

Chapter 7

Cancer of the Pancreas

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INTRODUCTION

Cancer of the pancreas is one of the most rapidly fatal of all cancers, and most cases are first recognized at a far advanced clinical stage. The American Cancer Society estimates that there will be 33,730 new cases of pancreatic cancer in 2006 and 32,300 deaths. Only cancers of the lung, colon, and breast cause more deaths than pancreatic cancer each year. (1) Currently there are few definitive recommendations for prevention and early detection. Cigarette smoking is probably the most consistently identified causal risk factor. Treatment is often limited to supportive care, palliation and pain control.

The lifetime risk of being diagnosed with pancreatic cancer is 1.29% for white males and 1.18% for black males. For white and black females the lifetime risks are 1.25% and 1.46% respectively (2). Because survival rates are low and survival times are short, the lifetime risks of dying from pancreatic cancer are only slightly lower than the risks of being diagnosed.

The pancreas is a complex organ, with exocrine components (acinar glands and ducts) that produce and deliver digestive enzymes and fluids to the small intestine. Endocrine components (islets of Langerhans) secrete hormones (including insulin) into the blood stream. Both components can give rise to malignant neoplasms, but the vast majority

of all pancreatic cancers are exocrine adenocarcinomas arising from cells of the pancreatic ducts. Acinar cells comprise at least 80% of the cells of the pancreas (3), however, acinar cell carcinomas were less than 1% of the total pancreatic cancers in this series.

Endocrine carcinomas of the pancreas represent about 3% of all pancreatic cancers. They tend to occur at younger ages and have a better prognosis.

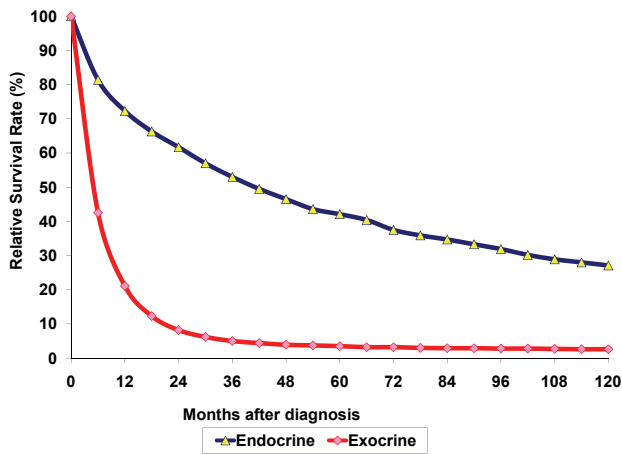
MATERIALS AND METHODS

Between 1988 and 2001, 46,968 cases of cancer of the pancreas were diagnosed within the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute (NCI). Please see the introductory chapter of this monograph for a full explanation of materials and methods. Table 7.1 shows the number of cases excluded, by reason, leaving 29,729 microscopically confirmed cases of cancer of the pancreas diagnosed between 1988 and 2001 in patients 20 years of age and older. The largest number of exclusions was for no microscopic confirmation. The AJCC Cancer Staging Manual (sixth edition) (4) coding scheme excludes endocrine and carcinoid tumors. Subsites were defined according to the International Classification of Diseases for Oncology, 2nd edition (ICD-O-2) (5).

Table 7.1: Cancer of the Pancreas: Number of Cases and Exclusions by Reason, 12 SEER Areas, 1988-2001

Number Selected/Remaining	Number Excluded	Reason for Exclusion/selection
46,968	0	Select 1988-2001 diagnosis (Los Angeles for 1992-2001 only)
40,241	6,727	Select first primary only
38,681	1,560	Exclude death certificate only or at autopsy
38,625	56	Exclude unknown race
38,586	39	Exclude alive with no survival time
38,553	33	Exclude children (Ages 0-19)
38,500	53	Exclude in situ cancers
29,765	8,735	Exclude no or unknown microscopic confirmation
29,729	36	Exclude sarcomas

Figure 7.1: Cancer of the Pancreas: Relative Survival Rates (%) by Histologic Subtype, Ages 20+, 12 SEER Areas, 1988-2001



The analysis described herein addresses demographic factors, histologic classification, extent of disease, and stage classification as they affect survival of patients with pancreatic cancer.

