 2016, the WHO made significant changes in the coding rules of causes of death and minor modifications in the Decision Tables of the automated data processing support program.
In order to detect the changes the 2016 data set was processed in two ways: at first by the Decision Tables used in 2015 with the coding rules of 2016, secondly by the Decision Tables of 2016 with the coding rules used in 2015.

Among the changes in the Decision Tables the following ones caused the detectable differences:

1. All types of malignant neoplasms (C00-C97) must be considered as the obvious cause of sepsis (A40-A41).
2. The malignant neoplasms of cerebral meninges (C70.0, D32.0, D42.0), brain (C71.-, C79.3, D33.0-D33.2, D43.0-D43.2), pituitary gland (C75.1-C75.3, D35.2-D35, D44.3-D44.5) and lymphoid and haematopoietic (C81-C96, D45-D47) must be considered as the obvious cause of cerebral infarction (I63.-, I69.3).
3. In addition to malignant neoplasms of urinary tract all malignant neoplasms (C00-C97) and neoplasm of uncertain behaviour (D37-D47) must be considered as the obvious cause of chronic kidney disease (N18.-).
4. Cerebral infarction (I63.-, I69.3) must be considered as the obvious cause of chronic kidney disease (N18.-).

Among the changes in the coding rules of causes of death the following ones have significant impact:

5. In 2016 there was a significant change in the selection of the underlying cause of death. The selection of the underlying cause of death consists of two separable parts. Until 2015, firstly the originating antecedent cause had to be determined by applying the General Principle or Selection Rules 1., 2., 3. From 2016 firstly the starting point must be determined on the basis of the eight steps required by WHO, each of which is a selection rule. There is no difference between the originating antecedent cause and the starting point – the disease or condition which resulted the chain of events leading to death – but the way of the selection differs. Then in the second part of the selection of the underlying cause it must be checked whether there is any special instruction for the first selected disease or condition. Until 2015, it was necessary to check whether the originating antecedent cause could be modified by the other diagnosis on the Death Certificate. All possible connections had to be searched, in case of several simultaneous connections the possible underlying cause had to be determined by the Selection Rules. Until then it had to be repeated till the re-selected cause was a condition that the previously selected possible cause was connected to. From 2016, it is also necessary to check whether there is any special coding instruction for the starting point determined in the first part. If so, then a new starting point should be selected accordingly. Then, this new possible underlying cause must also be examined whether it could be modified by some instruction. So, this step has to be repeated until you find some modifying coding instruction. By using these new rules, the expectation that the starting point of the first mentioned series must be selected for the statistical reporting is much more fulfilled.
6. From 2016, subsequent myocardial infarction (I22.-) can not be the underlying cause of death. If it is selected, it must be coded under acute myocardial infarction (I21.-).
7. In the case of death due to poisoning by multiple drug if the physician when fills in the Death Certificate did not indicate any of the drugs as the most important substance in bringing about the death, the appropriate category for “Other” must be selected.

The first three changes can explain the nearly 1 percent increase in neoplasms (C00–D48).

The third and fourth changes can be attributed to the 39 percent decrease in chronic kidney disease (N18.-).

The fifth change caused the most significant differences:

– The other acute ischemic heart disease (I24.-) increased by 2.5 fold, and this change was attributable to the part of the decline in chronic ischemic heart disease (I25.-) as well.

- The heart failure (I50.-) increased by 53 percent and this caused part of the decline in cerebrovascular disease (I60-I69) and arterial embolism and thrombosis (I74.-).
- The hypertensive heart and renal disease (I11–I13) increased by 10 percent, this change caused part of the significant decrease in cerebral atherosclerosis (I67.2) and valve disorders (I34–I38).

The sixth change can explain the slight increase in acute myocardial infarction (0.2 percent).

The seventh change explains the more than 90 percent increase in the number of deaths caused by intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances (X64), as well as the more than 40 percent decrease in the number of deaths due to the self-poisoning by sedative-hypnotic, antiparkinsonism and psychotropic drugs, narcotics and other drugs acting on the autonomic nervous system (X61–X63).

# 13. Changes in 2017

In 2017, the WHO implemented only a few modifications in the coding rules of causes of death and in the Decision Tables of the automated data processing support program. For the purpose of detecting these changes, the 2017 data set was processed by the Tables used in 2016 as well.

