

## PUBLIC HEALTH

## MORTALITY FROM MALIGNANT NEOPLASMS IN THE REPUBLIC OF NORTH MACEDONIA IN THE PERIOD FROM 2010 TO 2018

Lidushka Vasilevska<sup>1</sup>, Elena Kiosevska<sup>1</sup>, Tanja Lekovska-Stoicovska<sup>1</sup>, Aleksandar Kardashevski<sup>1</sup><sup>1</sup> Institute of Public Health of the Republic of North Macedonia, Skopje, Republic of North Macedonia

## Abstract

**Citation:** Vasilevska L, Kiosevska E, Lekovska Stoicovska T, Kardashevski A. Mortality from malignant neoplasms in the Republic of North Macedonia in the period from 2010 to 2018.

Arch Pub Health 2022; 14 (2).

doi.org/10.3889/aph.2022.6055

**Key words:** mortality, malignant neoplasms, Republic of North Macedonia.

\***Correspondence:** Lidushka Vasilevska, Institute of Public Health of the Republic of North Macedonia, Skopje, Republic of North Macedonia. E-mail: liduskav@yahoo.com

Received: 5-Dec-2021; Revised: 18-Apr-2022;

Accepted: 5-May-2022; Published: 25-may-2022

**Copyright:** © 2022, Lidushka Vasilevska, Elena Kiosevska, Tanja Lekovska Stoicovska, Aleksandar Kardashevski. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

**Competing Interests:** The author have declared that no competing interests

The aim of the paper was to provide data on the situation and the trend of the mortality rate from malignant neoplasms in the population of the Republic of North Macedonia (RNM) in the period 2010-2018 along with the most common causes of death from malignant neoplasms in 2018, with a special reference to the distribution of mortality by sex and age. Material and methods: A retrospective study was performed using epidemiological descriptive methodology. Data were statistically analyzed. The mortality rates for malignant neoplasms were estimated at 100,000 inhabitants. Data are displayed in tables and figures in total number for the Republic of North Macedonia. The data for the number of deaths were obtained from the State Statistical Office and processed and analyzed at the Institute of Public Health of RNM. Results: A total of 19,727 people died in RNM in 2018, and malignant diseases accounted for 18.9% of the total mortality and they were the second-rated cause of death behind the cardiovascular diseases, with 3,734 deaths or a rate of 179.8 deaths per 100,000 citizens. Of the total number of deaths from malignant neoplasms in RNM in 2018, a larger number of men died compared to women, and most of them (31.3%) died from malignant neoplasms of the bronchi and lungs. In 2018, in RNM, females mostly died from malignant breast neoplasms (18.3%) and 13.1% from malignant neoplasms of the bronchi and lungs. In the period 2010-2018, the mortality rate from malignant neoplasms in people aged 0-64 years decreased by 87.5 in 2010 to 79.2 in 2018 per 100,000 population. The same phenomenon was present in the population over the age of 65; it was 881.1 per 100,000 population in 2010 and 805.1 in 2018. Conclusion: Cancer is the second leading cause of death in RNM as well as globally. In 2018, 1 in 5 deaths were due to malignant diseases in RNM, while in the world 1 in 6 deaths were due to cancer. About one-third from cancer deaths are due to the five leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco and alcohol use.

## ЈАВНО ЗДРАВЈЕ

## МОРТАЛИТЕТ ОД МАЛИГНИ НЕОПЛАЗМИ ВО РЕПУБЛИКА СЕВЕРНА МАКЕДОНИЈА ВО ПЕРИОДОТ ОД 2010 ДО 2018 ГОДИНА

Лидушка Василеска<sup>1</sup>, Елена Косевска<sup>1</sup>, Тања Лековска-Стоицовска<sup>1</sup>, Александар Кардашевски<sup>1</sup><sup>1</sup> Институтот за јавно здравје на Република Северна Македонија, Скопје, Република Северна Македонија

## Извадок

**Цитирање:** Василеска Л, Косевска Е, Лековска-Стоицовска Т, Кардашевски А. Морталитет од малигни неоплазми во Република Северна Македонија во периодот од 2010 до 2018 година. Arch J Здравје 2022;14(1) doi.org/10.3889/aph.2022.6055

**Клучни зборови:** морталитет, малигни неоплазми, Република Северна Македонија

\***Кореспонденција:** Лидушка Василеска, Институт за јавно здравје на Република Северна Македонија, Скопје, Република Северна Македонија. E-mail: liduskav@yahoo.com

Примено: 5-дек-2021; Ревидирано: 18-апр-2022;

Прифатено: 5-мај-2022; Објавено: 23-мај-2022

**Печатарски права:** ©2022 Лидушка Василеска, Елена Косевска, Тања Лековска-Стоицовска, Александар Кардашевски. Оваа статија е со отворен пристап дистрибуирана под условите на нелокализирана лиценца, која овозможува неограничена употреба, дистрибуција и репродукција на било кој медиум, доколку се цитираат оригиналните автор(и) и изворот.

