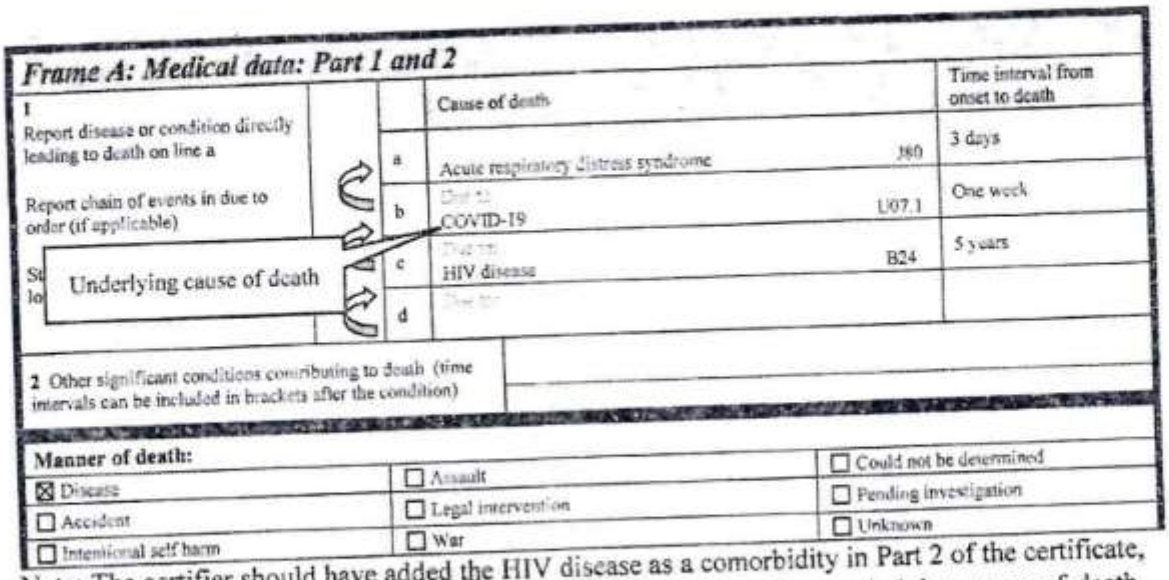


Frame A: Medical data: Part 1 and 2

		Cause of death		Time interval from onset to death
1 Report disease or condition directly leading to death on line a	a	Acute respiratory distress syndrome	J80	3 days
Report chain of events in due to order (if applicable)	b	COVID-19	U07.1	One week
Underlying cause of death	c	HIV disease	B24	5 years
	d			
2 Other significant conditions contributing to death (time intervals can be included in brackets after the condition)				

Manner of death:		
☒ Disease	☐ Assault	☐ Could not be determined
☐ Accident	☐ Legal intervention	☐ Pending investigation
☐ Intentional self harm	☐ War	☐ Unknown

Note: The certifier should have added the HIV disease as a comorbidity in Part 2 of the certificate, however the selection rules of ICD allow to identify COVID-19 as underlying cause of death. (COVID-19) is reported in a sequence ending with a terminal condition (Acute respiratory distress syndrome due to COVID-19). Mortality coding rule step SP4 applies as causes have been reported on more than one line in Part 1 and the condition reported first on the lowest used line (HIV disease) cannot cause all the conditions. [See ICD-10 2016 and later, Volume 2, Section 4.2.1].

