DATABASE ANALYSIS

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Epidemiology of Incidence and Mortality Due to Head and Neck Cancer in Poland in 2000 to 2022

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Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Background: There are no integrated, long-term studies on the epidemiology of cancer incidence and mortality as a whole in Poland, and the publications to date are fragmentary.

Material/Methods: The analysis of cancer incidence and mortality in Poland was based on the data of the National Cancer Registry in Poland in the years 2000 to 2022.

Results: The incidence of head and neck cancers in 2022 has increased compared to data from 2000, including oral cavity in total by 39.9%, salivary glands by 30.9%, oropharynx by 82.03%, larynx decreased by 34.5%, eye increased by 125.8%, and thyroid increased by 226.9%. Deaths from malignant cancers of the head and neck in 2022 increased compared to data from 2000, including cancers of the oral cavity in total by 74.8%, nasal cavity and middle ear increased by 33.3%, and eye increased by 70.9%.

Conclusions: The incidence of malignant head and neck cancers in 2022 increased by more than 50% compared to data from 2000; therefore, otorhinolaryngologists should intensify their efforts to educate patients about the transmission routes and methods of preventing HPV infections, including the role of HPV infection as a risk factor for head and neck cancers. The most common head and neck cancer in 2022 in terms of incidence was thyroid cancer and, compared to data from 2000, it more than doubled, both in women and men, which is related to, among other factors, overdiagnosis in the thyroid gland. The incidence of laryngeal cancer in 2022 compared to data from 2000 decreased by over 30%.

Keywords: Epidemiology • Head and Neck Neoplasms • Morbidity • Mortality • Oncology • Retrospective Studies • Poland

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Introduction

Head and neck cancers are a general term for malignant and benign tumors located in the area from the base of the skull to the collarbones, excluding the brain. Due to their similar etiopathogenesis, pathomorphology, and clinical course, they are grouped together. Tumors originating from the upper respiratory and gastrointestinal tracts include tumors of the oral cavity, tongue, pharynx, larynx, salivary glands, nasal cavity, paranasal sinuses, ear, and thyroid [1]. This group also includes lymphomas and sarcomas. Histopathologically, the majority (90%) of head and neck cancers are squamous cell carcinomas, originating from the mucosa. The tumors often involve lymph nodes, and their enlargement is often the first symptom of the disease. According to the international classification of diseases (ICD-10), these are diseases corresponding to codes C00-C14, C30-C32, C69, and C73 [1].

In Poland, as in other European countries, a new epidemiological phenomenon is being observed, referred to as the "epidemiological phenomenon," referring to the increased number of new cases of head and neck cancer in people under 40 years of age who have never smoked or abused alcohol. The growing incidence of head and neck cancer is primarily due to HPV [2-4].

The United States is currently observing a wave of cases caused by human papillomavirus, and it is surprising that many people still do not associate human papillomavirus with cancer, for example, of the tongue. Head and neck cancers are still diagnosed in stages III and IV. For this group of patients, medicine can only offer palliative treatment, the goal of which is to prolong life and improve quality of life.

Comprehensive nationwide analyses integrating multiple anatomical locations over long periods of time are limited, although reports from national registries and partial epidemiological studies exist, but integrated, long-term studies are lacking on the epidemiology of morbidity and mortality as a whole in recent years in Poland based on the National Cancer Registry. The publications so far are fragmentary and concern only particular regions or clinical centers [5-7].

Markowski et al [1] performed an analysis of patients with head and neck cancers (HNC) aged 60 to 69 years, 70 to 79 years, and > 80 years, during a 22-year period (1999-2021), using data from the Polish National Cancer Registry. Different HNC primary sites were categorized based on ICD-10 codes (C13, C11, C10, C04, C14, C02, C06, C08, C30, C32, C09, C01, C05, C07, C00, C12, C31). Markowski's analysis reveals a significant increase in the number of HNC cases in Poland, with dynamics occurring especially at the beginning in the 80+ cohort. The incidence has been observed to be higher in Black people and women. Higher incidence has been observed in both men and women, and differences in primary tumor locations should be noted. These epidemiological data need to be supplemented, and further studies are being completed to assess the effectiveness of HNC treatment in older people.

Therefore, the aim of the study was to determine the epidemiology of morbidity and mortality due to head and neck malignant tumors in Poland from 2000 to 2022. The main objectives of the research were to assess head and neck cancer incidence and mortality in 2000, 2005, 2010, 2015, 2020, and 2022, depending on sex, and to compare head and neck cancer incidence and mortality in 2000 versus 2022, depending on sex.

Material and Methods

According to the National Cancer Registry, there were 118 869 new cases of all types of cancer in Poland in 2000 (57 925 women and 60 944 men), and there were 87 826 related deaths (36 636 women and 51 190 men). Regarding malignant tumors of the head and neck in Poland in 2000, there were 7775 new cases (2485 women and 5290 men), and 3820 related deaths (795 women and 3025 men). According to the National Register of Malignant Tumors, in 2022 there were 395 538 new cases (228 240 women and 167 298 men) of all malignant tumors in Poland, with 96 127 related deaths (44 223 women and 51 904 men), and there were 12 100 new cases (6094 women and 6006 men) of head and neck cancer in Poland in 2022, with 4989 related deaths (1309 women and 3680 men).

