



Occurrences of Human Cancers, by age, with multimodal distributions

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filename: bimode.pdf

SEER is the U.S. National Cancer Institute's Surveillance, Epidemiology and End Results program. The SEER public use data files cover about 3.5 million de-identified U.S. cancer records for the years 1973 to 2005 and are available from:

<http://seer.cancer.gov/data/>

This document is a compilation of the SEER public use data files, produced by the author, using Perl and Ruby scripts.

A [companion document](#) lists distributions, by age, for over 700 different types of neoplasms contained in the SEER data files.

<http://www.julesberman.info/seerdist.pdf>

This document lists only those tumors that have a bimodal or multimodal distribution, by age (i.e., two or more peaks in

the ages of occurrences of the tumor).

For each cancer, the number of occurrences of cancers for all ages are binned into 5-year intervals, beginning with ages 0-5 and ending with ages 95 and above.

Specifically, each number following the name of the cancer is followed by 20 sequential intervals:

0-4, 5-9, 10-14, 15-19, 20-24....80-84, 85-89, 90-94, 95+

A schematic representation follows each raw distribution.

Purpose

The document provides pathologists with a guideline for the expected occurrences of cancers, by age. A good pathologist should be very careful when he/she assigns a diagnosis that does not "fit" the typical age profile of a cancer.

Epidemiologists may benefit by having a single source, indicating the likelihood of many types of specific cancer, in different age populations.

Researchers may, when reviewing all of the distributions at once, develop new questions and hypotheses that could not have been perceived through piecemeal observations.

Caveats

The crude cancer distributions are simply the number of occurrences of cases in age intervals. Consequently, most crude distributions have a "hump" shape, with a drop-off of cases in the older age groups. This does not mean that older people are less susceptible to cancer than younger individuals. It merely signifies that there are fewer older individuals in the population. The normalized distributions are rates, calculated by dividing the the raw numbers of occurrences, for each age group, by the number of individuals in that age in the general population (1950 U.S. census numbers).

Some cancers are rare and have very few occurrences, even in the large SEER data set. Whether the provided numbers are adequate for any reasonable analysis is a question that you must answer for yourself.

Some cancers listed here have no specific meaning without the context of their anatomic site of origin (e.g., medullary carcinoma of what? breast? thyroid?; adenocarcinoma of what organ?). In these cases, you should be aware of the ambiguity of the term, and you should interpret the distribution data conservatively.

SEER collects data on cancers, not benign neoplasms. The benign counterparts to many of the tumors listed here are missing. For example data is found here for the very rare "malignant" Warthin tumor, but not for the common "benign" Warthin tumor.

Please read the Disclaimer and the Acknowledgment at the end of this document

acute megakaryoblastic leukemia

Crude - 59 1 4 2 2 3 1 8 9 9 15 14 19 24 34 21 21 11



Normalized - 35 0 3 1 1 2 0 7 8 9 18 19 31 47 98 97 181 186



acute monocytic leukemia

Crude - 77 20 27 39 38 46 40 50 72 95 111 122 156 187 184 214
161 131



Normalized - 46 14 24 36 32 37 34 44 69 103 133 167 255 370
534 992 1388 2221



acute myeloid leukemia with maturation

Crude - 7 10 18 9 13 14 11 23 26 37 37 43 44 62 71 72 68 49



Normalized - 4 7 16 8 11 11 9 20 25 40 44 58 72 122 206 334
586 831



acute myeloid leukemia, t(8;21)(q22;q22)

Crude - 2 2 1 3 5 8 2 2 3 9 6 4 9 9 7 6 6 1



Normalized - 1 1 0 2 4 6 1 1 2 9 7 5 14 17 20 27 51 16



adenocarcinoma in situ in familial polyp. coli

Crude - 0 0 1 0 0 2 3 2 2 1 2 1 4 2 2 4 3 0



Normalized - 0 0 0 0 0 0 1 2 1 1 1 2 1 6 3 5 18 25 0



adenocarcinoma, endocervical type

Crude - 0 0 0 0 2 10 17 19 15 21 11 5 5 1 1 6 2 0

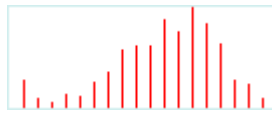


Normalized - 0 0 0 0 1 8 14 16 14 22 13 6 8 1 2 27 17 0

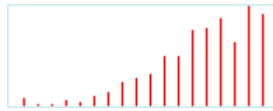


adrenal cortical carcinoma

Crude - 27 10 7 15 12 26 34 56 60 60 84 73 94 80 61 28 23 11



Normalized - 16 7 6 14 10 21 29 49 58 65 101 100 154 158 177
129 198 186



adult t-cell leukemia/lymphoma (htlv-1 pos.)