RESULTS

Cancers of the pancreas rank at or near the bottom of the list of all cancers in relation to patient survival following diagnosis. For the pancreatic cancers that arose from the exocrine pancreas, the 5-year relative survival rate was 4%. Cancers arising from endocrine elements of the pancreas were much less common and the 5-year survival rate was 42% (Figure 7.1).

Sixty-month (5-year) relative survival rates were 5% for the histologically confirmed cancers analyzed in this report

and were similar to the survival for those that weren't microscopically confirmed.

Anatomic Subsite

Table 7.2 outlines invasive cancers of the pancreas by subsite within the pancreas. More than half of the cancers were located in the head of the pancreas and 8.5% and 10.1% were in the body and tail respectively. Very few (0.2%) were in the Islets of Langerhans and pancreatic duct (0.6%). The remaining, nearly 30% of the cancers, were not assigned to a specific pancreatic region. Cancers of the head of the pancreas had a modest survival advantage over the body of pancreas at 12 months after diagnosis, but the advantage disappeared after 5 years after diagnosis.

Race and Sex

Overall survival rates were 23% at one year following diagnosis, and declined to 7%, 5%, and 4% at 3, 5, 10 years, respectively (Table 7.3). Twelve-month survival rates were poorer among blacks compared to whites, but at 36, 60 and 120 months following diagnosis, survival was fairly uniform across categories of race and sex.

Age Group

More than three fourths of cancers of the pancreas were diagnosed in patients over 60 years of age, whereas less than 2% of cases were diagnosed in adults less than 40 years of age. (Table 7.4) Survival rates were lowest for patients over age 60 and were higher for the younger patients who tend to have relatively greater proportions of the less lethal endocrine and neuroendocrine tumors. All age groups experienced dramatic overall decreases in survival as time since diagnosis increased.

Table 7.2: Cancer of the Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8- & 10-Year Relative Survival Rates (%) by Primary Site, Ages 20+, 12 SEER Areas, 1988-2001

Primary Site	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	29,729	100.0	22.8	10.0	6.7	4.8	3.9	3.6
Head of Pancreas	15,440	51.9	27.2	11.6	7.3	5.1	4.1	3.7
Body of Pancreas	2,525	8.5	19.0	7.8	5.7	4.8	4.2	3.7
Tail of Pancreas	2,995	10.1	19.0	11.3	8.9	7.2	6.4	6.0
Pancreatic Duct	189	0.6	49.7	28.2	19.8	15.4	8.2	8.2
Islets of Langerhans	50	0.2	79.2	68.0	54.9	47.8	22.1	22.1
Other Specified Parts of Pancreas	111	0.4	25.9	12.5	9.4	9.4	!	!
Overlapping Lesion of Pancreas	2,277	7.7	17.5	6.4	4.4	3.2	2.3	2.2
Pancreas, NOS*	6,142	20.7	15.7	6.7	4.4	2.9	2.2	1.8

! Not enough intervals to produce rates.
* NOS: Not Otherwise Specified

Table 7.3: Cancer of the Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by Race and Sex, Ages 20+, 12 SEER Areas, 1988-2001

Race/Sex	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
All Races	29,729	100.0	22.8	10.0	6.7	4.8	3.9	3.6
Male	15,015	50.5	22.1	9.7	6.5	4.6	3.6	3.1
Female	14,714	49.5	23.4	10.4	6.9	5.1	4.3	4.0
White	23,937	80.5	23.2	10.1	6.7	4.9	3.9	3.5
Male	12,169	40.9	22.8	9.8	6.7	4.8	3.7	3.2
Female	11,768	39.6	23.5	10.3	6.7	4.9	4.1	3.8
Black	3,471	11.7	19.2	8.7	5.5	3.7	3.4	3.3
Male	1,665	5.6	17.3	7.5	4.9	2.9	2.6	2.1
Female	1,806	6.1	21.0	9.8	6.0	4.3	4.1	4.1