The study of incidence and death due to malignant tumors in Poland was carried out based on a nationwide, retrospective, population-based observational analysis of data from the National Registry of Cancer in Poland [8] in 2000 to 2022, taking into account data for 2000, 2005, 2010, 2015, 2020, and 2022. The choice of follow-up years was related to the 5-year survival rate, while 2022 is the last year developed in the National Registry of Malignant Cancers in Poland. Sources and methods used to prepare estimates of the National Registry of Cancer in Poland have been documented and described online on a website that includes tabulation and graphical visualization tools for the national database by cancer type, sex, and age. National estimates are based on the best available data sources on cancer incidence and mortality in Poland, and their validity depends on the degree of representativeness and quality of the source information.

Inclusion of patients in the study was based data from the National Registry of Cancer in Poland, accessed on September 1, 2025. The analysis uses national aggregated numerical data, which are descriptive and generate hypotheses, in which no attempt at causal inference is made and the indicators are

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only approximate (without age standardization). Data were downloaded automatically by entering the year, cancer ICD, and sex. Mortality was derived directly from death registers and no linking or coding rule was used.

The methods used to develop the 2022 estimates are based largely on those developed previously, with particular emphasis on the use of short-term projections and modeled mortality-to-incidence ratios, where applicable. Estimates are available in the database of the National Cancer Registry in Poland for 19 malignant neoplasms of the head and neck, excluding skin cancer (International Classification of Diseases, Tenth Edition [ICD-10]). The ICD-10 codes (C00-C14, C30-C32, C69, C73) for the 19 types of cancer are: oral cavity (C00-C06), salivary glands (C07–C08), middle pharynx (C09–C10), nasopharynx (C11), hypopharynx (C12-C14), nasal cavity and middle ear (C30), paranasal sinuses (C31), larynx (C32), eye (C69), and thyroid gland (C73).

Laryngeal cancer has a different code than hypopharynx cancer, but in the results report they are presented together due to anatomical location and clinical conditions. The study results included data on the incidence and mortality of malignant tumors for individual codes falling within the scope of head and neck cancers and collectively for the whole (including thyroid cancer).

We statistically analyzed the incidence and mortality due to malignant tumors in 2000 and 2022, including head and neck cancers. The Cochran-Armitage test for trend was performed. The following mathematical formulas were used in statistical calculations:

p=m/n·100%, where; p – proportion, m – number of deaths due to head and neck cancer, n – number of deaths due to all malignant tumors;

C=(x_2022-x_2000)/x_2000·100%, where; C – relative change, x2000 – number of deaths in 2000, x2022 – number of deaths in 2022;

yg=√(n-1&x_2022/x_2000)·100%, where; yg – geometric mean, n – number of quotients,

x2000 – number of deaths in 2000, x2022 – number of deaths in 2022.

Proportions and relative growth were manually calculated when needed. MedCalc, version 23.4 was used for all statistical computations (MedCalc Software Ltd., Ostend, Belgium).

Results

Since 2000, in individual 5-year intervals until 2022, there has been a gradual increase in the incidence and mortality of oral cancer (ICD, C00-C06) (**Table 1**).

The incidence of oral cancer in 2022, compared to data from 2000, increased by 39.9% in total, with a more than 100.0% increase in women and 22.8% increase in men. Deaths from oral malignancies in 2022 increased by 74.8% overall compared to 2000 data, with an increase of 186.0% in women and 50.7% in men. Based on the 2022 National Register, the most common cause of death due to oral cancer in women and men was cancer of other unspecified parts of the tongue (ICD-C02), which accounted for 0.28% and 0.77%, respectively, of all cancer deaths (**Table 1**).

Since 2000, in individual 5-year intervals until 2022, there was a gradual increase in the incidence and mortality of malignant salivary gland tumors (ICD, C07-C08) (**Table 2**).

The incidence of malignant salivary gland tumors in 2022 compared to data from 2000 increased by 30.9%, with an increase of 37.9% in women and 24.8% in men. Deaths from malignant salivary gland tumors in 2022 compared to data from 2000 increased by a total of 45.6%, with an increase of 69.8% in women and 33.3% in men. Based on the 2022 National Register, the most common cause of death due to salivary gland cancer in women and men was a malignant tumor of the parotid gland (C07), which accounted for 0.15% and 0.19%, respectively, of all deaths due to malignant tumors (**Table 2**).

Since 2000, in individual 5-year intervals until 2022, there was a gradual increase in the incidence and mortality of malignant neoplasms of the oropharynx (ICD, C09-C10) (**Table 3**). The incidence of malignant tumors of the oropharynx (palatine tonsil ICD-C09 and oropharynx ICD-C10) in 2022, compared to data from 2000, increased by 182.3% in total, with 260.5% in women and 163.2% in men. In turn, deaths from malignant tumors of the oropharynx in 2022 compared to 2000 increased by 142.5% in total, with 282.5% in women and 119.2% in men. Based on data from 2022, the most common cause of death due to malignant tumor of the oropharynx in women and men was malignant tumor of the palatine tonsil (C09), which accounted for 0.21% and 0.59%, respectively, of all deaths due to malignant tumors (**Table 3**).