From the changes of the death coding rules, the following caused traceable deviation:

1. From 2017 the delirium superimposed on dementia (F05.1) cannot be the underlying cause of death. If it is chosen, it must be coded to the type of dementia.

From the changes in the Decision Tables, the followings caused the detectable differences:

2. The outcomes linked to the diabetes mellitus (E10–E14) since 2016 expanded by the following diseases among others: other gastroenteritis and colitis of infectious and unspecified origin (A09), sepsis (A40–A41), bacterial infection (A49), hypertension (I10), hypertensive heart disease (I11), ischaemic heart diseases (I20–I25), heart failure (I50), cerebral atherosclerosis (I67.2), other and unspecified atherosclerosis (I70.8–I70.9), pneumonia (J12–J18).
3. The range of contagious diseases that had already contracted with diabetes decreased considerably in 2017.

The first change caused partially the increase of vascular dementia (F01).

It can be explained by the second and third changes, that the diabetes with other specified complications are increased by more than three times, nevertheless the diabetes with multiple complications declined by 44%.

**Number of deceased due to diabetes according to the complications of diabetes**

| Cause of death | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| Diabetes mellitus | | | | | | | | |
| with coma | 58 | 30 | 28 | 34 | 36 | 27 | 16 | 17 |
| with ketoacidosis | 21 | 34 | 31 | 17 | 15 | 29 | 11 | 10 |
| with renal complications | 141 | 427 | 415 | 378 | 367 | 430 | 211 | 223 |
| with ophthalmic complications | 12 | 2 | 9 | 4 | 4 | 7 | – | – |
| with neurological complications | 28 | 8 | 22 | 16 | 17 | 20 | 6 | 7 |
| with peripheral circulatory complications | 259 | 345 | 389 | 322 | 294 | 286 | 116 | 112 |
| with other specified complications | 5 | 18 | 34 | 40 | 54 | 48 | 466 | 1 554 |
| with multiple complications | 138 | 213 | 213 | 344 | 354 | 357 | 1 859 | 1 033 |
| with unspecified complications | 79 | 87 | 81 | 81 | 57 | 63 | 9 | 4 |
| without complications | 1 818 | 1 618 | 1 620 | 1 348 | 1 385 | 1 504 | 92 | 137 |

# 14. Changes in 2018

In 2018, the WHO has conducted numerous changes on the death coding rules and to the Decision Tables of the automated data processing support program. In order to detect these changes, the 2018 data set was processed by the Tables used in 2017 as well.

The following changes in death coding rules have resulted in a traceable deviation:

1. Acute heart failure (I50) should be considered an ill-defined condition and ignored when determining the starting point.
2. If alcohol-induced mental and behavioural disorders (F10) are listed together with unspecified acute pancreatitis (K85.9) then according to M1 rule the code will be K85.2- alcohol-induced acute pancreatitis.
3. If alcohol-induced mental and behavioral disorders (F10) are present in association with other chronic pancreatitis (K86.1) then according to M1 rule the code will be K86.0- alcohol-induced chronic pancreatitis.
4. If hypertensive disease (I10 to I15) is reported as the cause of aortic aneurysm and dissection (I71), then aortic aneurysm and dissection (I71) should be coded according to M1.
5. If sequelae of cerebrovascular disease (I69) is accompanied by intracerebral hemorrhage, cerebral infarction or stroke (I60-I66), then coding for acute cerebrovascular disease (I60-I64) is required by M1.
6. If atherosclerosis (I70) is reported as a cause of certain cardiomyopathy (I42.0, I42.1, I42.2, I42.8, I42.9), then the code required by rule M1 is ischemic cardiomyopathy (I25.5)
7. If chronic obstructive pulmonary disease with acute lower respiratory infection (J44.0) is associated with emphysema (J43), then the M1 rule is to encode emphysema (J43).

Among the changes in the Decision Tables, the following also caused a noticeable difference:

8. From 2018 the chronic bronchitis, which is not defined as acute or chronic (J40), is also acceptable as a consequence of the following diseases: dementia (F01, F03), hypertensive diseases (I10-I15), ischemic heart disease (I20-I25), other forms of heart disease (I30 –I51) cerebrovascular diseases (I60 – I69), atherosclerosis (I70).

The first change had an impact on several deaths, among others dementia (F01, F03), other forms of heart disease (I30-I51), cerebrovascular disease (I60-I69), and atherosclerosis (I70).

