# INCIDENCE

**Experimental data source**
Incidence data come from the Cancer Registry of Veneto Region (RTV), established with the Regional Law n. 11 of 16 February 2010. From 2018 the RTV covers the entire regional population (4,900,000 residents); it is the largest cancer registry in Italy. The RTV is part of the Italian Association of Cancer Registries (AIRTUM) and collaborates with the most prestigious institutions dedicated to the epidemiology of tumors in the world. Data relating to the main malignancies in Veneto are updated to the period 2014-2015.

**Selected causes**
In line with mortality and hospitalization data, incidence for all malignant tumors was selected with the addition of 13 specific causes considered most relevant, with the description of "in situ" tumors and tumors with uncertain or unknown behavior. The complete list of selected causes is shown in the table below.

**Incidence breakdown diagram for all tumors**
A graphical representation, total and divided by gender, of the breakdown for the selected tumor causes is provided; the single age class is shown on the X axis, deaths in absolute value are shown in the Y axis.

**Average age of tumor cases:** this indicator is calculated directly from the incidence cases observed by age group, with the following formula:

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

**Specific rate by age group:** the specific rate is a frequency ratio and indicates how many cases 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 the cases, the specific rate for that age group and the confidence interval of the rate are shown by gender and in total, and by five-year age groups. The specific rate confidence interval is calculated at 95%, and used to evaluate the accuracy of the estimate.
The formula of the specific rate in the age group (x,x+i) is as follows:

$$T_{x,x+i} = \frac{ci_{(x,x+i)}}{P_{(x,x+i)}} \text{ x } 100.000$$

The formula for confidence intervals follows these algorithms:

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

$$Lim_{inf} = 0$$

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

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

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

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

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

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

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

**Standardized rate for all ages and by age groups 0-14, 15-64, 65-74 and +75:** the standardization technique is used to neutralize the effects of the different age structures of Local Health Units' populations and to allow comparisons between different populations (e.g. Local Health Unit rate → 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 the following algorithms:

defined υ the variance of $T_{std}$:

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

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

$$Lim_{inf} = \frac{\upsilon}{2T_{std}} (\chi^2)^{-1}_{\left(\alpha/2,\frac{2T_{std}{}^2}{\upsilon}\right)} \text{ x } 100.000$$

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

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

**Table. Selected incidence causes and relative ICD–10 codes**

| Incidence causes | ICD-10 codes |
|---|---|
| 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 the 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 |

**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**


- https://www.registrotumoriveneto.it/images/monografie_ULSS/Stime_2018_per_ULSS.pdf.pdf
- https://www.registrotumoriveneto.it/images/monografie_ULSS/Comuni_PFAS_Incidenza_2013.pdf
- https://www.registri-tumori.it/cms/pubblicazioni/manuel-des-procédures-denregistrement-des-tumeurs-settembre-2015
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