The incidence of malignant tumors of the nasopharyngeal part (ICD-C11) in 2022 compared to the data from 2000 decreased by 15.5%, with a slight increase in women by 10.6% and a decrease in men by 23.7%. In turn, deaths from malignant tumors of the nasopharyngeal part in 2022, compared to data from 2000, decreased by 6.5% in total, with a decrease of 16.3% in women and a slight decrease of 1.2% in men.

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Table 1. Incidences and mortality due to malignant tumors of the oral cavity (lip ICD-C00, base of the tongue ICD-C01, other and unspecified parts of the tongue ICD-C02, gingiva ICD-C03, floor of the mouth ICD-C04, palate ICD-C05, other and unspecified parts of the oral cavity ICD-C06) in selected years in Poland (National Cancer Registry – accessed September 1, 2025).

Years	Incidences		Mortality		Total	
	Women	Men	Women	Men	Incidences	Mortality
2000	335	1265	146	676	1600	822
ICD-C00	104	471	19	124	575	143
ICD-C01	16	69	3	59	85	62
ICD-C02	70	280	48	210	350	258
ICD-C03	34	57	13	22	91	35
ICD-C04	43	249	27	159	292	186
ICD-C005	27	71	7	41	98	48
ICD-C06	41	68	29	61	109	90
2005	413	1322	189	661	1735	850
ICD-C00	101	427	32	100	528	132
ICD-C01	22	84	6	51	106	57
ICD-C02	106	302	68	225	408	293
ICD-C03	30	59	7	17	89	24
ICD-C04	68	301	38	161	369	199
ICD-C005	33	60	10	43	93	53
ICD-C06	53	89	28	64	142	92
2010	515	1393	244	832	1908	1076
ICD-C00	92	332	24	81	424	105
ICD-C01	50	156	21	88	206	109
ICD-C02	119	292	64	259	411	323
ICD-C03	40	86	9	25	126	34
ICD-C04	89	350	58	250	439	308
ICD-C005	57	89	18	55	146	73
ICD-C06	68	88	50	74	156	124
2015	661	1635	344	995	2296	1339
ICD-C00	106	306	52	120	412	172
ICD-C01	62	177	46	167	239	213
ICD-C02	178	393	83	248	571	331
ICD-C03	65	104	16	37	169	53
ICD-C04	119	387	76	274	506	350
ICD-C005	55	123	24	60	178	84
ICD-C06	76	145	47	89	221	136
2020	638	1404	399	1064	2042	1463
ICD-C00	77	177	37	79	254	116
ICD-C01	62	185	51	186	247	237
ICD-C02	179	382	90	244	561	334
ICD-C03	52	73	25	48	125	73
ICD-C04	109	340	106	324	449	430
ICD-C005	58	98	27	62	156	89
ICD-C06	101	149	63	121	250	184
2022	685	1554	418	1019	2239	1437
ICD-C00	81	203	28	75	284	103
ICD-C01	54	193	47	160	247	207
ICD-C02	209	422	122	293	631	415
ICD-C03	52	61	23	37	113	60
ICD-C04	108	393	95	281	501	376
ICD-C005	50	89	25	52	139	77
ICD-C06	131	193	78	121	324	199

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Table 2. Incidences and mortality due to malignant tumors of the salivary glands (parotid gland ICD-C07 and other unspecified major salivary glands ICD-C08) in selected years in Poland (National Cancer Registry – accessed September 1, 2025).

Years	Incidences		Mortality		Total	
	Women	Men	Women	Men	Incidences	Mortality
2000	158	181	53	105	339	158
ICD-C07	104	122	36	54	226	90
ICD-C08	54	59	17	51	113	68
2005	176	170	82	90	346	172
ICD-C07	112	122	47	55	234	102
ICD-C08	64	48	35	35	112	70
2010	164	189	66	110	353	176
ICD-C07	124	142	43	78	266	121
ICD-C08	40	47	23	32	87	55
2015	223	254	90	128	477	218
ICD-C07	176	191	61	99	367	160
ICD-C08	47	63	29	29	110	58
2020	163	218	88	145	381	233
ICD-C07	126	162	61	103	288	164
ICD-C08	37	56	27	42	93	69
2022	218	226	90	140	444	230
ICD-C07	146	158	65	98	304	163
ICD-C08	72	68	25	42	140	67

Table 3. Incidences and mortality due to malignant tumors of the oropharynx (palatine tonsil ICD-C09, oropharynx ICD-C10) in selected years in Poland (National Cancer Registry – accessed September 1, 2025).