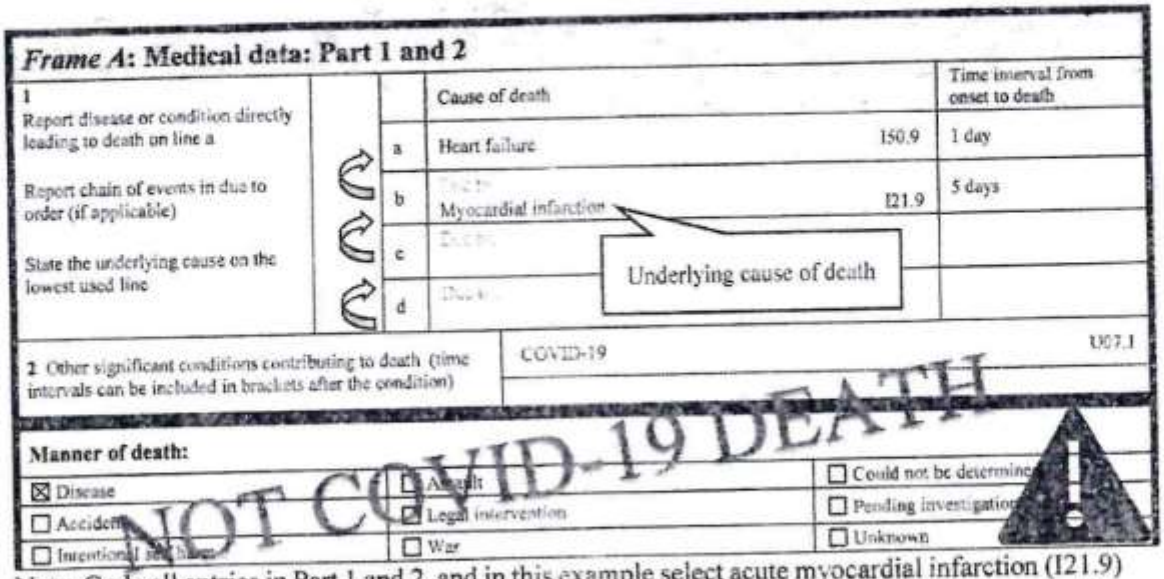
Frame A: Medical data: Part 1 and 2

		Cause of death		Time interval from onset to death
1 Report disease or condition directly leading to death on line a	a	Hypovolaemic shock	T79.4	1 day
Report chain of events in due to order (if applicable)	b	Aortic dissection	S25.0	1 day
State the underlying cause on the lowest used line	c	Motor vehicle accident	V89.2	2 days
Underlying cause of death	d			
2 C… to death (time intervals can be included in brackets after the condition)		COVID-19		U07.1

Manner of death:		
☐ Disease	☐ Assault	☐ Could not be determined
☒ Accident	☐ Legal intervention	☐ Pending investigation
☐ Intentional self harm	☐ War	☐ Unknown

NOT COVID-19 DEATH

Note: Code all entries in Part 1 and 2, and in this example select motor vehicle accident (V89.2) as underlying cause of death. Step SP3 applies as causes have been reported on more than one line in Part 1 and the condition reported first on the lowest used line, motor vehicle accident (V89.2), can cause all the conditions, traumatic aortic dissection (S25.0) and traumatic hypovolemic shock (T79.4), mentioned on the lines above. [See ICD-10 2016 and later, Volume 2, Section 4.2.1].



Note: Code all entries in Part 1 and 2, and in this example select acute myocardial infarction (I21.9) as underlying cause of death. Step SP3 applies as causes have been reported on more than one line in Part 1 and the condition reported first on the lowest used line, myocardial infarction (I21.9), can cause the condition, heart failure (I50.9), mentioned on the line above. [See ICD-10 2016 and later, Volume 2, Section 4.2.1].

E- Additional WHO cause of death certification links

- How to fill in a death certificate: Interactive Self Learning Tool (WHO)

  http://apps.who.int/classifications/apps/icd/icd10training/ICD-10DeathCertificate/html/index.html

- Cause of Death on the Death Certificate: Quick Reference Guide (Section 7.1.2)

  https://icd.who.int/browse10/Content/statichtml/ICD10Volume2_en_2016.pdf

- International form of medical certificate of cause of death (Section 7.1.1)

  https://icd.who.int/browse10/Content/statichtml/ICD10Volume2_en_2016.pdf

5. ANNEX

Examples of terms used by certifiers to describe COVID-19 and that can be coded as synonyms of COVID-19:

COVID Positive
Coronavirus Pneumonia
COVID-19 Infection
Sars-Cov-2 Infection (Coronavirus Two Infection)
COVID-19 Coronavirus
Infection – COVID-19 (Coroner Informed)
Hospital Acquired Pneumonia - COVID-Positive
Corona Virus two infection (SARS-Cov-2)
Corona Virus Pneumonia (COVID-19)
Coronavirus-Two Infection
Novel coronavirus

2. Data and methods

This section describes the sources of data, the methods used to process, edit and analyse the data as well as procedures that are used in assessing the quality of the data.