Histologic Classification

Cancers of the pancreas are aggregated into histologic categories and listed in decreasing order of frequency in Table 7.5 by the endocrine vs. exocrine pancreas. About 97% were carcinomas of the exocrine pancreas with overall survival rates of 21%, 5%, 4%, and 3% at 1, 3, 5, 10 years, respectively. The exocrine carcinomas with the best prognosis were cystadenocarcinomas and acinar cell carcinomas, but together these histologic categories accounted for less than 2% of the cases. Most of the exocrine tumors were adenocarcinomas not otherwise specified with a 5-year relative survival rate of only 2%.

One-year relative survival rates were higher for islet cell carcinomas, neuroendocrine carcinomas and carcinoid tumors; however, these histologic types only comprised 1.7%, 1.4% and 0.2% of all cancers of the pancreas.

Histology and Age

The most frequent histologic types of cancers of the pancreas are tabulated by age group in Table 7.6; the histologic types are listed in descending order according to their relative percentages. Above age 80, almost all of the cancers arose from the exocrine pancreas, whereas at 20-29 years of age the percentage was only 59%.

Extent of Disease

Tables 7.7 through 7.9 present survival by extent of disease (EOD) by the following classifications defined in the SEER Extent of Disease Codes and Coding Instructions: tumor size, extension, and lymph node involvement (6). As expected, survival rates declined as extent of disease increased.

For the majority of tumors of the pancreas, tumor size was unknown or not stated (53%) (Table 7.7). Survival was best for cancers that were 2.0 cm or less at the time of diagnosis, but above 2 cm, the relation of tumor size to outcome was inconsistent (data not shown). Distant

Table 7.4: Cancer of the Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8- & 10-Year Relative Survival Rates (%) by Age (20+), SEER 1988-2001

Age (Years)	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total (20+)	29,729	100.0	22.8	10.0	6.7	4.8	3.9	3.6
20-29	69	0.2	71.1	55.8	49.2	43.6	41.6	35.2
30-39	472	1.6	44.8	29.4	25.3	19.5	17.3	15.8
40-49	2,010	6.8	31.8	17.1	12.7	9.8	7.0	6.0
50-59	4,792	16.1	28.5	12.9	9.0	6.5	4.9	4.2
60-69	8,430	28.4	23.6	10.1	6.2	4.0	3.1	2.7
70-79	9,650	32.5	19.8	7.7	4.7	3.1	2.3	2.1
80+	4,306	14.5	12.9	4.7	2.6	1.8	1.6	1.2

Table 7.5: Cancer of the Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, 10-Year Relative Survival Rates (%) by Histology, Ages 20+, 12 SEER Areas, 1988-2001