Years	Incidences		Mortality		Total	
	Women	Men	Women	Men	Incidences	Mortality
2000	114	476	40	240	590	280
ICD C09	68	268	27	176	336	203
ICD C10	46	208	13	64	254	77
2005	133	500	67	264	633	331
ICD C09	90	304	44	167	394	211
ICD C10	43	196	23	97	239	120
2010	181	587	55	294	768	349
ICD C09	120	355	40	187	475	227
ICD C10	61	232	15	107	293	122
2015	224	672	112	416	896	528
ICD C09	166	449	62	244	615	306
ICD C10	58	223	50	172	281	222
2020	221	661	142	483	882	625
ICD C09	156	463	96	292	619	388
ICD C10	65	198	46	191	263	237
2022	297	777	153	526	1074	679
ICD C09	231	543	93	308	774	401
ICD C10	66	234	60	218	300	278

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Table 4. Incidence and mortality due to malignant tumors of the laryngeal part of the pharynx (piriform recess ICD-C12, laryngeal part ICD-C13, other and unspecified location within the throat ICD-C14) in selected years in Poland (National Cancer Registry – accessed September 1, 2025).

Years	Incidence		Mortality		Total	
	Women	Men	Women	Men	Incidence	Mortality
2000	46	302	49	257	348	306
ICD-C12	2	22	0	7	24	7
ICD-C13	23	167	9	103	190	112
ICD-C14	21	113	40	147	134	187
2005	58	423	56	337	481	393
ICD-C12	4	52	2	8	56	10
ICD-C13	26	224	12	112	250	124
ICD-C14	28	147	42	217	175	259
2010	80	467	74	441	547	515
ICD-C12	8	94	4	27	102	31
ICD-C13	43	222	21	147	265	168
ICD-C14	29	151	49	267	180	316
2015	89	520	90	501	609	591
ICD-C12	15	132	7	61	147	68
ICD-C13	56	315	37	231	371	268
ICD-C14	18	73	46	209	91	255
2020	77	463	99	472	540	571
ICD-C12	11	133	9	92	144	101
ICD-C13	44	231	46	237	275	283
ICD-C14	22	99	44	143	121	187
2022	93	513	88	432	606	520
ICD-C12	23	165	14	84	188	98
ICD-C13	40	229	42	232	269	274
ICD-C14	30	119	32	116	149	148

Since 2000, in individual 5-year intervals until 2022, a gradual increase in the incidence and mortality of malignant neoplasms of the laryngeal part of the throat has also been observed (**Table 4**).

The incidence of malignant tumors of the laryngeal part of the pharynx (piriform recess ICD-C12, laryngeal part ICD-C13, other and unspecified location within the throat ICD-C14) in 2022, compared to data from 2000, increased by 74.14% in total, with a 100.0% increase in women and a 70.5% increase in men. The incidence of malignant tumors of the laryngeal part of the pharynx (piriform recess ICD-C12, laryngeal part ICD-C13, other and unspecified location within the throat ICD-C14) in 2022, compared to data from 2000, increased by a total of 74.14% compared to the data from 2000, with an increase of 100.0% in women and 70.0% in men. In turn, deaths from malignant tumors of the laryngeal part of the throat in 2022 increased by 70.0% overall compared to data from 2000, with an increase of 80.0% in women and 70.0% in men. Based on data from 2022, the most common cause of death due to a malignant tumor of the laryngeal part of the pharynx in women and men was a malignant tumor of the laryngeal part of the pharynx (ICD-C13), which accounted for 0.09% and 0.45%, respectively, of all deaths due to malignant tumors (**Table 4**).

The incidence of laryngeal cancer (ICD-C32) in 2022 compared to data from 2000 decreased by 34.5%, with a decrease of 17.8% in women and 36.8% in men. In turn, deaths from laryngeal cancer in 2022 compared to data from 2000 decreased overall by 14.4%, with an increase of 9.7% in women and a decrease of 17.1% in men. Based on data from 2022, deaths from laryngeal cancer are more common in men than in women (5.7 times).

Mean growth in the incidence due to malignant tumors of the oral cavity (ICD, C00-C06), over the entire study 2000-2022 period, reached 8.8% ($P<0.0001$), and the relative change particularly in 2022 against 2000 was 39.9% ($P<0.0001$). Taking into account malignant tumors of the salivary glands (ICD, C07-C08), 7.0% (P<0.0001), 31.0% ($P<0.0001$), malignant tumors of the oropharynx, 16.2% (P<0.0001), 82.0% ($P<0.0001$), and malignant tumors of the laryngeal part of the pharynx (ICD, C12–C14), 14.9% ($P<0.0001$), 74.1% ($P<0.0001$), respectively (**Figure 1**).