2.1 Data source

The statistics presented in this release are based solely on administrative records from death notification forms obtained from the Department of Home Affairs. The DHA uses two types of death notification forms to capture deaths: Form BI-1663 which was introduced in 1998 and Form DHA-1663 which was introduced in 2009 as a replacement of Form BI-1663 (see Appendix B on pages 62). BI-1663 forms will continue to be used until all the remaining forms are depleted. In instances where there is no medical practitioner available to complete the death notification form, e.g. in rural areas, a traditional leader may complete it and if authorised it may also issue a Death Report form also known as Form B1-1680 which certifies the occurrence of death and a description of the circumstances that resulted in the death.

The Death Report is then sent to DHA where the information is transcribed on to either the BI-1663 or the DHA-1663. The major difference between the two forms is that stillbirths and deaths occurring within the first seven days of life (perinatal deaths) on Form BI-1663 are recorded in the same section as all other deaths, whereas Form DHA-1663 has a separate section that records perinatal deaths.

The Births and Deaths Registration Act, 1992 (Act No. 51 of 1992) amended in 2010 as the Births and Deaths Registration Amendment Act, 2010 (Act No. 18 of 2010) is the legislation governing the registration of deaths in South Africa (Republic of South Africa, 1992; Republic of South Africa, 2010). Additionally, the 2014 Births and Deaths Regulations which rescinded the 1992 Regulations prescribe that notice of occurrence of death including a stillbirth must be given within 72 hours by an informant, regardless of citizenship status of the deceased. After registration of the death, the DHA issues a death certificate to the informant and updates the National Population Register (NPR).

The NPR only includes deaths for South African citizens and permanent residents whose birth records were already captured onto the NPR prior to death. Persons not eligible for inclusion in the NPR are non-South African citizens who were temporarily in the country. South African citizens and permanent residents who died before notice of their births had been registered would also not be captured in the NPR. Stats SA, on the other-hand, collects all death notification forms, irrespective of the deceased's citizenship status for processing, analysis and dissemination of mortality and causes of death information. On this basis, the figure of deaths processed by Stats SA will always be higher than the figure of deaths recorded on the NPR for the same period.

The 2017 statistical release is based on a total of 446 544 deaths that occurred in 2017 and 18 742 late death registrations for 1997 to 2016 that were registered at the DHA and reached Stats SA in time for the 2018/2019 processing phase. About 99,94% of these deaths were registered using the new form DHA-1663, and 0,06% were registered using the old form BI-1663.

2.2 Data processing

The processing of the completed death notification forms takes place at the Stats SA Data Processing Centre. The process begins with sorting of the forms by year of death, pasting unique identifier labels on each of the forms, coding socio-demographic and causes of death variables, and ending with data capturing. The two death notifications (Form BI-1663 and Form DHA-1663) are then merged into one dataset as the data elements in these two forms are largely comparable.

2.2.1 Classification of the causes of death

The cause-of-death statistics in this publication are compiled using the International Classification of Diseases (ICD), 10th Revision 2016 Edition. The ICD is a system of categories to which morbid entities of either external or pathological causation are assigned according to established criteria. It is developed collaboratively between the World Health Organization (WHO) and various international centres and is revised from time to time in line with new adaptations, classifications and glossaries. All member states of the United Nations, including South Africa, agreed to use the ICD as the standard classification system for compiling morbidity and mortality statistics. The South African National Information System also adopted it as a standard.

The primary purpose of the ICD is to provide for the conversion of word descriptions of diseases or conditions into an alphanumeric code, which permit easy storage, retrieval and analysis of data. It also allows for the systematic and standardised recording, analysis, interpretation comparison and sharing of morbidity and mortality data within a population and across countries. The ICD-10 provides for the coding and classification of diseases and injuries and a wide range of signs, symptoms and other abnormal findings.