Histology	ICD-O Code	Cases	Percent	Relative Survival Rate (%)					
				1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	8000-9970	29,729	100.0	22.8	10.0	6.7	4.8	3.9	3.6
Cancers of the Endocrine Pancreas	8150-8155, 8240-8246	975	3.3	72.3	61.7	53.0	42.1	31.9	27.1
Islet Cell Carcinoma	8150-8155	494	1.7	80.7	70.0	59.3	47.7	37.8	32.5
Neuroendocrine Carcinoma	8246	411	1.4	61.5	50.3	43.7	32.2	20.9	18.4
Carcinoid Tumor	8240-8245	70	0.2	76.3	68.7	61.8	55.1	43.2	25.8
Cancers of the Exocrine Pancreas	8000-8149, 8156-8239, 8247-9970	28,754	96.7	21.1	8.2	5.0	3.5	2.8	2.6
Adenocarcinoma, NOS*	8140-8149	20,829	70.1	19.2	6.5	3.6	2.3	1.7	1.5
Carcinoma, NOS*	8010-8011	2,404	8.1	17.5	6.9	4.2	3.1	2.3	2.1
Mucin-Producing Adenocarcinoma	8480-8481	1,814	6.1	21.5	9.6	6.7	4.6	3.5	2.5
Infiltrating Duct Carcinoma	8500-8503	1,820	6.1	40.1	18.8	11.5	7.1	6.1	5.9
Malignant Neoplasm, NOS*	8000-8004	512	1.7	19.5	10.5	8.6	6.5	5.5	5.1
Cystadenocarcinoma	8440-8479	243	0.8	64.7	52.7	48.4	47.3	44.6	43.0
Carcinoma, Undifferentiated	8020-8039, 8230-8231	200	0.7	12.5	8.0	6.9	5.1	5.1	5.1
Adenosquamous Carcinoma	8560-8570	186	0.6	16.7	6.9	4.0	3.3	2.6	1.5
Papillary Adenocarcinoma	8050-8260	138	0.5	35.0	19.8	15.8	13.8	13.8	10.6
Signet Ring Cell Carcinoma	8490	155	0.5	17.5	9.7	3.3	2.3	!	!
Large Cell Carcinoma	8012	121	0.4	7.7	1.8	!	!	!	!
Small Cell Carcinoma	8040-8045	98	0.3	24.5	9.4	5.6	2.9	1.7	1.7
Squamous Cell Carcinoma	8051-8082	75	0.3	15.1	7.9	6.4	6.4	6.4	6.4
Acinar Cell Carcinoma	8550	76	0.3	61.4	44.5	33.7	28.3	26.6	24.4
Other Histologies		83	0.3	39.9	24.9	21.9	13.6	11.5	11.5

* NOS: Not Otherwise Specified

! Not enough intervals to produce rate.

metastasis at the time of diagnosis was documented in nearly half of the histologically confirmed cases (Table 7.8). Additionally, for the majority of cancers of the pancreas, lymph node involvement was unknown or not stated (Table 7.9).

AJCC Stage Classification (6th Edition)

Survival by AJCC stage classifications (6th Edition) (4) for carcinomas of the exocrine pancreas is presented in Table 7.10. The majority of cancers of the pancreas were diagnosed at Stage IV (49.5%) or the stage of disease was unknown (18.8%); whereas very few cancers of the pancreas were diagnosed in early stages: Stage IA and Stage IB comprise only 0.7% and 2.7% of diagnoses, respectively.

Figure 7.2 illustrates relative survival rate curves for AJCC Stages IA – IV (6th Edition). The unstaged cases, which represent about one-fifth of the total, most closely match

the Stage III group. Table 7.11 shows the components of stage based on SEER Extent of Disease (EOD) codes for Tumor Size, Extension, and Lymph Node Involvement.

DISCUSSION

Survival rates for cancers of the pancreas are very poor. The relative survival rate for all cases was only 23% at one year with dramatic decreases shown at 3 years (7%), 5 years (5%) and 10 years (4%). The majority of cancers of the pancreas were adenocarcinomas of the exocrine pancreas that occurred in patients 60 years of age and older. Malignant endocrine tumors arising from the islets of Langerhans, neuroendocrine carcinomas and carcinoid tumors had relatively better survival rates (48%, 32%, and 55%, respectively at 5 years).

Most cancers of the pancreas were diagnosed in late stages of disease. Frequently, information was incomplete re-

Table 7.6: Cancer of the Pancreas: Histologic Type Distribution by Age (20+), 12 SEER Areas, 1988-2001