**Конкурентски интереси:** Авторот изјавува дека нема конкурентски интереси.

Целта на трудот беше да се прикаже состојбата и трендот на стапката на морталитет од малигни неоплазми во периодот 2010-2018 година кај населението во Република Северна Македонија (РСМ), најчестите причини за смрт од малигни неоплазми во 2018 година, со посебен осврт на дистрибуцијата на смртноста по пол и возраст. Материјал и методи: беше изведена ретроспективна студија со примена на епидемиолошко-дескриптивниот меод на работа. Податоците беа статистички обработени. Добиените стапки на морталитет на малигни неоплазми беа пресметани на 100.000 жители. Податоците се прикажани табеларно и графички вкупно за РСМ. Податоците за бројот на умрени беа добиени од Државниот завод за статистика, а обработени и анализирани во Институтот за јавно здравје на РСМ. Резултати: Во РСМ во 2018 година починале вкупно 19.727 лица, а малигните заболувања учествувале со 18,9% во вкупниот морталитет и биле на второ место во структурата на причини за смрт по кардиоваскуларните заболувања со 3.734 починати лица или стапка од 179,8 починати на 100.000 жители. Од вкупниот број починати од малигни неоплазми во РСМ во 2018, регистрирани се поголем број починати кај машката популација отколку кај женската, а најголем дел од нив (31,3%) починале од малигни неоплазми на бронх и бел дроб. Кај женската популација, во 2018, најголем број починале од малигни неоплазми на дојка (18,3%), а 13,1% од малигни неоплазми на бронх и бел дроб. Во периодот 2010-2018 година стапката на морталитет од малигни неоплазми на возраст од 0-64 години бележи тренд на опаѓање, од 87,5 во 2010 до 79,2 во 2018 на 100.000 население. Истата појава е присутна и кај населението на возраст над 65 години, односно во 2010 изнесувала 881,1 на 100.000 население, а во 2018 е намалена на 805,1. Заклучок: Ракот е втора водечка причина за смрт во РСМ, како и на глобално ниво. Во 2018 година, 1 од 5 смртни случаи се должат на малигни заболувања во РСМ, додека глобално во светот 1 од 6 смртни случаи се должи на карциноми. Околу една третина од смртните случаи од рак се должат на 5-те водечки ризици во однесувањето и исхраната: висок индекс на телесна маса, низок внес на овошје и зеленчук, недостаток на физичка активност, употреба на тутун и алкохол.

## Introduction

Malignant neoplasms are one of the biggest socio-medical problems today due to the high frequency, high mortality, suffering of patients and their families caused by the disease and the great financial and social burden on the health care system and society as a whole.

According to the World Health Organization (WHO), more than 12 million people worldwide are diagnosed with malignant neoplasms each year, and 7.6 million die. In the total number of deaths in the world, malignant neoplasms as a cause of death account for 20-25%.

More than two-thirds of malignant neoplasms are caused by factors that are a result of the modern life style and are the cause of increased number of patients suffering from these diseases worldwide. More than 70% of malignant neoplasm deaths occur in low- and middle-income countries, where resources for the prevention, diagnosis, and treatment of malignancies are limited or non-existent. At the same time, WHO estimates the possibility of preventing one third of the existing malignancies, which risk factors widely cited as etiological factors of these diseases can be prevented. Also, about 30-50% of patients can be cured if the diagnosis is made in the early (initial) stage of the disease, and further treatment is appropriate. All these facts hypothetically confirm that every third patient suffers unnecessarily from a malignant disease, many people unnecessarily die prematurely and much more suffer. Many malignant neoplasms are curable if detected early and treated with appropriate diagnostic and therapeutic methods.

Fighting malignancies is a priority in many countries. It started in Europe

in 1985 by implementation of the “Europe against cancer” program. In 2005, the World Health Assembly held its 58th session in Geneva and adopted Resolution Cancer Prevention and Control (WHA 58.22)<sup>1</sup>, highlighting the growing problem of cancer worldwide. The resolution highlights the need to develop and strengthen comprehensive national cancer control programs, which include prevention, early detection, successful treatment and palliative care.

The aim of this paper was to provide data on the situation and the trend of the mortality rate from malignant neoplasms in the population of the Republic of North Macedonia (RSM) during the period 2010-2018 of, along with the most common causes of death from malignant neoplasms in 2018, with a special reference to the distribution of mortality by sex and age.

## Material and methods

A retrospective study was performed using an epidemiologically descriptive method of work. The source of data was the State Statistical Office of RNM. The data was statistically analyzed at the Institute of Public Health of RNM. The resulting mortality rates for malignant neoplasms were estimated per 100,000 inhabitants. The data are presented in tables and figures in total number for the Republic of North Macedonia.

## Results

Indicators of “negative” health are mortality indicators in the population. In 2018 in the Republic of North Macedonia, a total of 19,727 people died, of which 22.74% aged 0-64 years and 77.21% over 65 years (2,3) (Table 1).

**Table 1.** Deaths by sex and age in the Republic of North Macedonia, 2018

	Total	0-64	65+
Total	19727	4486	15232
Men	10339	2899	7432
Women	9388	1587	7800

Source: State Statistical Office

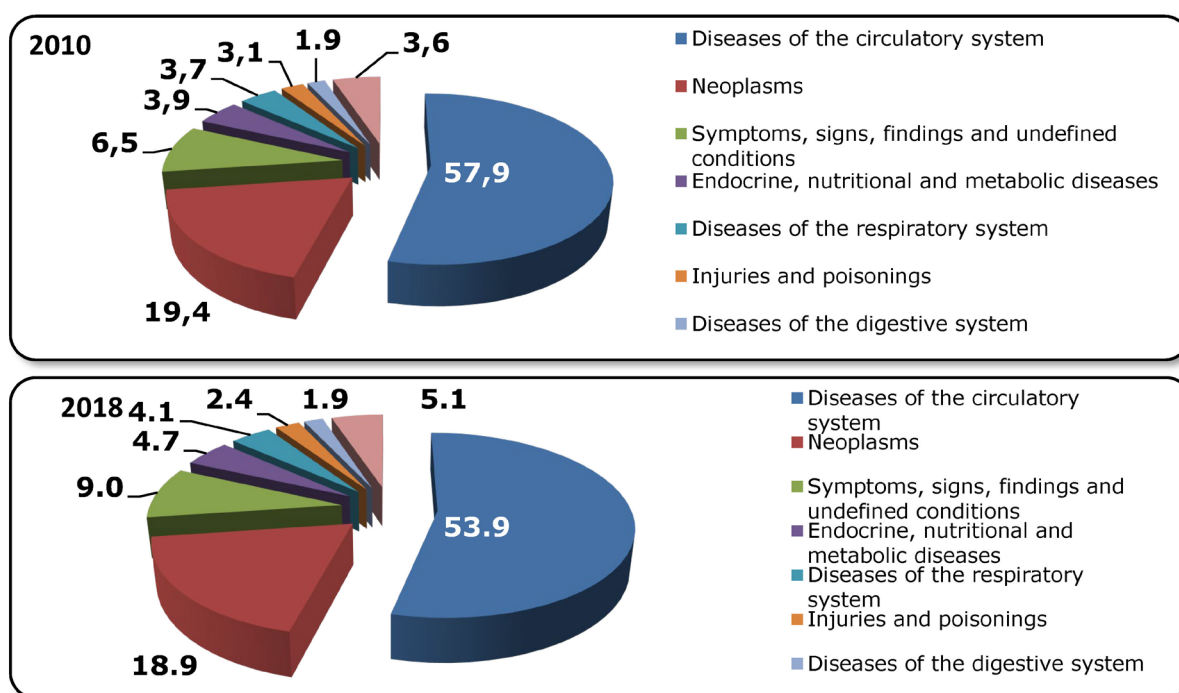
Processing: Center for statistical processing of health data and journalism

