

IX. TECHNICAL SECTION

To comprehend and interpret cancer data, it is important to understand the sources of data, collection methods, data quality, and the significance of reported measures.

The following section provides the essential background for understanding and interpreting the data contained in this report.

A. DATA SOURCES

Oregon Incidence Data – All cancer incidence data were obtained directly from the Oregon State Cancer Registry. A number of changes in cancer incidence reporting and collection were implemented in 2001, including transitions to Summary Stage 2000 and ICD-O-3. These changes create problems when comparing data across years. However, the updated reporting requirements and coding guidelines are intended to reflect current medical knowledge of the behavior, pathology, prognosis, and treatment of cancers, and should increase the applicability of registry data for surveillance and research.

Specifically, incidence for ovarian cancers, lymphomas, leukemias, and other hematopoietic diseases will be difficult to compare across years due to changes in ICD-O-3 definitions and reporting requirements implemented in 2001. In addition, comparing stage data for lung, ovarian, and colorectal cancers across years is problematic based on the new Summary Stage 2000 guidelines.

Changes in Stage Coding - Staging is the grouping of cases into broad categories based on extent of disease. Summary Stage is a coded format that has been used by cancer registries since 1977. It allows electronic analysis of cases with similar characteristics. Increasing stage number means more

widespread involvement or severity. New guidelines for staging cancer, called Summary Stage 2000, were put into effect for cancer cases diagnosed on or after January 1, 2001.

Overall, changes in the guidelines should result in increased accuracy and consistency in coding of stage. Instructions are highly detailed, site-specific, and include illustrations to assist coders. However, the new guidelines have differences in determining stage and some sites are coded differently. For instance, a lung cancer with a separate tumor nodule in a different lobe (same lung) was staged as localized using Summary Stage 1977, but is now coded distant/metastatic in Summary Stage 2000.

This means, for some sites, comparing stage data from 1996-2000 with data from 2001 to the present is difficult. In particular, the staging criteria for lung, ovarian, and colorectal cancers have changed with Summary Stage 2000. However, differences in coding stage reflect a new understanding of the natural history of cancer, and the new criteria should improve the usefulness of staging as an accurate predictor of prognosis and survival for cases staged under the new system. The new guidelines are detailed in *SEER Summary Staging Manual – 2000* available on the web at: <http://seer.cancer.gov/tools/ssm/>.

Changes in Reportable Cancers –The International Classification of Diseases for Oncology (ICD-O) has been the standard coding system for neoplasms for over 25 years. ICD-O includes a four-character code for primary site, four-digit numeric code for cell type, one-digit code for tumor behavior, and a one-digit code for tumor aggressiveness. An updated version of the ICD-O system, ICD-O-3, is used for cases diagnosed on or after January 1, 2001.

The changes in ICD-O-3 do not affect primary site codes but there are significant changes regarding cell type (histology). This affects leukemias and lymphomas particularly. A small number of cancers that were coded as borderline behavior are now coded as malignant, including refractory anemia, polycythemia vera, papillary meningioma, and a number of other hematopoietic diseases. (See *Appendix A*.) There are a number of previously reported borderline tumors of the ovary that are now considered benign. This means that counts of ovarian cancers, lymphomas, leukemias, and some hematopoietic diseases will change due to changes in reportability or definition. As with coding of stage, it is difficult to compare cases for those cancer sites diagnosed on or after January 1, 2001, with data from prior years. Nevertheless, like Summary Stage 2000, these amendments reflect advances in the understanding of pathology and behavior of cancers.

Other changes in ICD-O-3 include new codes, terms, synonyms, and guidelines intended to improve accuracy and consistency of coding. The ICD-O-3 manual is available from the World Health Organization's North American distributor, WHO Publications Center USA, 49 Sheridan Avenue, Albany, NY 12210.

Oregon Mortality Data – Cancer mortality data include all deaths among Oregon residents with malignant tumors as the primary

cause of death. These data exclude cases in which benign or *in situ* neoplasms or those of unknown behavior are listed as the cause of death, with the exception of newly reportable cases based on the 2001 adoption of ICD-O-3.

All of the cancer mortality data were obtained from the Center for Health Statistics (CHS) death certificate database. CHS is the state's depository for all vital records and is a major information source for vital statistics and health survey data about Oregonians. Mortality data from this report are age-adjusted and are, therefore, not comparable to the crude rates published by CHS. Moreover, invalid age or cause of death codes are excluded, so mortality counts presented in this report may differ from data presented in CHS publications.