According to the WHO (2016), the most effective public health objective is to prevent the underlying cause of death from operating. For this purpose, the WHO recommends that countries use the international form of medical certificate of cause of death to facilitate the selection of the underlying cause of death. The ICD-10 contains about 8 000 categories of causes of death which are organised into 22 chapters that consist of communicable diseases, non-communicable diseases, ill-defined causes of death and external causes of injury and death.

Each chapter contains three-character categories that can be subdivided into 10 four-character subcategories. However, for international comparisons, three-character coding is the mandatory level for reporting morbidity and mortality statistics, while four-character coding is recommended for more specific details about the disease or condition resulting in morbidity or mortality. Statistics South Africa codes the causes-of-death data at four-character level where sufficient details about the causes of death were available. However, this statistical release analyses up to three-character level.

The quality of the causes of mortality statistics depends on the completeness and accuracy of the certified death notification forms. Coders at Stats SA follow the principle of, 'what you see is what you code' when coding causes-of-death statistics. The coders use the ICD-10 for categories of causes of death coded in the ICD-10 manual. For categories that are not coded in the ICD-10 manual, Stats SA has outlined specific guidelines and procedures. For example, according to these rules and procedures *immunosuppression* is coded as *immunodeficiency* and not as *human immunodeficiency virus (HIV) disease*.

Medical practitioners sometimes report the cause of death as *acquired immune suppression* which is not coded in the ICD-10 manual. Based on the Stats SA guidelines, this is coded as *human immunodeficiency virus (HIV) disease (B20-B24)*. *Multidrug-resistant tuberculosis (MDR-TB)* and *extensively drug-resistant tuberculosis* (XDR-TB) were assigned the ICD-10 special codes U51 and U52, respectively, and are included in the *tuberculosis (A15-A19)* broad group causes of mortality.

2.2.2 Generation of the underlying causes of death

The underlying cause of death is defined as: "(a) the disease or injury that initiated the sequence of events leading directly to death, or (b) the circumstances of the accident or violence that produced the fatal injury" (WHO, 2016: 31). Stats SA uses two software packages, namely Automated Classification of Medical Entities (ACME 2011) and IRIS, for the automated derivation of the underlying causes of death. The ACME software was developed by the United States National Centre for Health Statistics (NCHS). It applies the WHO ICD-10 rules on the selection of the underlying cause of death. The IRIS software is used for comparison of results with ACME. Similarly, this software uses the WHO rules international death certificate form and the causes of death are coded according to WHO ICD-10 rules.

The low concordance of the two systems in comparison to previous years is attributed to comparison at four-character level, whereas previously, comparison was done at three-character level. Where one software failed to derive the underlying cause, the results of the other software were used. In occasions where both software packages failed to derive the underlying cause of death, experienced coders at Stats SA derived the underlying cause of death manually.