Crude - 2 0 1 0 5 2 4 15 3 6 9 6 10 8 12 18 16 9

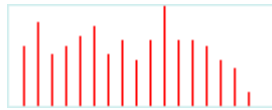


Normalized - 1 0 0 0 4 1 3 13 2 6 10 8 16 15 34 83 137 152



astroblastoma

Crude - 13 18 11 13 15 17 11 14 10 14 21 14 14 13 10 8 3 0



Normalized - 7 13 9 12 12 13 9 12 9 15 25 19 22 25 29 37 25 0



astrocytoma, nos

Crude - 291 323 329 291 345 460 534 529 519 505 595 668 680
794 631 485 240 116



Normalized - 177 241 293 272 295 372 457 466 504 552 715 915
1114 1572 1832 2250 2069 1967

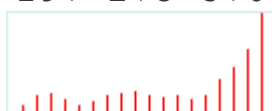


burkitt cell leukemia

Crude - 11 11 7 5 3 6 4 5 6 9 4 6 5 8 12 7 6 3



Normalized - 6 8 6 4 2 4 3 4 5 9 4 8 8 15 34 32 51 50

**burkitt lymphoma, nos**Crude - 81 154 141 95 67 91 125 137 141 103 86 76 50 58 68 59
43 34Normalized - 49 115 125 88 57 73 107 120 137 112 103 104 81
114 197 273 370 576**chondroblastic osteosarcoma**

Crude - 3 7 38 54 32 16 14 11 9 7 8 4 7 4 4 3 3 3



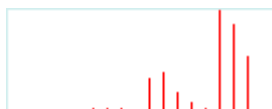
Normalized - 1 5 33 50 27 12 11 9 8 7 9 5 11 7 11 13 25 50

**chromophobe carcinoma**

Crude - 0 0 1 1 1 2 2 2 1 10 10 5 2 1 11 6 2 0



Normalized - 0 0 0 0 0 1 1 1 0 10 12 6 3 1 31 27 17 0



craniopharyngioma

Crude - 5 5 2 2 1 3 4 0 5 7 6 5 3 1 0 1 2 1



Normalized - 3 3 1 1 0 2 3 0 4 7 7 6 4 1 0 4 17 16

**adamantinomatous craniopharyngioma**

Crude - 4 5 2 0 1 1 0 1 2 3 3 3 0 0 0 1 0 1



Normalized - 2 3 1 0 0 0 0 0 1 3 3 4 0 0 0 4 0 16

**dermatofibrosarcoma, nos**Crude - 21 24 75 113 253 400 422 473 425 364 287 220 160 109
122 71 60 35Normalized - 12 17 66 105 216 323 361 416 413 398 345 301 262
215 354 329 517 593**embryonal rhabdomyosarcoma**

Crude - 244 166 86 106 38 21 19 13 13 6 4 12 6 9 5 2 4 2

Normalized - 148 124 76 99 32 16 16 11 12 6 4 16 9 17 14 9 34
33

**ependymoma, nos**

Crude - 218 71 74 49 67 106 94 103 107 107 94 93 69 60 37 27
8 4



Normalized - 132 53 65 45 57 85 80 90 103 117 113 127 113 118
107 125 68 67

**fibrillary astrocytoma**

Crude - 40 36 34 24 41 54 80 56 56 46 53 44 55 63 45 23 8 6



Normalized - 24 26 30 22 35 43 68 49 54 50 63 60 90 124 130
106 68 101

**fibroblastic osteosarcoma**

Crude - 0 4 15 19 13 11 6 5 4 12 5 7 4 3 4 1 0 1



Normalized - 0 2 13 17 11 8 5 4 3 13 6 9 6 5 11 4 0 16

**follicular carcinoma, minimally invasive**

Crude - 0 0 2 7 11 10 21 19 33 30 22 18 9 9 11 8 2 3



Normalized - 0 0 1 6 9 8 17 16 32 32 26 24 14 17 31 37 17 50



glioma, malignant

Crude - 274 299 185 91 83 106 123 145 132 143 173 192 216 259
270 254 231 161



Normalized - 166 223 164 85 71 85 105 127 128 156 208 263 353
512 783 1178 1992 2730