Changes in Cause-of-Death Coding

There has been a methodological change that alters how mortality data are presented but does not represent a true variation in the underlying burden of cancer in Oregon. In 1999, vital record departments across the nation were required to switch from the ninth revision of the International Classification of Diseases (ICD) to the tenth revision for recording cause of death. The ICD is the classification system used to code and classify mortality data from death certificates. The ICD has been revised approximately every ten years since the first international conference in 1900. The intent of the revisions is to reflect changes in disease nomenclature and understanding of etiology. ICD-10 is far more detailed than ICD-9 with approximately 3,000 additional codes. ICD-10 also uses an alphanumeric system, whereas ICD-9 is numeric only. The ICD-10 system is closely compatible with the ICD-Oncology (ICD-O) system used for reporting cancer cases, based on site of origin, whereas the ICD-9 system was not entirely compatible.

Although the ICD-10 and ICD-O systems correspond more directly with each other, switching to the ICD-10 system creates issues affecting the interpretation of mortality data over time. For cancer deaths, the number of overall cancer deaths using the ICD-9 and the ICD-10 systems is essentially the same; however, causes of cancer death are moved among different sub-categories.

One notable change in cancer mortality coding involves lung cancer deaths. Lung cancer is classified as secondary to some other cancers in ICD-10. Therefore, some of the deaths classified as lung cancer in ICD-9 were moved to one of 15 other primary sites in ICD-10. The result is a lower number of cancer deaths defined as lung cancer. *This is an artifact due to a change in classification and not a true change in mortality.*

Another important change for cancer death coding involves cancers with multiple primary sites. Using the ICD-9 system, individuals who died with two primary cancer sites were classified based on the site first listed on the death certificate. Under the new ICD-10 system, the same individuals are coded into the miscellaneous site group. The result is a higher rate of cancer deaths determined as miscellaneous cancer site and lower rates of cancer in sites with common secondary cancers such as oral cancer. *This is an artifact due to a change in classification and not a true change in mortality rates.*

An additional change in cancer coding in ICD-10 concerns mesothelioma. Mesothelioma is a rare form of cancer with cancerous cells found in the lining of the chest (pleura) or abdomen (peritoneum). This cancer was indistinguishable from respiratory and digestive system cancers in the ICD-9 system. The new ICD-10 coding creates a separate site code for these cases. The result

is a decrease in the number of respiratory system cases, which comprise the majority of malignant mesotheliomas.

Oregon Screening Data – Cancer screening data were obtained from the Behavioral Risk Factor Surveillance System (BRFSS) maintained by Oregon’s Center for Health Statistics. BRFSS is an ongoing random-digit-dialed telephone survey of adults concerning health-related behaviors. Information is used to guide health promotion and disease prevention programs. BRFSS includes questions on health behavior risk factors such as seat belt use, diet, weight control, tobacco and alcohol use, physical exercise, preventive health screening, and use of preventive and other health care services.

Oregon Population Data – Denominators used to calculate Oregon incidence and mortality rates are population estimates from the Population Estimates Branch of the US Census Bureau. Denominator data for 1996-1999 were based on the State and County Characteristics Population Estimates from the 1990 and 2000 US Census. Denominator data for 2000-2003 were based on the National Center for Health Statistics (NCHS) estimates of the July 1, 2000-July 1, 2003, United States resident population from the Bridged-race Vintage 2003 postcensal population estimate by year, county, single-year of age, bridged-race, Hispanic origin, and sex prepared under a collaborative arrangement with the US Census Bureau 2003. Available on the Internet at: <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm>.

Prior to the US 2000 Census, race was reported as only one category, whereas in 2000 respondents were allowed to report one or more races. Registry data, or numerator data, are also single race categories. It is essential to have comparable numerator

data (cancer counts) and denominator data (population counts) to calculate rates. Therefore, population data for years 2000 forward are 2000 US Census data bridged from a multiple-race count with 31 race categories to a single-race count with four race categories. Allocation probabilities developed by the NCHS were applied to the Census Bureau's April 1, 2000, Modified Race Data Summary File population counts to assign multiple-race responses to single-race categories. See the NCHS website <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm> for specific information about the bridging methodology.