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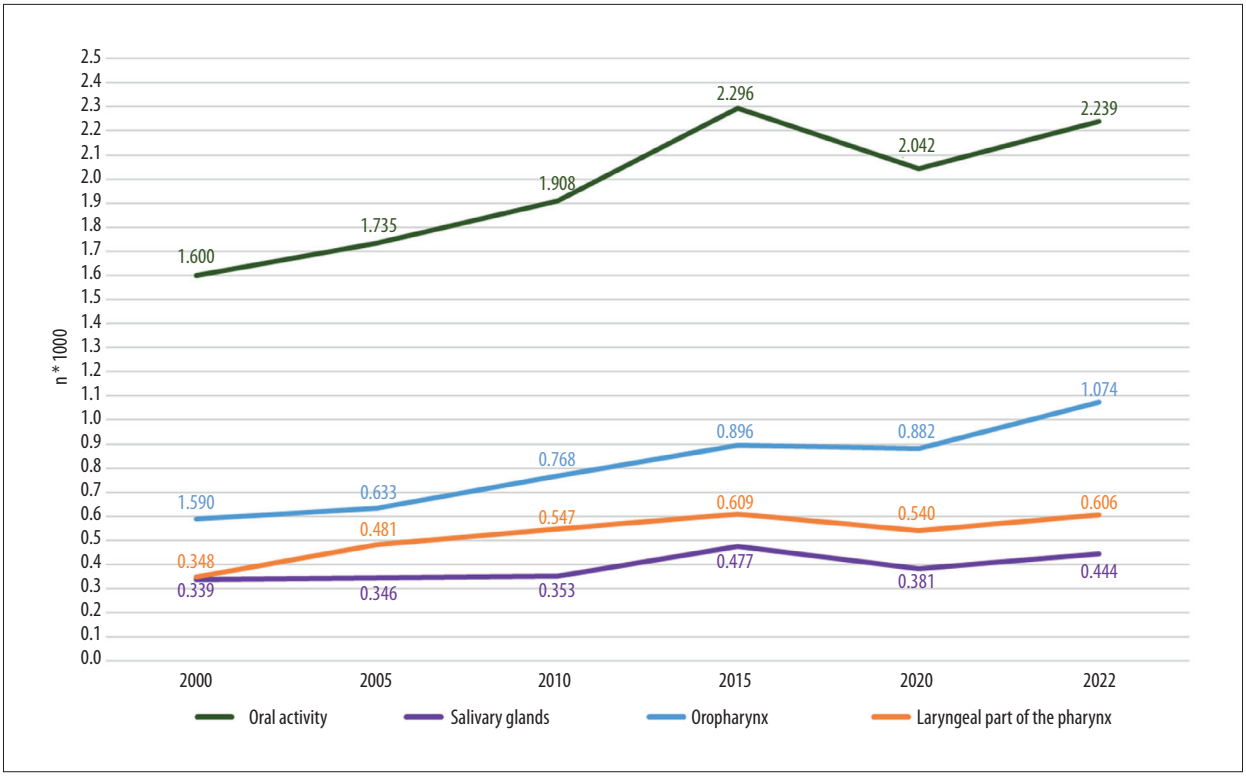

Figure 1. Incidences due to malignant tumors of selected regions within the oral cavity (C00-C06), the salivary glands (C07-C08), the oropharynx (C09-C10) and the laryngeal part of the pharynx (C12-C14) in 2000 to 2022 in Poland (National Cancer Registry – accessed September 1, 2025).

Based on data from 2022, deaths from laryngeal cancer were 470.0% more common in men than in women.

There was a 15.0% (P<0.0001) mean increase in the mortality due to malignant tumors of the oral cavity (ICD, C00-C06) from 2000 to 2022, and the relative change in mortality in 2022 versus 2000 was 74.8% (P<0.0001).

The incidence of malignant tumors of the nasal cavity and middle ear (ICD-C30) in 2022 compared to data from 2000 increased by 18.1%, with a 15.5% increase in women and 20.4% in men. Deaths from malignant tumors of the nasal cavity and middle ear in 2022, compared to the data from 2000, increased by 33.3% in total, with an increase of 56.2% in women and 20.7% in men.

The incidence of malignant tumors of the paranasal sinuses (ICD-C31) in 2022, compared to the data from 2000, increased by 24.2%, with increase in women by 42.5% and in men by 15.0%. Deaths from malignant tumors of the paranasal sinuses in 2022 compared to data from 2000 increased by 30.6% in total, with a 22.2% increase in women and 35.4% in men.

The incidence of malignant eye tumors (ICD-C69) in 2022 compared to data from 2000 increased by 125.8%, with an increase of 116.2% in women and 137.1% in men. Deaths from malignant eye tumors in 2022 compared to data from 2000 increased by 70.9%, with a 94.9% increase in women and 47.5. in men. There were 28.8% more deaths from malignant eye tumors in women than in men.

The incidence of malignant thyroid tumors (ICD-C73) in 2022 compared to data from 2000 increased by 226.9%, with an increase of 228.0% in women and 222.1% in men. Deaths from thyroid malignant tumors in 2022 compared to the National Data from 2000 increased by a total of 6.0%, with a 3.7% decrease in women and an increase of 30.9% in men. Deaths from thyroid cancer were 190% more common in women than in men (**Figure 2**).