With the second and third change can be explained a 33% increase in acute alcoholic pancreatitis and a 26% increase in chronic alcoholic pancreatitis.

The fourth change explains the 20% increase in aortic aneurysm and dissection (I71) and part of the decrease in the number of hypertension diseases.

The fifth amendment did not cause any detectable change.

The 11% increase in ischemic cardiomyopathy (I255) is due to the sixth change

The seventh change contributed to the 31% increase in emphysema.

The eighth modification caused a 2% decrease in non-acute or chronic bronchitis (J40) mortality.

The first and eighth changes contributed to the 4% increase in dementia (F01, F03), the 2% increase in acute ischemic heart disease (I20-I24) and more than 1% increase in other forms of heart disease (I30-I51).

# 15. Changes in 2019

In 2019, the WHO implemented only a few changes in the coding rules of causes of death and in the Decision Tables of the automated data processing support program. In order to detect the changes, the 2019 data set was processed with the tables in force in 2018.

Among the changes in the coding rules of causes of death, the following caused a traceable deviation:

1. If atherosclerosis of renal artery (I70.1) is reported as a cause of chronic kidney disease (N18), hypertensive renal disease with renal failure (I12.0) should be coded according to rule M1.
2. If atherosclerosis of renal artery (I70.1) is reported as a cause of unspecified kidney failure (N19), hypertensive renal disease with renal failure (I12.0) should be coded according to rule M1.
3. If atherosclerosis of renal artery (I70.1) is reported as a cause of unspecified contracted kidney (N26), hypertensive renal disease without renal failure (I12.9) should be coded according to rule M1.
4. If generalized and unspecified atherosclerosis (I70.9) is reported as a cause of chronic kidney disease (N18), hypertensive renal disease with renal failure (I12.0) should be coded according to rule M1.
5. If generalized and unspecified atherosclerosis (I70.9) is reported as a cause of unspecified kidney failure (N19), hypertensive renal disease with renal failure (I12.0) should be coded according to rule M1.
6. If generalized and unspecified atherosclerosis (I70.9) is reported as a cause of unspecified contracted kidney (N26), hypertensive renal disease without renal failure (I12.9) should be coded according to rule M1.

The above changes can explain the 20-20% increase in hypertensive renal disease (I12) and in hypertensive heart and renal disease (I13), and a 30% decrease in heart failure (I50) and a 10% decrease in atherosclerosis (I70) and a 9% decrease in chronic kidney disease and unspecified kidney failure (N18-N19).

# 16. Changes in 2020

Mortality statistics for 2020 were affected by the amendments of the International Classification of Diseases (ICD X.) introduced during the year and by the transition to the latest version of the automated coding program.

**Amendments of ICD X. for year 2020:**

1. For the cause of death classification of the new coronavirus infection (Covid-19), identified in 2020, the WHO has designated the following ICD codes: U07.1 Covid-19, virus identified; U07.2 Covid-19, virus not identified; U09.9 Post Covid-19 condition, unspecified; U10.9 Multisystem inflammatory syndrome associated with Covid-19, unspecified.

**The following caused a traceable deviation from the changes in the Decision Tables:**

2. Unspecified dementia (F03) is also acceptable from 2020 as a consequence of the following diseases: Hypertensive diseases (I10–I15), Ischaemic heart diseases (I20–I25), Pulmonary heart disease and diseases of pulmonary circulation (I26–I28), Acute pericarditis and Other diseases of pericardium (I30–I31).

The first change affected several groups of cause of death, of which the most significant alteration was observed in Diseases of the respiratory system (J00–J99), which decreased by 14% compared to 2019.

The second change contributed to a 22% increase in Hypertensive diseases (I10–I15).

# 17. Changes in 2021

In 2021, the WHO implemented only a few changes in the coding rules of causes of death and in the Decision Tables of the automated data processing support program.

**Amendments of ICD X. for year 2021:**

Regarding the coding of Covid-19, WHO introduced the following ICD code: Covid-19 vaccines causing adverse effects in therapeutic use (U12). This code should be classified as an external cause, similarly to category Other and unspecified vaccines and biological substances (Y59).

In 2021, there were only three cases where Covid-19 vaccines causing adverse effects in therapeutic use (U12) appeared as a cause of death in statistical publications.