

Appendices

Appendix A: Definitions for Cancer Incidence Data

MCSS collects information on all microscopically confirmed malignant and *in situ* tumors diagnosed in Minnesota residents, with the exception of basal and squamous cell carcinomas of non-genital skin sites and *in situ* cancers of the cervix. *In situ* cancers except those of the bladder are only included in stage-specific tables in Chapter III, and are excluded from all other tables. *In situ* bladder cancers are included with invasive bladder cancers and counts of all cancers sites combined because the distinction between *in situ* and invasive bladder cancers is often unclear, and some *in situ* bladder cancers can be life-threatening.

The anatomic site and histologic type reported for the cancer in the medical record or pathology report is coded according to the International Classification of Diseases for Oncology (ICD-O), developed by the World Health Organization. Cases diagnosed in 1988-1992 were coded to the first edition of ICD-O, and those diagnosed in 1993-1999 according to the second edition (ICD-O-2). These codes were then grouped according to conventions developed by the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Registry, given below.

Cancer	Anatomic site (ICD-O-2)	Histologic type (ICD-O-2)
Oral Cavity and Pharynx		Excluding 9590-9989
Lip	C00.0 – C00.9	
Tongue	C01.9 – C02.9	
Salivary gland	C07.9 – C08.9	
Floor of mouth	C04.0 – C04.9	
Gum and other mouth	C03.0-C03.9, C05.0-C05.9, C06.0-C06.9	
Nasopharynx	C11.0 – C11.9	
Tonsil	C09.0 – C09.9	
Oropharynx	C10.0 – C10.9	
Hypopharynx	C12.9, C13.0 – C13.9	
Other oral cavity and pharynx	C14.0, C14.2 – C14.8	
Digestive System		Excluding 9590-9989
Esophagus	C15.0 – C15.9	
Stomach	C16.0 – C16.9	
Small intestine	C17.0 – C17.9	
Colon excluding rectum	C18.0 – C18.9, C26.0	
Rectum & rectosigmoid junction	C19.9, C20.9	
Anus, anal canal, anorectum	C21.0 – C21.2, C21.8	
Liver	C22.0	
Intrahepatic bile duct	C22.1	
Gallbladder	C23.9	
Other biliary	C24.0 – C24.9	
Pancreas	C25.0 – C25.9	
Retroperitoneum	C48.0	
Peritoneum, omentum, mesentery	C48.1 – C48.2	
Other digestive organs	C26.8 – C26.9, C48.8	

Incidence Data Definitions

Cancer	Anatomic site (ICD-O-2)	Histologic type (ICD-O-2)
Respiratory System		Excluding 9590-9989
Nasal cavity, middle ear, sinuses	C30.0, C30.1, C31.0 – C31.9	
Larynx	C32.0 – C32.9	
Lung and bronchus	C34.0 – C34.9	
Pleura	C38.4	
Trachea, mediastinum, and other respiratory organs	C33.9, C38.1-C38.3, C38.8, C39.0, C39.8, C39.9	
Mesothelioma	All sites	9050 - 9055
Bones and Joints	C40.0 – C41.9	Excluding 9590-9989
Soft Tissue (including Heart)	C38.0, C47.0 – C47.9, C49.0-C49.9	Excluding 9590-9989
Skin		
Melanoma of the skin	C44.0 – C44.9	8720 – 8790
Other non-epithelial skin	C44.0 – C44.9	Excluding 8000-8004, 8010-8045, 8050-8082, 8090-8110, 8720-8790, 9590-9989
Kaposi's Sarcoma	All sites	9140
Breast	C50.0 – C50.9	Excluding 9590-9989
Female Genital System		Excluding 9590-9989
Cervix	C53.0 – C53.9	
Corpus and uterus, NOS	C54.0 – C54.9, C55.9	
Ovary	C56.9	
Vagina	C52.9	
Vulva	C51.0 – C51.9	
Other female genital organs	C57.0 – C58.9	
Male Genital System		Excluding 9590-9989
Prostate	C61.9	
Testis	C62.0 – C62.9	
Penis	C60.0 – C60.9	
Other male genital organs	C63.0 – C63.9	
Urinary System		Excluding 9590-9989
Bladder	C67.0 – C67.9	
Kidney and renal pelvis	C64.9, C65.9	
Ureter	C66.9	
Other urinary organs	C68.0 – C68.9	
Eye and Orbit	C69.0 – C69.9	Excluding 9590-9989