From 2000 to 2022, the incidence due to all malignancies increased by 294.0% in women (P<0.0001) and by 175.0% in men (P<0.0001). The incidence due to head and neck cancers in women rose by 145.0% (P<0.0001) and by 14% in men (P<0.0001). Head and neck cancers accounted for 4.3% of malignant neoplasms in women, in 2000 and 2.7% in 2022, a decrease of 38.0% (P<0.0001). The corresponding proportions in men were and 8.7% and 3.6%, respectively, with a 59.0% decrease (P<0.0001) (**Figure 3**).

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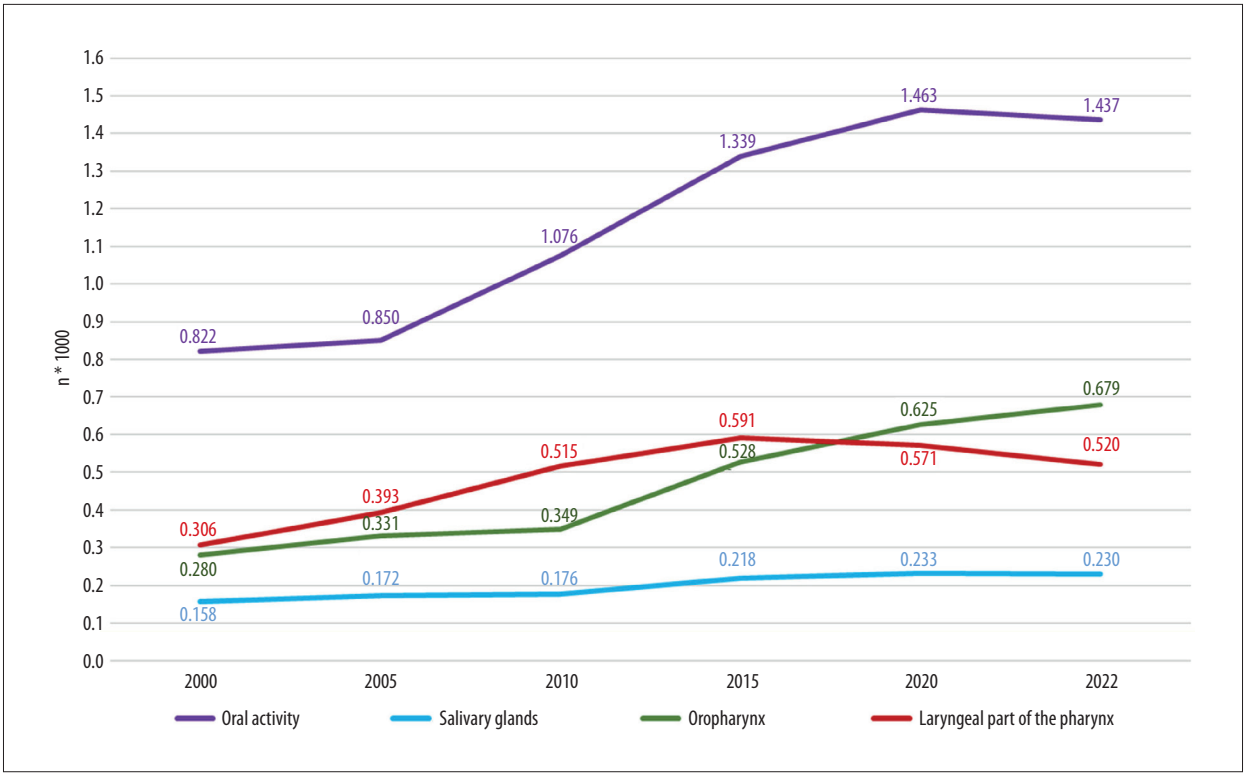

Figure 2. Mortality due to malignant tumors of selected regions within the oral cavity (C00-C06), the salivary glands (C07-C08), the oropharynx (C09-C10), and the laryngeal part of the pharynx (C12–C14) in years 2000 to 2022 in Poland (National Cancer Registry – accessed September 1, 2025).

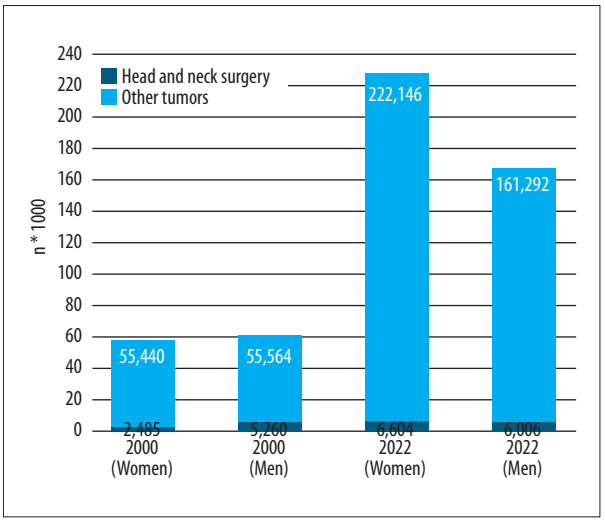

Figure 3. Incidences due to head and neck cancers against the background of all malignant tumors in 2000 and 2022 by sex (National Cancer Registry – September 1, 2025).

