Special Article

Prediction of Cancer Incidence and Mortality in Korea, 2023

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Purpose This study aimed to report the projected cancer incidence and mortality for the year 2023 to estimate Korea's current cancer burden.

Materials and Methods Cancer incidence data from 1999 to 2020 were obtained from the Korea National Cancer Incidence Database, and cancer mortality data from 1993 to 2021 were acquired from Statistics Korea. Cancer incidence and mortality were projected by fitting a linear regression model to observed age-specific cancer rates against their respective years and then by multiplying the projected age-specific rates by the anticipated age-specific population for 2023. A joinpoint regression model was used to determine the year in which the linear trend changed significantly; we only used the data of the latest trend.

Results In total, 273,076 new cancer cases and 81,818 cancer deaths are expected to occur in Korea in 2023. The most common cancer site is expected to be the lung, followed by the thyroid, breast, colon and rectum, and stomach. These five cancers are expected to represent half of the overall burden of cancer in Korea. The most common type of cancer leading to death is expected to be lung cancer, followed by liver, colorectal, pancreatic, and gallbladder cancers.

Conclusion The incidence rates for all types of cancer in Korea are estimated to gradually decrease. These up-to-date estimates of the cancer burden in Korea could be an important resource for planning and evaluating cancer-control programs.

Key words Incidence, Mortality, Neoplasms, Forecasting, Korea, 2023

Introduction

As the leading cause of death in Korea [1], cancer has been a major public health concern in the country since 1983. 250,000 patients were newly diagnosed with cancer in Korea, and 27% of deaths were due to cancer in 2020 [2]. Although the cancer registration system in Korea is highly efficient and can provide nationwide cancer statistics within a relatively short period, a lag time of at least 2 years is required to collect and analyze data for a specific year. For planning and implementing comprehensive cancer-control programs, it is important to assess the number of new cases and deaths that are expected to occur during the current year. In this study, we report the projected cancer incidence and mortality for the year 2023 based on data from the 1990s to 2020.

Materials and Methods

The Korean Ministry of Health and Welfare initiated a nationwide, hospital-based cancer registry, known as the Korea Central Cancer Registry (KCCR), in 1980. The histo-ry, objectives, and activities of the KCCR have been documented in detail elsewhere [3]. Cancer incidence data from 1999 to 2020 were obtained from the Korea National Cancer Incidence Database (KNCI DB). Cancer cases were classified according to the International Classification of Diseases for Oncology, 3rd edition [4] and converted according to the International Classification of Diseases, 10th edition (ICD-10) [5]. Mortality data from 1993 to 2021 were acquired from Statistics Korea [1]. The cause of death was coded and classified according to the ICD-10 [5].

The cancer sites included in this study were (1) all cancer sites combined and (2) the 24 cancer sites as follows: lips, oral cavity, and pharynx (C00-C14), esophagus (C15), stomach (C16), colon and rectum (C18-C20), liver (C22), gallbladder etc. (C23-C24), pancreas (C25), larynx (C32), lung (C33-C34), breast (C50), cervix uteri (C53), corpus uteri (C54), ovary (C56), prostate (C61), testis (C62), kidney (C64), bladder (C67), brain and central nervous system (C70-C72), thyroid (C73), Hodgkin lymphoma (C81), non-Hodgkin lymphoma (C82-C86, C96), multiple myeloma (C90), leukemia (C91-C95), and other and ill-defined sites (remainder of C00-C96).

