

Chapter 16

Cancer of the Ovary

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INTRODUCTION

Epithelial carcinoma of the ovary is one of the most common gynecologic malignancies. It is also the fifth most frequent cause of cancer death in women (behind lung, breast, colorectal, and pancreas). A little over 15% of epithelial ovarian tumors are of low malignant potential. These “borderline” tumors were classified as malignant in the International Classification of Diseases for Oncology second edition (ICD-O-2) (1) and were classified as non-malignant with the 2001 implementation of the third edition, ICD-O-3 (2), and they are different from the frank malignant invasive carcinomas. Uncommon tumors include germ cell tumors of the ovary, seen most often in younger women.

MATERIALS AND METHODS

The NCI contracts with medically-oriented, nonprofit institutions located in specific geographic areas to obtain data on all cancers diagnosed in residents of the SEER geographic areas. SEER collects data on all invasive and in situ cancers except basal cell and squamous cell carcinomas of the skin (of non-genital anatomic sites) and in situ carcinomas of the uterine cervix. SEER actively follows all previously diagnosed patients on an annual

basis to obtain vital status allowing the calculation of observed and relative survival rates.

This analysis is based on data from 12 SEER geographic areas which collectively cover about 14% of the total US population. The areas are the States of Connecticut, Iowa, New Mexico, Utah, and Hawaii; the metropolitan areas of Detroit, Michigan; Atlanta, Georgia; San Francisco, San Jose, and Los Angeles, California; Seattle, Washington; and 10 counties in rural Georgia. Los Angeles contributed data for diagnosis years 1992 to 2001, all other areas for 1988-2001.

Between 1988-2001, there were 40,250 cases of cancer of the ovary reported to SEER. The following were excluded from the analysis: patients for whom ovarian cancer was not the first primary, cases identified through autopsy or death certificate only, persons of unknown race, patients who were alive with no survival time, patients less than 20 years old, cases without microscopic confirmation, in situ tumors, sarcomas including stromal, mesenchymoma, and embryonal sarcomas, and carcinoids. After these exclusions, 32,019 cases remained for analysis (Table 16.1).

Table 16.1: Cancer of the Ovary: Number of Cases and Exclusions by Reason, 12 SEER Areas, 1988-2001

Number Selected/Remaining	Number Excluded	Reason for Exclusion/Selection
40,250	0	Select 1988-2001 diagnosis (Los Angeles for 1992-2001 only)
35,047	5,203	Select first primary only
34,607	440	Exclude death certificate only or at autopsy
34,468	139	Exclude unknown race
34,401	67	Exclude alive with no survival time
33,880	521	Exclude children (ages 0-19)
33,804	76	Exclude in situ cancers
32,374	1,430	Exclude no or unknown microscopic confirmation
32,160	214	Exclude sarcomas
32,040	120	Exclude carcinoids
32,019	21	Exclude stromal, mesenchymoma, and embryonal sarcomas

Staging

Ovarian cancer staging by the Federation Internationale de Gynecologie et d'Obstetrique (FIGO) and the American Joint Committee on Cancer (AJCC) are in the AJCC *Manual for Staging of Cancer*, 3rd edition (3):

Stage I ovarian cancer is growth limited to the ovaries.

Stage IA: growth limited to one ovary; no ascites. No tumor on the external surface; capsule intact.

Stage IB: growth limited to both ovaries; no ascites. No tumor on the external surfaces; capsules intact.

Stage IC: tumor either stage IA or IB, but with tumor on the surface of one or both ovaries; or with capsule ruptured; or with ascites present containing malignant cells or with positive peritoneal washings.

Stage II ovarian cancer is growth involving one or both ovaries with pelvic extension.

Stage IIA: extension and/or metastases to the uterus and/or tubes.

Stage IIB: extension to other pelvic tissues.

Stage IIC: tumor either stage IIA or stage IIB, but with tumor on the surface of one or both ovaries; or with capsule(s) ruptured; or with ascites present containing malignant cells or with positive peritoneal washings.

Stage III ovarian cancer is tumor involving one or both ovaries with peritoneal implants outside the pelvis and/or positive retroperitoneal or inguinal nodes. Superficial liver metastasis equals stage III. Tumor is limited to the true pelvis but with histologically verified malignant extension to small bowel or omentum.

Stage IIIA: tumor grossly limited to the true pelvis with negative nodes but with histologically confirmed microscopic seeding of abdominal peritoneal surfaces.

Stage IIIB: tumor of one or both ovaries with histologically confirmed implants of abdominal peritoneal surfaces, none exceeding 2 centimeters in diameter. Nodes negative.

Stage IIIC: abdominal implants greater than 2 centimeters in diameter and/or positive retroperitoneal or inguinal nodes.

Stage IV ovarian cancer is growth involving one or both ovaries with distant metastasis. If pleural effusion is present, there must be positive cytologic test results to allot a case to stage IV. Parenchymal liver metastasis equals stage IV.

Since the emphasis is on extension, SEER modified version of stage was used in which positive lymph nodes were N1 and Stage IIIC but unknown lymph node involvement was ignored, i.e. treated like N0.

RESULTS

Age and Race

Of the 32,019 eligible adult cases, approximately half occurred before age 60 (Table 16.2). Eighty-six percent of eligible patients were white. White women were slightly older than black women with ovarian cancer.

