

## Methodology for the Stage Distribution

### Inclusion/Exclusion Criteria

- Cancer cases are classified according to the *International Classification of Diseases for Oncology - Third Edition (ICDO-3)*
- Disease sites are based on the Canadian Cancer Statistics (CCS) groupings with colorectal separated out into colon (C18 and C19, using ICDO-3 diagnosis codes) and rectal (C20). For further details please refer to <http://www.bccancer.bc.ca/statistics-and-reports-site/Documents/Cancer%20Definitions.pdf>
- Stage data were obtained using the Collaborative Stage (CS) Data System, which was derived using the seventh edition of the TNM staging definitions from the American Joint Committee on Cancer (AJCC) (<http://www.cancerstaging.org/cstage/Pages/default.aspx>).
- The stage reports consists of three separate reports
  - Stage Distribution
  - Stage Distribution by Age
  - Age-standardized Incidence Rate by Stage

### Inclusions:

- We only report stage distribution for Lung, Colorectal, Colon, Rectal, Female Breast, Prostate and Cervical cancer because the collaborative stages are only available for those cancers. We calculate colon and rectal separately because the stage distribution as well as the survival estimates of the two cancer types are quite different.
- BC residents at time of diagnosis
- Adult cases only (*age at time of diagnosis greater than or equal to 18 years*)
- Invasive/malignant cancer cases
- Stages I–IV and stage unknown (stage unknown is assigned when stage information is insufficient to determine a stage).

### Exclusions:

- Cases that were not staged, cases that were In Situ and Occult stage (Occult cases were derived for lung cancers).
- Sarcoma histology codes provided by the Canadian Partnership Against Cancer (CPAC):  
8710, 8800-8806, 8810-8814, 8832-8833, 8840, 8850-8858, 8890-8896, 8900-8902, 8910, 8912, 8920-8921, 8930-8931, 8933, 8935-8936, 8963-8964, 8991, 9040-9044, 9051, 9120, 9124, 9140, 9170, 9180-9187, 9192-9195, 9220-9221, 9231, 9240, 9242-9243, 9250-9252,



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9260, 9270, 9290, 9330, 9342, 9442, 9480, 9530, 9539, 9581, 9591, 9662, 9684, 9740, 9755-9758, 9930

(8980-8981 are included because they are included in AJCC 7<sup>th</sup> Edition for the cancer sites listed in this report. These codes are grouped with the above histology codes as sarcoma cancer and hence excluded for other cancer types in our survival reports).

### **Calculation of cancer stage distribution**

The percentage of a specific cancer stage was calculated as the proportion of the rounded incidence count of the stage to the rounded incidence count of all five stages included in the report. The actual cancer incidence counts were rounded using an unbiased random rounding procedure to prevent inappropriate disclosure of information (details are in the section of “Rounding for report”). The percentages were rounded to the nearest 10<sup>th</sup>.

The stage distribution for female breast, colorectal, lung, and prostate cancers were calculated using the number of cancer cases diagnosed in a specific year. The rounded yearly counts for overall stage were also presented in the report. Stage distributions in the most recent three years were included in the report to make a comparison over the years.

The number of cancer cases for some stages diagnosed in a single year for cervical, colon, or rectal cancers was small and calculations based on rounded counts resulted in inaccurate stage distributions. Therefore percentages per stage group were calculated using 4-year counts combined. The total number of cancer cases diagnosed in specified four years were randomly rounded to calculate stage distributions. Stage distributions in the most recent three 4-year periods were included in the report to make the comparison over the 4-year periods. The average of rounded 4-year counts for overall stage were rounded to the nearest integer and reported as annual counts for the specified diagnosis years.

### **Calculation of cancer stage distribution by age**

Three age groups were used in this report: 18-59, 60-79, and  $\geq 80$  in order to be consistent with our incidence report and CCS 2018 stage report. Cervical, colon and rectal Cancer are excluded from the “stage distribution by age” report because the numbers are too small to provide reliable estimates for some age categories. Percentages per stage group for each age group for female breast, colorectal, lung and prostate were calculated using 4-year counts combined. The total number of cancer cases diagnosed in specified four years were randomly rounded to calculate stage distributions. Stage distributions in the most recent three 4-year periods were included in the report to make a comparison over the periods. The average of rounded 4-year counts for overall stage were rounded to the nearest integer and reported as annual counts for the specified diagnosis years.



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## Calculation of age-standardized incidence rate by stage

Age-standardized rates were calculated using actual age-specific counts because they combine data across multiple age groups. Age-specific rates per 100,000 population for a specific cancer stage were calculated as the ratio of age-specific counts for this stage to the population of the same age groups multiplied by 100,000. Population estimates are from PEOPLE 2018 produced by BC Stats. Then the age-specific rates were standardized to 2011 Canadian population to obtain the age-standardized rates.

Similar to stage distribution, age-standardized rates for female breast, colorectal, lung and prostate cancers were calculated using the number of cancer cases diagnosed in a specific year, whereas cancer cases diagnosed in specific 4 years were used to calculate age-standardized rates for cervical, colon or rectal cancers. Age-standardized rates for the most recent three years or 4-year periods were included in the report to make a comparison over the periods.

## Rounding for report

To prevent inappropriate disclosure of information, the actual count within a given cell or the actual total counts for 4-year combined data was randomly rounded to a lower or higher multiple of 5. True zeros and actual counts evenly divisible by 5 were not affected. Specifically, an unbiased random rounding procedure was applied to each cell count independently such that numbers ending in 0 or 5 were not rounded; numbers ending in a 1 or 6 were rounded up with a probability of 0.20 and down with a probability of 0.80; numbers ending in 2 or 7 were rounded up and down with probabilities of 0.40 and 0.60, respectively; numbers ending in 3 or 8 were rounded up and down with probabilities of 0.60 and 0.40, respectively; and numbers ending in 4 or 9 were rounded up and down with probabilities of 0.80 and 0.20, respectively. Consequently, columns and rows that are additive will sum to totals only by chance. By design, differences between the rounded and actual counts will never exceed 4 and actual counts are more likely to be rounded to the nearest multiple of 5.

Percentages and age-standardized rates were rounded to the nearest 10th. Average annual counts were rounded to the nearest integer.

## References

1. Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin L, Parkin D, et al. (eds). International Classification of Disease for Oncology, 3rd edition (ICD-O-3). Geneva: World Health Organization; 2000.
2. Collaborative Staging Task Force of the American Joint Committee on Cancer. Collaborative Stage Data Collection System user documentation and coding instructions, version 02.05. Chicago: American Joint Committee on Cancer; 2013.



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3. Edge SB, Compton CC. The American Joint Committee on Cancer: the 7th edition of the AJCC cancer staging manual and the future of TNM. *Annals of Surgical Oncology*. 2010;17(6):1471–4.
4. *Canadian Cancer Statistics 2018*. Toronto, ON: Canadian Cancer Society; 2018. Available at: [cancer.ca/Canadian-Cancer-Statistics-2018-EN](https://cancer.ca/Canadian-Cancer-Statistics-2018-EN) (accessed August 2019).