The population data from 1993 to 2023 were obtained from

Table 1. Estimated new cancer cases and deaths by sex during 2023 in Korea

Site	Estimated new cases			Estimated deaths		
	Both sexes	Men	Women	Both sexes	Men	Women
All sites	273,076	144,379	128,697	81,818	49,730	32,088
Lip, oral cavity, and pharynx	4,347	3,111	1,236	1,278	927	351
Esophagus	2,778	2,439	339	1,240	1,092	148
Stomach	24,735	16,385	8,350	4,972	3,243	1,729
Colon and rectum	27,657	16,407	11,250	8,767	4,839	3,928
Liver[a]	14,164	10,466	3,698	9,340	6,831	2,509
Gallbladder[b]	8,315	4,797	3,518	5,675	3,077	2,598
Pancreas	9,718	4,981	4,737	7,577	3,873	3,704
Larynx	1,047	991	56	223	212	11
Lung[c]	33,413	22,225	11,188	18,536	13,767	4,769
Breast	28,969	118	28,851	2,963	19	2,944
Cervix uteri	2,784	-	2,784	729	-	729
Corpus uteri	3,813	-	3,813	445	-	445
Ovary	3,257	-	3,257	1,439	-	1,439
Prostate	22,837	22,837	-	2,425	2,425	-
Testis	351	351	-	18	18	-
Kidney	6,823	4,712	2,111	1,071	713	358
Bladder	5,232	4,303	929	1,616	1,208	408
Brain and CNS	2,203	1,189	1,014	1,415	745	670
Thyroid	32,977	9,079	23,898	337	105	232
Hodgkin lymphoma	358	221	137	58	40	18
Non-Hodgkin lymphoma	6,314	3,637	2,677	2,401	1,376	1,025
Multiple myeloma	2,047	1,136	911	1,098	565	533
Leukemia	4,059	2,338	1,721	2,185	1,281	904
Other and ill defined	24,878	12,656	12,222	6,010	3,374	2,636

CNS, central nervous system. [a]Includes the liver and intrahepatic bile duct, [b]Includes the gallbladder and other/unspecified parts of the biliary tract, [c]Includes the lung and bronchus.

the resident registration population data, reported by Statistics Korea. Data of the mid-year population (July 1 of the respective year) were used as the denominator to obtain the annual incidence and mortality rates. However, for the year 2023, we used the population data on December 31, 2022, as the mid-2023 resident registration population data were not yet available at the time of the analysis.

Linear regression models [6] were used to assess time trends and create projections. We first performed a joinpoint regression analysis on the data available to detect the year when significant changes occurred in cancer trends according to sex and cancer site. A joinpoint regression describes changes in data trends by connecting several different line segments on a log scale at "Joinpoints." This analysis was performed using *Joinpoint* software (version 4.7.0.0, http://surveillance.cancer.gov/joinpoint) from the Surveillance Research Program of the US National Cancer Institute [7]. For the analysis, we arranged to have at least four data points between consecutive joinpoints. Secondly, to predict age-specific cancer rates, a linear regression model was fitted to age-specific rates by 5-year age groups against their respective years, based on the observed cancer incidence data of the latest trends. Finally, we multiplied the projected age-specific rates by the age-specific population to get the projected number of cancer cases and deaths for the year 2023.

We summarized the results using crude rates (CRs) and age-standardized rates (ASRs) of cancer incidence and mortality. ASRs were standardized using the world standard population [8] and expressed per 100,000 persons.

Results

1. Incidence

In total, 273,076 new cancer cases are expected to occur in 2023 (Table 1, Fig. 1); more men (n=144,379) than women (n=128,697) are expected to be affected.

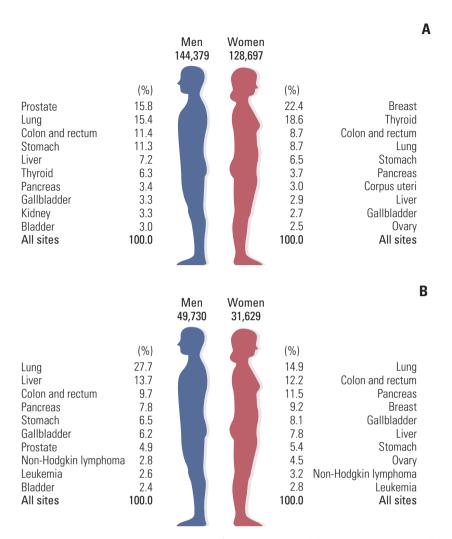The projected CRs per 100,000 for all of the sites combined

A

	Men 144,379 (%)			Women 128,697 (%)	
Prostate	15.8			22.4	Breast
Lung	15.4			18.6	Thyroid
Colon and rectum	11.4			8.7	Colon and rectum
Stomach	11.3			8.7	Lung
Liver	7.2			6.5	Stomach
Thyroid	6.3			3.7	Pancreas
Pancreas	3.4			3.0	Corpus uteri
Gallbladder	3.3			2.9	Liver
Kidney	3.3			2.7	Gallbladder
Bladder	3.0			2.5	Ovary
All sites	100.0			100.0	All sites