For all women, relative survival declines with age. In adult women under age 50, 5-year relative survival is 76.6% compared to 50.2% in women 50-69 and 31.6% in women aged 70 and older. Survival is lower for black women compared to white women in all age groups presented, especially ages 50-69 (Table 16.3).

Geographic Location

There was little variation in survival by geographic area. Five-year relative survival rates in the 12 SEER areas represented in this study ranged from 57.0% in Los Angeles to 48.4% in Rural Georgia (Table 16.4).

Histology

Distribution by histology is presented in Table 16.5. Tumors classified as adenocarcinoma comprise almost 90% of all cancers of the ovary. Of these, the most common subclassification was papillary serous cystadenocarcinoma, which accounted for slightly more than one fourth of all cancers and 29% of all adenocarcinomas registered. "Borderline" adenocarcinoma was the next most common, at 15.9%, which is slightly underestimated since it wasn't collected prior to 1991 or after 2000. Adenocarcinoma, Not Otherwise Specified (12.6%), endometrioid (9.8%), serous cystadenocarcinoma (5.8%), papillary (5.5%), mucinous cystadenocarcinoma (4.2%), clear cell (4.0%), mucinous adenocarcinoma (3.4%) and cystadenocarcinoma (1.3%) were also observed.

Table 16.2: Cancer of the Ovary: Age Distribution by Race, Ages 20+, 12 SEER Areas, 1988-2001

Age Group (Years)	Total		White		Black		Other	
	Cases	Percent	Cases	Percent	Cases	Percent	Cases	Percent
Total	32,019	100.0	27,595	100.0	2,035	100.0	2,389	100.0
20-29	1,292	4.0	1,009	3.7	122	6.0	161	6.7
30-39	2,736	8.5	2,243	8.1	196	9.6	297	12.4
40-49	5,081	15.9	4,231	15.3	345	17.0	505	21.1
50-59	6,226	19.4	5,299	19.2	376	18.5	551	23.1
60-69	6,954	21.7	6,036	21.9	466	22.9	452	18.9
70-79	6,525	20.4	5,837	21.2	370	18.2	318	13.3
80+	3,205	10.0	2,940	10.7	160	7.9	105	4.4

Table 16.3: Cancer of the Ovary: Number of Cases, Median Survival Time (Months) and 5-year Survival Rates (%) by Race and Age (20+), 12 SEER Areas, 1988-2001

Race/Age (years)	Cases	Median Survival Time (Months)	5-Year Survival Rate (%)		
			Observed	Expected	Relative
All Races, 20+	32,019	54.5	48.4	89.9	53.8
White, 20+	27,595	53.7	48.0	89.6	53.6
Black, 20+	2,035	38.0	43.1	88.6	48.5
All Races, 20-49	9,109	> 120	75.8	99.1	76.6
White, 20-49	7,483	> 120	76.7	99.1	77.4
Black, 20-49	663	> 120	71.4	98.1	72.7
All Races, 50-69	13,180	53.2	47.5	94.5	50.2
White, 50-69	11,335	54.1	47.9	94.6	50.6
Black, 50-69	842	30.7	35.1	91.1	38.6
All Races, 70+	9,730	18.7	23.8	75.2	31.6
White, 70+	8,777	18.8	23.5	74.9	31.3
Black, 70+	530	13.5	20.6	72.8	27.7

Table 16.4: Cancer of the Ovary: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by SEER Geographic Area, Ages 20+, 12 SEER Areas, 1988-2001

SEER Geographic Area	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	32,019	100.0	80.3	69.3	61.8	53.8	49.4	48.5
Atlanta and Rural Georgia	2,007	6.3	80.0	71.1	65.1	56.5	51.9	50.8
Atlanta (Metropolitan) - 1988+	1,911	6.0	80.3	71.7	65.7	56.9	52.1	50.9
Rural Georgia - 1988+	96	0.3	74.5	59.8	52.5	48.4	46.3	46.3
California								
Los Angeles - 1992+	5,593	17.5	81.9	72.0	65.4	57.0	52.9	51.9
Greater Bay Area	5,723	17.9	80.1	69.7	61.3	52.9	48.0	46.6
San Francisco-Oakland SMSA - 1988+	3,814	11.9	79.0	68.2	59.4	51.5	47.8	46.6
San Jose-Monterey - 1988+	1,909	6.0	82.2	72.8	65.2	55.5	48.5	46.5
Connecticut - 1988+	3,580	11.2	80.7	68.2	60.2	51.7	46.0	45.3
Detroit (Metropolitan) - 1988+	4,092	12.8	77.2	66.6	58.1	51.1	46.8	45.3
Hawaii - 1988+	943	2.9	82.8	72.7	65.9	56.5	51.4	50.0
Iowa - 1988+	3,278	10.2	77.7	65.4	59.2	52.1	49.0	48.7
New Mexico - 1988+	1,341	4.2	78.7	67.6	59.0	50.2	46.8	45.2
Seattle (Puget Sound) - 1988+	4,012	12.5	83.0	70.8	63.6	55.6	51.2	51.0
Utah - 1988+	1,450	4.5	80.1	68.9	60.8	53.8	51.5	49.6

Table 16.5: Cancer of the Ovary: Number and Distribution of Cases and 5-Year Relative Survival Rate (RSR) (%) by Histology, Ages 20+, 12 SEER Areas, 1988-2001