In 2018, 4,486 people aged 0-64 years died in the Republic of North Macedonia, 64.6% men and 35.3% women.

Mortality in the population over 65 years is a very important indicator of the health status of this population group. The health indicators of this age group are in fact indicators of all

measures and activities undertaken in order to improve the health of the population up to 64 years of age. Out of 15,232 deaths in people over 65 years in 2018, 51.2% were men and 48.7% women (2,3,4,5).

The most common causes of death



**Figure 1 and 2.** Ten most common causes of death in the Republic of North Macedonia, 2010 and 2018

Source State Statistical Office

Processing: Center for statistical processing of health data and journalism

In 2018 in the Republic of North Macedonia, malignant diseases participated with 18.9%, and in 2010 with 19.4% in the total mortality and were the second-rated mortality cause of death, behind the cardiovascular

diseases<sup>2,3</sup>. Mortality from malignant neoplasms decreased in 2018 compared to 2010.

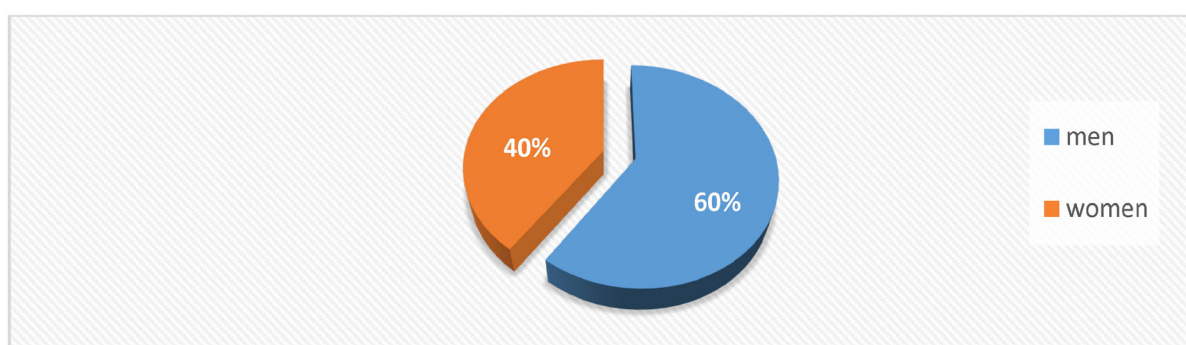
## Causes of death from malignant neoplasms by sex in the Republic of North Macedonia, 2018

Out of a total of 3,734 people who died from malignant neoplasms in the Republic of North Macedonia in 2018, 60% were men and 40% are women. (Table 2). A larger number of men died compared to women.

**Table 2.** Causes of death from malignant neoplasms by sex in the Republic of North Macedonia, 2018

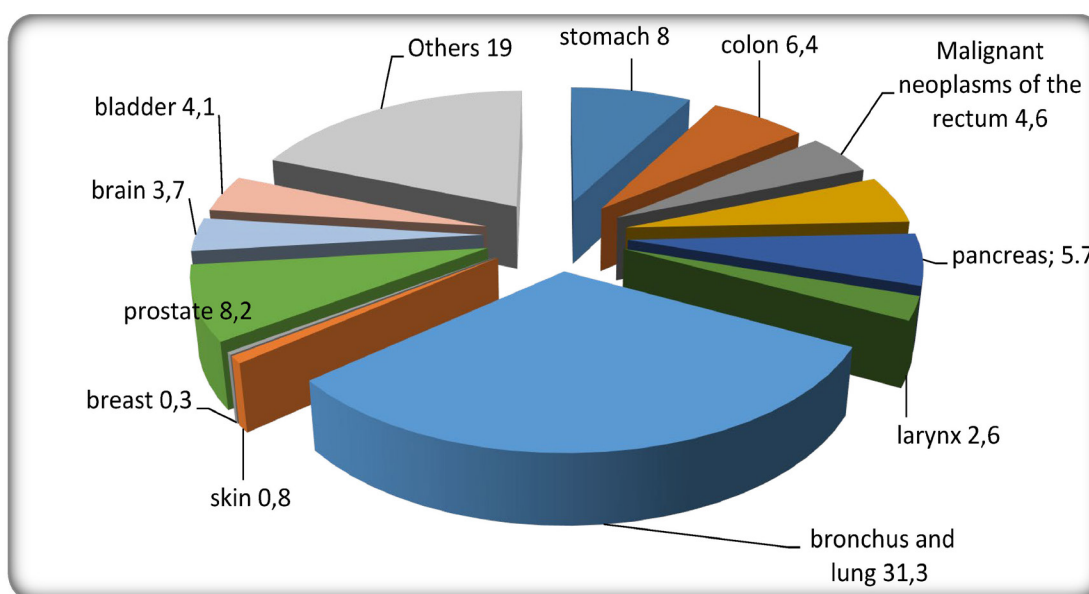
MKB-10 Code	MALIGNANT NEOPLASM	Sex	2018	
			Number	rate/100 000
	Total deaths from malignant neoplasms	Total	3734	179.8
		m	2240	215.4
		f	1494	144.1
C16	Malignant neoplasms of the stomach	Total	257	12.4
		m	178	17.1
		f	79	7.6
C18	Malignant neoplasms of the colon	Total	240	11.6
		m	144	13.8
		f	96	9.3
C20	Malignant neoplasms of the rectum	Total	174	8.4
		m	103	9.9
		f	71	6.9
C22	Malignant neoplasms of the liver and intrahepatic bile ducts	Total	198	9.5
		m	119	11.4
		f	79	7.6
C25	Malignant neoplasms of the pancreas	Total	225	10.8
		m	128	12.3
		f	97	9.4
C32	Malignant neoplasms of the larynx	Total	63	3.0
		m	58	5.6
		f	5	0.5
C34	Malignant neoplasms of the bronchi and lungs	Total	895	43.1
		m	700	67.3
		f	195	18.8
C44	Other skin neoplasms	Total	27	1.3
		m	19	1.8
		f	8	0.8
C50	Malignant neoplasms of the breast	Total	281	13.5
		m	7	0.7
		f	274	26.4
C53 (2017) C54	Malignant neoplasms of the cervix	f	30	2.89
	Malignant neoplasms of the body of the uterus	Total	59	2.8
		m	0	0.0
		f	59	5.7