B

	Men 49,730 (%)			Women 31,629 (%)	
Lung	27.7			14.9	Lung
Liver	13.7			12.2	Colon and rectum
Colon and rectum	9.7			11.5	Pancreas
Pancreas	7.8			9.2	Breast
Stomach	6.5			8.1	Gallbladder
Gallbladder	6.2			7.8	Liver
Prostate	4.9			5.4	Stomach
Non-Hodgkin lymphoma	2.8			4.5	Ovary
Leukemia	2.6			3.2	Non-Hodgkin lymphoma
Bladder	2.4			2.8	Leukemia
All sites	100.0			100.0	All sites

Fig. 1. The 10 leading types of estimated new cancer cases and deaths by sex in 2023. (A) Estimated new cases. (B) Estimated deaths.

in 2023 are 563.4 cases and 499.0 cases for men and women, respectively (Table 2). The projected ASRs per 100,000 for all of the sites combined are 280.4 cases and 270.6 cases for men and women, respectively. In men, the five leading primary sites of cancer are expected to be the prostate (CR, 89.1; ASR, 39.0), lung (CR, 86.7; ASR, 38.3), colon and rectum (CR, 64.0; ASR, 31.7), stomach (CR, 63.9; ASR, 30.5), and liver (CR, 40.8; ASR, 19.6), accounting for 61.2% of all new cancer cases in 2023. In women, the five leading primary sites are expected to be the breast (CR, 111.9; ASR, 67.7), thyroid (CR, 92.7; ASR, 69.4), colon and rectum (CR, 43.6; ASR, 17.7), lung (CR, 43.4; ASR, 17.3), and stomach (CR, 32.4; ASR, 14.0), accounting for 64.9% of all new cancer cases in 2023 (Fig. 1).

The five most common cancer sites expected in 2023 according to sex and age group are shown in Table 3. Leukemia and thyroid cancer are expected to be the most common forms of cancer in both sexes for those aged 0-14 years and

15-34 years, respectively. Colorectal cancer is predicted to be the most prevalent cancer in men aged 35-64 years, while prostate cancer is expected to be more frequent in men aged 65 years and above. Breast cancer is predicted to be the most common cancer in women aged 35-64 years, whereas lung cancer is expected to be the most common form in women aged 65 years and above. According to the projection, the incidences of stomach, lung, liver, colorectal, and prostate cancers will increase gradually with age for men (Fig. 2A). In women, the age-specific incidence rates for stomach, colorectal, liver, lung, and cervical cancers denote an increasing trend with age; however, the incidences of breast and thyroid cancers in women are expected to level off after the age of 45 and 50 years, respectively (Fig. 2B).

Table 2. Estimated crude and age-standardized cancer incidences by sex during 2023 in Korea

Site	Crude incidence rates per 100,000			Age-standardized incidence rates per 100,000[a]		
	Both sexes	Men	Women	Both sexes	Men	Women
All sites	531.1	563.4	499.0	269.7	280.4	270.6
Lip, oral cavity, and pharynx	8.5	12.1	4.8	4.4	6.4	2.6
Esophagus	5.4	9.5	1.3	2.3	4.3	0.6
Stomach	48.1	63.9	32.4	21.7	30.5	14.0
Colon and rectum	53.8	64.0	43.6	24.4	31.7	17.7
Liver[b]	27.5	40.8	14.3	12.2	19.6	5.4
Gallbladder[c]	16.2	18.7	13.6	6.1	8.2	4.4
Pancreas	18.9	19.4	18.4	7.9	9.0	6.9
Larynx	2.0	3.9	0.2	0.9	1.7	0.1
Lung[d]	65.0	86.7	43.4	26.6	38.3	17.3
Breast	56.3	0.5	111.9	33.9	0.2	67.7
Cervix uteri	5.4	-	10.8	3.5	-	7.0
Corpus uteri	7.4	-	14.8	4.3	-	8.7
Ovary	6.3	-	12.6	3.8	-	7.5
Prostate	44.4	89.1	-	17.9	39.0	-
Testis	0.7	1.4	-	0.7	1.4	-
Kidney	13.3	18.4	8.2	7.1	10.1	4.2
Bladder	10.2	16.8	3.6	4.0	7.4	1.3
Brain and CNS	4.3	4.6	3.9	3.0	3.3	2.7
Thyroid	64.1	35.4	92.7	46.9	25.4	69.4
Hodgkin lymphoma	0.7	0.9	0.5	0.6	0.7	0.5
Non-Hodgkin lymphoma	12.3	14.2	10.4	6.9	8.4	5.5
Multiple myeloma	4.0	4.4	3.5	1.7	2.1	1.4
Leukemia	7.9	9.1	6.7	5.7	6.7	4.7
Other and ill defined	48.4	49.4	47.4	23.4	26.1	21.0

CNS, central nervous system. [a]Age adjusted to the world standard population, [b]Includes the liver and intrahepatic bile duct, [c]Includes the gallbladder and other/unspecified parts of the biliary tract, [d]Includes the lung and bronchus.