National Data – National incidence data were calculated from the Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence-SEER 13 Registries (Atlanta, Connecticut, Detroit, Hawaii, Iowa, Los Angeles, New Mexico, San Francisco-Oakland, San Jose-Monterey, Seattle-Puget Sound, Utah, rural Georgia, plus the Alaska Native Tumor Registry) Public-Use Data (1992-2003), National Cancer Institute (NCI), DCCPS, Surveillance Research Program

(SRP), Cancer Statistics Branch (CSB), released April 2006, based on the Nov 2005 submission. SEER data were used to calculate a five-year aggregate rate for 1999-2003.

National mortality data were calculated using the National Center for Health Statistics (NCHS) (www.cdc.gov/nchs), US Mortality Public Use Data set included in the SEER (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Public-Use With State, Total U.S. (1990-2003), NCI, DCCPS, SRP, CSB, released April 2006.

National incidence rankings were obtained from the US Cancer Statistics Working Group. *United States Cancer Statistics: 1999-2002 Incidence and Mortality Web-based Report Version*. Atlanta (GA): Department of Health and Human Services, CDC, and NCI; 2005, available at: www.cdc.gov/cancer/npcr/uscs.

National rates used in the Public-Use Database and CDC Wonder were calculated using national Census 2000 population data for denominators.

B. DATA QUALITY

Data Review – When OSCaR receives reports, they are closely reviewed and edited for quality control. The anatomical site of origin of the cancer was known and reported for 98% of cancers reported in 2003. Stage of progression of the cancer at the time of diagnosis was determined for 92% of cancers reported in 2003.

The accuracy and usability of OSCaR data has increased through efforts on several

different levels. Data review protocols to review Hispanic ethnicity for American Indians and Filipinos have been instituted to increase accuracy of ethnicity data. Increased use of Registry data in linkage projects through academic research as well as general registry operations like death clearance (see page 101) helps ensure that Registry data are reviewed and corrected on many levels in addition to the standard internal data review protocols.

One notable effort is in race coding for American Indians/Alaskan Natives (AI/AN). Due to a cooperative effort among state registries, the Northwest Portland Area Indian Health Board (NPAIHB), the Indian Health Service (IHS), and the Centers for Disease Control and Prevention (CDC), OSCaR links annually with local tribal clinic registry data and national IHS patient data to determine if AI/AN are miscoded as white or some other race. One-third of the AI/AN cases currently in the OSCaR database were identified through data linkages and have been corrected due to this effort.

In addition to internal Registry operations, OSCaR conducts audits of reporting hospitals and facilities across the state to assess quality and completeness of data maintained in the central registry. Initially, hospitals to be audited were selected based on the identification of reporting problems (i.e., a high number

of missed cases). However, because overall reporting has improved from early years, the Registry now performs random facility audits every quarter. Hospitals are divided into groups based on the total number of hospital patients. The sampling method used ensures that all sizes of facilities are selected each time for auditing. OSCaR is beginning to audit other reporting facilities such as freestanding clinics and cancer centers.

External Data Review – Federal funding requires that OSCaR is audited by an outside agency every five years to assess the quality and completeness of registry data. In July 2003, Macro International Inc. conducted an audit of OSCaR data. The results of the audit estimated OSCaR's overall case completeness rate as 98.9%, and the overall data accuracy rate for 13 essential data elements was 96.0%. OSCaR was commended for exceeding national standards for both outcomes.

C. CANCER REPORTING

The North American Association of Central Cancer Registries (NAACCR) annually reviews cancer registries for their ability to produce complete, accurate, and timely data. The NAACCR certification program recognizes registries that meet the highest standards with a Gold or Silver Certification. OSCaR data for diagnosis year 2003 received Gold Certification. OSCaR has received certification for every year of complete data. Additional information about NAACCR certification is available on the web: http://www.naacr.org/index.asp?Col_SectionKey=12&Col_ContentID=54.

Reportable Cancers – Not all cancers diagnosed in Oregon are reportable to the Oregon

State Cancer Registry (OSCaR). Reportable cancers include all malignant neoplasms that are *in situ* or invasive (ICD-O behavior codes 2 and 3) with the following exceptions:

- Basal and squamous cell carcinoma of the skin (except of genitalia)
- Carcinoma *in situ* of the cervix

Although incidence is high for these cancers, they have an extremely high treatment success rate. In addition, *in situ* cervical cancer is a diagnosis that is inconsistently used. Carcinoma *in situ* of the cervix overlaps with some diagnoses that indicate precancerous conditions.