Histology	ICD-O Code	Cases	Percent	5-Year RSR (%)
Total	8000-9989	32,019	100.0	53.8
Epidermoid	8051-8130	174	0.5	51.3
Adenocarcinoma	8050,8140-8147,8160-8162,8180-8221,8250-8506,8520-8550,8560,8570-8575,8940-8941,9110	28,728	89.7	54.4
Adenocarcinoma NOS*	8140	4,021	12.6	18.3
Papillary	8050,8260	1,750	5.5	21.0
Clear Cell	8310,9110	1,291	4.0	61.5
Endometrioid	8380-8381,8570	3,133	9.8	70.9
Serous Cystadenocarcinoma	8441	1,863	5.8	44.2
Cystadenocarcinoma	8440,8450	427	1.3	50.7
Papillary Serous Cystadenocarcinoma	8460-8461	8,458	26.4	39.6
Mucinous Cystadenocarcinoma	8470-8471	1,346	4.2	77.7
Mucinous Adenocarcinoma	8480-8481	1,089	3.4	49.1
“Borderline”	8442,8451,8462,8472-8473	5,094	15.9	98.2
All Other Adenocarcinomas	8141-8147,8160-8162,8180-8221,8250-8259,8261-8309,8311-8379,8382-8439,8443-8449,8452-8459,8463-8469,8474-8479,8482-8506,8520-8550,8560,8571-8575,8940-8941	256	0.8	44.2
Other Specified Carcinomas	8030-8046,8150-8155,8170-8171,8230-8231,8247-8248,8510-8512,8561-8562,8580-8671	460	1.4	76.5
Stromal Cell	8620-8631,8650	353	1.1	87.8
All Other Specified Carcinomas	8030-8046,8150-8155,8170-8171,8230-8231,8247-8248,8510-8512,8561-8562,8580-8619,8632-8649,8651-8671	107	0.3	37.3
Carcinoma NOS	8010-8022	1,299	4.1	26.8
Other Specified Types	8240-8246,8720-8790,8935,8950-8982,9000-9030,9060-9104,9350-9364,9380-9512,9530-9539	1,153	3.6	61.4
Mullerian	8950-8951,8980	547	1.7	29.8
Brenner	9000	69	0.2	67.9
Germ Cell	9060-9090,9102	486	1.5	91.0
Dysgerminoma	9060	153	0.5	96.8
Teratoma	9080-9085,9102	248	0.8	89.1
All Other Germ Cells	9061-9079,9086-9090	85	0.3	85.1
All Other Specified Types	8240-8246,8720-8790,8935,8952-8979,8981-8982,9001-9030,9091-9101,9103-9104,9350-9364,9380-9512,9530-9539	51	0.2	71.7
Unspecified	8000-8004	205	0.6	23.0

* NOS: Not Otherwise Specified

Germ cell was observed in 1.5% of all cases. Of these 31% were dysgerminoma and 51% teratoma. Tumors classified as Mullerian comprised 1.7% of all cases.

Five-year relative survival rates varied by histologic type. The highest rates were seen for “borderline” tumors, 98%, but “borderline” tumors were only considered reportable and malignant for 1991-2000. The germ cell tumors also had survival rates over 85%. Survival rates under 25% were

seen for unspecified malignant tumors, adenocarcinomas NOS, and papillary adenocarcinomas (Table 16.5).

ADENOCARCINOMA (NON-BORDERLINE)

The histologies used for adenocarcinoma are in Table 16.5 in the category “Adenocarcinoma” (28,728 cases) excluding the “Borderline” cases (5,094). There were a total of 23,634 adenocarcinomas excluding borderline.

Table 16.6: Adenocarcinoma of the Ovary (excluding Borderline Tumors): Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) for Cases (Ages 20+) by AJCC Stage (SEER modified 3rd 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	23,634	100.0	77.5	64.0	54.4	43.9	37.8	36.4
I	5,215	22.1	96.8	94.3	92.1	89.3	85.6	84.1
IA	3,108	13.2	98.9	97.3	96.1	94.0	91.1	88.9
IB	337	1.4	98.0	94.5	93.2	91.1	82.4	78.7
IC	1,548	6.5	92.4	88.1	84.5	79.8	76.0	76.0
I NOS*	222	0.9	94.8	92.8	88.2	84.7	77.0	73.7
II	1,833	7.8	87.1	78.9	73.2	65.5	58.4	55.7
IIA	485	2.1	96.4	89.5	84.7	76.4	69.0	66.8
IIB	587	2.5	88.3	80.6	73.6	66.9	63.2	57.4
IIC	699	3.0	80.4	70.7	65.1	57.0	47.0	45.9
II NOS*	62	0.3	78.0	71.0	68.8	58.9	50.2	38.8
III	8,346	35.3	78.8	62.0	48.9	33.5	24.4	22.2
IIIA	469	2.0	86.4	71.6	61.8	45.3	34.1	31.4
IIIB	660	2.8	81.5	66.8	54.0	38.6	27.2	26.1
IIIC	4,596	19.4	82.2	65.5	51.2	35.2	25.3	22.6
III NOS*	2,621	11.1	70.5	52.8	40.8	26.9	20.0	17.9
IV	7,499	31.7	61.7	42.5	30.1	17.9	11.6	10.4
Unknown/Unstaged	741	3.1	61.8	49.3	41.5	29.5	24.2	20.2

* NOS = Not Otherwise Specified

Stage

Table 16.6 and Figure 16.1 show the contrast between stage at diagnosis and months/years since diagnosis. In stages II-IV, the steepest declines in survival are observed within 3-5 years of diagnosis. Survival continues to decline throughout the 10 years observed in these stages.