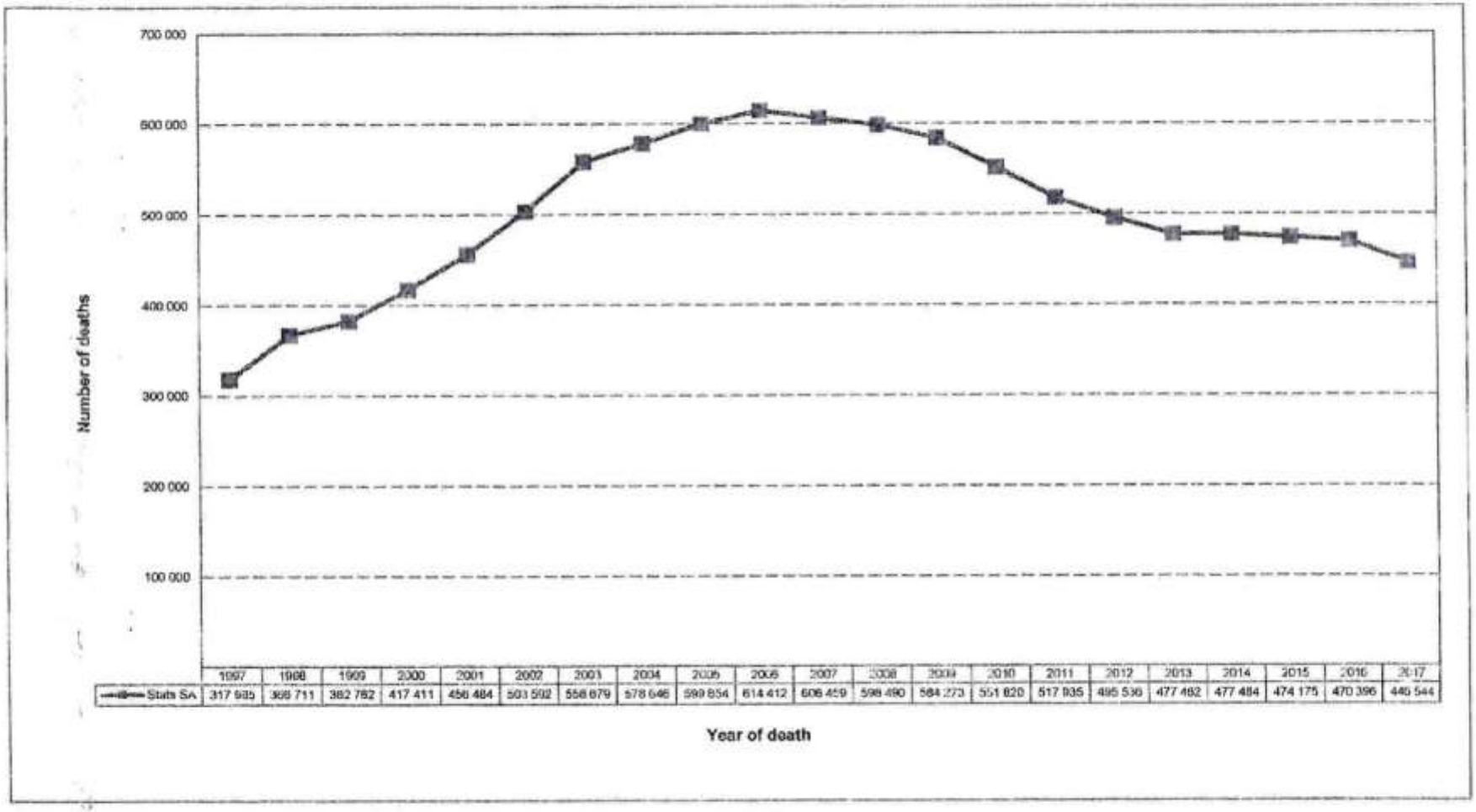
2.3 Data editing

On completion of all data processing, the Stats SA editing program was used to check for accuracy and flag implausible causes of death for further investigation. Additionally, two electronic tools both developed by WHO: Analyzing mortality levels and causes-of-death (ANACoD) version 2.0 and CoDEdit version 1.0 were used to further check data consistency and plausibility (WHO, 2014a and WHO, 2014b, respectively). The tools were developed to enhance the value of mortality statistics in informing health policies and programmes.

The Analyzing mortality levels and causes-of-death (ANACoD) version 2.0 and CoDEdit version 1.0 tools were used to automatically check the 2017 mortality data for accuracy and consistency. The tools were also used for highlighting cases with causes that were unlikely to cause death categorised by age and sex (sex-specific causes, age-specific causes and notifiable diseases) and possible misuse of ICD-10 codes as well as providing a summary of the records within the dataset (WHO, 2014a; WHO, 2014b). For instance, regarding causes of death that are specific to one sex, the tools warn and flag for errors when the combination of sex and cause is incorrect.

Errors flagged by the tools, were manually investigated for verification and corrections were made where necessary. The main difference between the two tools is that CoDEdit assesses data consistency and plausibility for each unit record, while ANACoD checks the data at an aggregate level.