Cancer	Anatomic site (ICD-O-2)	Histologic type (ICD-O-2)
Brain and Other Nervous System		
Brain	C71.0 – C71.9	Excluding 9530-9539, 9590-9989
Other nervous system	C71.0 – C71.9 and C70.0 – C70.9, C72.0 – C72.9	9530-9539 Excluding 9590-9989
Endocrine System		Excluding 9590-9989
Thyroid	C73.9	
Other endocrine, including thymus	C37.9, C74.0 – C74.9, C75.0 – C75.9	
Lymphomas		
Hodgkin's lymphoma	All sites	9650-9667
Non-Hodgkin's lymphoma	All sites and Excluding C42.0,C42.1,C42.4	9590-9595, 9670-9717 9823, 9827
Multiple Myeloma	All sites	9731-9732
Leukemia		
Lymphocytic leukemia		
Acute lymphocytic leukemia	All sites	9821, 9828
Chronic lymphocytic leukemia	C42.0, C42.1, C42.4	9823
Other lymphocytic leukemia	All sites	9820, 9822, 9824, 9825, 9826
Myeloid leukemia		
Acute myeloid leukemia	All sites	9840, 9861, 9866, 9867, 9871-9874
Chronic myeloid leukemia	All sites	9863, 9868
Other myeloid leukemia	All sites	9860, 9862, 9864
Monocytic leukemia		
Acute monocytic leukemia	All sites	9891
Chronic monocytic leukemia	All sites	9893
Other monocytic leukemia	All sites	9890, 9892, 9894
Other leukemia	All sites	9800-9804, 9830, 9841, 9842, 9850, 9870, 9880, 9900, 9910, 9930-9932, 9940, 9941
	and C42.0,C42.1,C42.4	9827
Ill Defined and Unspecified Sites	All sites and C76.0 – C76.8, C80.9, C42.0 – C42.4, C77.0 – C77.9	9720-9723, 9740, 9741, 9760-9764, 9950-9989 8000-9589

Appendix B: Definitions for Cancer Mortality Data

Cancer mortality data on Minnesota residents were obtained from death certificates reported to the Minnesota Center for Health Statistics. The underlying cause of death was coded according to the Manual of the International Classification of Diseases (ICD), developed by the World Health Organization. From 1988 to 1998, the ninth revision of ICD was used, and starting with deaths occurring in 1999, the tenth revision was used (ICD-10). These codes are then grouped according to conventions developed by the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Registry, given below.

Cancer	Anatomic site (ICD-10)
Oral Cavity and Pharynx	
Lip	C00.0 – C00.6, C00.8 – C00.9
Tongue	C01.0 – C01.9, C02.0 – C02.4, C02.8 – C02.9
Salivary gland	C07.0 – C07.9, C08.0 – C08.1, C08.8 – C08.9
Floor of mouth	C04.0 – C04.1, C04.8 – C04.9
Gum and other mouth	C03.0 - C03.1, C03.9, C05.0 - C05.2, C05.8 – C05.9, C06.0 - C06.2, C06.8 – C06.9
Nasopharynx	C11.0 – C11.3, C11.8 – 11.9
Tonsil	C09.0 – C09.1, C09.8 – C09.9
Oropharynx	C10.0 – C10.4, C10.8 – C10.9
Hypopharynx	C12.0 – C12.9, C13.0 – C13.2, C13.8 – C13.9
Other oral cavity and pharynx	C14.0 - C14.2, C14.8
Digestive System	
Esophagus	C15.0 – C15.5, C15.8 – C15.9
Stomach	C16.0 – C16.6, C16.8 – C16.9
Small intestine	C17.0 – C17.3, C17.8 – C17.9
Colon excluding rectum	C18.0 – C18.9, C26.0
Rectum & rectosigmoid junction	C19.0 – C19.9, C20.0 – C20.9
Anus, anal canal, anorectum	C21.0 – C21.2, C21.8
Liver	C22.0, C22.2 – C22.4, C22.7, C22.9
Intrahepatic bile duct	C22.1
Gallbladder	C23.0 – C23.9
Other biliary	C24.0 – C24.1, C24.8 – C24.9
Pancreas	C25.0 – C25.4, C25.7 – C25.9
Retroperitoneum	C48.0
Peritoneum, omentum, mesentery	C45.1, C48.1 – C48.2
Other digestive organs	C26.8 – C26.9, C48.8
Respiratory System	
Nasal cavity, middle ear, sinuses	C30.0, C30.1, C31.0 – C31.3, C31.8 – C31.9
Larynx	C32.0 – C32.3, C32.8 – C32.9
Lung and bronchus	C34.0 – C34.3, C34.8 – C34.9
Pleura	C38.4, C45.0
Trachea, mediastinum, and other respiratory organs	C33.0 – C33.9, C38.1-C38.3, C38.8,C39.0, C39.8, C39.9