Age and Stage

Of the 23,634 cases of non-borderline adenocarcinoma, enough information to establish stage at diagnosis was available for 22,893 (97%). Across all age groups, 31.7% of all cancers were diagnosed in Stage IV. Stage IV disease occurs in 19.4% among women ages 20-49 to 38.5% in women over age 70, while Stage I declines from 39.6% to 13.1% in these same age groups (Table 16.7).

For all ages combined, little difference is seen between survival in stages IA & IB (Table 16.8, Figure 16.2). No survival differential with increased age is present. Stages IA & IB both involve tumor confined to the ovary, with an intact capsule. However, a difference does exist between Stages IA & IB and Stage IC with stage IC having much poorer survival than IA or IB.

Stage IC also involves tumor limited to the ovary, however, capsule rupture, external invasion or ascites also exist. For stages IC and higher, a survival differential by age is observed, with declining survival with increasing age (Table 16.8 & Figure 16.2).

Figure 16.1: Adenocarcinoma of the Ovary (excluding Borderline Tumors): Relative Survival Rates (%) by AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

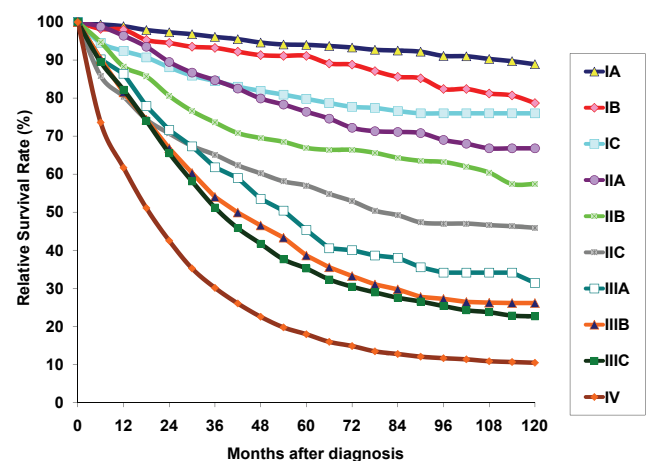


Table 16.7: Adenocarcinoma of the Ovary (excluding Borderline Tumors): Number and Distribution of Cases by AJCC Stage (SEER modified 3rd edition) and Age (20+), 12 SEER Areas, 1988-2001

AJCC Stage	Age (Years)							
	Total		20-49		50-69		70+	
	Cases	Percent	Cases	Percent	Cases	Percent	Cases	Percent
Total	23,634	100.0	5,090	100.0	10,576	100.0	7,968	100.0
I	5,215	22.1	2,016	39.6	2,156	20.4	1,043	13.1
IA	3,108	13.2	1,300	25.5	1,223	11.6	585	7.3
IB	337	1.4	118	2.3	156	1.5	63	0.8
IC	1,548	6.5	506	9.9	695	6.6	347	4.4
I NOS*	222	0.9	92	1.8	82	0.8	48	0.6
II	1,833	7.8	446	8.8	815	7.7	572	7.2
IIA	485	2.1	144	2.8	222	2.1	119	1.5
IIB	587	2.5	135	2.7	257	2.4	195	2.4
IIC	699	3.0	153	3.0	313	3.0	233	2.9
II NOS*	62	0.3	14	0.3	23	0.2	25	0.3
III	8,346	35.3	1,540	30.3	3,896	36.8	2,910	36.5
IIIA	469	2.0	103	2.0	216	2.0	150	1.9
IIIB	660	2.8	146	2.9	319	3.0	195	2.4
IIIC	4,596	19.4	901	17.7	2,301	21.8	1,394	17.5
III NOS*	2,621	11.1	390	7.7	1,060	10.0	1,171	14.7
IV	7,499	31.7	988	19.4	3,445	32.6	3,066	38.5
Unknown/ Unstaged	741	3.1	100	2.0	264	2.5	377	4.7

* NOS: Not Otherwise Specified

Histology and Stage

Tumors of the papillary subtype and adenocarcinoma NOS are associated with poor survival. Mucinous cystadenocarcinoma has the highest five-year survival rate

(77.7%) for all stages combined, due to a high percentage of cases diagnosed in Stage I. Tumors of the endometrioid type have better prognosis in each stage (Table 16.9 & Figure 16.3).

Figure 16.2: Adenocarcinoma of the Ovary (excluding Borderline Tumors): 5-Year Relative Survival Rate (%) by AJCC Stage (SEER modified 3rd edition) and Age Group (20+), 12 SEER Areas, 1988-2001

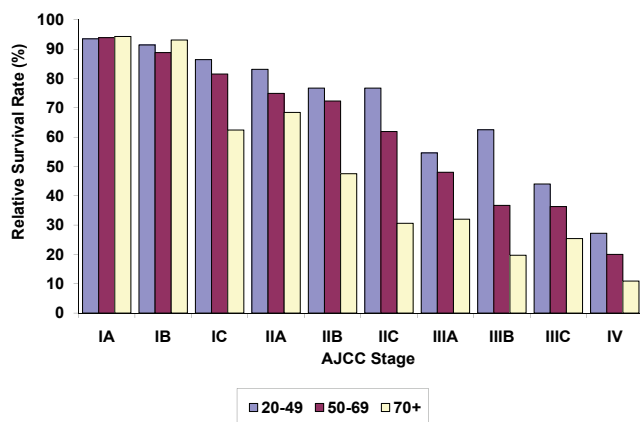


Figure 16.3: Adenocarcinoma of the Ovary (excluding Borderline Tumors): 5-Year Relative Survival Rate (%) by Histology and AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