Reporting Source – By law, outside of the above exceptions, all cancers diagnosed or treated in Oregon must be reported to OSCaR by the patient’s physician. However, most hospitals retain cancer registrars that are trained to collect and report cancer cases in accordance with national standards. Most of the cases included in this report were reported from hospitals by cancer registrars. Some case reports originated from doctors’ offices and a few from death certificates. Since cancer reporting started in 1996, 88% of new cancer diagnoses have come from hospitals, 11% from physician offices, and 1% were identified from review of death certificates. The remaining cases were identified by review of pathology reports from laboratories or by autopsy. Many of the physician office cases were initially identified through active follow-up from laboratory reports or death certificates, and the physician was queried for additional information.

Death Clearance – Death clearance is a process used to identify cases diagnosed by a physician but not reported to the Registry, as well as cases diagnosed through autopsy. Death certificates are compared, or cleared, with Registry files. Deaths due to cancer that are not found in the Registry are investigated further by contacting the certifying physician listed on the certificate. Cases with no physician response and subsequent report are classified as death certificate only (DCO) cases. Cases for which a response and full report are received are classified as a physician office report. Deaths due to cancer diagnosed prior to the Registry’s first reporting year, 1996, are not included in the Registry.

Full death clearance procedures were not necessary during the first few years of Registry operation since most of the cancer deaths were due to cancers diagnosed

prior to 1996. Initially, death clearance was performed only for selected cancer sites that have known short-term survival.

Initial death clearance efforts focused on deaths due to cancers of the esophagus, liver, lung, pancreas, stomach, multiple myeloma, and cancers with unknown primaries for years 1996-1998. For the year 1998, lung cancer deaths were aggressively reviewed in this process. For the year 1999, death certificate review procedures were expanded to include all cancer sites. Consequently, there is a higher percentage of cases reported from death certificates since 1999. Typically, cancer cases identified by death certificate are those with a poor prognosis, often with stage distant or not determinable due to the patient’s health.

Due to increased review, more DCO cases were identified from 1999 to present. These cases differ from other cases due to increased severity of disease and lack of information about the cases. DCO cases are staged unknown due to lack of information. This requires caution when comparing stage of diagnosis from year to year.

Changes in the death clearance process resulted in increased data quality and completeness for diagnosis year 2000 onward. Prior to 2000, Registry cases and the death certificate data were linked on Social Security Number in an external system. Any cancer deaths not reported in the Registry were followed back to the physician or hospital to see if they were missed cases. The death clearance process is now performed using an automated program within the main Registry system. The deterministic match criteria are extremely stringent and have resulted in the identification of thousands of discrepancies in demographic information

between death certificate data and the Cancer Registry. The discrepancies are reviewed and corrected.

This process improves completeness of race data reporting by supplying race information from the death certificate on cases in the Registry that were reported as *unknown* race. Gender data was also improved. Discrepancies between the death certificate and registry data for sex of male breast cases prompted further review of these cases. In 1999, 24 male breast cancer cases were reported. After review of each case, only 17 were actually male. Seven of the cases had been miscoded and were in fact female.

Primary Site Definitions – Cancer data presented in the current incidence and mortality sections of this report follow nationally accepted standards for groupings of site categories for analysis. Cancer groupings for analysis are classified using the National Cancer Institute’s SEER Program Recodes. (Please see Appendices F and G.) The majority of neoplasms are grouped by the organ in which they originate. Neoplasms of the lymphatic, hematopoietic, and reticuloendothelial systems, however, are grouped by their histologies (leukemias, lymphomas, etc.), and not by the anatomic site where they occurred. Melanoma of the skin is a combination of both anatomic site and histologic type.

For mortality years 1996-1998, the ICD-9 codes did not directly match ICD-O codes. Therefore, minor discrepancies exist for those years between Oregon’s Center for Health Statistics (CHS) counts and the mortality counts reported in this publication. Beginning in 1999, with the change to ICD-10 coding, mortality coding and counts match exactly for most sites. However, since 2001, the all-site mortality and miscellaneous cancer mortality

differ due to the inclusion of newly reportable cancers which are excluded from the CHS counts. Additionally, cases of unknown age or invalid ICD-10 code are excluded from the data in this report, which also results in occasional differences in counts from CHS.

Multiple Primaries – The majority of cancer diagnoses reported to OSCaR were the first primary cancer diagnosed for the patient. However, nearly 20% of the cancer diagnoses occur in individuals with a previous cancer, so the number of cancer cases and number of people with cancer are not the same. Rates are calculated using the number of cancer cases as the numerator and population as the denominator.