Figure 3.1: Number of registered deaths by year of death, 1997–2017*



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Stats SA	317 985	368 711	382 782	417 411	456 484	503 592	558 679	578 646	599 854	614 412	606 459	598 490	584 273	551 820	517 935	495 536	477 482	477 484	474 175	470 396	446 544

*Data for 1997–2016 have been updated with late registrations/delayed death notification forms processed in 2018/2019.

Table 4.3: Distribution of deaths by main groups of causes of death, 2017

No.	Main groups of underlying causes of death (based on ICD-10)	Number	Percentage
9	Diseases of the circulatory system (I00-I99)	81 992	18,4
1	Certain infectious and parasitic diseases (A00-B99)*	78 562	17,6
18	Symptoms and signs not elsewhere classified (R00-R99)	59 773	13,4
19	External causes of morbidity and mortality (V01-Y98)	51 164	11,5
2	Neoplasms (C00-D48)	43 120	9,7
10	Diseases of the respiratory system (J00-J99)	42 202	9,5
4	Endocrine, nutritional and metabolic diseases (E00-E90)	31 362	7,0
11	Diseases of the digestive system (K00-K93)	11 598	2,6
3	Diseases of the blood and immune mechanism (D50-D89)	10 375	2,3
14	Diseases of the genitourinary system (N00-N99)	9 506	2,1
6	Diseases of the nervous system (G00-G99)	9 434	2,1
16	Certain conditions originating in the perinatal period (P00-P96)	8 519	1,9
5	Mental and behavioural disorders (F00-F99)	2 542	0,6
17	Congenital malformations (Q00-Q99)	2 367	0,5
13	Diseases of the musculoskeletal system etc. (M00-M99)	1 804	0,4
12	Diseases of the skin and subcutaneous tissue (L00-L99)	1 346	0,3
15	Pregnancy, childbirth and puerperium (O00-O99)	671	0,2
7	Diseases of the eye and adnexa (H00-H59)	61	0,0
8	Diseases of the ear and mastoid process (H60-H95)	46	0,0
Total		**446 544**	**100**

* Including deaths due to MDR-TB and XDR-TB

Table 4.5: The ten leading underlying natural causes of death, 2015–2017*

Causes of death (based on ICD-10)	2015			2016			2017		
	Rank	Number	%	Rank	Number	%	Rank	Number	%
Tuberculosis (A15-A19)**	1	34 106	7,2	1	30 441	6,5	1	28 678	6,4
Diabetes mellitus (E10-E14)	2	25 805	5,4	2	25 799	5,5	2	25 336	5,7
Cerebrovascular diseases (I60-I69)	3	23 540	5,0	4	23 695	5,0	3	22 259	5,0
Other forms of heart disease (I30-I52)	4	23 324	4,9	3	24 552	5,2	4	22 098	4,9
Human immunodeficiency virus [HIV] disease (B20-B24)	5	22 594	4,8	5	22 483	4,8	5	21 439	4,8
Hypertensive diseases (I10-I15)	7	19 876	4,2	6	20 289	4,3	6	19 900	4,5
Influenza and pneumonia (J09-J18)	6	21 055	4,4	7	20 152	4,3	7	18 837	4,2
Chronic lower respiratory diseases (J40-J47)	9	13 031	2,7	10	13 040	2,8	8	13 167	2,9
Ischaemic heart diseases (I20-I25)	10	12 726	2,7	9	13 269	2,8	9	12 766	2,9
Other viral diseases (B25-B34)	8	16 501	3,5	8	16 877	3,6	10	12 622	2,8
Other natural causes		208 242	43,9		205 281	43,9		198 278	44,4
Non-natural causes		53 375	11,3		53 518	11,4		51 164	11,5
All causes		**474 175**	**100,0**		**470 396**	**100,1**		**446 544**	**100,0**

*Data from 2014–2015 have been updated with late registrations/delayed death notification forms processed in 2018/2019.
** Including deaths due to *MDR-TB* and *XDR-TB*.
.. Category not in top ten.