Cancer Mortality Definitions

Cancer	Anatomic site (ICD-10)
Bones and Joints	C40.0 – C40.3, C40.8 – C40.9, C41.0 – C41.4, C41.8 – C41.9
Soft Tissue (including Heart)	C38.0, C45.2, C47.0 – C47.6, C47.8 – C47.9, C49.0-C49.6, C49.8 – C49.9
Skin	
Melanoma of the skin	C43.0 – C43.9
Other non-epithelial skin	C44.0 – C44.9, C46.0 – C46.3, C46.7 – C46.9
Breast	C50.0 – C50.6, C50.8 – C50.9
Female Genital System	
Cervix	C53.0 – C53.1, C53.8 – C53.9
Corpus and uterus, NOS	C54.0 – C54.3, C54.8 – C54.9, C55.0 – C55.9
Ovary	C56.0 - C56.9
Vagina	C52.0 – C52.9
Vulva	C51.0 – C51.2, C51.8 – C51.9
Other female genital organs	C57.0 – C57.4, C57.7 – C57.9, C58.0 – C58.9
Male Genital System	
Prostate	C61.0 – C61.9
Testis	C62.0 – C62.1, C62.9
Penis	C60.0 – C60.2, C60.8 – C60.9
Other male genital organs	C63.0 – C63.2, C63.7 – C63.9
Urinary System	
Bladder	C67.0 – C67.9
Kidney and renal pelvis	C64.0 – C64.9, C65.0 – C65.9
Ureter	C66.0 – C66.9
Other urinary organs	C68.0 – C68.1, C68.8 – C68.9
Eye and Orbit	C69.0 – C69.6, C69.8 – C69.9
Brain and Other Nervous System	
Brain	C71.0 – C71.9
Other nervous system	C70.0 – C70.1, C70.9, C72.0 – C72.5, C72.8 – C72.9
Endocrine System	
Thyroid	C73.0 – C73.9
Other endocrine, including thymus	C37.0 – C37.9, C74.0 – C74.1, C74.9, C75.0 – C75.5, C75.8 – C75.9
Lymphomas	
Hodgkin's lymphoma	C81.0 – C81.3, C81.7, C81.9
Non-Hodgkin's lymphoma	C82.0 – C82.2, C82.7, C82.9, C83.0 – C83.9, C84.0 – C84.5, C85.0 – C85.1, C85.7, C85.9, C96.3
Multiple Myeloma	C90.0, C90.2
Leukemia	
Lymphocytic leukemia	
Acute lymphocytic leukemia	C91.0
Chronic lymphocytic leukemia	C91.1
Other lymphocytic leukemia	C91.2, C91.3, C91.7, C91.9