hemangioma, nos

Crude - 1 2 0 1 4 3 2 1 3 3 4 6 2 1 0 2 1 0



Normalized - 0 1 0 0 3 2 1 0 2 3 4 8 3 1 0 9 8 0



hepatocellular carcinoma, fibrolamellar

Crude - 0 1 1 11 20 11 5 9 3 5 5 3 5 5 5 4 2 1

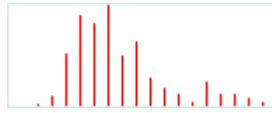


Normalized - 0 0 0 10 17 8 4 7 2 5 6 4 8 9 14 18 17 16

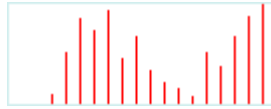


hodgkin lymphoma, nod. scler., grade 1

Crude - 4 7 16 33 51 42 58 45 33 18 20 13 18 11 15 14 11 7

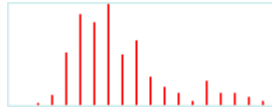


Normalized - 2 5 14 30 43 33 49 39 32 19 24 17 29 21 43 64 94
118



hodgkin lymphoma, nod. scler., grade 2

Crude - 0 2 8 39 68 62 74 37 48 22 14 9 4 18 9 10 7 4

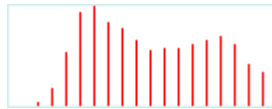


Normalized - 0 1 7 36 58 50 63 32 46 24 16 12 6 35 26 46 60
67



hodgkin lymphoma, nos

Crude - 4 17 57 166 285 299 253 239 200 170 179 177 191 202
214 189 131 105

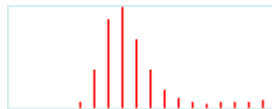


Normalized - 2 12 50 155 243 241 216 210 194 185 215 242 312
400 621 876 1129 1780



kaposi sarcoma

Crude - 0 0 0 11 209 1357 3045 3398 2364 1356 634 349 215 165
218 253 243 290

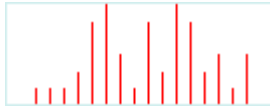


Normalized - 0 0 0 10 178 1097 2608 2994 2297 1483 762 478
352 326 632 1173 2095 4918



leydig cell tumor, malignant

Crude - 0 1 1 1 2 5 6 3 1 5 2 6 5 2 3 1 3 0



Normalized - 0 0 0 0 1 4 5 2 0 5 2 8 8 3 8 4 25 0



malignant histiocytosis

Crude - 32 9 17 12 11 12 5 14 8 12 15 18 26 28 23 21 6 16



Normalized - 19 6 15 11 9 9 4 12 7 13 18 24 42 55 66 97 51
271



papillary mucinous cystadenoma, borderline malignancy (c56.9)

Crude - 0 0 1 0 5 11 9 21 13 11 7 3 4 8 11 4 3 0



Normalized - 0 0 0 0 4 8 7 18 12 12 8 4 6 15 31 18 25 0



precursor b-cell lymphoblastic lymphoma

Crude - 9 9 10 5 3 0 1 1 1 0 0 5 3 0 1 0 0 1



Normalized - 5 6 8 4 2 0 0 0 0 0 0 6 4 0 2 0 0 16



precursor cell lymphoblastic lymphoma, nos

Crude - 66 84 89 86 74 74 79 51 38 40 26 39 44 42 46 36 32 17



Normalized - 40 62 79 80 63 59 67 44 36 43 31 53 72 83 133
167 275 288



precursor t-cell lymphoblastic leukemia

Crude - 15 13 24 16 5 8 5 3 6 7 6 1 1 1 2 2 1 1



Normalized - 9 9 21 14 4 6 4 2 5 7 7 1 1 1 5 9 8 16



precursor t-cell lymphoblastic lymphoma

Crude - 9 13 13 9 7 9 4 9 13 2 4 5 1 4 2 0 2



Normalized - 5 9 11 8 5 7 7 3 8 14 2 5 8 1 11 9 0 33



protoplasmic astrocytoma

Crude - 8 2 2 6 8 11 15 6 8 4 4 7 7 1 2 2 1 0



Normalized - 4 1 1 5 6 8 12 5 7 4 4 9 11 1 5 9 8 0



pulmonary blastoma

Crude - 3 0 1 1 3 2 0 2 0 1 0 1 3 4 0 2 1 0



Normalized - 1 0 0 0 2 1 0 1 0 1 0 1 4 7 0 9 8 0

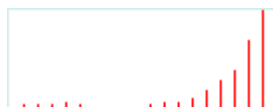


rhabdomyosarcoma, nos

Crude - 48 39 31 34 27 15 14 15 14 23 26 26 30 38 39 33 31 22



Normalized - 29 29 27 31 23 12 11 13 13 25 31 35 49 75 113
153 267 373



secretory carcinoma of breast

Crude - 0 0 2 3 1 1 5 1 7 5 9 9 3 4 5 5 6 4



Normalized - 0 0 1 2 0 0 4 0 6 5 10 12 4 7 14 23 51 67



serous cystadenoma, borderline malignancy (c56.9)