C56	Malignant neoplasms of the ovary	Total	73	3.5
		m	0	0.0
		f	73	7.0
C61	Malignant neoplasms of the prostate	Total	184	8.9
		m	184	17.7
		f	0	0.0
C71	Malignant neoplasms of the brain	Total	154	7.4
		m	82	7.9
		f	72	6.9
C67	Malignant neoplasms of the bladder	Total	120	5.8
		m	92	8.8
		f	28	2.7



**Figure 3.** Structure of deaths from malignant neoplasms by sex in the Republic of North Macedonia, 2018

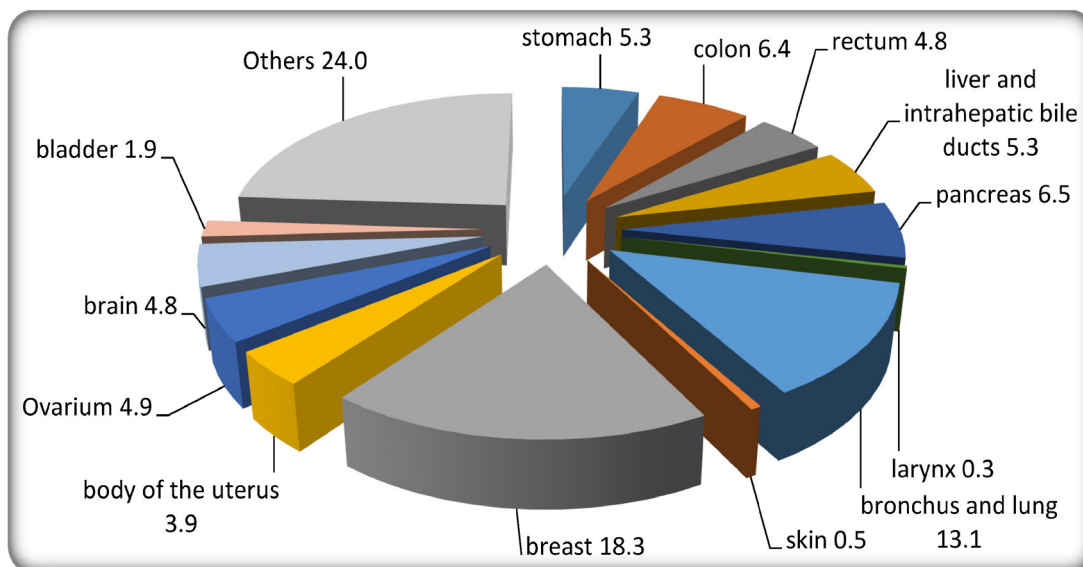
Out of a total of 2,240 men who died from malignant neoplasms in 2018 in RSM, the largest number died from malignant neoplasms of the bronchi and lungs, 31.3%. The second leading cause of death in men was prostate malignant neoplasm, from which 8.2% of men died.



**Figure 4.** Causes of death from malignant neoplasms in men in the Republic of North Macedonia, 2018



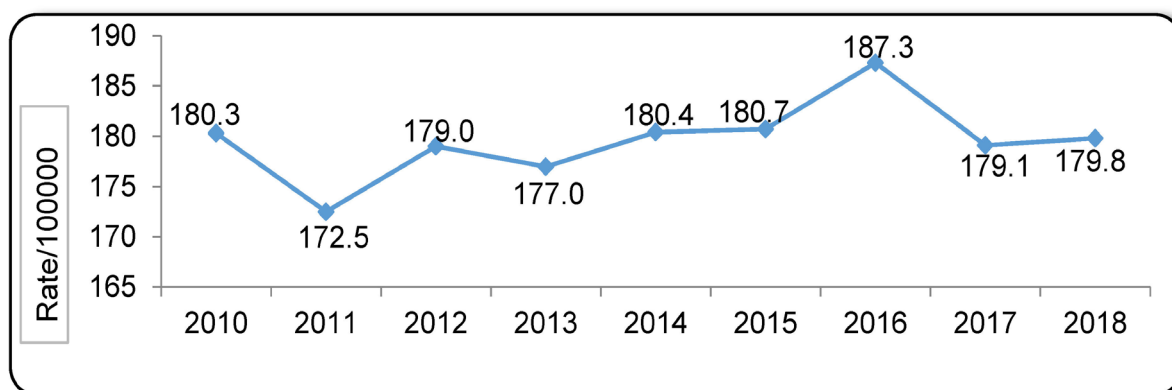
Out of a total of 1,494 women who died from malignant neoplasms in 2018 in RSM, the largest number died of breast malignant neoplasms (18.3%), and 13.1% died from malignant neoplasms of the bronchi and lungs, as the second leading cause of death in women.