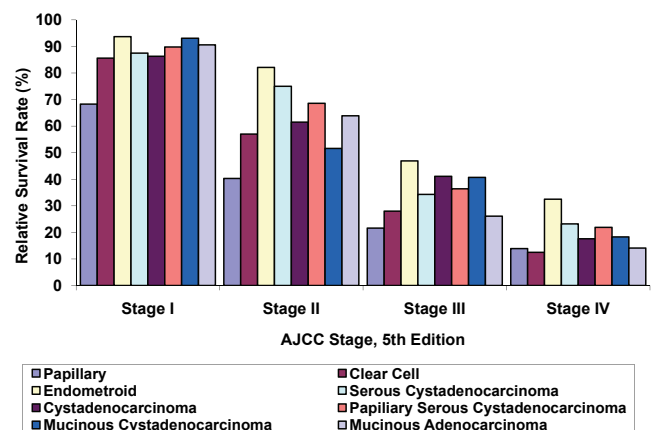


Table 16.8: Adenocarcinoma of the Ovary (excluding Borderline Tumors): Number of Cases and 5-Year Relative Survival Rates (RSR) (%) for Patients with by AJCC Stage (SEER modified 3rd edition) and Age (20+), 12 SEER Areas, 1988-2001

AJCC Stage	Total		20-49		50-69		70+	
	Cases	5-Year RSR (%)	Cases	5-Year RSR (%)	Cases	5-Year RSR (%)	Cases	5-Year RSR (%)
Total	23,634	43.9	5,090	63.3	10,576	44.0	7,968	27.5
I	5,215	89.3	2,016	91.2	2,156	89.2	1,043	83.8
IA	3,108	94.0	1,300	93.5	1,223	93.9	585	94.3
IB	337	91.1	118	91.4	156	88.8	63	93.1
IC	1,548	79.8	506	86.4	695	81.5	347	62.4
I NOS	222	84.7	92	85.1	82	82.9	48	85.6
II	1,833	65.5	446	78.7	815	68.9	572	45.5
IIA	485	76.4	144	83.1	222	74.9	119	68.4
IIB	587	66.9	135	76.7	257	72.3	195	47.5
IIC	699	57.0	153	76.7	313	61.9	233	30.6
II NOS	62	58.9	14	~	23	~	25	39.3
III	8,346	33.5	1,540	45.9	3,896	35.3	2,910	21.8
IIIA	469	45.3	103	54.6	216	48.0	150	32.0
IIIB	660	38.6	146	62.5	319	36.7	195	19.7
IIIC	4,596	35.2	901	44.0	2,301	36.3	1,394	25.4
III NOS	2,621	26.9	390	42.1	1,060	30.1	1,171	16.3
IV	7,499	17.9	988	27.2	3,445	20.0	3,066	10.9
Unknown/Unstaged	741	29.5	100	56.0	264	33.5	377	16.1

* NOS: Not Otherwise Specified

~ Statistic not displayed due to less than 25 cases.

Table 16.9: Adenocarcinoma of the Ovary (excluding Borderline Tumors): Number of Cases and 5-Year Relative Survival Rates (RSR) (%) by Histology and AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

Histology	AJCC Stage											
	Total		I		II		III		IV		Unknown/Unstaged	
	Cases	5-Year Relative Survival Rate(%)	Cases	5-Year Relative Survival Rate(%)	Cases	5-Year Relative Survival Rate(%)	Cases	5-Year Relative Survival Rate(%)	Cases	5-Year Relative Survival Rate(%)	Cases	5-Year Relative Survival Rate(%)
Total Adenocarcinoma	23,634	43.9	5,215	89.3	1,833	65.5	8,346	33.5	7,499	17.9	741	29.5
Adenocarcinoma NOS*	4,021	18.3	276	61.7	233	35.2	1,189	21.2	2,021	8.9	302	14.5
Papillary	1,750	21.0	84	68.3	83	40.3	649	21.6	845	13.9	89	20.3
Clear Cell	1,291	61.5	708	85.6	145	57.0	271	28.0	151	12.5	16	~
Endometrioid	3,133	70.9	1,404	93.7	454	82.1	743	46.9	483	32.5	49	56.3
Serous Cystadenocarcinoma	1,863	44.2	331	87.5	147	75.0	786	34.3	567	23.2	32	24.9
Cystadenocarcinoma	427	50.7	131	86.3	33	61.5	137	41.1	111	17.6	15	~
Papillary Serous Cystadenocarcinoma	8,458	39.6	885	89.8	570	68.6	3,999	36.4	2,829	21.9	175	41.0
Mucinous Cystadenocarcinoma	1,346	77.7	953	93.1	68	51.6	175	40.7	126	18.3	24	~
Mucinous Adenocarcinoma	1,089	49.1	378	90.6	74	63.9	299	26.1	301	14.1	37	30.1
All Other Adenocarcinomas	256	44.2	65	87.7	26	60.1	98	27.5	65	12.6	<5	~

* NOS: Not Otherwise Specified

~ Statistic not displayed due to less than 25 cases.