Crude - 0 0 1 20 38 75 80 114 130 116 99 82 67 75 62 43 21 18

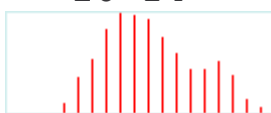


Normalized - 0 0 0 18 32 60 68 100 126 126 119 112 109 148
180 199 181 305



**serous papillary cystic tumor of borderline malignancy
(c56.9)**

Crude - 0 0 3 22 70 108 165 194 192 185 150 119 87 89 101 76
28 14



Normalized - 0 0 2 20 59 87 141 170 186 202 180 163 142 176
293 352 241 237



sertoli-leydig cell tumor, poorly differentiated

Crude - 0 0 1 10 6 2 2 2 1 0 3 3 1 1 3 2 3 0



Normalized - 0 0 0 9 5 1 1 1 0 0 3 4 1 1 8 9 25 0



sq. cell carcinoma, keratinizing, nos, in situ

Crude - 0 0 0 6 28 63 78 58 39 35 19 30 35 32 22 21 8 8

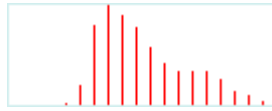


Normalized - 0 0 0 5 23 50 66 51 37 38 22 41 57 63 63 97 68
135



sq. cell carcinoma, micro-invasive

Crude - 0 0 0 17 128 490 607 555 477 356 260 210 213 214 161
 94 66 25



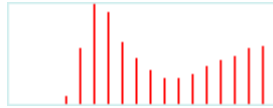
Normalized - 0 0 0 15 109 396 519 489 463 389 312 287 349 423
 467 436 569 424

**squamous cell carcinoma in situ, nos**

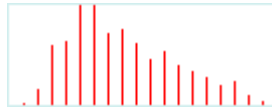
Crude - 0 3 13 1081 7328 13576 11890 7919 5291 3455 2504 2169
 2045 2142 1691 1163 717 383



Normalized - 0 2 11 1012 6273 10982 10184 6979 5141 3779 3012
 2974 3350 4242 4910 5396 6183 6495

**synovial sarcoma, nos**

Crude - 2 11 41 44 67 67 49 52 42 31 37 28 23 19 14 17 8 3



Normalized - 1 8 36 41 57 54 41 45 40 33 44 38 37 37 40 78 68
 50

**undifferentiated sarcoma**

Crude - 2 1 2 4 1 0 1 0 0 2 2 2 3 1 4 4 0 0



Normalized - 1 0 1 3 0 0 0 0 0 2 2 2 4 1 11 18 0 0



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"Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) Limited-Use Data (1973-2005), National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2008, based on the November 2007 submission."

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AUTHOR'S BIOGRAPHY

Jules Berman, PhD, M.D, has studied cancer for the past 36 years. After earning two bachelor of science degrees (mathematics and earth sciences from MIT), he entered the graduate program in pathology at Temple University, where he began his thesis work in the Fels Cancer Research Institute. He spent the final year of his graduate studies at the Naylor Dana Institute of the American Health Foundation in Valhalla, NY, before beginning his post-doctoral studies in the Perinatal Carcinogenesis Section of the Laboratory of Experimental Pathology at the U. S. National Cancer Institute, Bethesda, MD. He earned his medical degree from the University of Miami, Miami, FL, he completed his residency in Anatomic Pathology at the George Washington University Medical Center in Washington, DC. He became Board

Certified in Anatomic Pathology and in Cytopathology, and served as the chief of Anatomic Pathology, Surgical Pathology, and Cytopathology at the Veterans Affairs Medical Center in Baltimore, MD. He has held adjunct appointments at the University of Maryland Medical Center and at the Johns Hopkins Medical Institutions, Baltimore, MD. In 1998, he was appointed as Program Director and Medical Officer in the Cancer Diagnosis Program at the U. S. National Cancer Institute. He served as President of the Association for Pathology Informatics in 2006. Over the course of his career, he has co-authored hundreds of scientific contributions, and he has first-authored more than 100 publications. Dr. Berman has written six books, most recently, Neoplasms: Principles of Development and Diversity.

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