

MORTALITY

Data source

Mortality data are elaborated by the Unit of Statistics of Istituto Superiore di Sanità on the basis of official data released by the Italian National Institute of Statistics (Istat) (causes of death and data on municipal populations).

The causes of death are classified according to WHO Coding System called ICD (*International Classification of Diseases*). ICD is periodically subjected to updates, called "Revisions", in order to adopt increasingly analytical classifications and to better address advances in medical knowledge. The current classification (ICD-10) has been adopted in Italy in 2003.

Selected causes

In order to render the health profile of Local Health Units as informative as possible in terms of mortality, 37 specific causes have been added to the general mortality, which include, in addition to large groups of pathologies, single causes, such as acute myocardial infarction within the group of diseases of the circulatory system. The complete list of selected causes is shown in the Table below.

General mortality breakdown diagram: a graphical representation, in total and by gender, of the breakdown for the selected causes is provided. Single age classes are reported on the X axis, deaths in absolute value on the Y axis.

Average age at death for specific cause of death: this indicator is not taken from mortality tables, it is directly calculated from the deaths observed by age group, with the following formula:

$$\bar{x} = \frac{\sum(x * d_x)}{\sum d_x}$$

Specific rate by age group: the specific rate is a frequency ratio and indicates how many deaths occur in the age group (x,x+i) during an established time interval (one year, three years) for every 100,000 individuals averagely present in the population, in that same age group. For each selected cause, the absolute value of deaths, the specific rate for that age group and the confidence interval of the rate are shown in total and by gender, and by five-year age groups. The specific rate confidence interval is calculated at 95%, and used to evaluate the accuracy of the estimate made.

The formula of the specific rate in the age group (x,x+i) is as follows:

$$T_{x,x+i} = \frac{d_{(x,x+i)}}{P_{(x,x+i)}} \times 100.000$$

The formula for confidence intervals follows these algorithms:

$$- d_{(x,x+i)} = 0:$$

$$Lim_{inf} = 0$$

$$Lim_{sup} = \frac{-\ln(\alpha)}{P_{(x,x+i)}} \times 100.000$$

- $0 < d_{(x,x+i)} < 100$:

$$Lim_{inf} = \frac{inv\Gamma_{(\alpha/2, d_{(x,x+i)})}}{P_{(x,x+i)}} \times 100.000$$

$$Lim_{sup} = \frac{inv\Gamma_{(1-\alpha/2, d_{(x,x+i)}+1)}}{P_{(x,x+i)}} \times 100.000$$

where $inv\Gamma_{(p,a)}$ is the inverted gamma function that provides the p-th quantile from a gamma distribution with parameter of form α .

- $d_{(x,x+i)} > 100$:

$$Lim_{inf,sup} = T_{(x,x+i)} \pm Z_{\alpha/2} \frac{\sqrt{d_{(x,x+i)}}}{P_{(x,x+i)}} \times 100.000$$

Standardized rate for all ages and for the age groups 0-14, 15-64, 65-74 and +75 years: the standardization technique is used to neutralize the effects of the different age structures of Local Health Units' populations and to allow comparisons among different populations (e.g. Local Health Unit rate $\rightarrow$ Italy rate). The method used for standardization is "direct", as the specific rates of the studied populations are weighed with the "Standard Europe 2013" population; all the populations studied are attributed an identical age structure, which does not interfere on the intensity of the studied phenomenon.

The formula of the standardized rate, always expressed per 100,000 is:

$$T_{std} = \sum_x \frac{ci_{(x,x+i)}}{P_{(x,x+i)}} w_{(x,x+i)}$$

where $w_{(x,x+i)}$ is the proportion of the Standard European Population in the age layer $x, x+i$.

The formula for confidence intervals follows these algorithms:

defined v the variance of T_{std} :

$$v = \sum ci_{(x,x+i)} \left(\frac{w}{P_{(x,x+i)}} \right)^2$$

and w_{ω} the maximum value of $\frac{w_{(x,x+i)}}{P_{(x,x+i)}}$, we have:

$$Lim_{inf} = \frac{v}{2T_{std}} (\chi^2)^{-1} \left(\alpha/2, \frac{2T_{std}^2}{v} \right) \times 100.000$$

$$Lim_{sup} = \frac{v + w_{\omega}^2}{2(T_{std} + w_{\omega})} (\chi^2)^{-1} \left(1-\alpha/2, \frac{2(T_{std} + w_{\omega})^2}{v + w_{\omega}} \right) \times 100.000$$

where $(\chi^2)^{-1}_{(a,b)}$ is the inverse distribution of the chi square on level a , with b degrees of freedom.

Table. Selected causes of death and related ICD-10 codes

Cause of death	ICD-10 Codes
GENERAL MORTALITY	A00-T98
Infectious and parasitic diseases	A00- B99
All malignant tumors	C00-C97
Malignant tumor of the stomach	C16
Malignant colorectal tumor	C18-C21
Primary malignant tumor of the liver and intrahepatic bile ducts	C22
Malignant tumor of the pancreas	C25
Malignant tumor of trachea, bronchi and lung	C33-C34
Malignant breast tumor (F)	C50
Malignant tumor of the uterus (F)	C53-C55
Malignant prostate tumor (M)	C61
Malignant tumor of the bladder	C67
Malignant tumor of the central nervous system	C70-C72
Malignant tumor of the thyroid gland	C73
Malignant tumor of the lymphohematopoietic system	C81-C96
Leukemia	C91-C95
Endocrine diseases	E00-E35
Diabetes mellitus	E10-E14
Dementias	F00-F01,F02.0-F02.3,F03,G30,G31.0
Diseases of the nervous system	G00-G99
Parkinson's disease	G20-G22
Circulatory system diseases	I00-I99
Ischemic heart diseases	I20-I25
Acute myocardial infarction	I21-I22
Cerebrovascular diseases	I60-I69
Respiratory diseases	J00-J99
Acute respiratory diseases	J00-J06,J10-J18,J20-J22
Chronic respiratory diseases	J41-J44,J47
Asthma	J45-J46
Digestive tract diseases	K00-K93
Chronic liver diseases	K70,K73-K74
Diseases of the genitourinary system	N00-N99
Acute and chronic renal failure	N17-N19
Congenital malformations	Q00-Q99
External causes (violent deaths)	V01-Y89
Transport accidents	V01-V99
Falls	W00-W19
Suicides	X60-X84

Data confidentiality

In order to ensure respect for the confidentiality of personal data concerning health, only aggregated data (frequencies greater than or equal to the minimum threshold of three) are displayed, as indicated in the art.5 of the "Code of ethics and good conduct for the processing of personal data for statistical and scientific purposes".

In the Tables, frequencies below this threshold are indicated with "<3"; the corresponding rates are indicated with "-".

Essential bibliography

- Organizzazione Mondiale della Sanità. Classificazione statistica internazionale delle malattie e dei problemi sanitari correlati. Decima revisione. 3 voll. Traduzione della prima edizione a cura del Ministero della Sanità, Roma: Istituto Poligrafico e Zecca dello Stato; 2001.
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