Table 16.10: Adenocarcinoma of the Ovary (excluding Borderline Tumors): Number of Cases and 5-Year Relative Survival Rates (%) by AJCC Stage (SEER modified 3rd edition) and Grade, Ages 20+, 12 SEER Areas, 1988-2001

AJCC Stage	Grade									
	Total		Well Differentiated		Moderately Differentiated		Poorly/ Undifferentiated		Unknown	
	Cases	5-Year Relative Survival Rate (%)	Cases	5-Year Relative Survival Rate (%)	Cases	5-Year Relative Survival Rate (%)	Cases	5-Year Relative Survival Rate (%)	Cases	5-Year Relative Survival Rate (%)
Total	23,634	43.9	2,071	82.6	4,505	54.9	10,511	35.3	6,547	36.3
I	5,215	89.3	1,277	95.1	1,451	92.6	1,051	82.6	1,436	85.1
IA	3,108	94.0	896	95.9	872	94.9	494	88.8	846	93.3
IB	337	91.1	75	90.7	84	91.9	101	90.4	77	89.5
IC	1,548	79.8	253	92.3	439	88.2	409	74.3	447	68.2
I NOS^	222	84.7	53	95.3	56	88.1	47	71.8	66	80.3
II	1,833	65.5	179	85.8	421	73.9	781	62.8	452	52.8
IIA	485	76.4	54	94.4	131	80.5	201	70.8	99	69.9
IIB	587	66.9	61	75.4	148	73.4	261	65.3	117	55.2
IIC	699	57.0	62	87.2	131	66.1	288	56.2	218	42.0
II NOS^	62	58.9	<5	~	11	~	31	45.2	18	~
III	8,346	33.5	370	62.3	1,473	36.4	4,720	33.0	1,783	25.2
IIIA	469	45.3	51	79.1	100	52.4	202	40.5	116	30.0
IIIB	660	38.6	40	62.7	142	36.5	360	40.5	118	25.2
IIIC	4,596	35.2	173	63.4	777	35.1	2,851	34.8	795	30.1
III NOS^	2,621	26.9	106	51.6	454	34.6	1,307	26.2	754	19.3
IV	7,499	17.9	212	37.7	1,083	21.0	3,769	19.6	2,435	11.6
Unknown/ Unstaged	741	29.5	33	79.4	77	41.8	190	25.6	441	24.4

~ Statistic not displayed due to less than 25 cases.
 ^ NOS: Not Otherwise Specified

Stage and Grade

Of the 23,634 cases of non-borderline adenocarcinoma, 17,087 (72%) had information on tumor grade (Table 16.10 & Figure 16.4). Within stage, 5-year relative survival generally declines as grade increases with the exception of stage IB tumors, where little difference is seen by grade (possibly due to the small number of cases).

Figure 16.4: Adenocarcinoma of the Ovary (excluding Borderline Tumors): 5-Year Relative Survival Rate (%) by Grade and AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

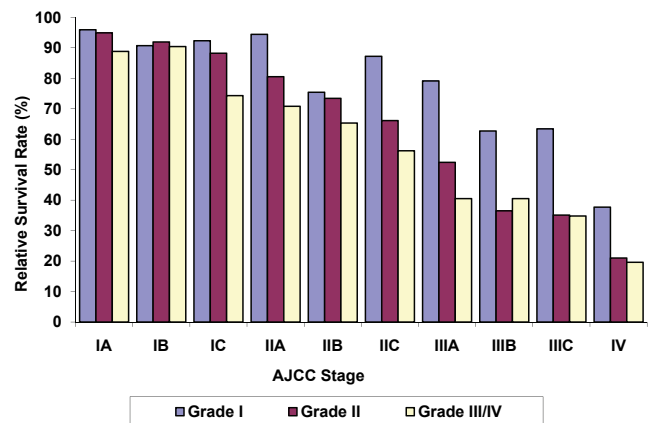


Table 16.11: Adenocarcinoma of the Ovary (excluding Borderline Tumors): 5-Year Relative Survival Rates (%), Conditioned on Years Since Diagnosis by AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

AJCC Stage	Surviving the Next 5 Years					
	From Diagnosis	After 1 Year	After 2 Years	After 3 Years	After 4 Years	After 5 years
Total	43.9	51.5	59.3	66.8	73.6	79.2
I	89.3	90.5	91.8	92.6	94.1	94.1
IA	94.0	94.3	95.1	95.0	95.8	95.1
IB	91.1	90.5	90.8	88.7	89.1	86.5
IC	79.8	82.8	85.5	88.6	91.5	94.3
I NOS	84.7	85.5	84.0	87.2	88.9	87.4
II	65.5	70.5	74.4	77.4	79.6	82.4
IIA	76.4	74.7	78.6	80.7	82.6	86.7
IIB	66.9	73.5	77.8	83.1	84.0	83.4
IIC	57.0	63.5	67.0	69.3	73.5	76.2
II NOS	58.9	73.8	80.5	70.9	62.4	62.9
III	33.5	36.1	41.9	48.2	54.9	63.2
IIIA	45.3	45.6	51.5	53.2	61.9	66.5
IIIB	38.6	40.0	43.4	49.0	54.7	65.2
IIIC	35.2	36.5	41.2	48.2	55.2	62.2
III NOS	26.9	32.1	40.0	46.5	52.1	62.3
IV	17.9	23.0	28.6	36.6	45.2	54.5
Unknown/ Unstaged	29.5	40.8	49.0	53.4	60.1	62.2

Conditional Survival

Five year relative survival, conditioned on years since diagnosis, is presented in Table 16.11 and Figure 16.5. Except for stages IA and IB, the probability of surviving for 5 years increases as time since diagnosis increases. This is most marked for the stage IV cases. For stage IV, five year survival from time of diagnosis is 18%. For those individuals who survived 1 year post diagnosis, 5-year survival increased to 23%. This increased to 55% for those individuals who survived 5 years after they had already survived 5 years.