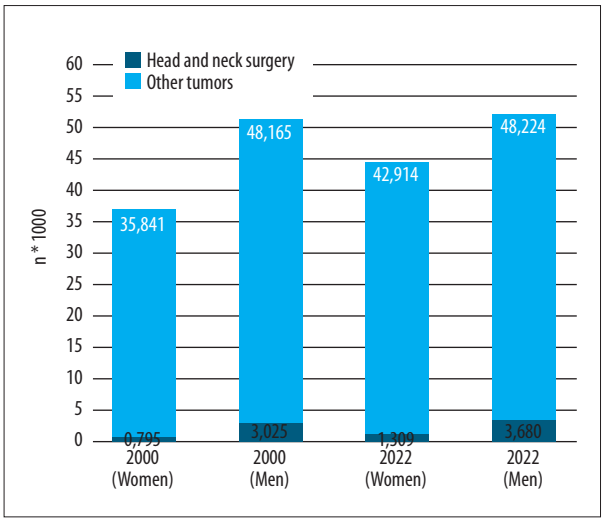

Figure 4. Mortality due to head and neck cancers against the background of all malignant tumors in 2000 and 2022 by sex (National Cancer Registry – September 1, 2025).

From 2000 to 2022, the mortality due to all malignant neoplasms increased in women by 21.0% (P<0.0001) and in men by 1.4% (not significant). The incidence due to head and neck cancers in women increased by 65.0% (P<0.0001), in men by 22.0% (P<0.0001). The proportions of head and neck cancers against all malignant neoplasms in women was 2.2% in 2000 and 3.0% in 2022, which reflected an increase by 36.0% (P<0.0001). The corresponding proportions in men were 5.9% and 7.1%, respectively, with a 20.0% increase (P<0.0001) (**Figure 4**).

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Discussion

Cancer is a major social, public health, and economic problem of the 21st century, accounting for 16.8% of deaths and 22.8% of deaths due to non-communicable diseases (NCDs) worldwide [8,9].

Our own research indicates that both cases and deaths increased for the following head and neck cancers in 2022 compared to data from 2000: oral cavity (ICD, C00-C06), salivary glands (ICD, C07–C08), oropharynx (ICD, C09-C10), laryngeal part of the pharynx (ICD, C12–C14), nasal cavity and middle ear (ICD-C30), paranasal sinuses (ICD-C31), eye (ICD-C69), and thyroid gland (ICD-C73). Malignant thyroid cancer in women is the 5th most common cancer and 28th most common cause of death in the National Register of 2022. The incidence and death rates in our research on malignant tumors of the nasopharyngeal part (ICD-C11) and larynx (ICD-C32) in 2022 decreased compared to the data from 2000. Laryngeal malignancy in men was the 11th most common malignancy in the National Register in 2022 in terms of the number of cases and deaths. The decrease in the incidence of laryngeal cancer in our research is probably due to effective tobacco control. Poland strengthened tobacco control after 2010, but this is not supported by local policy data or changes in smoking prevalence.

The incidence of head and neck cancer in 2022 compared to the data from 2000 increased by 55.6%, while deaths increased by 30.6%. Thyroid cancer (ICD-C73) has been included collectively in head and neck cancers due to similar etiopathogenesis, pathomorphology, and clinical course.

However, thyroid-specific incidence trends are not representative of mucosal SCC head and neck cancers and bias the pooled estimates for head and neck cancers. Thus, the incidence of head and neck cancer in 2022 compared to data from 2000, excluding thyroid cancer, increased by only 13.5%, while deaths increased by 32.7%.

The latest data (variant 1) according to the forecasts of the Health Needs Map in 2022 to 2031 for the cancer group "head and neck" indicate that in Poland there will be an increase in the recorded incidence by 10.5%. In variant 2 (demographic), it is indicated that in 2022 to 2031 there will be a 9.9% increase in the registered incidence for the "Head and neck" group of cancers in Poland [9].

The 5-year survival rate in Poland among patients with lip (ICD-C00), oral cavity (ICD-C06), and oropharynx (palatine tonsil ICD-C09, oropharynx ICD-C10) increased during the first decade of the 21st century in men from 43.3% to 47.6%, and in women from 44.1% to 49.1%.

The 5-year survival rate in Poland among patients with laryngeal cancer (ICD-C32) during the first decade of the 21st century remained 50.6% in men, while in women it slightly increased from 60.4% to 62.7% [10]. Age is the strongest risk factor for cancer. It increases in both sexes with age (up to and including the age of 64). In the male population, 60% and in the female population, 52% of diagnosed head and neck cancers occur in people aged 45 to 64. The risk of developing the disease is highest in both men and women among those aged 50 to 70 years [11,12].

Our analyzes are based on aggregated registry data and raw numbers without age standardization. Age standardization was not possible due to data structure limitations (lack of access to age-stratified denominators).

The number of new cancer cases and deaths due to cancer was extracted from the GLOBOCAN 2022 database for 36 types of cancer, 8 of which concern the head and neck. In 2022, almost half of all cases (49.2%) and most (56.1%) of cancer deaths worldwide are estimated to occur in Asia, where 59.2% of the world's population lives.