**Figure 5.** Causes of death from malignant neoplasms in women in the Republic of North Macedonia, 2018

### Mortality rate from malignant neoplasms in RN Macedonia by sex and age, 2010 – 2018

In the analyzed period of 2010-2018, the mortality rate ranged from 180.3 per 100,000 population in 2010 to 179.8% in 2018. The mortality rate from malignant neoplasms was the highest in 2016 (187.3%), and the lowest in 2011 (172.5%) (Figure 6).



**Figure 6.** Mortality rate from malignant neoplasms in RN Macedonia, 2010 – 2018

In the analyzed period of 2010-2018, the mortality rate was higher in men than in women, starting from 2010 when the mortality rate was 215.4 for men and 145.1 for women, i.e., the number increased by 70.3 index points for men compared to women, until 2018 when the mortality rate for men was 215.4

and 144.1 for women, with an increase of 71.3 index points for men compared to women. In 2016, the largest increase in the mortality rate from malignant neoplasms in both men (220.8) and women (153.7) was observed compared to the entire analyzed period (Figure 7).

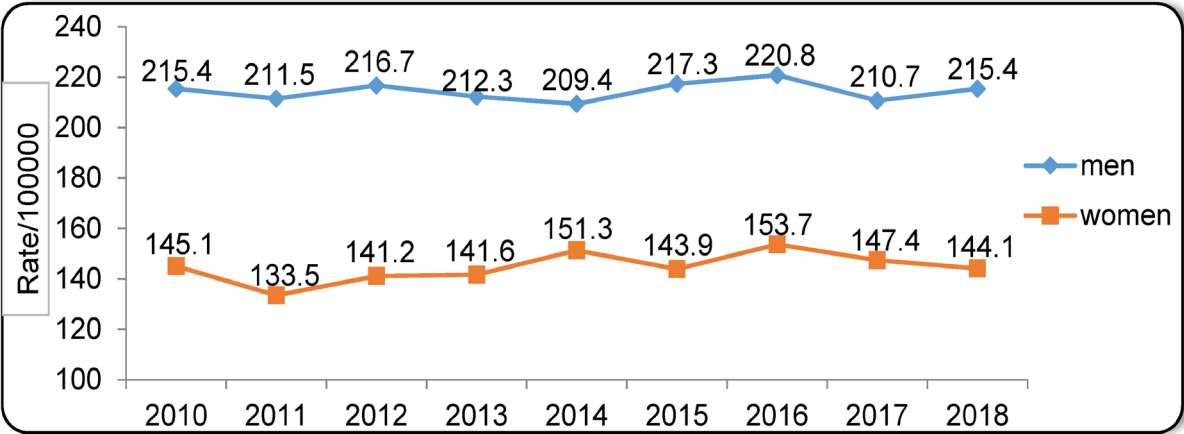


Figure 7. Mortality rate from malignant neoplasms in RN Macedonia, 2010 – 2018

**Mortality from malignant neoplasms in people aged 0-64 years**

In the period of 2010-2018, the mortality rate from malignant neoplasms in people aged 0-64 years declined and ranged from 87.5 in 2010 to 79.2 in 2018 per 100,000 population. The mortality rate in the analyzed period decreased by 8.3 index points.

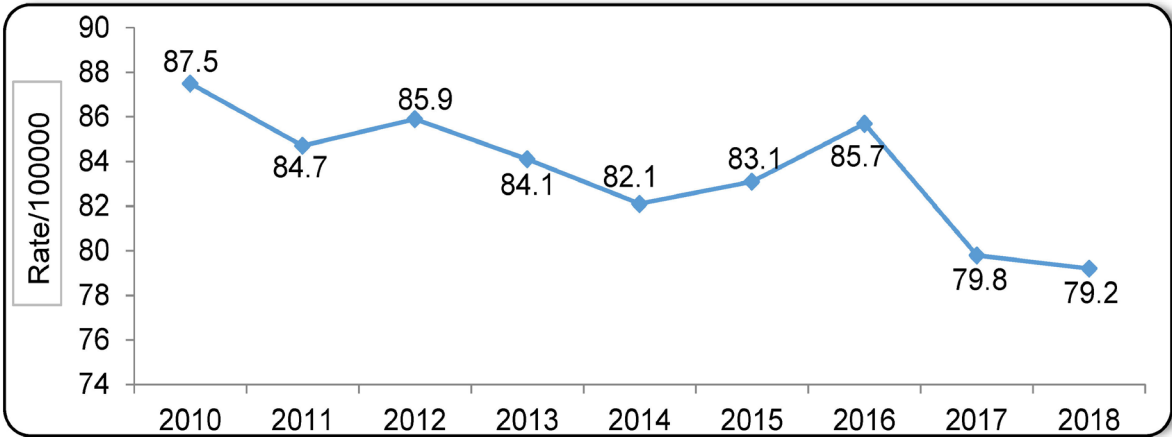
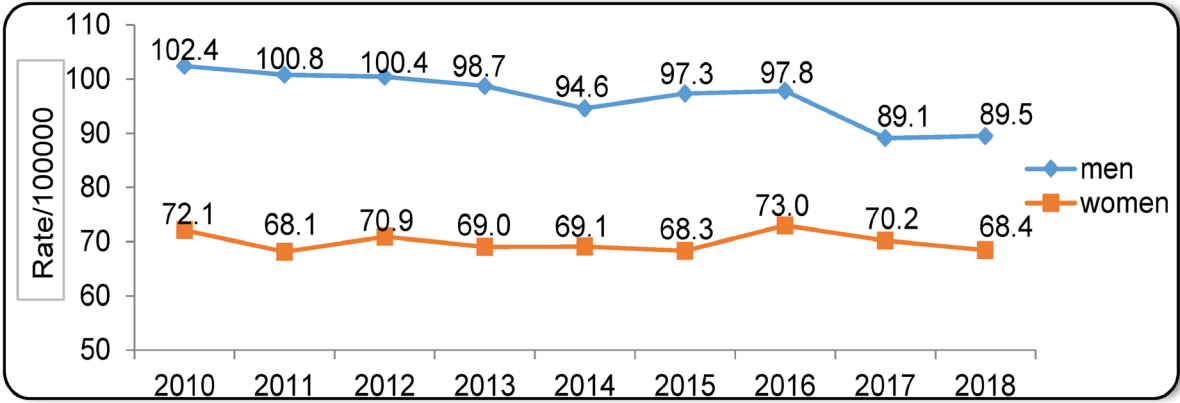