Histology	Age (Years)								
	Total (20+)		20-29	30-39	40-49	50-59	60-69	70-79	80+
	Cases	Percent	Cases	Cases	Cases	Cases	Cases	Cases	Cases
Total	29,729	100.0	69	472	2,010	4,792	8,430	9,650	4,306
Cancers of the Endocrine Pancreas	975	3.3	28	92	171	213	226	195	50
Islet Cell Carcinoma	494	1.7	14	54	93	110	119	93	11
Neuroendocrine Carcinoma	411	1.4	13	29	68	91	93	87	30
Carcinoid Tumor	70	0.2	<5	9	10	12	14	15	9
Cancers of the Exocrine Pancreas	28,754	96.7	41	380	1,839	4,579	8,204	9,455	4,256
Adenocarcinoma, NOS*	20,829	70.1	19	246	1,275	3,329	6,075	6,860	3,025
Carcinoma, NOS*	2,404	8.1	<5	34	142	334	573	826	493
Mucin-Producing Adenocarcinoma	1,814	6.1	<5	24	147	299	548	577	217
Infiltrating Duct Carcinoma	1,820	6.1	<5	22	122	345	545	607	177
Malignant Neoplasm, NOS*	512	1.7	5	9	27	52	108	170	141
Cystadenocarcinoma	243	0.8	<5	15	31	38	53	72	32
Carcinoma, Undifferentiated	200	0.7	<5	6	17	40	49	62	25
Adenosquamous Carcinoma	186	0.6	0	<5	17	30	45	65	26
Papillary Adenocarcinoma	138	0.5	5	6	9	16	32	42	28
Signet Ring Cell Carcinoma	155	0.5	0	<5	14	30	41	46	22
Large Cell Carcinoma	121	0.4	0	<5	13	21	32	36	16
Small Cell Carcinoma	98	0.3	<5	<5	7	12	26	30	20
Squamous Cell Carcinoma	75	0.3	0	<5	<5	6	29	25	10
Acinar Cell Carcinoma	76	0.3	0	5	8	11	23	16	13
Other Histologies	83	0.3	<5	<5	6	16	25	21	11

* NOS: Not Otherwise Specified

garding tumor size and lymph node involvement, but evidence of distant metastasis permitted the cases to be classified as Stage IV.

Pancreatic cancers present huge challenges for future research across the entire cancer continuum (cause and prevention; screening and early detection; imaging and diagnosis; investigational therapeutics; standard treatment and management; quality of life; pain management and other end of life issues).

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Table 7.7: Cancer of the Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by Tumor Size, Ages 20+, 12 SEER Areas, 1988-2001

Tumor Size	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	29,729	100.0	22.8	10.0	6.7	4.8	3.9	3.6
0 - 2 cm	1,404	4.7	45.7	26.1	20.0	14.9	12.7	12.0
> 2 cm	12,696	42.7	26.7	12.6	8.6	6.4	5.2	4.7
Unknown	15,629	52.6	17.5	6.5	4.0	2.7	2.1	1.9

Table 7.8: Cancer of the Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by Extension, Ages 20+, 12 SEER Areas, 1988-2001

Extension (Code)	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	29,729	100.0	22.8	10.0	6.7	4.8	3.9	3.6
Confined to Pancreas (10-30)	3,011	10.1	44.8	26.8	20.2	17.7	16.5	16.3
Limited Extension (40-52)	4,769	16.0	41.5	19.0	12.6	8.5	6.8	6.0
Further Extension (54-80)	4,234	14.2	28.0	9.4	5.0	3.2	2.2	1.9
Metastasis (85)	14,468	48.7	9.9	3.9	2.6	1.7	0.9	0.6
Unknown (99)	3,247	10.9	25.4	9.7	6.0	3.9	3.5	3.1

Table 7.9: Cancer of the Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by Lymph Node Involvement, Ages 20+, 12 SEER Areas, 1988-2001

Nodal Status (Code)	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	29,729	100.0	22.8	10.0	6.7	4.8	3.9	3.6
No Positive Nodes (0)	6,720	22.6	35.9	18.7	13.5	11.1	9.7	8.9
Positive Regional Nodes (1)	5,747	19.3	31.5	14.1	9.1	6.1	4.4	4.3
Positive Distant Nodes (7)	929	3.1	14.0	3.8	1.2	1.2	0.8	0.8
Positive Nodes, NOS (8)	158	0.5	17.6	7.7	4.3	4.3	3.7	2.7
Unknown (9)	16,175	54.4	14.7	5.3	3.3	2.0	1.5	1.2

Figure 7.2: Carcinomas of the Exocrine Pancreas: Relative Survival Rates (%) by AJCC Stage, 6th Edition, Ages 20+, 12 SEER Areas, 1988-2001