Cancer	Anatomic site (ICD-10)
Myeloid leukemia	
Acute myeloid leukemia	C92.0, C92.4 – C92.5
Chronic myeloid leukemia	C92.1
Other myeloid leukemia	C92.2, C92.3, C92.7, C92.9
Monocytic leukemia	
Acute monocytic leukemia	C93.0
Chronic monocytic leukemia	C93.1
Other monocytic leukemia	C93.2, C93.7, C93.9
Other leukemia	C90.1, C91.4, C91.5, C94.0 – C94.5, C94.7, C95.0 – C95.2, C95.7, C95.9
Ill Defined and Unspecified Sites	C26.1, C45.7, C45.9, C76.0 – C76.5, C76.7, C76.8, C77.0 – C77.5, C77.8 – C77.9, C78.0 – C78.8, C79.0 – C79.8, C80.0 – C80.9, C88.0 – C88.3, C88.7, C88.9, C96.0 – C96.2, C96.7, C96.9, C97.0 – C97.9

Appendix C: Definition of Minnesota Regions

For purposes of evaluating geographic variation in cancer rates, Minnesota counties have been grouped into regions as shown below. The abbreviations adopted in the text and graphs are shown in parentheses.

Region	Counties		
Metropolitan Minnesota (Metro)	Anoka	Hennepin	Washington
	Carver	Ramsey	
	Dakota	Scott	
Southeastern Minnesota (SE)	Dodge	Houston	Steele
	Fillmore	Mower	Wabasha
	Freeborn	Olmsted	Winona
	Goodhue	Rice	
South Central Minnesota (SC)	Blue Earth	Le Sueur	Sibley
	Brown	Martin	Waseca
	Faribault	Nicollet	Watonwan
Southwestern Minnesota (SW)	Big Stone	Lincoln	Pipestone
	Chippewa	Lyon	Redwood
	Cottonwood	McLeod	Renville
	Jackson	Meeker	Rock
	Kandiyohi	Murray	Swift
	Lac Qui Parle	Nobles	Yellow Medicine
Central Minnesota (Central)	Benton	Kanabec	Stearns
	Cass	Mille Lacs	Todd
	Chisago	Morrison	Wadena
	Crow Wing	Pine	Wright
	Isanti	Sherburne	
West Central Minnesota (WC)	Becker	Grant	Stevens
	Clay	Otter Tail	Traverse
	Douglas	Pope	Wilkin
Northwestern Minnesota (NW)	Beltrami	Lake of the Woods	Pennington
	Clearwater	Mahnomen	Polk
	Hubbard	Marshall	Red Lake
	Kittson	Norman	Roseau
Northeastern Minnesota (NE)	Aitkin	Itasca	Lake
	Carlton	Koochiching	St. Louis
	Cook		

Appendix D: Glossary

Age-Specific Rate: The rate of occurrence of a cancer for a specific age group (the number of cancers occurring during a specified period of time in a particular age group divided by the total number of individuals in the age group and time period).

Age-Standardized Rate (age-adjusted rate): Refers to a rate that has been adjusted to control for differences in age distribution between populations. It is a weighted average of age-specific rates, with the proportion of individuals in the corresponding age groups of the standard population functioning as the weights. The 200 U.S. population is used as the standard in this report.

ALL: Acute lymphocytic leukemia.

Artifact: Any artificial product. In epidemiology, any observation that has been introduced by the methods used for data collection or data analysis.

Ascertainment: The collection of information; the process of finding desired information.

ATSDR: Agency for Toxic Substances and Disease Registries, an agency within the U.S. Centers for Disease Control and Prevention.

Benign: Not malignant, not likely to metastasize.

Biopsy: The removal and examination, usually microscopic, of tissue from the living body, performed to establish precise diagnosis.

Cancer: Diseases characterized by rapid, uncontrolled cell growth, with a tendency to spread throughout the body.

Cancer-Directed Treatment: As defined by SEER, this is therapy specifically undertaken to affect, control, change, remove, or destroy cancer tissue, or to induce remission in leukemias.

Cancer Registry: An ongoing system for the registration and follow-up of patients who develop cancer.

- **Hospital-Based Cancer Registry:** A cancer registry that uses hospital records as the primary data source for identification of cases.
- **Pathology-Based Cancer Registry:** A cancer registry that uses pathology laboratory records as the primary data source for identification of cases.
- **Population-Based Cancer Registry:** A cancer registry that attempts to collect information on at least 95 percent of the incident cancers occurring in the individuals residing within a defined geopolitical region.