Figure 16.5: Adenocarcinoma of the Ovary (excluding Borderline Tumors): 5-Year Relative Survival Rate (%), Conditioned on Years Since Diagnosis, by AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

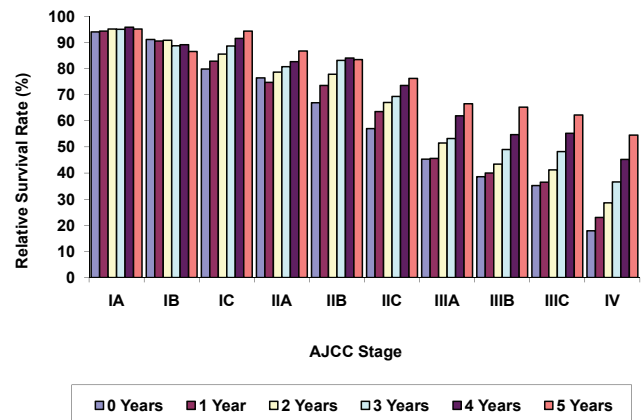


Table 16.12: Borderline Tumors of the Ovary: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2000

AJCC Stage	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total (1988-2000 only)	5,092	100.0	99.3	99.1	98.8	98.2	97.2	96.1
I	4,176	82.0	99.6	99.5	99.3	99.1	98.8	98.0
IA	3,131	61.5	99.8	99.7	99.6	99.5	99.4	99.1
IB	329	6.5	99.7	99.2	99.2	97.9	94.0	90.8
IC	520	10.2	98.7	98.6	97.9	97.4	95.8	95.7
I NOS [^]	196	3.8	98.5	98.5	98.1	97.9	95.4	94.2
II	290	5.7	99.2	99.1	98.2	98.2	95.4	93.6
IIA	92	1.8	100.0	99.8	97.8	96.6	94.9	90.3
IIB	94	1.8	98.5	98.5	98.1	97.5	92.5	92.5
IIC	98	1.9	98.4	98.0	98.0	98.0	97.1	95.2
II NOS [^]	6	0.1	~	~	~	~	~	~
III	449	8.8	99.1	98.9	98.4	95.7	90.2	88.1
IIIA	112	2.2	98.9	98.6	98.6	97.1	91.0	88.5
IIIB	50	1.0	100.0	100.0	100.0	97.3	91.4	91.4
IIIC	139	2.7	97.7	97.1	96.9	96.6	89.8	85.3
III NOS [^]	148	2.9	99.5	99.5	97.5	93.2	88.6	86.9
IV	114	2.2	90.1	84.7	82.7	76.9	74.7	70.0
Unknown/Unstaged	63	1.2	97.7	93.5	92.4	91.0	84.7	84.7

~ Statistic not displayed due to less than 25 cases.

[^] NOS: Not Otherwise Specified

ADENOCARCINOMA (“BORDERLINE”)

Stage

“Borderline” adenocarcinoma is of low malignant potential. These tumors are no longer reportable as malignant with the implementation of ICD-O-3, but were reportable during the years 1988-2000. Eighty-two percent of these tumors were diagnosed in stage I (Table 16.12) compared to 22% in the

non-borderline adenocarcinomas (Table 16.7). Survival is quite high across all stages with five-year relative survival in the high 90% range in stages IA-IIIC, and 77% at stage IV (Table 16.12).

Table 16.13: Germ Cell Cancer of the Ovary: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by Age (20+), 12 SEER Areas, 1988-2001

Age (Years)	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	486	100.0	94.6	92.7	91.6	91.0	90.3	90.3
20-29	241	49.6	98.0	97.6	96.7	96.2	95.6	95.6
30-39	161	33.1	96.3	92.4	92.4	91.8	91.8	91.8
40-49	46	9.5	87.1	84.9	82.7	82.7	82.7	82.7
50-69	29	6.0	75.1	67.8	63.8	53.1	46.9	46.9
70+	9	1.9	~	~	~	~	~	~

~ Statistic not displayed due to less than 25 cases.

GERM CELL

Stage

Germ cell tumors are seen in younger women. Of the 486 reported in 12 SEER areas, between 1988-2001, almost 83% were diagnosed in women under the age of 40 (Table 16.13). For germ cell tumors, survival decreased as age increased (Table 16.13).

For germ cell tumors, 67.1% were diagnosed in stage I (Table 16.14). Table 16.14 and Figure 16.6 show stage at diagnosis for germ cell by years since diagnosis. After two years from diagnosis, stage III survival is slightly better than stage II survival. Survival rates level off for each stage but at different times. In stages I and IV, survival begins to level later than for stages II and III: 8 years for stage I, 2 years for stage II, 3 years for stage III, and 5 years for stage IV.