Table 3. Estimated cancer incidence by age group and sex during 2023 in Korea

Rank	Age group (yr)			
	0-14	15-34	35-64	≥ 65
Men				
1	Leukemia (4.8)	Thyroid (27.0)	Colon and rectum (60.8)	Prostate (445.8)
2	Non-Hodgkin lymphoma (3.3)	Colon and rectum (4.7)	Stomach (56.6)	Lung[a] (413.5)
3	Brain and CNS (2.3)	Leukemia (4.1)	Thyroid (51.9)	Stomach (230.7)
4	Kidney (0.3)	Non-Hodgkin lymphoma (3.4)	Lung[a] (43.0)	Colon and rectum (212.2)
5	Lip, oral cavity, and pharynx (0.2)	Testis (3.2)	Prostate (37.7)	Liver[b] (143.9)
Women				
1	Leukemia (4.2)	Thyroid (77.1)	Breast (183.6)	Lung[a] (139.4)
2	Brain and CNS (1.9)	Breast (13.3)	Thyroid (139.4)	Colon and rectum (137.3)
3	Non-Hodgkin lymphoma (1.8)	Cervix uteri (5.3)	Colon and rectum (32.9)	Breast (117.5)
4	Thyroid (1.0)	Ovary (3.7)	Lung[a] (32.3)	Stomach (93.3)
5	Ovary (0.8)	Corpus uteri (3.3)	Stomach (28.7)	Pancreas (67.5)

CNS, central nervous system. [a]Includes the lung and bronchus, [b]Includes the liver and intrahepatic bile duct.
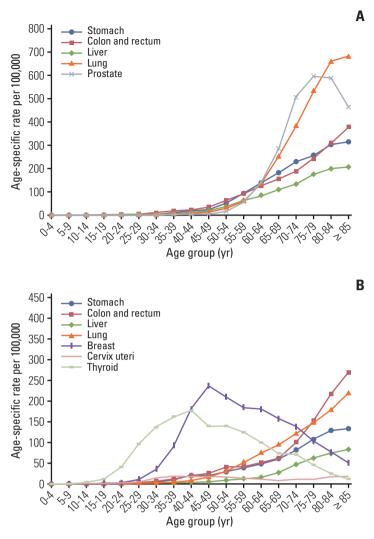
Fig. 2. Projected age-specific incidences of major cancers during 2023 in Korea. (A) Men. (B) Women.

2. Mortality

It is estimated that 81,818 cancer deaths will occur in Korea during 2023 (Table 1, Fig. 1). The projected CRs per 100,000 for all of the sites combined in 2023 for men and women are 194.0 cases and 124.4 cases, respectively, whereas the projected ASRs per 100,000 for all sites combined for men and women are expected to be 85.0 cases and 43.2 cases, respectively (Table 4). The predicted five leading cancer sites causing mortality in men are the lung (CR, 53.7; ASR, 22.4), liver (CR, 26.7; ASR, 12.1), colon and rectum (CR, 18.9; ASR, 8.4), pancreas (CR, 15.1; ASR, 6.7), and stomach (CR, 12.7; ASR, 5.6). During the same period, lung cancer (CR, 18.5; ASR, 5.7) is projected to be the leading cause of cancer death in women, followed by colon and rectal (CR, 15.2; ASR, 4.6), pancreatic (CR, 14.4; ASR, 4.7), breast (CR, 11.4; ASR, 5.7), and gallbladder (CR, 10.1; ASR, 2.8) cancers.

The predicted age-specific mortality rates of the leading causes of cancer-associated death in men and women in 2023 are shown in detail in Fig. 3. According to age, Korean men and women aged at least 60 years are expected to have the highest mortality rates due to lung cancer.