Carcinoma: A malignant tumor of epithelial origin.

Case-Control Study: A study in which individuals with a particular condition such as cancer (referred to as cases) are selected for comparison with individuals in whom the condition is absent (controls). Cases and controls are compared with respect to past exposures, risk factors, or attributes thought to be relevant to the development of the condition under study.

Glossary

Cell Type: See Histologic Type.

Central Nervous System (CNS): Brain, meninges, spinal cord and cranial nerves.

Clinically Diagnosed: Refers to cancers which are not histologically confirmed, but are instead diagnosed through other means—for example, through imaging procedures such as CT scans. Cancers which are only clinically diagnosed and have no microscopic confirmation are not collected by MCSS.

Cohort: In this report, cohort refers to a group of people with one or more common characteristics. Researchers follow cohorts over time, often to see if certain members are at higher risk than others of developing a disease like cancer.

Completeness: In the context of cancer surveillance, it is the ascertainment of all newly diagnosed cases of cancer occurring in Minnesota residents.

Death Clearance: A quality control activity that links MCSS' database of incident cancers with Minnesota cancer-related death certificates. Any death certificates that do not have a corresponding match in the MCSS database indicate a cancer that may have been missed. MCSS staff members follow up each of these cases to see if the cancer should have been included in the database.

Demographic Data: Descriptive information such as name, social security number, address, age, and sex, that is useful in identifying individuals or their geographical location of residence.

Epidemiology: The study of health conditions (e.g., cancers, injuries, etc.) by looking for patterns of occurrence by time, place, or person in the hopes of finding causes or identifying control measures for the condition.

Etiology: The study or theory of the causation of any disease; the sum of knowledge regarding causes.

Expected Number of Cases: The number of cases (of a cancer) expected in a given population in a given time period if the incident rates for that cancer were the same as the rates in a comparison population, adjusting for age differences of the two populations.

Histologic Type: “Histo” refers to tissue, and histologic type refers to the type of tissue in which a tumor originated, e.g., glandular tissue, connective tissue, etc.

Histologically Confirmed: Refers to a tumor of which at least a piece has been examined microscopically and diagnosed by a pathologist or other specialist.

Hospital-Based: See Cancer Registry.

In Situ: Preinvasive cancer; a cancer that is diagnosed before it penetrates too deeply.

Incidence Rate: The rate at which new events (in this case, cancers) occur in a population. It is usually expressed as a number per 100,000 persons per year.

Incident: A newly-diagnosed cancer from a defined population, within a specified period of time.

Invasive: The tendency to spread to adjacent healthy tissues. Technically, “invasive” means the carcinoma has penetrated the basement membranes and is close to blood vessels.

Lifetime Risk of Cancer: An approximate measure of the chance of developing cancer in an individual's lifetime.

Malignant: Tending to become progressively worse, to spread, and invade other tissues.

MCHS: Minnesota Center for Health Statistics.

MCSS: Minnesota Cancer Surveillance System.

MDH: Minnesota Department of Health.

Metro (Metropolitan): In this report the metro area refers to Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties.

Minnesota Resident: Defines the population of individuals on whom cancer occurrence information is being collected by the MCSS.

Mortality Rate: A measure of the rate at which deaths occur in a population (the number of deaths occurring in a defined period of time divided by the total number of people in the population during that period of time).

NCI: National Cancer Institute.

Non-Metro (Non-metropolitan): In this report, non-Metro refers to all Minnesota counties except Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington.

Non-Identified File: A set of electronic records from which the identity of any one individual cannot be deduced.

Observed Number of Cases: The actual (also called crude) number of cases of a cancer recorded for a given population for a given time period.

Pathology: The branch of medicine that studies the essential nature of disease, especially the structural changes in tissues or organs associated with disease.

Pathology-Based: See Cancer Registry.

Population: All the inhabitants of a given area considered together; the number of inhabitants of a given area.