Figure 8. Mortality rate from malignant neoplasms in RN Macedonia in people aged 0 - 64 years, 2010 – 2018

The mortality rate from malignant neoplasms in the analyzed period in the age group 0-64 years was higher in men. Starting from 2010 when the mortality rate was 102.4 for men, it increased by 30.3 index points compared to the mortality rate for women, which was 72.1, until 2018 when the mortality rate for men was 89.5 and 68.4 for women, with an increase of 21.1 index points in men compared to women (Figure 9).

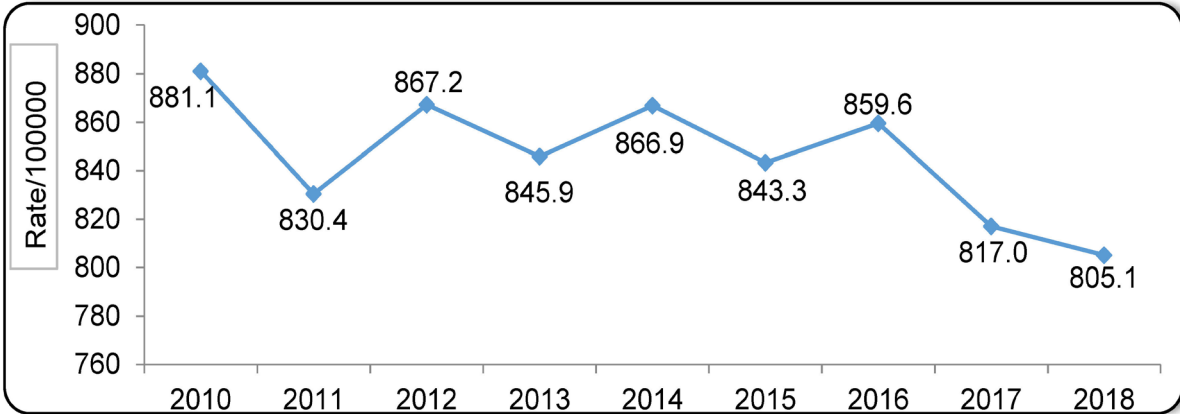
There was a downward trend in the mortality rate among men, which was 89.5 in 2018 compared to 102.4 in 2010, and among women, from 72.1 in 2010 to 68.4 in 2018.



**Figure 9.** Mortality rate from malignant neoplasms in RN Macedonia in people aged 0-64 years by sex, 2010-2018

**Mortality from malignant neoplasms in people over the age of 65 years**

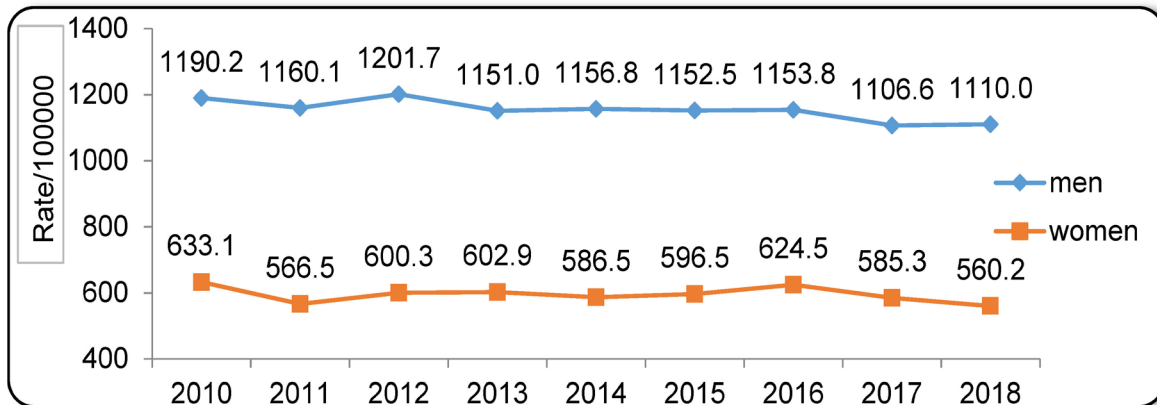
In the period 2010-2018, the mortality rate from malignant neoplasms in people over 65 years of age had a downward trend. In 2018, it was 805.1 per 100,000 population and was reduced by 76 index points compared to 2010 when the mortality rate from malignant neoplasms was 881.1. The mortality rate from malignant neoplasms in the age group 0-64 years was significantly lower than the mortality rate in people over the age of 65 years.



**Figure 10.** Mortality rate from malignant neoplasms in RN Macedonia over the age of 65, 2010 - 2018

The mortality rate from malignant neoplasms in the age group over 65 years was higher in men.