The burden of cancer mortality in African and Asian regions is disproportionately greater than the corresponding incidence burden. This reflects the distribution of individual cancer types, as well as the relatively higher mortality rates on these continents, partly due to late diagnoses. Europe has a disproportionately higher rate of cancer incidence and mortality, given that the continent has 22.4% of global cancer cases and 20.4% of cancer deaths, but has only 9.6% of the world's population [9]. With over 821 000 cases worldwide in 2022, thyroid cancer ranks as the 7th most common cancer in terms of overall incidence and fifth in women. The incidence rate is 3 times higher in women than in men.

Overdiagnosis and appropriate concomitant treatments have a significant impact on the overall costs of thyroid cancer treatment, as recently measured in France [13]. In recent years, changes have been introduced in national and international clinical practice guidelines [14] that recommend against thyroid cancer screening. A recent study estimated that 16% of all cancer cases and 63% of large tumors in the United States were attributable to obesity [15], suggesting that obesity control could reduce the burden of thyroid cancer.

The demographic transition is a key factor influencing the burden of cancer, with a global population of approximately 8 billion in 2022 reaching 9.7 billion by 2050.

The incidence and deaths from cancer were probably influenced by the coronavirus disease pandemic (2019), which caused over 6 million deaths in 2020 to 2022 and seriously impacted health care systems around the world. Oncology services have

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been significantly impacted, resulting in long delays in diagnosis and treatment. Many cancer registries around the world reported disruptions to their operations during the first wave of the COVID-19 pandemic, and monthly cancer registrations were markedly reduced for common cancers in many countries [16-20]. However, the long-term impact on cancer survival and mortality remains to be assessed, while modeling studies predict that a transient increase in diagnoses at more advanced stages may lead to increased cancer mortality in the future.

Direct comparisons across years and between sexes using approximate numbers and percentages do not adequately account for demographic changes, an aging population, changes in diagnostic intensity, coding practices, or registry completeness over a 22-year period. These limitations are particularly important in malignancies such as thyroid cancer, and is widely recognized that the significant increase in incidence in the absence of a proportionate increase in mortality is largely influenced by overdiagnosis.

In recent years, the number of scientific studies indicating the relationship between human papillomavirus (HPV) infection and the development of head and neck cancers has increased significantly [21]. It is estimated that 60% to 70% of head and neck cancers are associated with HPV infection [22,23]. A relationship has also been shown between diet, poor oral hygiene or chewing betel nut (black pepper leaves), and an increased risk of developing head and neck cancer [24].

This is particularly important in the context of the rapidly increasing incidence of HPV-related head and neck cancers and the popularization of prevention methods (especially in the form of vaccination against HPV).

Positron emission tomography/computed tomography (PET/CT) using fluorodeoxyglucose (FDG) is essential in oncology for precise tumor delineation. Anh et al [25] assessed the impact of FDG PET/CT on therapeutic decisions in head and neck cancer, comparing metabolic tumor volume (MTV) measured by various methods with radiotherapy goals, crucial for treatment planning and patient outcomes. FDG PET/CT before radiotherapy significantly influences therapeutic decisions in patients with head and neck cancer. Anh et al [25] found that the absolute threshold method (SUV: 2.5) appears to be effective for calculating MTV for radiotherapy planning.

The present study may generate hypotheses, but this topic requires further research. Thorough analysis of the epidemiology of head and neck cancers in Poland is difficult due to the quality and completeness of data collected in public registers. The discrepancy between the number of new diagnoses of malignant tumors of the lip, mouth, and throat between the National Health Fund and National Cancer Registry indicates the need to improve the quality of data collected within public registers. Therefore, planning health policy and assessing the health needs of Poles requires ensuring reliable epidemiological data, including those on cancer incidence. Access to nationwide epidemiology databases of clinical importance, creating the possibility of numerous analyses, the results of which will directly contribute to improving the quality of care for patients with head and neck cancer.

Conclusions

1. The incidence of malignant head and neck cancers in 2022 increased by more than 50.0% compared to data from 2000; therefore, otorhinolaryngologists should intensify their efforts to educate patients about the transmission routes and methods of preventing HPV infections, including the role of HPV infection as a risk factor for head and neck cancers.
2. The most common head and neck cancer in 2022 in terms of incidence was thyroid cancer and, compared to data from 2000, it more than doubled, both in women and men, which is related to, among others, overdiagnosis of the gland caused by the widespread use of high-sensitivity ultrasound.
3. The incidence of laryngeal cancer in 2022 compared to data from 2000 decreased by over 30.0%, as well as deaths, which probably reflects the effectiveness of tobacco control, which Poland strengthened after 2010.
4. There is a need to develop a unified database on the incidence of head and neck cancer to provide medical professionals with access to current epidemiological data, which will facilitate the development of preventive health programs and the assessment of the effectiveness of these programs over the years.

Department and Institution Where Work Was Done

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Bioethics Committee Approval and Patient Consent

Not required because the data are publicly available and came from the National Register of Cancer in Poland.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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