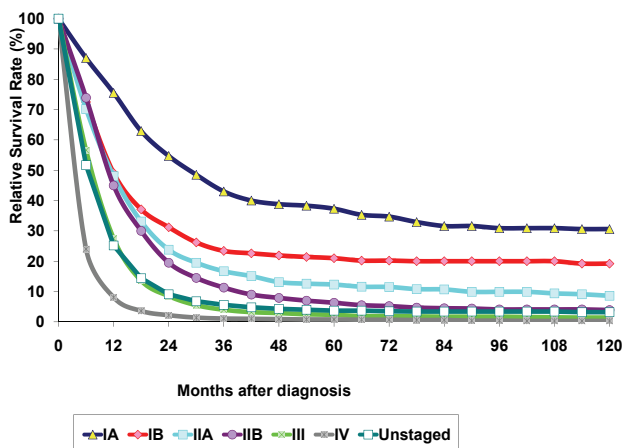


Table 7.10: Carcinomas of the Exocrine Pancreas: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by AJCC Stage (6th Edition), Ages 20+, 12 SEER Areas, 1988-2001

AJCC Stage	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	28,754	100.0	21.1	8.2	5.0	3.5	2.8	2.6
IA (T1, N0, M0)	201	0.7	75.5	54.7	43.0	37.3	30.9	30.6
IB (T2, N0, M0)	788	2.7	49.1	31.2	23.4	21.0	20.0	19.2
IIA (T3, N0, M0)	1,617	5.6	48.1	23.8	16.7	12.3	9.9	8.6
IIB (T1-3, N1, M0)	2,472	8.6	45.0	19.5	11.3	6.3	4.1	3.9
III (T4, any N, M0)	4,043	14.1	27.5	8.5	4.0	2.3	1.7	1.4
IV (any T, any N, M1)	14,230	49.5	8.1	2.2	1.1	0.8	0.4	0.3
Unstaged/Unknown	5,403	18.8	25.2	9.1	5.6	3.7	3.4	3.2

Table 7.11: Carcinomas of the Exocrine Pancreas: Number of Cases and 5-Year Relative Survival Rates (RSR) (%) by TNM Values, Ages 20+, 12 SEER Areas, 1988-2001

T Values	N Values											
	Total		No Positive Nodes (N0)		Positive Regional Nodes (N1)		Positive Distant Nodes (M1)		Positive Nodes, NOS (NX)		Unknown (NX)	
	Cases	5-Yr RSR (%)	Cases	5-Yr RSR (%)	Cases	5-Yr RSR (%)	Cases	5-Yr RSR (%)	Cases	5-Yr RSR (%)	Cases	5-Yr RSR (%)
Total	28,754	3.5	6,465	8.8	5,515	3.8	898	0.7	157	3.6	15,719	1.3
Confined to Pancreas (Ext. 10-30)	2,842	13.4	1,428	20.9	712	6.1	34	!	<5	~	664	5.6
0 - 2 cm (T1)	315	27.4	201	37.3	74	14.8	0	~	0	~	40	4.2
> 2 cm (T2)	1,542	14.0	788	21.0	423	6.7	17	~	<5	~	311	6.0
Unknown Size (TX)	985	7.7	439	12.7	215	1.9	17	~	<5	~	313	5.0
Limited Extension (Ext. 40-52 - T3)	4,682	7.2	1,617	12.3	1,760	6.4	80	!	18	~	1,207	1.3
Further Extension (Ext. 54-80 - T4)	4,136	2.2	1,337	3.1	1,005	2.3	93	!	23	~	1,678	1.5
Metastasis (Ext. 85 - M1)	13,926	0.8	1,895	1.3	1,790	1.2	594	0.6	98	1.1	9,549	0.6
Unknown (Ext. 99 - TX/MX)	3,168	2.6	188	3.1	248	3.0	97	!	14	~	2,621	2.6

~ Statistic not displayed due to less than 25 cases.

! Not enough intervals to produce rate.