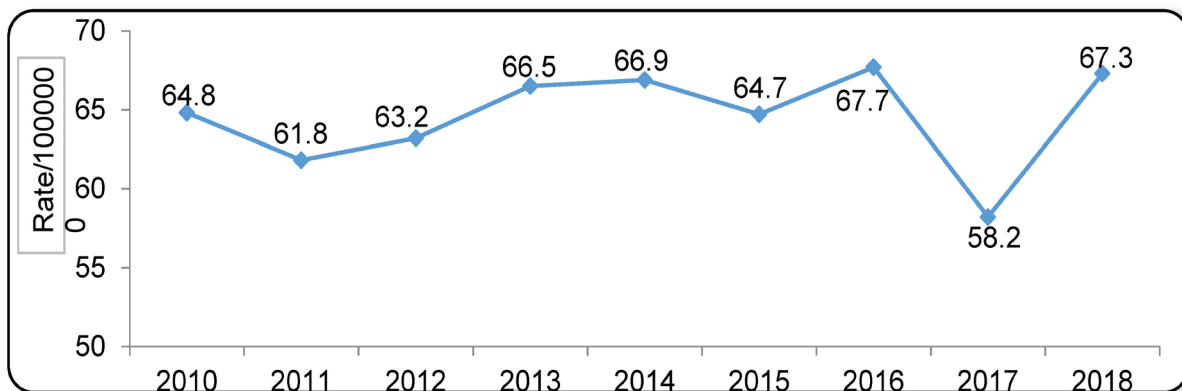




**Figure 11.** Mortality rate from malignant neoplasms in RN Macedonia over the age of 65 by sex, 2010 – 2018

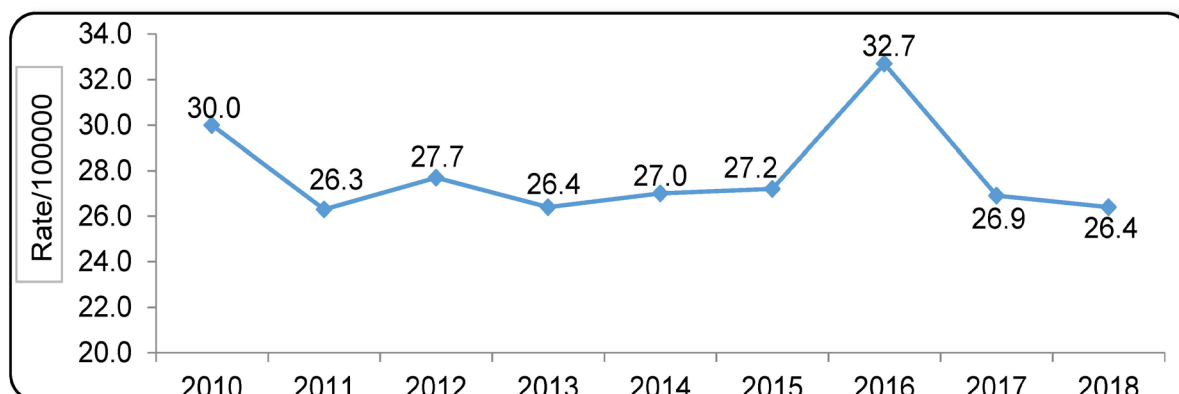
### The most common primary sites of malignant neoplasms

The most common cause of death from malignant neoplasms in men, with an increasing trend in the period 2010-2018, was malignant neoplasm of the bronchi and lungs with a mortality rate ranging from 64.8 in 2010 to 66.9 in 2014 and 67.3 per 100,000 men in 2018.



**Figure 12.** Mortality rate from malignant neoplasm of bronchi and lung in men in RN Macedonia, 2010 – 2018

In the period 2010-2018, the most common cause of death from malignant neoplasms in women was malignant breast neoplasm. The mortality rate ranged from 30.0 in 2010 to 26.4 in 2018 per 100,000 women. In the analyzed period, the mortality rate had a declining trend, with the exception of 2016 when the highest mortality rate of 32.7 index points was recorded.



**Figure 13.** Mortality rate from malignant breast neoplasm in women in RN Macedonia, 2010 – 2018

## Discussion

Among non-communicable diseases, malignant neoplasms are the most common causes of death in the world. Malignant neoplasms such as local, atypical, autonomic, intermittent, and inadequate tissue growth, together with cardiovascular diseases, are the leading cause of nearly three-quarters of all deaths in the European region.

In 2018, globally there were about 18.1 million new cases of cancer and 9.6 million deaths of cancer<sup>4</sup>.

In 2018 in the Republic of North Macedonia, a total of 19,727 people died, of which 22.74% from 0-65 years old and 77.21% over 65 years, whereby in both age groups a larger number of deaths among men was recorded than among women.

In the same year, malignant diseases accounted for 18.9% of the total mortality and were the second-rated cause of death behind the cardiovascular diseases.

In 2018, there were 18.1 million new cases worldwide (17.0 million excluding the NMSC) and 9.6 million cancer deaths (9.5 million excluding the

NMSC). For both sexes combined, it was estimated that nearly half of the world's cancer cases and more than half of all deaths occurred in Asia in 2018, as nearly 60% of the global population lives there.

Europe accounted 23.4% of all cancer cases and 20.3% of all cancer deaths, although it accounted for only 9% of the global population, followed by America with 21% of all cancer cases and 14.4% of deaths in the world. Unlike other regions, the share of cancer deaths in Asia (57.3%) and Africa (7.3%) is higher than the incidence rate (48.4% and 5.8%, respectively), due to different distribution of cancer types and higher mortality rate in these regions<sup>5,6</sup>.

Globally, for both sexes, lung cancer is the most commonly diagnosed cancer (11.6% of all cases) and the leading cause of cancer death (18.4% of all cancer deaths), closely followed by female breast cancer (11.6%), colorectal cancer (10.2%) and prostate cancer (7.1%) incidence and colorectal cancer (9.2%), gastric cancer (8.2%) and carcinoma of the liver (8.2%) due to mortality. By sex, lung cancer is the most commonly diagnosed cancer and the

leading cause of cancer death in men, followed by prostate and colorectal cancer due to the incidence and liver and gastric cancer due to mortality. In women, breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death, followed by colorectal and lung cancer for the incidence and lung cancer cause of death. Cervical cancer ranks fourth in both incidence and mortality. Overall, the top 10 cancers account for over 65% of newly diagnosed and malignant neoplasm deaths.

Of the total number of deaths from malignant neoplasms in RSM in 2018, there was a larger number of deaths recorded among the male population compared to the female, and most of them (31.3%) died from malignant neoplasms of the bronchi and lungs.