4.7.2 Leading underlying natural causes of death by sex

The distribution of the ten leading underlying natural causes of death in 2017 by sex is shown in Table 4.6. Overall, nine of the ten leading causes were the same for both sexes, although with different rankings. *Tuberculosis* was the leading underlying cause of death for males accounting for 7,6% of male deaths while the leading underlying cause of death amongst females was diabetes mellitus accounting for 7,3% of female deaths. Human immunodeficiency virus [HIV] disease (4,7%) was the second leading cause of death for the males, followed by Other forms of heart disease (4,4%). Cerebrovascular diseases (6,0%) was the second leading underlying cause of death for females.

There were no leading causes of death between the two sexes which had the same rank. The vast difference in terms of rankings between the two sexes were for the hypertensive diseases, cerebrovascular diseases, tuberculosis and Human immunodeficiency diseases – with the highest difference being hypertensive diseases which ranked 5 positions high for females compared to males. Hypertensive diseases ranked 3rd for males while it ranked 8th for males. The other causes had a 4 position deference and the most notable being human immunodeficiency diseases which ranked 2nd for males but were 6th for females.

In terms of the global burden on diseases, three of the top five leading underlying causes of death for males were communicable diseases whilst among females, tuberculosis was the only communicable disease and the rest being non-communicable diseases.

Table 4.15: Distribution of the 20 most commonly reported causes of death, 2017

Rank	Cause of death (based on ICD-10)	Number of deaths in which the cause was reported	Percentage of all deaths
1	Other forms of heart disease (I30-I52)	61 602	13,8
2	Hypertensive diseases (I10-I15)	52 536	11,8
3	Ill-defined and unknown causes of mortality (R95-R99)	49 161	11,0
4	Tuberculosis (A15-A19)*	43 725	9,8
5	Influenza and pneumonia (J09-J18)	42 365	9,5
6	Other external causes of accidental injury (W00-X59)	35 608	8,0
7	Cerebrovascular diseases (I60-I69)	33 474	7,5
8	Renal failure (N17-N19)	33 269	7,4
9	Diabetes mellitus (E10-E14)	28 456	6,4
10	Other viral diseases (B25-B34)	26 266	5,9
11	Other bacterial diseases (A30-A49)	25 040	5,6
12	Human immunodeficiency virus [HIV] disease (B20-B24)	23 067	5,2
13	Ischaemic heart diseases (I20-I25)	19 023	4,3
14	Chronic lower respiratory diseases (J40-J47)	18 816	4,2
15	Other diseases of the respiratory system (J95-J99)	15 847	3,5
16	Metabolic disorders (E70-E90)	15 589	3,5
17	Malignant neoplasm of ill-defined, secondary and unspecified sites(C76-C80)	14 071	3,2
18	Intestinal infectious diseases (A00-A09)	13 535	3,0
19	Malignant neoplasm of digestive organs (C15-C26)	10 856	2,4
20	Other acute lower respiratory infections (J20-J22)	10 109	2,3

*Including deaths due to MDR-TB and XDR-TB.

The ten leading underlying natural causes of death shown in Table 4.5 (page 31) for 2017 deaths are presented in Table 4.16 to show the breakdown of the number of deaths by whether the death was selected as the underlying cause, or whether it was reported as the immediate or contributing cause.

It is important to note that within each category, the counts of underlying causes and immediate or contributing causes are not duplicated, so that they can be summed up to equal the total number of times a specific cause of death was recorded on a death notification form. For example, 28 678 deaths had *tuberculosis* as the underlying cause and another 15 047 deaths had it as an immediate or contributing cause. This gives a total of 43 725 death notification forms. Thus, proportionally *tuberculosis* contributed more as underlying cause than the immediate or contributing cause.

The percentage distributions show that *human immunodeficiency virus [HIV] disease* was selected in 92,9% of cases as the underlying cause where the disease was reported on the form. Furthermore, where *diabetes mellitus* was reported on the form, it was selected as the underlying cause in 89,0% of the forms, while *chronic lower respiratory diseases* was selected as the underlying cause in 70,0% of the forms. The causes of death which, when mentioned, were least selected as the underlying causes were *hypertensive diseases* (37,9%) and *other forms of heart disease* (35,5%).