Conclusion

A total of 273,076 new cancer cases and 81,818 cancer deaths are expected to occur in Korea during 2023. Prostate cancer is predicted to be the most common type of cancer among men, followed by lung, colorectal, stomach, and liver cancers. Lung, liver, colorectal, pancreatic, and stomach cancers are expected to be the most common causes of cancer deaths among men. In women, the five leading primary can-

Table 4. Estimated crude and age-standardized cancer mortality rates by sex during 2023 in Korea

Site	Crude mortality rates per 100,000			Age-standardized mortality rates per 100,000[a]		
	Both sexes	Men	Women	Both sexes	Men	Women
All sites	159.1	194.0	124.4	61.1	85.0	43.2
Lip, oral cavity, and pharynx	2.5	3.6	1.4	1.0	1.7	0.5
Esophagus	2.4	4.3	0.6	0.9	1.8	0.2
Stomach	9.7	12.7	6.7	3.6	5.6	2.0
Colon and rectum	17.1	18.9	15.2	6.3	8.4	4.6
Liver[b]	18.2	26.7	9.7	7.3	12.1	3.0
Gallbladder[c]	11.0	12.0	10.1	3.8	5.0	2.8
Pancreas	14.7	15.1	14.4	5.6	6.7	4.7
Larynx	0.4	0.8	0.0	0.2	0.3	0.0
Lung[d]	36.1	53.7	18.5	13.0	22.4	5.7
Breast	5.8	0.1	11.4	2.9	0.0	5.7
Cervix uteri	1.4	-	2.8	0.7	-	1.4
Corpus uteri	0.9	-	1.7	0.4	-	0.8
Ovary	2.8	-	5.6	1.3	-	2.5
Prostate	4.7	9.5	-	1.5	3.7	-
Testis	0.0	0.1	-	0.0	0.1	-
Kidney	2.1	2.8	1.4	0.8	1.3	0.4
Bladder	3.1	4.7	1.6	1.0	1.9	0.4
Brain and CNS	2.8	2.9	2.6	1.5	1.7	1.3
Thyroid	0.7	0.4	0.9	0.2	0.2	0.2
Hodgkin lymphoma	0.1	0.2	0.1	0.0	0.1	0.0
Non-Hodgkin lymphoma	4.7	5.4	4.0	1.8	2.4	1.3
Multiple myeloma	2.1	2.2	2.1	0.8	0.9	0.7
Leukemia	4.3	5.0	3.5	1.9	2.5	1.4
Other and ill defined	11.7	13.2	10.2	4.7	6.2	3.4

CNS, central nervous system. [a]Age adjusted to the world standard population, [b]Includes the liver and intrahepatic bile duct, [c]Includes the gallbladder and other/unspecified parts of the biliary tract, [d]Includes the lung and bronchus.
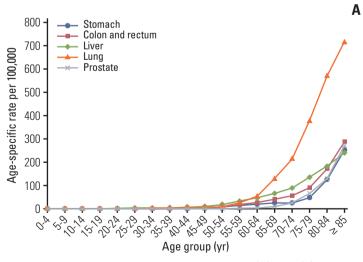

Fig. 3. Projected age-specific mortality rates of major cancers during 2023 in Korea. (A) Men. (B). Women. *(Continued to the next page)*
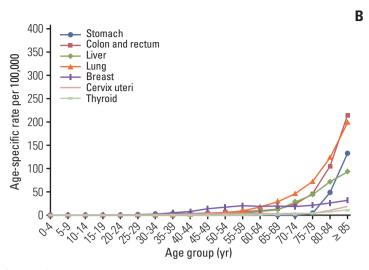
Fig. 3. *(Continued from the previous page)*

cer sites are expected to be the breast, thyroid, colon and rectum, lung, and stomach, while lung, colorectal, pancreatic, breast, and gallbladder cancers are projected to be the most common causes of cancer deaths.

Cancer is currently one of the foremost public health concerns in Korea. Although cancer incidence rates are anticipated to slightly decrease, the burden of most types of cancers will continue to grow with the increasing age of the population. The current projections of cancer incidence and mortality for 2023 represent an important resource for planning and evaluating cancer-control programs. As the estimates in this study are model-based, these results should be interpreted with caution. Also due to coronavirus disease 2019 epidemic, the number of cancer cases in 2020 decreased by 3.6% compared to the previous year. As a result, it may be affected by the predict of 2023, so attention should be paid to the interpretation.

Author Contributions

Conceived and designed the analysis: Jung KW.
Contributed data or analysis tools: Jung KW, Kong HJ, Kim HJ.
Performed the analysis: Jung KW.
Wrote the paper: Jung KW.
Interpretation and review: Kang MJ, Park EH, Yun EH, Kim HJ, Im JS, Seo HG.

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Conflicts of Interest

Conflict of interest relevant to this article was not reported.

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