Out of a total of 1,494 women who died from malignant neoplasms in 2018 in RSM, the majority died from malignant neoplasms of the breast (18.3%), and 13.1% died from malignant neoplasms of the bronchi and lungs, as a second cause of death in women.

Cancer is the second leading cause of death globally, with about 1 in 6 deaths due to cancer.

About 70% of cancer deaths occur in low- and middle-income countries.

About one-third of cancer deaths are due to the top 5 behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco and alcohol use.

Tobacco use is the most important risk factor for onset of cancer and is responsible for about 22% of cancer deaths<sup>7</sup>.

Cancer-causing infections, such as hepatitis and human papillomavirus (HPV), are responsible for up to 25% of cancer cases in low- and middle-income countries<sup>8</sup>.

The economic impact of cancer is significant and increasing. The total annual economic cost of cancer in 2010 was estimated at approximately \$ 1.16 trillion<sup>9</sup>.

Only 1 in 5 low- and middle-income countries have the data needed to pursue a cancer policy<sup>10</sup>.

In order to reduce the morbidity and mortality from malignant neoplasms in the Republic of North Macedonia, the Program for early detection of malignant diseases is being implemented. The program refers to:

- I. Screening for prevention and early detection of cervical cancer which main goal is to reduce the incidence and mortality from cervical cancer in women in the Republic of North Macedonia.
- II. Pilot screening of colorectal cancer in the Republic of North Macedonia in order to reduce the morbidity and mortality of the population from colon cancer.
- III. Promotional campaign for prevention and early detection of prostate cancer organized by the Ministry of Health in order to raise awareness among the male population for prevention and early detection of prostate cancer. In addition, the goal is to encourage family doctors to recommend preventive examinations (at the secondary and tertiary level) for all men aged 50-55 years and those with a family risk from prostate cancer aged 40-50 years.

IV. Organized mammographic screening for early detection of breast cancer which main goal is early detection of breast cancer in women in the Republic of North Macedonia by conducting screening, following the European recommendations for implementation of organized screening.

## Conclusion

Cancer is the second leading cause of death globally and was responsible for about 9.6 million deaths in 2018, about 1 in 6 deaths due to cancer.

In 2018 in the Republic of North Macedonia, a total of 19,727 people died, of which 22.74% from 0-65 years old and 77.21% over 65 years, whereby in both age groups a larger number of deaths was recorded in men compared to women.

Of the total number of deaths from malignant neoplasms in 2018, 60% were men and 40% women.

In 2018 in RSM, out of a total of 2,240 men who died from malignant neoplasms, the majority died from malignant neoplasms of the bronchi and lungs (31.3%), and 8.2% died from malignant prostate neoplasm, as the second leading cause of death.

In the same year, out of a total population of 1,494 women who died from malignant neoplasms, the majority died from malignant breast neoplasms (18.3%), and 13.1% died from malignant neoplasms of the bronchi and lungs, as the second leading cause of death in women.

The most common cause of death from malignant neoplasms in men with an increasing trend in the period 2010-2018, was malignant neo-

plasm of the bronchi and lungs with a mortality rate of 64.8 in 2010 to 67.3 per 100,000 men in 2018.

In women, the most common cause of death from malignant neoplasms in the period 2010-2018 was malignant breast neoplasm with a declining trend from 30.0 in 2010 to 26.4 in 2018 per 100,000 women.

In the period 2010-2018, the mortality rate from malignant neoplasms in people aged 0-64 years was declining, from 87.5 in 2010 to 79.2 in 2018 per 100,000 population. The same phenomenon was present in the population over the age of 65, i.e., 805.1 per 100,000 population in 2018 and 881.1 in 2010.

About one-third of cancer deaths are due to the top 5 behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco and alcohol use.

WHO estimates support opportunities to prevent one-third of existing malignancies by developing and strengthening comprehensive national cancer control programs, which include prevention, early detection, successful treatment, and palliative care. It will contribute in reducing the number of patients with malignant neoplasms, reducing the mortality from malignant neoplasms, reducing the suffering of patients and their families and improving the quality of life.

## References

1. WHA58.22. Cancer prevention and control. World Health Assembly 58(2005). Official Record. Resolution and Decision.

- Available from: [https://apps.who.int/iris/bitstream/handle/10665/20372/WHA58\\_22-en.pdf](https://apps.who.int/iris/bitstream/handle/10665/20372/WHA58_22-en.pdf)
2. Institute of Public Health of the Republic of North Macedonia. Report for population health in North Macedonia. Skopje, 2011 to 2018. Republic of North Macedonia.
  3. State Statistical Office of the Republic of North Macedonia. Mortality statistics. Skopje, Republic of North Macedonia, 2010-2018
  4. Freddie Bray, Jacques Ferlay, Isabelle Soerjomataram, Rebecca L Siegel, Lindsey A Torre, Ahmedin Jemal. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*. 2018;0:1/31. Available from: <https://pubmed.ncbi.nlm.nih.gov/30207593/>
  5. IARC.Global Cancer Observatory. GLOBOCAN 2018. Lyon, France. Available from : <https://gco.iarc.fr/>
  6. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C et al. Cancer Incidence and Mortality Worldwide.GLOBOCAN 2012 v1.0,[Internet]: IARC Cancer Base No. 11 Lyon, France: International Agency for Research on Cancer; 2013.Available from: <https://www.uicc.org/news/iarc-release-latest-world-cancer-statistics>
  7. GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioral, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016; 388 (10053):1659-1724.
  8. Plummer M, de Martel C, Vignat J, Ferlay J, Bray F, Franceschi S. Global burden of cancers attributable to infections in 2012: a synthetic analysis. *Lancet Glob Health*. 2016;4(9):e609-16.
  9. Stewart BW, Wild CP, editors. World cancer report 2014 Lyon: International Agency for Research on Cancer; 2014.
  10. Global Initiative for Cancer Registry Development. [Internet]. International Agency for Research on Cancer Lyon: France.Available from: <https://gicr.iarc.fr/>