Population-Based: Pertaining to a population defined by geopolitical boundaries; this population is used as the denominator in calculating rates. For the MCSS, this is the State of Minnesota. (Also see Cancer Registry.)

Primary Site (Site): The place in the body where the cancer first arose.

Quality Control: The steps taken to avoid making errors and to find and correct errors before the data are added to the master database.

Rapid Ascertainment: The process by which cases are reported within a shorter time than through the routine process.

Record Linkage: The process of comparing two records from different sources, deciding if the records correspond to the same individual or entity, and then taking some action based on that decision.

Risk Factor: An attribute or exposure that is associated with an increased probability of developing a condition or disease, but does not necessarily imply cause and effect.

SEER (Surveillance, Epidemiology and End Results): An ongoing, population-based cancer surveillance system sponsored by the National Cancer Institute that monitors cancer incidence, treatment, and follow-up in nine or eleven U.S. regions comprising approximately 10 or 14 percent of the U.S. population depending on which years of data are examined.

Stage (of a tumor): Stage at diagnosis classifies how far a cancer has progressed, in order to determine the best course of treatment and to predict a patient's prognosis. Although there are various staging systems in use, two of the most well-known are:

- General Summary Stage (GSS), developed for the National Cancer Institute's SEER Program, which categorizes tumors as in situ, localized, regional, distant (see specific terms for further definitions); and
- The American Joint Committee on Cancer's TNM system, which incorporates information on the size of the tumor; which (if any) lymph nodes are affected; and whether the tumor has spread to distant organs, and then assigns a cancer-specific stage (e.g., Stage IIA breast cancer).

Certain cancers, such as leukemias, may be staged differently. Clinicians use prognostic factors specific to these cancers to determine the appropriate course of action.

Surveillance: The systematic collection, analysis, and interpretation of data pertaining to the occurrence of specific diseases (in this report, cancer).

- **Active Surveillance:** The reporters of disease are contacted at regular intervals and specifically asked about the occurrence of the disease under surveillance. This is considered the most ideal and complete form of surveillance.
- **Passive Surveillance:** Reporting of the disease in question is initiated by the reporting source.

Tumor: A mass resulting from the abnormal growth of cells. Tumors may either be benign (with little tendency to spread throughout the body) or malignant (with a tendency to spread throughout the body). Malignant tumors are synonymous with cancer.

Underlying Cause of Death: The disease or injury that initiated events resulting in death.

Appendix E: Statistical Methods

Estimated Annual Percent Change (EAPC)

The EAPC was calculated using the same method as employed by the NCI's SEER program. A regression line was fit to the natural logarithm of the rates (r) using the calendar year as the independent variable. That is, $y = mx + b$ where $y = \ln(r)$, x = the calendar year, and m is the slope of the line. The EAPC was estimated as $100(e^m - 1)$. The determination of whether the EAPC was different than zero was made by testing whether the slope of the regression line was statistically different than zero.

Regression

There are many models for creating a regression line that "best fits" empirical data. The purpose of modeling the data is to smooth out random variation from an underlying relationship and to enhance the parsimonious interpretation of that relationship.

Least square regression used in the report is one of the methods used to model data (e.g. cancer incidence rates as a function of calendar year). A straight line is estimated that minimizes the square of the difference between the observed and expected values. In this context, the best fitting straight line is the one that minimizes this difference. Once the characteristics of the best fitting line are determined, analytic parameters, such as slope and intercept required for specific estimates, can be easily defined.

Standard Error of Age Standardized Rates

Age-standardized rates are computed from weighted averages of the age-specific rates. The weights were calculated from the 2000 U.S. census as the proportion of the total census that the specific age group represents. Age-standardized rates are then considered age-adjusted in that differences in age distributions of two populations will not distort the comparison of the (directly) age-standardized rates.

The statistical inference whether the rates are different requires consideration of the variability (standard error) of the age-standardized rates. Keyfitz (*Human Biology* 26:301-7, 1966) developed estimates of the standard error using the Poisson probability distribution. The larger the population and the resultant number of cases, the smaller the standard error of the estimated rate.