Case Ascertainment/Completeness – The Registry conducts random case-finding audits to monitor case-reporting completeness from hospitals, and contacts physician offices that have a reduction in case reporting. Identifying missed cases through review of pathology reports and death certificates is part of normal Registry procedure. Data sharing agreements among neighboring states help identify Oregon residents diagnosed elsewhere.

The 2003 data have a greater than expected number of cases based on national models.

The estimated percentage of case completeness is calculated in accordance with procedures outlined by the North American Association of Central Cancer Registries (NAACCR). However, using mathematical models based on national numbers to estimate reporting completeness for individual states has inherent limitations and is the subject of national debate.

D. EPIDEMIOLOGIC MEASURES

Cancer Rates – In analyzing Oregon’s cancer data, we looked at various measures commonly used in epidemiologic studies of cancer. One measure is a rate. Rates help compare the burden of disease across populations of various sizes.

Incidence rates provide information on the frequency with which cancers occur in the population. Cases of invasive cancer only are included in rate calculations except for cancer of the bladder, which includes *in situ* cases. The mortality rate describes the frequency of deaths due to cancer.

All rates in this report are per 100,000 population. Rates based on counts <11 are unstable and are not presented.

Crude Rates – Crude rates are used when a summary measurement is needed and there is no need to adjust for confounding factors, such as age. Since cancer risk is very dependent upon age, age-adjusted rates are more useful for comparison among regions, time periods, etc. Crude rates are not included in the tables in the annual report but are still reported for individual sites in the *Selected Sites* sections.

The denominators in Figure IX-1 can be used to calculate additional crude rates.

Figure IX-1

Oregon’s Population by Year			
Year	Total	Male	Female
1996	3,247,111	1,604,527	1,642,584
1997	3,304,469	1,634,309	1,670,160
1998	3,352,449	1,659,190	1,693,259
1999	3,393,941	1,681,715	1,712,226
2000	3,430,707	1,701,604	1,729,103
2001	3,472,629	1,723,589	1,749,040
2002	3,520,355	1,748,055	1,772,300
2003	3,559,596	1,768,478	1,791,118

Age-Adjusted Rates – Age-adjusted rates are calculated to allow comparisons between two different populations (i.e., Oregon and US) whose age distributions differ. Age-adjusted rates are calculated by direct method, using the age distribution of Year 2000 United States Standard Population. All age-adjusted rates are expressed as events per 100,000 individuals per year.

In the past, a number of different standard populations have been used. Most vital statistics data were age-adjusted using a standard population based on the 1940 United States population. Most cancer data were age-adjusted using a standard population based on the 1970 United States population. Age-adjusted rates calculated using different standard populations are not comparable. All age-adjusted rates presented in this report are calculated using the Year 2000 Standard to ensure comparability.

Year 2000 Standard has a higher percentage of individuals in middle and older age groups. Hence, more weight is applied to cancer cases or deaths of individuals in these age groups using the direct standardization method. These are the same age groups that have higher numbers of cancer. Using the Year 2000 Standard for age-adjusting results in cancer rates that are higher than rates using older population standards.

Childhood Cancer Classification – The classification system used in this report to record the occurrence of childhood cancer is the International Classification of Childhood Cancer (ICCC), which was developed by the World Health Organization’s International Agency for Research on Cancer (IARC). This system places greater emphasis on tumor morphology than does the International Classification of Diseases (ICD) classification system, which emphasizes tumor location.

Childhood cancers are defined as cancers diagnosed in individuals less than 15 years of age. The five-year age group stratification for childhood cancers is 0-4, 5-9, and 10-14. The following are included in the IARC classification system for lymphomas: Hodgkin lymphoma, non-Hodgkin lymphoma, Burkitts lymphoma, Histiocytosis X, unspecified lymphomas, and other reticuloendothelial neoplasms. Histologic confirmation is obtained on nearly every diagnoses of childhood cancer reported to OSCaR.

Geographic Comparisons

County Comparisons – This report compares incidence and mortality rates by county. These analyses may help target screening and/or educational efforts. Because some counties with small populations only have a few cases reported, rates for those counties are unstable and must be interpreted with caution.

Regional Comparisons – Regional maps depict “smoothed” or fitted county rates and should not be used to evaluate individual county rates. Data smoothing is a statistical technique intended to limit the influence of randomness in data. Through this process, information (cancer rates) are interpolated or “borrowed” from neighboring areas to stabilize results for less populated areas.