Figure 16.6: Germ Cell Cancer of the Ovary: Relative Survival Rate (%) by AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

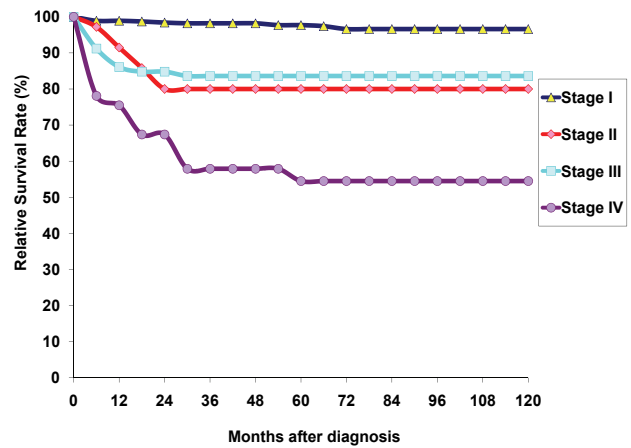


Table 16.14: Germ Cell Cancer of the Ovary: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001

AJCC Stage	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
Total	486	100.0	94.6	92.7	91.6	91.0	90.3	90.3
Stage I	326	67.1	98.9	98.4	98.2	97.7	96.6	96.6
Stage II	35	7.2	91.5	80.0	80.0	80.0	80.0	80.0
Stage III	79	16.3	86.1	84.8	83.6	83.6	83.6	83.6
Stage IV	36	7.4	75.5	67.4	57.9	54.5	54.5	54.5
Unknown/Unstaged	10	2.1	~	~	~	~	~	~

~ Statistic not displayed due to less than 25 cases.

Table 16.15: Germ Cell Cancer of the Ovary: By AJCC Stage (SEER modified 3rd edition): Surviving the Next Five Years From Diagnosis, 1, 2, 3, 4 and 5 Years After Diagnosis, Ages 20+, 12 SEER Areas, 1988-2001

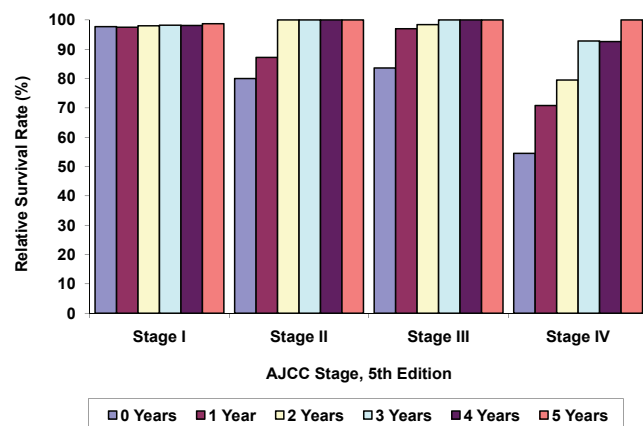
AJCC Stage	Surviving the Next 5 Years					
	From Diagnosis	After 1 Year	After 2 Years	After 3 Years	After 4 Years	After 5 Years
Total	91.0	95.0	97.2	98.2	98.1	99.1
Stage I	97.7	97.5	98.0	98.2	98.1	98.7
Stage II	80.0	87.2	100.0	100.0	100.0	100.0
Stage III	83.6	97.0	98.4	100.0	100.0	100.0
Stage IV	54.5	70.8	79.5	92.8	92.6	100.0
Unknown/Unstaged	~	~	~	~	~	~

~ Statistic not displayed due to less than 25 cases.

Conditional Survival

Five year relative survival, conditioned on years since diagnosis, is presented in Table 16.15 and Figure 16.7. For stages II-IV, the probability of surviving the next five years after diagnosis increases as time since diagnosis increases. This is most marked for the stage IV cases. For stage IV, five year survival from time of diagnosis is 55%. For stage IV, for those individuals who survive 1 year post diagnosis, 5-year survival increases to 71%. This increases to 94% for those individuals who survive 4 years and approximately 100% for those who have already survived 5 years. Five-year relative survival reaches approximately 100% for stage II patients who have already survived two years; for stage III patients who have already survived 3 years; and is over 98% for stage I patients who have already survived 2 years.

Figure 16.7: Germ Cell Cancer of the Ovary: 5-Year Relative Survival Rate (%), Conditioned on Years Since Diagnosis, By AJCC Stage (SEER modified 3rd edition), Ages 20+, 12 SEER Areas, 1988-2001



DISCUSSION

Survival rates were presented for three groups of ovarian cancer: non-borderline adenocarcinoma, borderline adenocarcinoma, and germ cell tumors. Women with cancer of the ovary have poorer survival than women with other gynecologic cancers. While overall 5-year relative survival is under 50% for adenocarcinoma of the ovary, the 5-year relative survival rates were better for stage I (89%), younger women (63%) and well-differentiated tumors (83%). For borderline tumors, survival rates were very high. Even the 10-year relative survival rate was over 95%. For germ cell tumors, a larger percentage (67.1%) were found as stage I at diagnosis which yielded a high overall 5-year relative survival rate, 91%.

REFERENCES

1. Percy, C., Van Holten, V., and Muir, C. International Classification of Diseases for Oncology--second edition. Geneva: World Health Organization, 1990.
2. Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin L, Parkin DM, Whelan S. International Classification of Diseases for Oncology--Third Edition. Geneva: World Health Organization, 2000.
3. Beahrs, OH, Henson DE, Hutter RVP, Myers MH (eds). AJCC Cancer Staging Manual, Third edition. American Joint Committee on Cancer. Philadelphia: Lippincott, 1988.