The statistical algorithm used for the regional maps is a weighted, median-based method intended for non-point, spatial data called “head-banging”. The observed rate for each county is compared to the median rates of neighboring counties. The county rates are weighted by population size to ensure that statistically stable rates are not modified based on rates from sparsely populated counties. Please see <http://srab.cancer.gov/headbang/> for additional information.

This process stabilizes the county cancer rates for counties with low population density to allow potential geographic patterns to emerge. However, the smoothed rates for individual counties are not appropriate for single county comparisons. To compare single county rates, please use the county rates presented in Tables 3 and 4.

Incidence Counts – All primary reportable malignancies diagnosed among Oregon residents are reported to OSCaR. Cases are categorized based on the International Classification of Diseases for Oncology (ICD-O) and are presented using the Surveillance, Epidemiology, and End Results (SEER) Program recodes. (See Appendix F.)

Cancer counts represent the number of primary cancers reported to OSCaR, not the number of persons with cancers. People may be diagnosed with more than one primary tumor (e.g. lung cancer and Hodgkin lymphoma), and, therefore, counted as more than one case. About 20% of the cases reported to OSCaR occur in a person who has already been diagnosed with another cancer.

The number of cancers is reported in two ways – *total* cancers and *invasive* cancers. The invasive cancer category excludes *in situ* cancers with the exception of urinary bladder cancer. The *Total* cancer category includes all cancers, regardless of stage at diagnosis, with the exception of cervical cancer since *in situ* cervical cancer is not reported to the Registry.

The *All Sexes* and *Total* categories used in this report for cancer incidence include cases defined as male, female, and other (i.e., hermaphrodite, transsexual) and may exceed the total of male and female alone.

Prognosis and Burden – Several methods are used to measure the prognosis and burden of cancer within a defined population. In this report we use two such measures: mortality-to-incidence ratio (M/I ratio) and years of potential life lost (YPLL).

The M/I ratio provides a measure of disease severity. The M/I ratio is the number of deaths among a population divided by the number of invasive cases (of that particular cancer) within the same population. In general, the higher the value, the poorer the prognosis for that cancer site. Occasionally, a M/I ratio will exceed 1.0 when there are more deaths than diagnoses within a particular time period.

The years of potential life lost (YPLL) index quantifies premature mortality from cancer occurring in younger age groups. YPLL can be interpreted as lost productive years (both economic and non-economic) that a person dying prematurely of cancer would have contributed to society had he or she survived. A person dying of cancer at age 35 would have 30 more YPLL than a person dying of cancer at age 65.

Race and Ethnicity – The data used in the *Race and Ethnicity* section of the overview do not include cases with race or ethnicity listed as “unknown”. The 2003 “unknown” race category was 2% of cases, and the 2003 “unknown” Hispanic origin category was also 2%. There are ongoing Registry efforts to improve the quality of race and ethnicity reporting from hospitals.

Software – All incidence and mortality counts were generated using SEER*Stat [Surveillance Research Program, National Cancer Institute SEER*Stat software (www.seer.cancer.gov/seerstat) Version 6.2.3, May 5, 2006]. Data were formatted for SEER*Stat using SEER Prep [Surveillance Research Program, National Cancer Institute SEER*Prep software Version 2.3.2.,

February 2005]. Historical trends were calculated using Joinpoint Regression Software [(www.srab.cancer.gov/joinpoint) Version 3.0, April 2005, National Cancer Institute]. Smoothed rates for regional maps were calculated using Headbang [Hansen Simonson and Surveillance Research Program, NCI Headbang software (<http://srab.cancer.gov/headbang>) Version 3.0].

Trends – All trends are calculated using age-adjusted rates and reported as an annual percent change (APC). The APC is calculated by fitting a weighted, least-squares regression line to the natural logarithm of the rates using year as a regressor variable.

Current Five-Year Trends – These trends are calculated using two-year averages of the age-adjusted rates as endpoints. The trends are used to compare general Oregon trends with national trends based on direction (increase or decrease) and slope (rapid or slow change). This trend analysis is intended to describe broad, temporal changes of cancer rates in Oregon.

Historical Trends – Historical trends are calculated using age-adjusted rates for all years of data (1996-2003, eight years, for this report). Because of limitations due to a small number of years of data, analysis was done assuming no joinpoints (constant annual percent change for all years) and then compared to results using one joinpoint to determine if any change in trends is statistically significant. The number of joinpoints considered statistically significant is determined using the permutation test. In subsequent years, the number of joinpoints analyzed will increase with increasing years of data available for analysis. The purpose of these trends is to describe temporal changes in Oregon cancer rates.